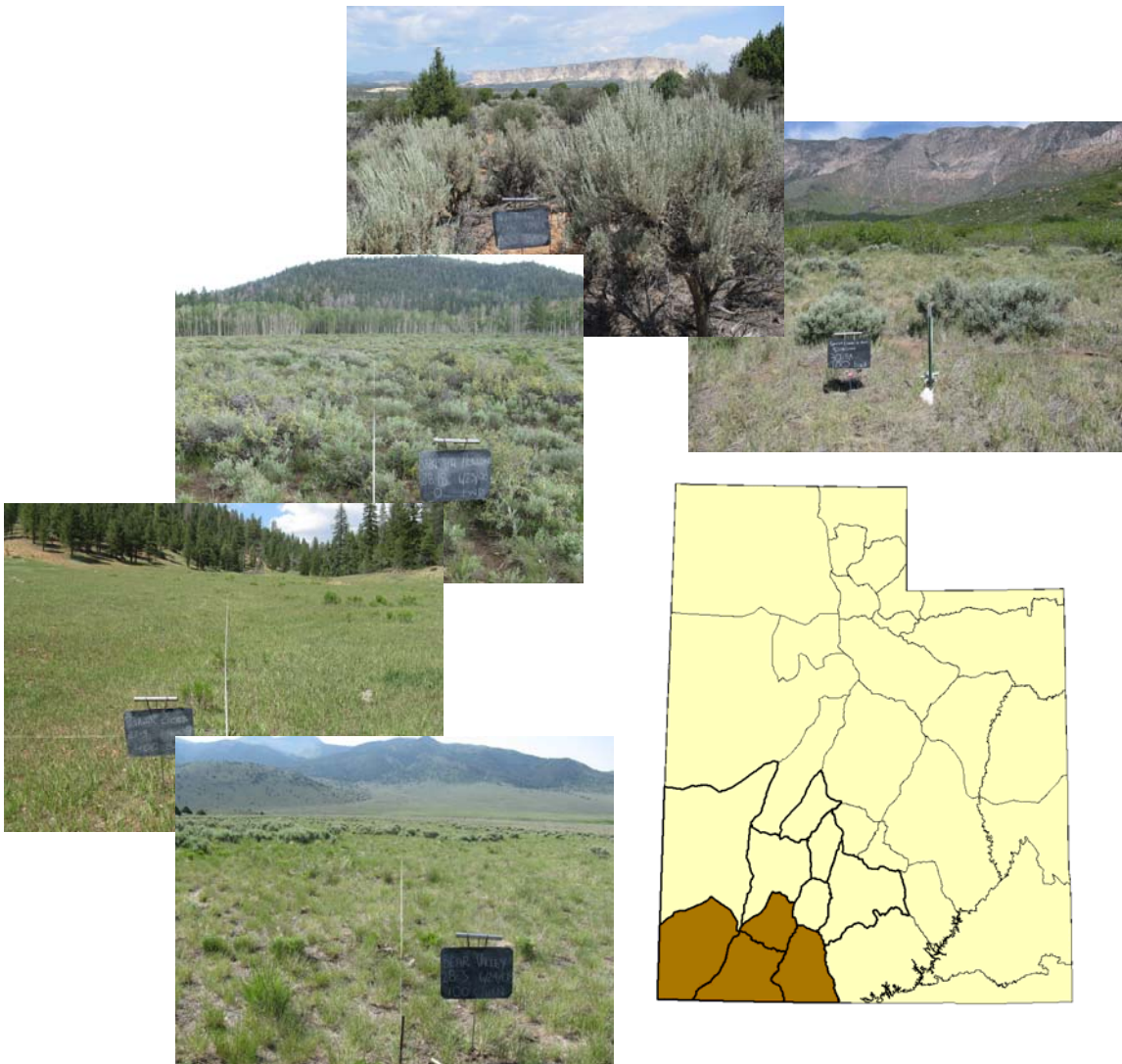


# UTAH BIG GAME RANGE TREND STUDIES 2008 Volume 2 Southern Region



**PUBLICATION NUMBER 10-02  
REPORT FOR FEDERAL AID PROJECT W-82-R-53**

**STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF WILDLIFE RESOURCES**

**UTAH BIG GAME  
RANGE TREND STUDIES  
2008 Volume 2**

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Performance Report for Federal Aid Project W-82-R-53

Publication No. 10-02

UTAH DEPARTMENT OF NATURAL RESOURCES  
Division of Wildlife Resources  
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## PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

### Need:

The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Division's big game management program. The health and vigor of big game populations are closely correlated to the quality and quantity of forage in key areas. The majority of the permanent range trend studies will be located on deer and elk winter ranges, however on certain management units, studies will be located on spring and/or summer ranges, if vegetation composition on these ranges is the limiting factor for big game populations. Range trend data are used by wildlife biologists for habitat improvement planning purposes, reviewing BLM and USFS allotment management plans, and as one of several sources of information for revising deer and elk herd unit management plans.

### Objective:

Monitor, evaluate, and report range trend at designated key areas throughout the state, and inform Division biologists, public land managers and private landowners of significant changes in plant community composition in these areas.

### Expected Results or Benefits:

Range trend studies in each region will be reread every five years, and vegetation condition and trend assessments will be made for key areas. DWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate the impact of land management programs on big game habitat. Annual reports will be readily available on the Division's website, on CDs, and in hard copies located in DWR regional offices, BLM and USFS offices, and public libraries. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give DWR biologists and public land managers additional information to address local resource management problems.

## REMARKS

The work completed during the 2008 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southern Region. Most trend studies surveyed in these management units were established in the 1980's with rereads at 5 year intervals.

The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies which add to the value of this interagency report:

### Bureau of Land Management

- Cedar City Field Office
- Grand Staircase-Escalante National Monument
- Kanab Field Office
- Fillmore Field Office
- Richfield Field Office
- St. George Field Office

### Dixie National Forest

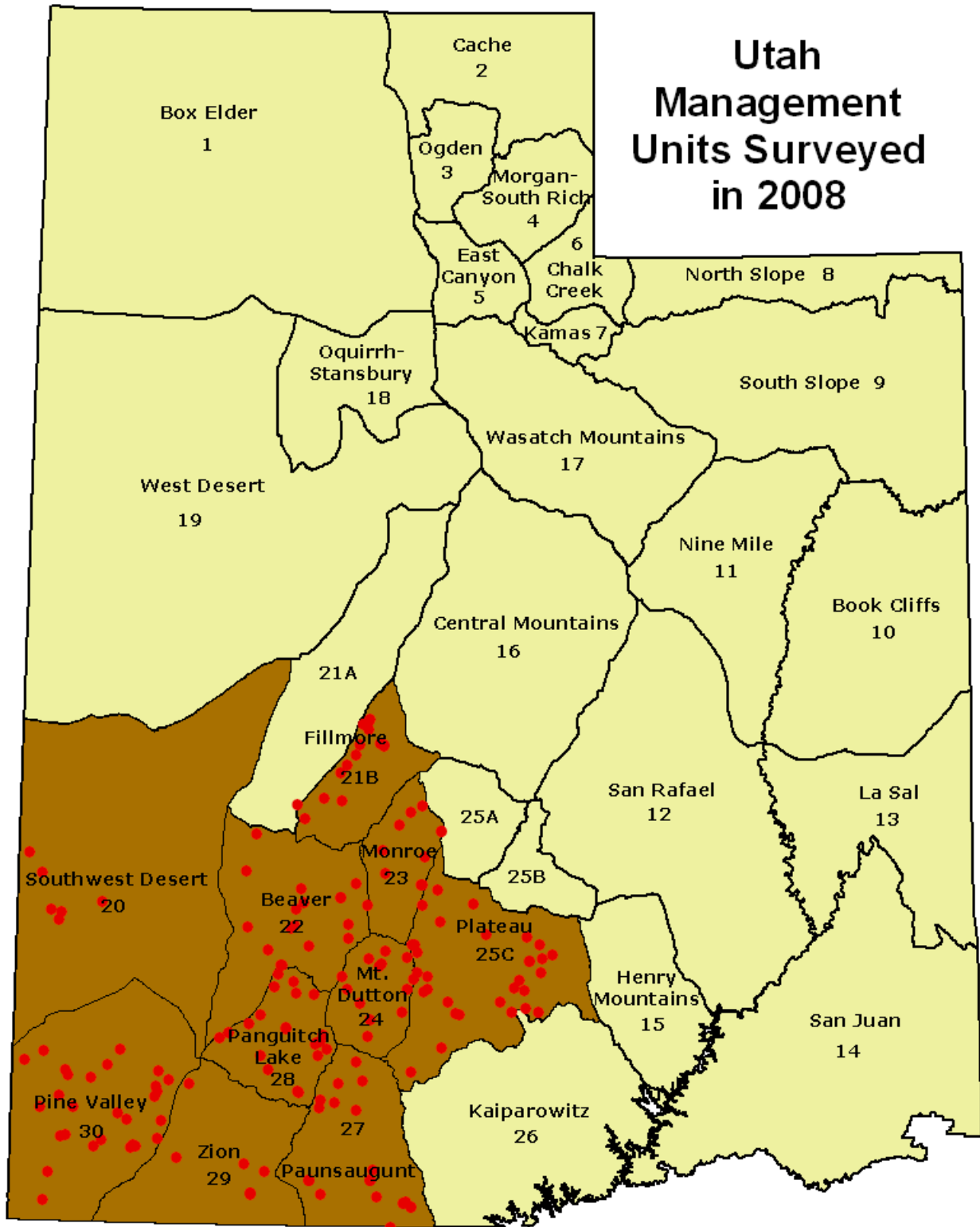
- Cedar City Ranger District
- Escalante Ranger District
- Pine Valley Ranger District
- Powell Ranger District
- Teasdale Ranger District

### Fishlake National Forest

- Beaver Ranger District
- Fillmore Ranger District
- Richfield Ranger District

Private landowners were cooperative in allowing access to study sites located on their land.

# Utah Management Units Surveyed in 2008



## RANGE TREND STUDY METHODS

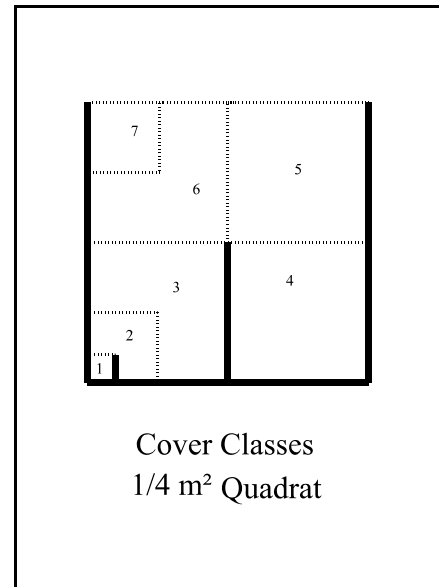
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be places where big game have demonstrated a definite pattern of use during normal climatic conditions over a long period of time. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by DWR, BLM, and USFS personnel. Often, range trend studies are established in conjunction with permanently marked pellet group transects. Once a “key” area has been selected, specific placement for sampling is determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. All sampling baselines are permanently marked by half-high steel fence posts. The first, or beginning baseline stake, is marked with a metal tag for proper identification of the transect.

### Vegetative composition

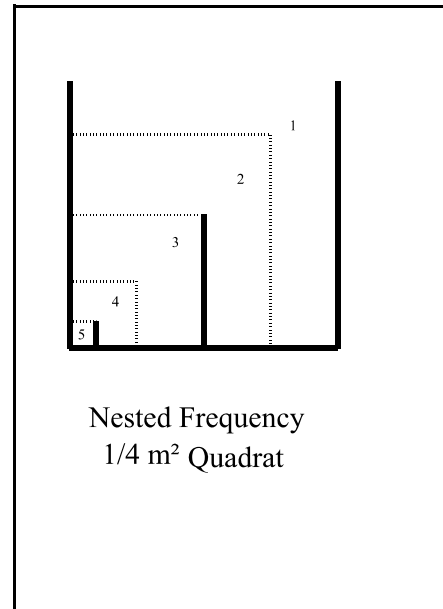
Determining vegetational characteristics for each “key” area is determined by setting up 5 consecutive 100 foot baseline transects in the area of interest. This 500 foot line is the baseline and one, 100 foot belt is placed perpendicular to each 100 foot section of the baseline at random foot marks and centered on the 50 foot mark. The beginning of each belt is marked by a rebar stake to ensure a more precise alignment of the originally sampled belt. A 1/4 m<sup>2</sup> quadrat is centered every 5 feet along the same side of the belt, starting at the 5 foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species.

Cover is determined using an ocular cover estimation procedure using 7 cover classes (Bailey and Poulton, 1968, Daubenmire 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100%. For example, to estimate vegetative cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the average for a given site.

Total canopy cover of shrubs or trees is estimated using the line-intercept method. The distance along each belt covered by a particular species of tree or shrub is divided by the total length of the line to give percent canopy cover. Prior to 2002, only canopy cover above eye level was estimated.



Nested frequency values for the quadrat range from 1-5 according to which area or sub-quadrat the plant species or cover type is rooted in. The notation for each sub-quadrat is as follows: 5 = 1% of the area, 4 = 5% of the area, 3 = 25% of the area, 2 = 50% of the area, and 1 = the remainder of the quadrat. Each time a particular plant species or cover type occurs within the quadrat, it is scored relative to which of the smallest nested quadrats it is rooted in (in the case of vegetation) or where it first occurs (for all other cover types). The highest possible score is 5 for each quadrat occurrence and 100 per belt, for a possible score of 500 for each species or cover type at a given site.



Higher nested frequency scores represent a higher abundance for that plant species or cover type. These summed values are used to help determine changes in trend and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Smith et al. 1987, Smith et al. 1986, Mosley et al. 1986). Plant cover and density values are not reliable indicators of trend for herbaceous species and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used by themselves and do not necessarily indicate changes in composition and/or distribution of key plant species.

Nested frequency and average percent cover data for individual grass and forb species are summarized in the “Herbaceous Trends” table. Nested frequency and average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground are summarized in the “Basic Cover” table.

Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100 foot belt. All shrubs rooted within each strip are counted and placed in the following five classes. (U.S. Department of Interior Bureau of Land Management 1996).

Seedling: Plants up to three years old which have become firmly established, usually less than 1/8-inch diameter.

Young: Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/5-inch diameter.

Mature: Complex branching, rounded growth form, larger size, seed is produced on healthy plants. Generally larger than 1/4-inch diameter.

Decadent: Plant, regardless of age, that is in a state of decline, usually evidenced by 25% or more dead branches.

Dead: A plant which is no longer living.



Shrubs are also rated according to their availability and the amount of use they display, and placed in one of 9 form classes.

1. All available, lightly hedged.
2. All available, moderately hedged.
3. All available, heavily hedged.
4. Largely available, lightly hedged.
5. Largely available, moderately hedged.
6. Largely available, heavily hedged.
7. Mostly unavailable.
8. Unavailable due to height.
9. Unavailable due to hedging.

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

Heavily hedged: Over 60 percent of twigs browsed. Degree of hedging is based on leader use over the past three years: current annual growth is not included.

Largely available: One-third to two-thirds of plant available to animal.

Mostly unavailable: Less than one-third of plant available to animal.

In classifying browse to a form class, unavailability may be the result of height, location, or density.

Shrubs are also rated on their health and placed into one of 4 vigor classes.

1. Normal and vigorous.
2. Insect infested or diseased.
3. Poor vigor - chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.
4. Dying - substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

In addition, each mature shrub species closest to every 10 foot mark along a sampling belt is measured to determine average height and crown. This allows a maximum sample of 50 plants per species to be measured at a given site depending on their respective densities. Annual leader growth is estimated for key browse species at each study site. This is done by measuring five leaders on the closest mature shrub in each quarter

(similar to point-center quarter method) from 3 stakes along the study site baseline (0', 200' and 400' stakes). These numbers are then averaged. Tree density is determined using the point-center quarter method at two hundred foot intervals along the baseline. Three hundred feet are added to the end of the transect so that five, 200 foot point-quarter centers can be read. This allows sampling trees on a much larger scale. The strip method that is used to estimate shrub density, can in most cases, effectively inventory seedling and young tree densities. However, the strip method is less effective at estimating densities of mature trees that are often widely disbursed.

Prior to 1992, shrub frequency was determined using the nested frequency method that was previously described. It was found that nested frequency of shrubs did not usually reflect accurate trends in shrub populations which had particularly low or high densities. Therefore, beginning in mid-1992, each 1/100th acre shrub strip is divided into 20, five foot segments. To give a more accurate measure of shrub frequency, presence or absence of shrub species is determined within these strip segments, and this measurement is termed strip frequency. For example, if a species was rooted in 25 of the 100 shrub strips, strip frequency for this species would be 25%. This larger sample will better reflect changing trends in shrub populations. This data along with shrub cover is recorded in the "Browse Trends" table.

### TREND DETERMINATION

The methods described above rely on relative and absolute measurements of plant composition as determined from the frequency, cover, and density data. In addition, estimates of plant vigor, average height and crown diameter, form class, and age class are utilized to characterize shrub populations. Particular attention is given to woody plants and their important role as indicators on critical winter ranges. A variety of parameters are used to help determine trend for key browse species through time. These include:

- 1) changes in density or number of plants/acre
- 2) proportion of decadent plants, and the percentage of decadent plants that are classified as dying
- 3) biotic potential or proportion of seedlings to the population
- 4) proportion of young plants in population (recruitment)
- 5) proportion of individuals moderately or heavily browsed
- 6) proportion of plants in poor vigor
- 7) changes in height and crown diameter measurements for mature age class
- 8) changes in browse species composition
- 9) strip frequency values
- 10) proportion of cover contributed by key species

Trends in herbaceous plants as a group or as a single "key" species can be determined by comparing the sum of nested frequency values between readings. Attention is also given to changes in species composition of grasses and forbs through time. A non-parametric statistical test (Friedman test which is analogous to analysis of variance) (Conover 1980) is conducted on nested frequencies of each species to determine significant changes at  $\alpha = .10$ . Beginning in 2002, an erosion condition class assessment adapted from the Bureau of Land Management is also completed on each study site to provide additional qualitative information on soil condition. On newly established studies, a more subjective or apparent assessment is made from qualitative comparisons.

The following tables and partial tables are taken from study number 23-1 to help illustrate some basic comparisons that can be made with the data. The "Herbaceous Trends" table summarizes average cover and nested frequency data for individual grass and forb species. The table contains all the grass and forb species that have been sampled on study 23-1. Readings prior to mid-1992 include only nested frequency data for *perennial* species. Beginning in mid-1992, all trend studies have data for perennial and annual species as well as cover estimates for individual species.

In the following example, grasses had a combined total cover value of 11.39% in 1998 and 7.08% in 2003. In 1985 and 1991, bluebunch wheatgrass (*Agropyron spicatum*) had a nested frequency value of 227 out of a possible nested frequency score of 400. By 1998, nested frequency declined to 183. The subscript letters indicate that the nested frequency value for *A. spicatum* between 1991 and 1998 declined significantly. Nested frequency declined to 160 in 2003, but the subscript letters indicate that this was not a significant change. Cover was estimated at 7.78% for *A. spicatum* in 1998 declining to 5.59% in 2003. Trend for this grass is down over the life of the transect due to a significant decline in sum of nested frequency since 1991.

HERBACEOUS TRENDS --

Management unit 23 , Study no: 1

| Type                        | Species                        | Nested Frequency |                  |                  |                  | Average Cover % |      |
|-----------------------------|--------------------------------|------------------|------------------|------------------|------------------|-----------------|------|
|                             |                                | '85              | '91              | '98              | '03              | '98             | '03  |
| G                           | <i>Agropyron spicatum</i>      | <sub>b</sub> 227 | <sub>b</sub> 227 | <sub>a</sub> 183 | <sub>a</sub> 160 | 7.78            | 5.59 |
| G                           | <i>Bromus tectorum</i> (a)     | -                | -                | <sub>b</sub> 42  | <sub>a</sub> 15  | .43             | .03  |
| G                           | <i>Oryzopsis hymenoides</i>    | 4                | 12               | 12               | 5                | .17             | .04  |
| G                           | <i>Poa fendleriana</i>         | <sub>a</sub> 6   | <sub>bc</sub> 36 | <sub>c</sub> 49  | <sub>ab</sub> 24 | .98             | .46  |
| G                           | <i>Poa secunda</i>             | <sub>a</sub> 3   | <sub>a</sub> 18  | <sub>b</sub> 94  | <sub>b</sub> 80  | 2.00            | .94  |
| G                           | <i>Sitanion hystrix</i>        | <sub>c</sub> 25  | <sub>bc</sub> 20 | <sub>ab</sub> 6  | <sub>a</sub> 2   | .01             | .01  |
| Total for Annual Grasses    |                                | 0                | 0                | 42               | 15               | 0.43            | 0.03 |
| Total for Perennial Grasses |                                | 265              | 313              | 344              | 271              | 10.95           | 7.05 |
| Total for Grasses           |                                | 265              | 313              | 386              | 286              | 11.39           | 7.08 |
| F                           | <i>Agoseris glauca</i>         | <sub>a</sub> -   | <sub>a</sub> 10  | <sub>ab</sub> 1  | <sub>a</sub> -   | .00             | -    |
| F                           | <i>Arabis</i> spp.             | <sub>a</sub> -   | <sub>b</sub> 18  | <sub>a</sub> 1   | <sub>a</sub> 1   | .00             | .00  |
| F                           | <i>Astragalus convallarius</i> | 2                | 4                | 6                | 6                | .15             | .10  |
| F                           | <i>Calochortus nuttallii</i>   | 4                | 8                | -                | -                | -               | -    |
| F                           | <i>Crepis acuminata</i>        | -                | 6                | 7                | -                | .06             | -    |
| F                           | <i>Eriogonum racemosum</i>     | -                | -                | 4                | -                | .03             | -    |
| F                           | <i>Eriogonum umbellatum</i>    | <sub>a</sub> -   | <sub>a</sub> 1   | <sub>b</sub> 9   | <sub>ab</sub> 5  | .16             | .07  |
| F                           | <i>Phlox austromontana</i>     | -                | 6                | 4                | 6                | .16             | .15  |
| F                           | <i>Physaria chambersii</i>     | 1                | 4                | -                | -                | -               | -    |
| F                           | <i>Phlox longifolia</i>        | <sub>a</sub> 8   | <sub>b</sub> 27  | <sub>a</sub> 16  | <sub>a</sub> 6   | .20             | .02  |
| Total for Annual Forbs      |                                | 0                | 0                | 0                | 0                | 0.00            | 0    |
| Total for Perennial Forbs   |                                | 15               | 84               | 48               | 24               | 0.83            | 0.35 |
| Total for Forbs             |                                | 15               | 84               | 48               | 24               | 0.83            | 0.35 |

Values with different subscript letters are significantly different at alpha = .10 (annuals excluded)

In 1985, perennial grasses had a sum of nested frequency value of 265. This value steadily increased to 313 in 1991 and 344 in 1998 before declining to 271 in 2003. These changes would indicate a slightly upward perennial grass trend from 1985 to 1998 and a stable trend overall for the life of the transect. The forb trend can be determined in a similar manner. The herbaceous understory trend is determined using both the grass and forb sum of nested frequency values. For example, total herbaceous cover was 12.23% in 1998 with grasses providing the bulk of the cover. Therefore, when determining herbaceous trend, the grass proportion

should be weighted more heavily than the forb proportion in this example.

The following “Browse Trends” table summarizes strip frequency and cover for all shrub species occurring on this site. All of the shrubs encountered at study number 23-1 are listed. For example, mountain big sagebrush (*Artemisia tridentata vaseyana*) had a strip frequency of 40 out of a possible 100 in 1998, declining to 26 in 2003. Average cover is determined using cover classes in conjunction with the 1/4m<sup>2</sup> quadrat and estimating the percent of the quadrat covered. In this case, mountain big sagebrush cover was estimated to be 2.54% in 1998, declining to only 0.76% in 2003.

BROWSE TRENDS --

Management unit 23 , Study no: 1

| Type             | Species                              | Strip Frequency |                       | Average Cover % |       |
|------------------|--------------------------------------|-----------------|-----------------------|-----------------|-------|
|                  |                                      | '98             | '03                   | '98             | '03   |
|                  |                                      | B               | <i>Artemisia nova</i> | 35              | 26    |
| B                | <i>Artemisia tridentata vaseyana</i> | 40              | 26                    | 2.54            | .76   |
| B                | <i>Gutierrezia sarothrae</i>         | 2               | 0                     | -               | -     |
| B                | <i>Juniperus osteosperma</i>         | 4               | 5                     | 5.51            | 9.29  |
| B                | <i>Opuntia spp.</i>                  | 1               | 2                     | .15             | -     |
| B                | <i>Pinus edulis</i>                  | 4               | 6                     | 5.99            | 8.81  |
| B                | <i>Purshia tridentata</i>            | 18              | 15                    | 3.20            | 4.31  |
| Total for Browse |                                      | 104             | 80                    | 19.63           | 25.58 |

To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100 foot belt. This data is reported in the “Canopy Cover, Line Intercept” table. For example, Utah juniper (*Juniperus osteosperma*) had an estimated average cover of 23.31% in 2003. Prior to 2002, only trees species were sampled in the line-intercept transect. Beginning in 2002, all woody species are included in the line-intercept transect and a canopy cover value for each is determined.

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 1

| Species                              | Percent Cover |       |
|--------------------------------------|---------------|-------|
|                                      | '98           | '03   |
| <i>Artemisia nova</i>                | -             | 1.85  |
| <i>Artemisia tridentata vaseyana</i> | -             | .55   |
| <i>Juniperus osteosperma</i>         | 7.19          | 23.31 |

Beginning in 2002, annual leader growth of the key browse species is measured to get an idea of shrub production and vigor. This data is displayed in the “Key Browse Annual Leader Growth” table. For example, annual leaders on bitterbrush (*Purshia tridentata*) averaged 4 inches in length while mountain big sagebrush leaders averaged only 1.1 inches in 2003.

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 23 , Study no: 1

| Species                       | Average leader growth (in) |
|-------------------------------|----------------------------|
|                               | '03                        |
| Artemisia tridentata vaseyana | 1.1                        |
| Purshia tridentata            | 4.0                        |

The following “Point-Quarter Tree Data” table displays tree density estimates using the point-center quarter method which better estimates density of widely disbursed trees than the shrub density strips. Average basal diameter is also listed in inches. Data from 2003 estimated 197 juniper and 119 pinyon trees/acre with average basal diameters of 7.0 inches and 5.3 inches respectively.

POINT-QUARTER TREE DATA --  
Management unit 23 , Study no: 1

| Species               | Trees per Acre |     | Average diameter (in) |     |
|-----------------------|----------------|-----|-----------------------|-----|
|                       | '98            | '03 | '98                   | '03 |
| Juniperus osteosperma | 213            | 197 | 8.8                   | 7.0 |
| Pinus edulis          | 115            | 119 | 4.8                   | 5.3 |

The “Basic Cover” table summarizes average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Average cover prior to mid-1992 adds up to only 100%, while cover with the current method (post mid-1992) estimates several layers of plant and ground cover and will usually exceed 100%. For vegetation cover, the previous method only determined basal vegetative cover (2.0 and 5.75), while the new method estimates the vertical projection of the crown, or aerial cover (30.04 and 32.5%). Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

BASIC COVER --  
Management unit 23 , Study no: 1

| Cover Type  | Average Cover % |       |       |       |
|-------------|-----------------|-------|-------|-------|
|             | '85             | '91   | '98   | '03   |
| Vegetation  | 2.00            | 5.75  | 30.04 | 32.50 |
| Rock        | 6.00            | 5.25  | 11.18 | 13.20 |
| Pavement    | 30.50           | 24.25 | 26.32 | 19.74 |
| Litter      | 46.50           | 46.50 | 42.49 | 37.44 |
| Cryptogams  | 5.00            | 3.00  | .93   | 3.45  |
| Bare Ground | 10.00           | 15.25 | 21.42 | 13.10 |

A summary of the soil data is found in the “Soil Analysis Data” table. Effective rooting depth is an average of 25 soil penetrometer readings, 5 of the deepest probes possible near each of the 5 baseline starting stakes. The effective rooting depth is a relative index that can be used for site comparisons with regard to individual species differences, site preferences, and abundance. Average soil temperature is taken from the deepest probe, one at each of the 5 baseline starting stakes. The temperature is listed in the table as the top measurement (e.g., 62.3°F), with the average depth (in inches) as the lower measurement (12.7). Average soil temperature is re-measured with each reading and the most current soil temperature and depth is listed in the

soil analysis table. Chemical and textural characteristics are also listed and were determined by laboratory analysis of a composite soil sample taken near each of the 5 baseline starting stakes.

SOIL ANALYSIS DATA --

Management unit 23, Study # 01, Study Name: Bear Ridge

| Effective rooting depth (in) | Temp °F (depth) | pH  | % sand | % silt | % clay | % OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|------|-------|-------|------|
| 11.2                         | 62.3 (12.7)     | 7.3 | 40.0   | 33.4   | 26.6   | 3.4  | 9.0   | 57.6  | 0.5  |

The descriptive terms used for ranges in pH are as follows:

|                        |         |
|------------------------|---------|
| Ultra acid             | < 3.5   |
| Extremely acid         | 3.5-4.4 |
| Very strongly acid     | 4.5-5.0 |
| Strongly acid          | 5.1-5.5 |
| Moderately acid        | 5.6-6.0 |
| Slightly acid          | 6.1-6.5 |
| Neutral                | 6.6-7.3 |
| Slightly alkaline      | 7.4-7.8 |
| Moderately alkaline    | 7.9-8.4 |
| Strongly alkaline      | 8.5-9.0 |
| Very strongly alkaline | > 9.1   |

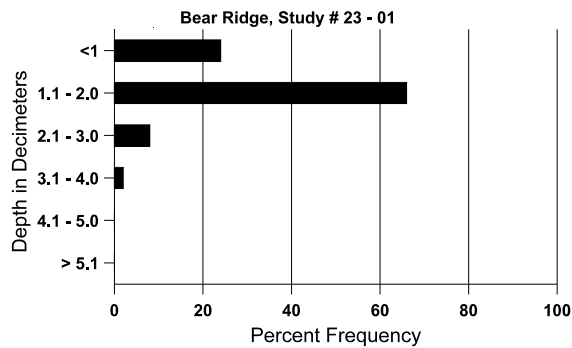
Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 6 ppm and 60 ppm, respectively may have limited availability for plant growth and development.

The electrical conductivity of the soil is reported in decisiemens per meter (dS/m). Electrical conductivity is related to the amount of salts more soluble than gypsum in the soil. The following classes can be used as a reference.

|                      |      |
|----------------------|------|
| Non saline           | 0-2  |
| Very slightly saline | 2-4  |
| Slightly saline      | 4-8  |
| Moderately saline    | 8-16 |
| Strongly saline      | >16  |

To determine how rock is distributed throughout the upper soil profile, a stoniness index is determined for each study site. Depth to the nearest rock is estimated on the first 10 feet (at one-foot intervals) along each of the 5 baselines, which allows 50 measurements. These data are then analyzed for each of the 5 incremental decimeter measurements, making it possible to visually determine the proportion (relative percent of rock at each depth) of rock from <1 decimeter to >5 decimeters. In the following example, most of the rock in the soil profile (~65%) was encountered in the 1 to 2 decimeter (4 to 8 inch) depth range. The distribution of rock in the soil profile can be an important factor for what is growing on the site.

## Stoniness Index



The “Pellet Group Data” table summarizes the frequency of animal pellets sampled within the 100 quadrats placed along the sampling belts as well as data from a pellet group transect read parallel to the study site baseline. Quadrat frequency of wildlife and livestock droppings is included in reports done prior to mid-1992. For example in 1998, rabbit pellets were found in 25% of the quadrats placed on study 23-1, increasing to 32% in 2003. Quadrat frequency of rabbit or big game pellets indicate a relative amount of use by that particular animal. This data can help characterize changes in wildlife use patterns on the site.

### PELLET GROUP DATA --

Management unit 23 , Study no: 1

| Type   | Quadrat Frequency |     | Days use/acre (ha) |          |
|--------|-------------------|-----|--------------------|----------|
|        | '98               | '03 | '98                | '03      |
| Rabbit | 25                | 32  | -                  | -        |
| Elk    | 4                 | -   | 7 (17)             | 1 (3)    |
| Deer   | 36                | 20  | 51 (125)           | 54 (134) |

It was determined that additional information on pellet groups was necessary. Therefore, a pellet group transect is now sampled in conjunction with the vegetative transects. The pellet group transect utilizes 50, 100ft<sup>2</sup> circular plots which are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetative transect which runs 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre. In the above example, deer days use/acre was estimated at 51 in 1998 increasing slightly to 54 in 2003. If a trend study needs to be read annually and more precision is required, the pellet group transect is marked permanently (rebar) and the pellet groups within the circular plots are removed or marked after being counted.

On the following page is a section of a “Browse Characteristics” table which summarizes characteristics of the shrub community on study 23-1. Only mountain big sagebrush is included in this example. The sagebrush population is characterized by age class, vigor, utilization, and average height and crown for mature plants. Total density in plants/acre for mountain big sagebrush, excluding seedlings, was 1,400 in 1985, 1,065 in 1991, 1,100 in 1998, and 840 plants/acre in 2003. Seedlings are excluded from the population estimate because with summer drought, many will die by late fall causing great fluctuations in population estimates between sampling dates. Since mid-1992, a larger shrub sample (more than three times larger) is used to better characterize the shrub populations. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that characteristically are clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate

shrub populations. Other characteristics like percent decadence, percent of the population displaying poor vigor, percent heavy hedging, young recruitment, etc. should be given more weight in determining shrub trend when comparing survey years where sample sizes are different.

**BROWSE CHARACTERISTICS --**

Management unit 23 , Study no: 1

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |              |                           |
| 85                                   | <b>1400</b>                           | 266                                      | 200   | 400    | 800      | -    | 67          | 24      | 57         | 14           | 13/15                     |
| 91                                   | <b>1065</b>                           | 333                                      | 333   | 66     | 666      | -    | 19          | 6       | 63         | 38           | 12/13                     |
| 98                                   | <b>1100</b>                           | -  | 100   | 260    | 740      | 2300 | 56          | 2       | 67         | 40           | 15/23                     |
| 03                                   | <b>840</b>                            | -  | 120   | 140    | 580      | 1740 | 29          | 0       | 69         | 40           | 14/21                     |

The data on mountain big sagebrush shows the proportion of decadent shrubs in the population has steadily increased from 57% in 1985 to 69% by 2003. More seedlings were encountered in 1985 and 1991, with slight fluctuations in the number of young plants. Dead plants, included in sampling after 1992, are abundant at 2,300 plants/acre in 1998 and 1,740 in 2003, and outnumber live plants by a ratio of 2:1 in both years. The percentage of plants displaying poor vigor has increased from 14% in 1985 to 40% in 1998 and 2003. The proportion of shrubs displaying heavy hedging declined from 24% in 1985, to 6% in 1991, and 0% by 2003. The proportion of shrubs displaying moderate use has ranged from 67% in 1985 to 19% in 1991. The average height of mature sagebrush has remained similar in all readings and averaged 14 inches in 2003. Average crown diameter has fluctuated from 13 inches in 1991 to 23 inches in 1998.

Considering all these factors, trend for sagebrush in 2003 is slightly downward due to a decline in density and increased percent decadence. Also, the number of dead plants encountered is more than double the number of live plants inventoried. No seedlings were encountered in 1998 or 2003 and young plants are only moderately abundant.

Management background information, photographs, and knowledgeable plant identification add to the database for each site. Management and background information for each site is obtained from the administering agency. Permanently located photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Species identification mostly follows "A Utah Flora" (Welsh et al. 2003). In some cases, most notably *Agropyron* and *Purshia*, the species names used by the Range Trend Study Plant Species List (Giunta 1983) and the Intermountain Flora (Cronquist et al. 1977) are retained to maintain continuity and alleviate confusion with earlier published reports.



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- <sup>2</sup>U.S. Department of Interior Bureau of Land Management. 1996. *Sampling vegetation attributes, Interagency Technical Reference, BLM/RS/ST-96/002+1730.*
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## REPORT FORMAT

An introductory segment at the beginning of each wildlife management unit categorizes the trend studies and provide references to further information on winter range limits, land ownership patterns, livestock management practices, and management unit objectives.

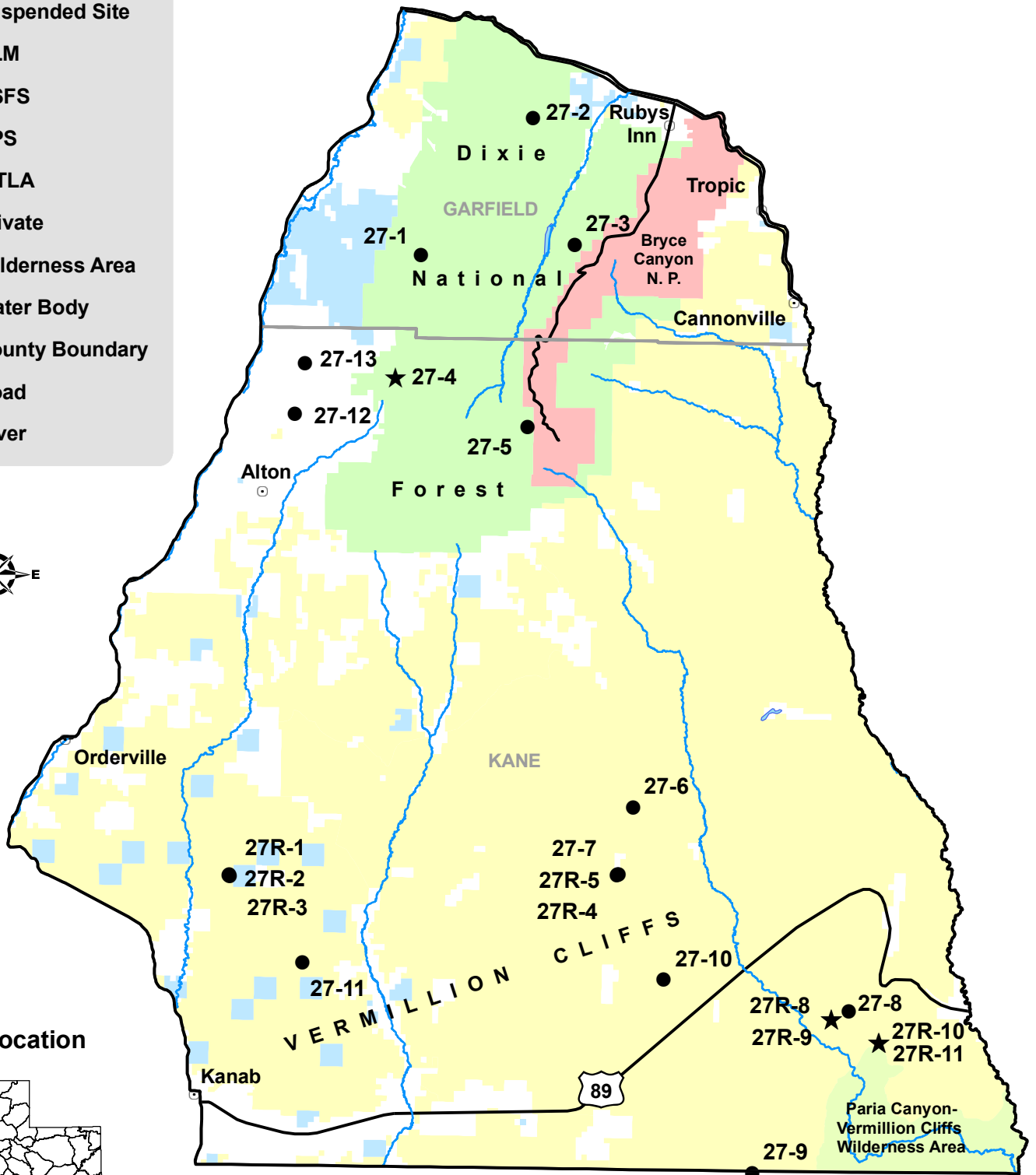
The name of the site and directions for locating the site are given on the location page. Also included on this page are the vegetation type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T).

A discussion of the study site includes descriptions of the site's physical characteristics (elevation, slope, aspect), soil, ground cover, vegetative community, and species composition. The trend assessment is based upon the comparison of the recent year and the previous years data. Additional assessment is made by comparing photographs from year to year.

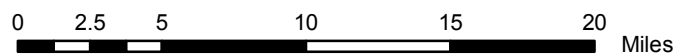
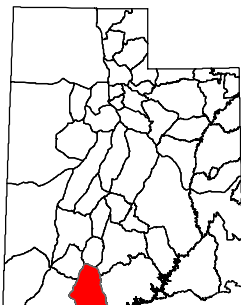
Tables with the compiled data follow the study discussions. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization. A nonparametric statistical analysis, the Friedman test, is performed on the nested frequency values between years. This analysis indicates significance levels between species over time at  $\alpha = 0.10$ . Significant changes are indicated in the herbaceous trends table with subscript letters.

Summaries and evaluations at the end of each management unit address range trends in these key areas. This report will serve to identify and verify changes that are occurring on key areas for big game.

# Management Unit 27



Unit Location



## WILDLIFE MANAGEMENT UNIT 27 - PAUNSAUGUNT

### Boundary Description

**Kane and Garfield counties** - Boundary begins at highway US-89A and the Utah-Arizona state line; then north on US-89A to Highway US-89; then north on US-89 to Highway SR-12; then east on SR-12 to the Paria River; then south along the Paria River to the Arizona-Utah state line; then west along this state line to US-89A and beginning point.

### Winter Range Description

The Paunsaugunt wildlife management unit encompasses approximately 280,471 acres of summer range and 205,284 acres of winter range for deer, of which only 26% and 7%, respectively, occurs on private land. The vast majority of the winter range in the unit (85%) is managed by the Bureau of Land Management, while most of the summer range falls under Forest Service administration (40%), private land holdings (26%), and the Bureau of Land Management (25%). The Paunsaugunt Plateau provides the bulk of the summer range in the unit with an average elevation of 9,000 feet. The southern rim of the plateau is delineated by the Pink Cliffs of Bryce Canyon National Park and the Sunset Cliffs to the west. Terrain of the transitional and/or winter range is characterized by gently sloping terraces interspersed by extensive cliff formations. The Skutumpah Terrace lies between the Pink Cliffs and White Cliffs; the Wygaret Terrace, Nephi Pasture, and No Man's Mesa lie between the White and Vermillion Cliffs. The bulk of the winter range is found on the Wygaret Terrace.

### Key Areas

The key areas that have been identified on the summer range are the mixed mountain brush community in the upper reaches of Proctor Canyon, a high elevation black sagebrush-grass community between Ahlstrom Hollow and Johnson Bench, the ponderosa pine type on Whiteman Bench, the conifer clear-cut with its associated aspen resurgence below the Sunset Cliffs near Sand Pass, and the grass meadow type in Podunk Creek. Three studies were established in 1987 on deer winter range which are all on BLM land. A basin big sagebrush community is the dominant vegetation type on the two Nephi Pasture sites, and black sagebrush (*Artemisia nova*) predominates on the Five Mile Mountain study site. An additional five study sites were established in 1997 to include important areas previously missed by trend studies. These include critical winter ranges on the south end of the unit on Buckskin Mountain, Telegraph Flat, and Crocodile. Two additional sites at Moon's Landing and Heaton, on the west side of the unit, sample mountain brush and sagebrush/bitterbrush transitional ranges at around 8,000 feet. In 1998, six trend studies were established at several exclosures in the unit to determine differences in grazing treatments. These studies are found at the exclosure complexes in Nephi Pasture and John R. Flat. Both of these areas are important deer wintering areas. The three John R. Flat exclosure studies were suspended in 2008.

Trend Study 27-1-08

Study site name: Proctor Canyon.

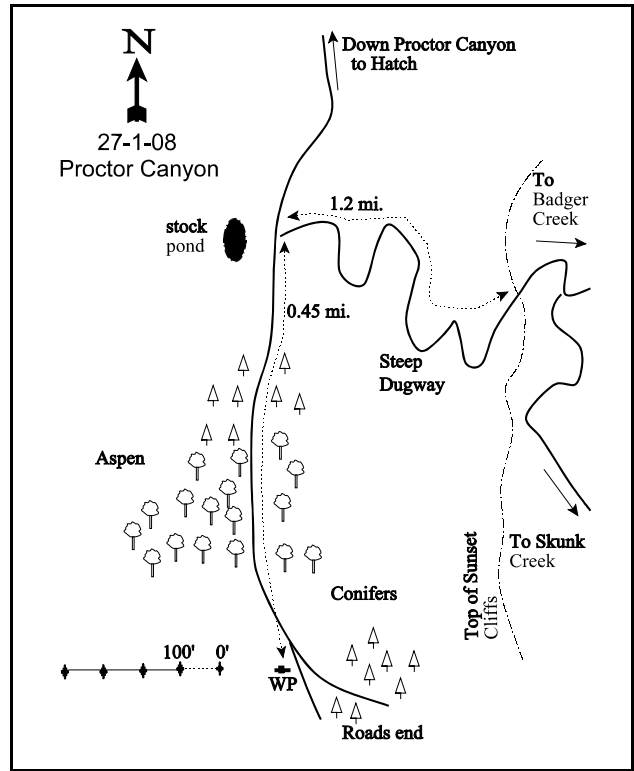
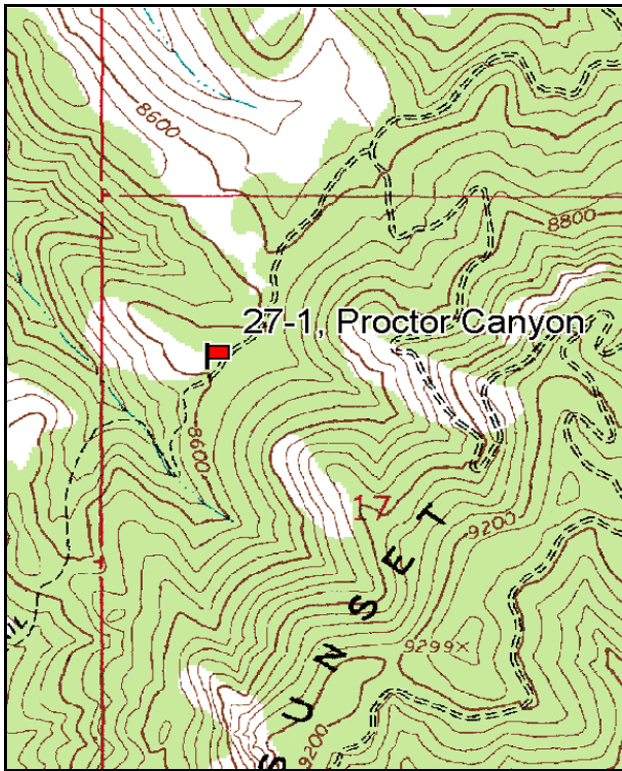
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 297 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (95ft), line 3 (59ft), line 4 (34ft; only 50 ft long). No rebar.

LOCATION DESCRIPTION

At the south end of Tropic Reservoir, turn west off the East Fork Sevier Road and proceed up Badger Creek 2.45 miles. Keep left at the fork and continue towards Proctor Canyon 3.5 miles to a fork at the top of the mountain. Go right towards Hatch for 1.2 miles, down a narrow, rocky dugway, to a fork in the aspens. Turn hard left towards Big Hollow/Camp Eli, and go 0.45 miles to a clearing and the witness post. The frequency baseline starts near the top of the hill and runs west-northwest. The trend study is marked by 2 foot tall green fence posts. The 0-foot baseline stake is 50 west of the witness post and is marked with a red browse tag #7161.



Map Name: Tropic Reservoir

Diagrammatic Sketch

Township 37S, Range 4 1/2W, Section 17

GPS: NAD 83, UTM 12S 380077 E, 4161288 N

## DISCUSSION

### Proctor Canyon - Trend Study No. 27-1

#### Study Information

This study is located on big game summer range on the west side of the Paunsaugunt Plateau below the Sunset Cliffs [elevation: 8,600 feet (2,621 m), slope: 1%-7%, aspect: northwest]. The small open ridge top where the study is located is a mixed mountain brush community surrounded by dense conifer forest and aspen (*Populus tremuloides*) stands. It is representative of larger, but more inaccessible, open, sagebrush ridges to the northwest. One-half mile to the north, in the same cattle allotment, is a seeded area and stock pond. Deer sign, consisting of pellet groups and antler drops, was noted in 1992, along with a few elk pellet groups. Quadrat frequency of deer pellet groups increased by nearly two-fold in 1997, while elk pellet group frequency remained at similar but low levels. Recent livestock use was also noted in 1997. Pellet group transect data estimated deer use to be heavy in 2003 (49 ddu/acre:121 ddu/ha) and very heavy in 2008 (78 ddu/acre:193 ddu/ha). Elk use was estimated to be minimal in both 2003 and 2008 (2 edu/acre:5 edu/ha). Cattle use was estimated to be light in 2003 (8 cdu/acre:20 cdu/ha) and no cattle patties were encountered in 2008.

#### Soil

The soil on the ridge is fairly deep with an effective rooting depth estimated at 14 inches. It is a light colored loamy sand with a neutral pH (7.1). Phosphorus is low at 8 ppm, when values between 6-11 ppm may have marginal availability for plant growth and development (Tiedemann and Lopez 2004). Organic matter is also relatively low at 1.5%. Relative combined vegetation and litter cover was high at 81%-86% from 1992 to 2008. Relative bare ground cover has been moderate at 12%-18% from 1992 to 2008. The road and steeper side hills show evidence of gullying and other surface erosion features. The erosion condition rating was classified as stable in 2003 and 2008.

#### Browse

The browse composition is diverse with 14 shrub species being sampled on the site. The most abundant key browse species are bitterbrush (*Purshia tridentata*) and black sagebrush (*Artemisia nova*) which account for over half of the total browse cover. Serviceberry (*Amelanchier utahensis*) and squaw currant (*Ribes cereum* ssp. *inebrians*) are also prominent due to their larger size. At the edge of the aspen and conifer stands, young ponderosa pine (*Pinus ponderosa*) and Rocky Mountain juniper (*Juniperus scopulorum*) are abundant. Of the 14 browse species encountered on the transect, serviceberry and bitterbrush provide the bulk of the forage utilized by big game, with black sagebrush also providing some. Both bitterbrush and serviceberry have been moderately to heavily hedged in all readings, and black sagebrush showed moderate to heavy use in 1987 and moderate use in 2008. In 1987 and 1992, the serviceberry population consisted of a high proportion of plants having poor vigor at 43% and 94%, respectively. The shrubs were apparently suffering from Cedar-apple rust. During the 1997, 2003, and 2008 surveys, serviceberry vigor was normal on most plants. Bitterbrush and black sagebrush have maintained normal vigor in all readings. Serviceberry and black sagebrush have had moderate to high recruitment by young plants in all surveys. Bitterbrush recruitment was moderately high in 1987 and 1992, fair in 1997, low in 2003, and there was no new recruitment in 2008. All three of these key species have had low decadence rates in all surveys, except for black sagebrush in 1987 when decadence was estimated at 36%. Serviceberry and bitterbrush leaders averaged around 3.5 and 2.5 inches of annual growth, respectively, for both the 2003 and 2008 readings.

It appears that during the 1987 reading there was trouble identifying the different rabbitbrush species. In 1992, the majority of the rabbitbrush was classified as stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and dwarf rabbitbrush (*Chrysothamnus depressus*), with lesser amounts of Parry rabbitbrush (*Chrysothamnus parryi* ssp. *attenuatus*). These three species combined for an estimated density of 8,520 plants/acre in 1992, 59% of which was stickyleaf low rabbitbrush. In 1997, all of the rabbitbrush species showed population declines. In 2003, dwarf rabbitbrush had a 64% density increase with Parry and low

rabbitbrushes slightly increased in density. In 2008, the density of dwarf and Parry rabbitbrushes decreased slightly, and low rabbitbrush density stayed relatively constant.

#### Herbaceous Understory

Complementing the diverse shrub overstory is a wide variety of herbaceous species. Eleven perennial grass species have been sampled on the transect with the most common being Kentucky bluegrass (*Poa pratensis*), mutton bluegrass (*Poa fendleriana*), prairie junegrass (*Koeleria cristata*), Letterman needlegrass (*Stipa lettermani*), needle-and-thread grass (*Stipa comata*), and slender wheatgrass (*Agropyron trachycaulum*). Total grass production was poor in 1997, 2003, and 2008 with average cover values between 8%-10%. Total grass cover was much higher in 1992 at nearly 19%. Forty-six species of forbs have been sampled at least once on the transect. Redroot eriogonum (*Eriogonum racemosum*), dusty penstemon (*Penstemon comarrhenus*), Pacific aster (*Aster chilensis*), and silverweed cinquefoil (*Potentilla concinna*) seem to be the preferred forb species. Although highly diverse, most of the forb species are infrequent. Grasses accounted for 30% of the total vegetation cover on the site in 1992, but only about 15% in 1997, 2003, and 2008. Average forb cover has declined as well.

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Density differences may be related to the larger sample area used in 1992, therefore, trend for browse was determined using other parameters. Vigor is good on all species except serviceberry which is suffering from Cedar-apple rust. Decadence of black sagebrush has declined from 36% in 1987 to 11%. Age class analysis indicates that the key species serviceberry, black sagebrush, and bitterbrush have healthy populations. The abundance of the less desirable dwarf, Parry, and stickyleaf low rabbitbrush is a concern on this site. Continued increases in these shrubs could come at the expense of the more desirable shrub species. Trend for the grasses is slightly up with a slight increase in the sum of nested frequency of perennial grasses. Trend for forbs is slightly down with a slight decrease in the sum of nested frequency of perennial forbs.

browse - stable (0)

grass - slightly up (+1)

forb - slightly down (-1)

#### 1997 TREND ASSESSMENT

Trend for the key browse species, serviceberry, black sagebrush and bitterbrush is slightly down. Density of serviceberry has declined by 52% since 1992 to 480 plants/acre. The number of mature serviceberry plants increased slightly while the proportion of young plants declined from 62% in 1992 to 17%. Black sagebrush declined 16% in population density since 1992 with a similar decline in young plants and an increase in decadence. Bitterbrush density has declined 51% since 1992 and young plants dropped from 740 plants/acre to 140 plants/acre. Decadence in bitterbrush is still low, however, and the current number of seedlings and young appear to be adequate to maintain the population. On the beneficial side, the combined density of the less desirable dwarf, Parry and stickyleaf low rabbitbrush declined from 8,520 plants/acre in 1992 to 4,720 plants/acre. Rabbitbrush populations are mostly mature with few seedlings or young. Trend for the grasses is down. Sum of nested frequency of perennial grasses declined and production of perennial grasses decreased from nearly 19% of total cover in 1992 to just over 8%. Composition of the grasses is also changing on the site. Needle-and-thread grass along with Kentucky bluegrass have increased significantly in nested frequency since 1992. Currently, these two species account for 65% of the total grass cover. Slender wheatgrass, Prairie Junegrass, and Letterman needlegrass have all declined significantly. The trend for forbs is down, as well. Sum of nested frequency of perennial forbs decreased and production of perennial forbs decreased from 11% of total cover in 1992 to just over 5%. Some of the common forb species on the site, Arizona thistle (*Cirsium arizonicum*), Pacific aster, redroot eriogonum, longleaf phlox (*Phlox longifolia*), and silverweed cinquefoil, are all weedy increasers.

browse - slightly down (-1)

grass - down (-2)

forb - down (-2)

2003 TREND ASSESSMENT

Trend for browse is stable. The key species have low decadence, generally good vigor, and consistent (serviceberry) or increasing (black sagebrush and bitterbrush) population densities. Recruitment of young plants was consistent from 1997 for serviceberry and increased in the black sagebrush population. Bitterbrush had lower recruitment of young plants compared to 1997. Dwarf rabbitbrush increased by nearly three-fold in total density, but the other two rabbitbrush species remained stable. Trend for the grasses is slightly down. Sum of nested frequency values of perennial grasses had a large decline, but cover of perennial grasses increased slightly. The trend for forbs is down. Sum of nested frequency for perennial forbs declined 45% since 1997.

browse - stable (0)                      grass - slightly down (-1)                      forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable. The density of the primary browse species, serviceberry, black sagebrush, and bitterbrush, were relatively consistent. Recruitment of young plants was good for serviceberry and black sagebrush, but there were no young bitterbrush plants sampled. Vigor and decadence remain good in all three species populations. The trend for grasses is stable. The sum of nested frequency of perennial grasses and production of perennial grasses remained relatively constant. Composition of grasses shifted slightly with a significant decrease in frequency of needle-and-thread grass and a significant increase in Kentucky bluegrass and bluebunch wheatgrass (*Agropyron spicatum*) frequency. The trend for forbs is up. Sum of nested frequency of perennial forbs greatly increased and production increased to nearly 6% of total cover.

browse - stable (0)                      grass - stable (0)                      forb - up (+2)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 1

| T<br>y<br>p<br>e            | Species                       | Nested Frequency |                   |                  |                  |                   | Average Cover % |      |      |      |
|-----------------------------|-------------------------------|------------------|-------------------|------------------|------------------|-------------------|-----------------|------|------|------|
|                             |                               | '87              | '92               | '97              | '03              | '08               | '92             | '97  | '03  | '08  |
| G                           | <i>Agropyron spicatum</i>     | <sub>ab</sub> 6  | <sub>b</sub> 25   | <sub>b</sub> 27  | <sub>a</sub> -   | <sub>b</sub> 22   | .16             | .07  | -    | .34  |
| G                           | <i>Agropyron trachycaulum</i> | <sub>c</sub> 185 | <sub>b</sub> 112  | <sub>a</sub> 40  | <sub>a</sub> 49  | <sub>a</sub> 64   | 1.71            | .13  | .62  | .81  |
| G                           | <i>Bouteloua gracilis</i>     | <sub>b</sub> 34  | <sub>a</sub> 15   | <sub>ab</sub> 13 | <sub>a</sub> 3   | <sub>a</sub> 4    | .36             | .15  | .03  | .03  |
| G                           | <i>Bromus anomalus</i>        | <sub>a</sub> 8   | <sub>b</sub> 39   | <sub>a</sub> 1   | <sub>a</sub> -   | <sub>a</sub> 3    | .75             | .00  | .00  | .03  |
| G                           | <i>Carex sp.</i>              | <sub>b</sub> 64  | <sub>a</sub> 24   | <sub>a</sub> 11  | <sub>a</sub> 6   | <sub>a</sub> 10   | .87             | .10  | .09  | .19  |
| G                           | <i>Koeleria cristata</i>      | <sub>a</sub> 54  | <sub>c</sub> 144  | <sub>ab</sub> 78 | <sub>ab</sub> 72 | <sub>bc</sub> 109 | 2.99            | .61  | 1.11 | 1.67 |
| G                           | <i>Poa fendleriana</i>        | <sub>a</sub> 88  | <sub>b</sub> 78   | <sub>ab</sub> 45 | <sub>b</sub> 72  | <sub>b</sub> 72   | 2.52            | .54  | 1.14 | 1.52 |
| G                           | <i>Poa pratensis</i>          | <sub>a</sub> -   | <sub>b</sub> 39   | <sub>c</sub> 101 | <sub>b</sub> 39  | <sub>c</sub> 83   | 2.99            | 2.25 | 1.68 | 1.83 |
| G                           | <i>Stipa columbiana</i>       | <sub>a</sub> -   | <sub>a</sub> 1    | <sub>b</sub> 14  | <sub>ab</sub> 8  | <sub>a</sub> 1    | .03             | .08  | .04  | .00  |
| G                           | <i>Stipa comata</i>           | <sub>a</sub> 17  | <sub>b</sub> 96   | <sub>b</sub> 124 | <sub>b</sub> 97  | <sub>a</sub> 42   | 3.22            | 3.13 | 3.26 | 1.04 |
| G                           | <i>Stipa lettermani</i>       | <sub>b</sub> 133 | <sub>ab</sub> 115 | <sub>a</sub> 83  | <sub>a</sub> 91  | <sub>a</sub> 75   | 2.85            | 1.20 | 1.12 | 2.04 |
| Total for Annual Grasses    |                               | 0                | 0                 | 0                | 0                | 0                 | 0               | 0    | 0    | 0    |
| Total for Perennial Grasses |                               | 589              | 688               | 537              | 437              | 485               | 18.50           | 8.28 | 9.11 | 9.55 |
| Total for Grasses           |                               | 589              | 688               | 537              | 437              | 485               | 18.50           | 8.28 | 9.11 | 9.55 |
| F                           | <i>Achillea millefolium</i>   | <sub>b</sub> 74  | <sub>ab</sub> 40  | <sub>b</sub> 55  | <sub>a</sub> 20  | <sub>ab</sub> 41  | .82             | .58  | .07  | .46  |



| Type | Species                              | Nested Frequency |                  |                  |                 |                  | Average Cover % |      |     |     |
|------|--------------------------------------|------------------|------------------|------------------|-----------------|------------------|-----------------|------|-----|-----|
|      |                                      | '87              | '92              | '97              | '03             | '08              | '92             | '97  | '03 | '08 |
| F    | <i>Agoseris glauca</i>               | a-               | a-               | a-               | ab <sup>5</sup> | b <sup>11</sup>  | -               | -    | .04 | .08 |
| F    | <i>Alyssum alyssoides</i> (a)        | -                | -                | -                | 6               | 3                | -               | -    | .01 | .00 |
| F    | <i>Antennaria rosea</i>              | -                | 3                | 3                | -               | 5                | .15             | .15  | -   | .03 |
| F    | <i>Androsace septentrionalis</i> (a) | -                | 8                | 2                | 5               | 7                | .02             | .00  | .03 | .01 |
| F    | <i>Arabis</i> sp.                    | -                | 1                | 2                | -               | 1                | .00             | .00  | -   | .00 |
| F    | <i>Artemisia dracunculus</i>         | b <sup>40</sup>  | b <sup>33</sup>  | ab <sup>23</sup> | a <sup>4</sup>  | a-               | 1.12            | .66  | .09 | -   |
| F    | <i>Artemisia ludoviciana</i>         | b <sup>15</sup>  | ab <sup>7</sup>  | ab <sup>6</sup>  | a-              | a-               | .06             | .06  | -   | -   |
| F    | <i>Aster chilensis</i>               | c <sup>95</sup>  | bc <sup>64</sup> | b <sup>43</sup>  | a <sup>13</sup> | a <sup>6</sup>   | .67             | .21  | .04 | .03 |
| F    | <i>Astragalus humistratus</i>        | ab <sup>16</sup> | b <sup>29</sup>  | b <sup>28</sup>  | a <sup>1</sup>  | ab <sup>15</sup> | .42             | .22  | .00 | .33 |
| F    | <i>Astragalus tenellus</i>           | b <sup>27</sup>  | a <sup>5</sup>   | a <sup>8</sup>   | a <sup>3</sup>  | a-               | .06             | .01  | .04 | -   |
| F    | <i>Aster</i> sp.                     | -                | -                | -                | 3               | -                | -               | -    | .03 | -   |
| F    | <i>Castilleja linariaefolia</i>      | -                | 2                | 11               | 3               | 7                | .00             | .05  | .01 | .04 |
| F    | <i>Calochortus nuttallii</i>         | a-               | ab <sup>7</sup>  | a <sup>4</sup>   | ab <sup>8</sup> | b <sup>20</sup>  | .01             | .01  | .04 | .04 |
| F    | <i>Chaenactis douglasii</i>          | 7                | 1                | -                | -               | -                | .00             | -    | -   | -   |
| F    | <i>Chenopodium fremontii</i> (a)     | -                | -                | 1                | -               | -                | -               | .00  | -   | -   |
| F    | <i>Chenopodium leptophyllum</i> (a)  | -                | -                | 3                | 1               | -                | -               | .00  | .00 | -   |
| F    | <i>Cirsium arizonicum</i>            | b <sup>37</sup>  | b <sup>40</sup>  | ab <sup>35</sup> | a <sup>11</sup> | a <sup>15</sup>  | 1.17            | .43  | .08 | .42 |
| F    | <i>Collinsia parviflora</i> (a)      | -                | -                | a-               | b <sup>11</sup> | a-               | -               | -    | .02 | -   |
| F    | <i>Crepis acuminata</i>              | -                | -                | 2                | 3               | 1                | -               | .00  | .06 | .00 |
| F    | Cruciferae                           | 5                | -                | -                | -               | -                | -               | -    | -   | -   |
| F    | <i>Erigeron eatonii</i>              | a-               | a-               | b <sup>11</sup>  | ab <sup>1</sup> | b <sup>6</sup>   | -               | .12  | .00 | .03 |
| F    | <i>Erigeron flagellaris</i>          | c <sup>148</sup> | b <sup>63</sup>  | a <sup>6</sup>   | a <sup>10</sup> | a <sup>5</sup>   | .52             | .01  | .05 | .18 |
| F    | <i>Erigeron pumilus</i>              | 1                | 5                | 10               | 12              | 10               | .15             | .03  | .13 | .10 |
| F    | <i>Eriogonum racemosum</i>           | 36               | 44               | 48               | 34              | 48               | 1.02            | .34  | .37 | .64 |
| F    | <i>Eriogonum umbellatum</i>          | 23               | 44               | 28               | 28              | 27               | 1.06            | 1.16 | .57 | .62 |
| F    | <i>Fritillaria atropurpurea</i>      | -                | -                | 4                | -               | -                | -               | .01  | -   | -   |
| F    | <i>Gayophytum ramosissimum</i> (a)   | -                | -                | 3                | 11              | 8                | -               | .00  | .05 | .04 |
| F    | <i>Hymenoxys richardsonii</i>        | 13               | 21               | -                | 10              | 13               | .23             | -    | .22 | .42 |
| F    | <i>Ipomopsis aggregata</i>           | ab <sup>6</sup>  | b <sup>15</sup>  | a <sup>6</sup>   | a-              | a-               | .08             | .01  | -   | -   |
| F    | <i>Linum lewisii</i>                 | a <sup>4</sup>   | b <sup>20</sup>  | b <sup>18</sup>  | a-              | ab <sup>7</sup>  | .26             | .05  | -   | .10 |
| F    | <i>Lotus utahensis</i>               | 4                | -                | -                | -               | -                | -               | -    | -   | -   |
| F    | <i>Lychnis drummondii</i>            | -                | 10               | 1                | 6               | -                | .02             | .00  | .01 | -   |
| F    | <i>Machaeranthera canescens</i>      | 12               | 16               | 13               | 22              | 17               | .06             | .12  | .28 | .77 |
| F    | <i>Microsteris gracilis</i> (a)      | -                | -                | -                | 8               | -                | -               | -    | .04 | -   |
| F    | <i>Oenothera caespitosa</i>          | -                | 2                | -                | -               | -                | .03             | -    | -   | -   |
| F    | <i>Oenothera pallida</i>             | -                | 3                | -                | 11              | 12               | .00             | -    | .19 | .10 |

| T<br>y<br>p<br>e          | Species                 | Nested Frequency |                  |                  |                  |                  | Average Cover % |      |      |      |
|---------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------|------|------|
|                           |                         | '87              | '92              | '97              | '03              | '08              | '92             | '97  | '03  | '08  |
| F                         | Orthocarpus luteus (a)  | 6                | <sub>b</sub> 56  | <sub>a</sub> 13  | <sub>b</sub> 45  | <sub>b</sub> 49  | 1.53            | .16  | .41  | .82  |
| F                         | Penstemon comarrhenus   | <sub>b</sub> 50  | <sub>ab</sub> 41 | <sub>a</sub> 37  | <sub>ab</sub> 24 | <sub>ab</sub> 36 | .15             | .21  | .13  | .26  |
| F                         | Penstemon humilis       | -                | -                | -                | 3                | 7                | -               | -    | .00  | .21  |
| F                         | Phlox longifolia        | <sub>ab</sub> 37 | <sub>c</sub> 65  | <sub>bc</sub> 56 | <sub>a</sub> 17  | <sub>c</sub> 69  | .45             | .27  | .04  | .24  |
| F                         | Potentilla concinna     | <sub>b</sub> 65  | <sub>a</sub> 23  | <sub>a</sub> 30  | <sub>a</sub> 24  | <sub>a</sub> 30  | .87             | .65  | .46  | .58  |
| F                         | Polygonum douglasii (a) | -                | <sub>b</sub> 78  | <sub>b</sub> 58  | <sub>a</sub> 2   | <sub>a</sub> 13  | .28             | .12  | .01  | .03  |
| F                         | Senecio douglasii       | 6                | -                | -                | -                | 2                | -               | -    | -    | .03  |
| F                         | Taraxacum officinale    | <sub>b</sub> 42  | <sub>a</sub> 1   | <sub>a</sub> 4   | <sub>a</sub> -   | <sub>a</sub> 7   | .00             | .01  | -    | .02  |
| F                         | Tragopogon dubius       | <sub>b</sub> 31  | <sub>ab</sub> 15 | <sub>a</sub> 9   | <sub>a</sub> -   | <sub>a</sub> 6   | .08             | .02  | -    | .03  |
| Total for Annual Forbs    |                         | 6                | 142              | 80               | 89               | 80               | 1.84            | 0.30 | 0.60 | 0.91 |
| Total for Perennial Forbs |                         | 794              | 620              | 501              | 276              | 424              | 9.54            | 5.46 | 3.00 | 5.86 |
| Total for Forbs           |                         | 800              | 762              | 581              | 365              | 504              | 11.38           | 5.77 | 3.60 | 6.78 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --  
Management unit 27 , Study no: 1

| T<br>y<br>p<br>e | Species  | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |  | '92             | '97 | '03 | '08 | '92             | '97   | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>                     | 22              | 21  | 16  | 21  | 3.45            | 2.30  | 4.71  | 4.21  |
| B                | <i>Artemisia nova</i>                            | 33              | 28  | 44  | 44  | 4.94            | 5.62  | 7.39  | 8.25  |
| B                | <i>Chrysothamnus depressus</i>                   | 22              | 14  | 26  | 26  | 1.22            | 1.36  | 1.04  | 2.03  |
| B                | <i>Chrysothamnus parryi attenuatus</i>           | 11              | 8   | 6   | 3   | .24             | .01   | .04   | .00   |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 73              | 60  | 67  | 65  | 4.99            | 4.16  | 5.74  | 6.05  |
| B                | <i>Gutierrezia sarothrae</i>                     | 10              | 3   | 2   | 4   | .33             | .03   | .03   | .21   |
| B                | <i>Juniperus scopulorum</i>                      | 0               | 0   | 0   | 1   | 4.28            | 3.40  | 2.78  | 2.91  |
| B                | <i>Mahonia repens</i>                            | 1               | 1   | 0   | 0   | .00             | .00   | -     | -     |
| B                | <i>Opuntia sp.</i>                               | 3               | 0   | 0   | 1   | .00             | -     | -     | .00   |
| B                | <i>Pinus ponderosa</i>                           | 1               | 1   | 0   | 0   | .00             | .00   | -     | -     |
| B                | <i>Purshia tridentata</i>                        | 60              | 52  | 53  | 51  | 22.88           | 22.12 | 19.85 | 14.46 |
| B                | <i>Ribes cereum inebrians</i>                    | 6               | 3   | 4   | 1   | 1.74            | 1.78  | 1.86  | .53   |
| B                | <i>Rosa woodsii</i>                              | 14              | 10  | 11  | 14  | .85             | .78   | .45   | 1.94  |
| B                | <i>Symphoricarpos oreophilus</i>                 | 21              | 18  | 27  | 22  | 2.37            | 3.02  | 3.40  | 2.99  |
| B                | <i>Tetradymia canescens</i>                      | 26              | 17  | 25  | 22  | 1.06            | .21   | .69   | .73   |
| Total for Browse |  | 303             | 236 | 281 | 275 | 48.40           | 44.83 | 48.04 | 44.32 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 1

| Species                                   | Percent Cover |       |
|---|---------------|-------|
|   | '03           | '08   |
| Amelanchier utahensis                     | 3.84          | 2.95  |
| Artemisia nova                            | 6.15          | 8.91  |
| Chrysothamnus depressus                   | 1.61          | 2.61  |
| Chrysothamnus parryi attenuatus           | .23           | .20   |
| Chrysothamnus viscidiflorus viscidiflorus | 5.26          | 11.41 |
| Juniperus scopulorum                      | 7.59          | 8.03  |
| Pinus ponderosa                           | -             | .55   |
| Purshia tridentata                        | 25.61         | 28.88 |
| Ribes cereum inebrians                    | 1.39          | 1.60  |
| Rosa woodsii                              | .66           | 2.54  |
| Symphoricarpos oreophilus                 | 4.25          | 5.88  |
| Tetradymia canescens                      | 1.16          | 2.01  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 1

| Species               | Average leader growth (in) |     |
|-----------------------|----------------------------|-----|
|                       | '03                        | '08 |
| Amelanchier utahensis | 3.6                        | 3.5 |
| Purshia tridentata    | 2.5                        | 2.4 |

BASIC COVER --

Management unit 27 , Study no: 1

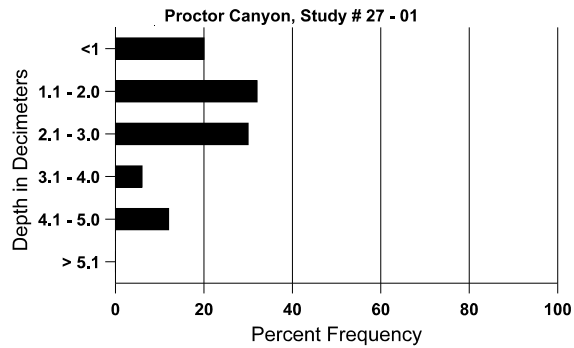
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 11.00           | 63.12 | 53.09 | 57.47 | 63.29 |
| Rock        | 2.25            | 2.82  | .37   | .77   | .79   |
| Pavement    | 5.25            | 0     | 1.62  | .67   | 1.89  |
| Litter      | 64.50           | 40.95 | 50.03 | 48.00 | 41.97 |
| Cryptogams  | 0               | .16   | .83   | .42   | .07   |
| Bare Ground | 17.00           | 20.06 | 21.83 | 23.27 | 14.78 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 1, Study Name: Proctor Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %0M | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 14.4                         | 63.0 (14.3)     | 7.1 | 80.0       | 7.1   | 12.9  | 1.5 | 8.0   | 54.4  | 0.4  |

Stoniness Index



PELLET GROUP DATA --

Management unit 27, Study no: 1

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | 6                 | 1   | 6   | 17  |
| Elk    | 3                 | 2   | 5   | 1   |
| Deer   | 12                | 22  | 19  | 16  |
| Cattle | -                 | 2   | 4   | 3   |

| Days use per acre (ha) |          |
|------------------------|----------|
| '03                    | '08      |
| -                      | -        |
| 2 (5)                  | 2 (5)    |
| 49 (121)               | 78 (193) |
| 8 (20)                 | -        |

BROWSE CHARACTERISTICS --  
 Management unit 27 , Study no: 1

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>465</b>                            | 66                                       | 266   | 199    | -        | -    | 0           | 86      | 0          | -       | 43           | 52/49                     |
| 92                                     | <b>1000</b>                           | -  | 620   | 280    | 100      | -    | 66          | 8       | 10         | 6       | 94           | -/-                       |
| 97                                     | <b>480</b>                            | -  | 80    | 400    | -        | -    | 58          | 8       | 0          | -       | 0            | 44/41                     |
| 03                                     | <b>440</b>                            | -  | 60    | 320    | 60       | -    | 23          | 32      | 14         | -       | 5            | 42/40                     |
| 08                                     | <b>460</b>                            | -  | 60    | 320    | 80       | -    | 30          | 4       | 17         | 13      | 17           | 45/49                     |
| <b>Artemisia nova</b>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>3531</b>                           | -  | 466   | 1799   | 1266     | -    | 38          | 45      | 36         | 1       | 4            | 14/19                     |
| 92                                     | <b>1840</b>                           | 60                                       | 500   | 1140   | 200      | -    | 12          | 3       | 11         | -       | 0            | -/-                       |
| 97                                     | <b>1540</b>                           | 20                                       | 180   | 1020   | 340      | 140  | 10          | 0       | 22         | 6       | 6            | 14/27                     |
| 03                                     | <b>2720</b>                           | -  | 520   | 1940   | 260      | 60   | 10          | 0       | 10         | .73     | .73          | 19/27                     |
| 08                                     | <b>3100</b>                           | 960                                      | 380   | 1860   | 860      | 140  | 38          | 0       | 28         | 7       | 7            | 18/30                     |
| <b>Cercocarpus ledifolius</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 60/47                     |
| <b>Chrysothamnus depressus</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>133</b>                            | -  | -     | 133    | -        | -    | 50          | 50      | 0          | -       | 0            | 4/7                       |
| 92                                     | <b>2880</b>                           | -  | 440   | 2440   | -        | -    | 0           | 0       | 0          | -       | 1            | -/-                       |
| 97                                     | <b>900</b>                            | -  | 100   | 780    | 20       | -    | 0           | 7       | 2          | 2       | 2            | 4/12                      |
| 03                                     | <b>2480</b>                           | -  | -     | 2480   | -        | -    | 6           | 15      | 0          | -       | 0            | 4/9                       |
| 08                                     | <b>1940</b>                           | -  | -     | 1940   | -        | -    | 45          | 30      | 0          | -       | 0            | 4/10                      |
| <b>Chrysothamnus parryi attenuatus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>3732</b>                           | 199                                      | 533   | 2666   | 533      | -    | 14          | 2       | 14         | -       | 0            | 17/16                     |
| 92                                     | <b>580</b>                            | -  | 180   | 400    | -        | -    | 0           | 3       | 0          | -       | 0            | -/-                       |
| 97                                     | <b>320</b>                            | -  | 140   | 180    | -        | -    | 0           | 0       | 0          | -       | 0            | 12/7                      |
| 03                                     | <b>420</b>                            | -  | -     | 420    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/8                       |
| 08                                     | <b>100</b>                            | 100                                      | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/11                      |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 5060                                  | 80                                       | 1760  | 2900   | 400      | -    | 2           | 0       | 8          | .39     | 2            | -/-                       |
| 97   | 3500                                  | -  | 100   | 3380   | 20       | -    | 0           | 0       | 1          | -       | 0            | 16/21                     |
| 03   | 3640                                  | -  | -     | 3420   | 220      | -    | 0           | 1       | 6          | .54     | .54          | 14/17                     |
| 08   | 3960                                  | 80                                       | 80    | 3440   | 440      | -    | 0           | 0       | 11         | 4       | 4            | 19/26                     |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 333                                   | -  | -     | 333    | -        | -    | 0           | 0       | -          | -       | 0            | 7/6                       |
| 92   | 580                                   | -  | 60    | 520    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 200                                   | -  | -     | 200    | -        | -    | 0           | 0       | -          | -       | 0            | 7/3                       |
| 03   | 100                                   | -  | 80    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 9/5                       |
| 08   | 80                                    | -  | -     | 80     | -        | -    | 25          | 0       | -          | -       | 0            | 7/10                      |
| <i>Juniperus scopulorum</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Mahonia repens</i>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 60                                    | -  | 60    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/17                      |
| <i>Pinus ponderosa</i>                           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 20                                    | -  | 20    | -      | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 97   | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Purshia tridentata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>2732</b>                           | 333                                      | 533   | 2133   | 66       | -    | 24          | 68      | 2          | -       | 0            | 22/35                     |
| 92                               | <b>3460</b>                           | 180                                      | 740   | 2600   | 120      | -    | 50          | 31      | 3          | -       | 0            | -/-                       |
| 97                               | <b>1680</b>                           | 140                                      | 140   | 1460   | 80       | 20   | 54          | 33      | 5          | 1       | 1            | 27/56                     |
| 03                               | <b>2340</b>                           | -  | 80    | 2160   | 100      | 20   | 9           | 80      | 4          | -       | 0            | 24/48                     |
| 08                               | <b>1960</b>                           | 60                                       | -     | 1880   | 80       | -    | 58          | 18      | 4          | 2       | 3            | 25/54                     |
| <b>Ribes cereum inebrians</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                               | <b>280</b>                            | 40                                       | 160   | 100    | 20       | -    | 0           | 0       | 7          | 7       | 7            | -/-                       |
| 97                               | <b>80</b>                             | -  | -     | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 61/72                     |
| 03                               | <b>80</b>                             | -  | -     | 60     | 20       | -    | 0           | 0       | 25         | -       | 0            | 54/48                     |
| 08                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | 0          | -       | 0            | 47/68                     |
| <b>Rosa woodsii</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | <b>1880</b>                           | -  | 1820  | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                               | <b>1200</b>                           | 60                                       | 580   | 620    | -        | -    | 0           | 0       | -          | -       | 0            | 14/15                     |
| 03                               | <b>1140</b>                           | 120                                      | 800   | 340    | -        | -    | 0           | 0       | -          | -       | 0            | 8/8                       |
| 08                               | <b>1140</b>                           | 20                                       | 240   | 900    | -        | -    | 0           | 0       | -          | -       | 0            | 11/9                      |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                               | <b>1260</b>                           | -  | 740   | 500    | 20       | -    | 2           | 0       | 2          | -       | 2            | -/-                       |
| 97                               | <b>480</b>                            | -  | 80    | 380    | 20       | -    | 8           | 0       | 4          | 4       | 4            | 17/42                     |
| 03                               | <b>1200</b>                           | -  | 40    | 1140   | 20       | -    | 2           | 10      | 2          | 2       | 2            | 14/20                     |
| 08                               | <b>900</b>                            | -  | 160   | 740    | -        | -    | 2           | 0       | 0          | -       | 0            | 28/40                     |
| <b>Tetradymia canescens</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>1265</b>                           | 199                                      | 399   | 866    | -        | -    | 37          | 16      | 0          | -       | 0            | 9/10                      |
| 92                               | <b>820</b>                            | -  | 460   | 300    | 60       | -    | 0           | 0       | 7          | -       | 0            | -/-                       |
| 97                               | <b>400</b>                            | -  | 40    | 300    | 60       | -    | 0           | 0       | 15         | -       | 0            | 15/14                     |
| 03                               | <b>940</b>                            | -  | 160   | 720    | 60       | -    | 0           | 0       | 6          | -       | 0            | 12/12                     |
| 08                               | <b>640</b>                            | 60                                       | 40    | 380    | 220      | -    | 0           | 0       | 34         | 3       | 6            | 9/12                      |



Trend Study 27-2-08

Study site name: Ahlstrom Hollow .

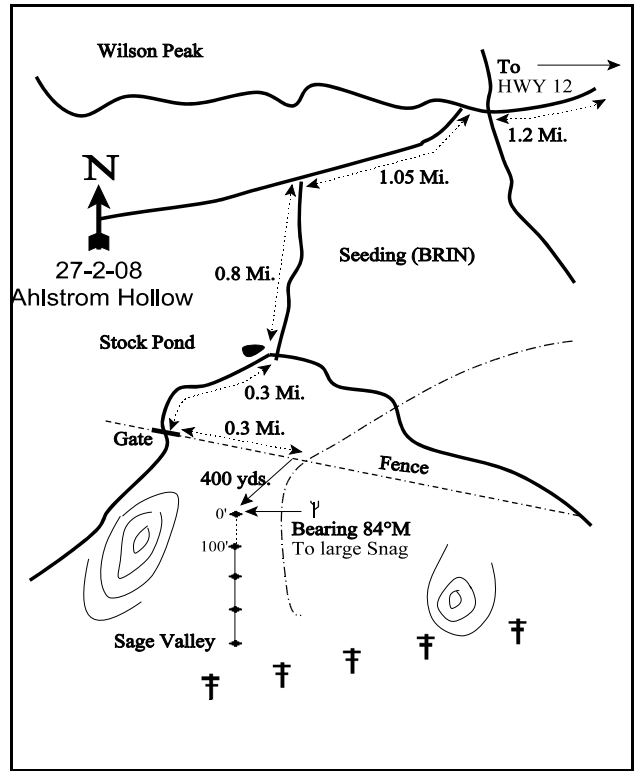
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 190 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From the Bryce Canyon area, take SR 12 west towards Red Canyon. From the Forest Service boundary sign and mile marker 9, go 0.6 miles further west. Turn left onto Wilson Peak Rd #111, cross a cattleguard and go 1.2 miles to the Ahlstrom Hollow road intersection. Pass this 90° intersection and continue 0.05 miles on the Wilson Peak Road to a dirt road going off to the left at a 45° angle. Go down this road 1.05 miles to a fork. Bear left and continue 0.8 miles to a fork by a stock pond. Turn right and go 0.3 miles to a fence. Park here. Walk east along the fenceline up and over a ridge and down to the middle of the next valley. At the bottom of this valley, turn and walk up (south) along the bottom for about 400 yards to the 0-foot baseline, a 2-foot fencepost tagged #7150.



Map Name: Wilson Peak

Diagrammatic Sketch

Township 36S, Range 4W, Section 18

GPS: NAD 83, UTM 12S 388140 E, 4171099 N

## DISCUSSION

### Ahlstrom Hollow - Trend Study No. 27-2

#### Study Information

Although named Ahlstrom Hollow, this study is actually situated in a drainage north of the wide, open, revegetated valley that is Ahlstrom Hollow [elevation: 8,000 feet (2,438 m), slope: 8%-10%, aspect: east-southeast]. The small valley sampled by this trend study is above Johnson Bench, an area seeded mainly with smooth brome (*Bromus inermis*) and other grasses. This particular black sagebrush (*Artemisia nova*) and rabbitbrush (*Chrysothamnus* spp.) valley shows little evidence of the seeding treatments done in the early 1950's. Surrounded by pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland and mountain mahogany (*Cercocarpus montanus*) ridges, the valley supports a mixture of black sagebrush, rabbitbrush, and grasses with a scattered population of bitterbrush (*Purshia tridentata*). The valley drains to the northeast via an intermittent wash. A fire burned this area prior to the 2003 reading, no data was available on the fire. The area is used by deer, elk, and cattle. Pellet group transect data estimated elk use to be moderate in 2003 (31 edu/acre:76 edu/ha) and slightly moderate in 2008 (19 edu/acre:48 edu/ha). Deer use was estimated to be light in 2003 and 2008 (7 ddu/acre:18 ddu/ha and 5 ddu/acre:13 ddu/ha, respectively). Cattle use was estimated to be moderate in both 2003 and 2008 (32 cdu/acre:79 cdu/ha and 38 cdu/acre:93 cdu/ha, respectively).

#### Soil

The soil on the site is relatively deep with an average effective rooting depth of almost 18 inches. The soil is a sandy loam with a mildly alkaline reaction (pH 7.4). There is a high percentage of gravel in the profile, but the soil surface has very little rock or pavement cover. The soil appears to be more shallow around the edges of the valley. There is evidence of past erosion and serious gully formation, especially on the surrounding hillsides. Relative combined vegetation and litter cover was 67% in 1992, 73% in 1997, 63% in 2003, and 77% in 2008. Relative bare ground cover was 27% in 1992, 20% in 1997, 33% in 2003, and 17% in 2008. The erosion condition rating was classified as stable in 2003 and 2008.

#### Browse

Black sagebrush is the dominant shrub over most of the valley, although rabbitbrush is prevalent in the bottoms. Black sagebrush density was estimated at 9,680 plants/acre in 1997, 8,120 plants/acre in 2003, and 7,960 plants/acre in 2008. A fire burned through a portion of the site between the 1997 and 2003 surveys, and accounts for some of the loss in density in that year. The black sagebrush population has maintained a healthy condition over all years with a decent proportion of young, moderately low decadence, and normal vigor. Utilization of black sagebrush has been mostly light to moderate in all readings. A few bitterbrush were encountered on the frequency belts even though it appears to be more common in the lower part of the valley. Bitterbrush is a preferred forage species, and displays moderate to heavy hedging in all years. Bitterbrush plants are large, spreading, and vigorous with annual leaders averaging about three inches of growth in 2003 and 2008.

Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and dwarf rabbitbrush (*C. depressus*) are also common on the site. In 2003, all rabbitbrush on the site was classified as low rabbitbrush while the species were split in previous readings. Combined rabbitbrush density has totaled from about 3,000-4000 plants/acre over all surveys.

#### Herbaceous Understory

As this area is transitional/summer range for big game, and also grazed by livestock, grasses are an important component of this site. Eight perennial grass species have been sampled on the site in at least one year, with mutton bluegrass (*Poa fendleriana*), needle-and-thread grass (*Stipa comata*), prairie junegrass (*Koeleria cristata*), and slender wheatgrass (*Agropyron trachycaulum*) being the most abundant. Only a few remnant individual smooth brome plants were found in 1987, but none were encountered in any other survey. Much of

the biomass provided by grasses had been utilized in 2003 and some cattle trampling was evident. Sum of nested frequency of grasses declined between 1987 and 1992, remained constant in 1997, decreased again in 2003, and increased for the first time in 2008. Forbs are diverse but not particularly abundant. Many of the more palatable forb species had been utilized by big game during the 1987 reading. Utilization of forbs was not evident in 2003. Average cover of forbs was 6% in 1992, declining to 3% in 1997 and 2003, and increasing to 5% in 2008. Most forbs are found only rarely with the more common species including yellow owlclover (*Orthocarpus luteus*), Eaton and low fleabane (*Erigeron eatonii* and *E. pumilus*, respectively) and longleaf phlox (*Phlox longifolia*).

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Trend is somewhat difficult to determine based on a larger sample area used to determine density. The health and vigor of black sagebrush is good, though decadence increased. Trend for the grasses and forbs is down. The sum of nested frequency of perennial grasses decreased by 24 %. The sum of nested frequency of perennial forbs decreased by 19% and the sum of nested frequency of annual forbs increased dramatically.

browse - stable (0)

grass - down (-2)

forb - down (-2)

#### 1997 TREND ASSESSMENT

Trend for black sagebrush is stable even though density has declined 40% since 1992. Density of black sagebrush was extremely high in 1992 at 16,200 plants/acre. The current estimated population density is similar to 1987 levels at 9,680 plants/acre. This is a more manageable density for a black sagebrush site and reduces intraspecific competition. Recruitment is adequate with 11% of the population consisting of young plants. Decadence has also declined from 23% in 1992 to 14%. Vigor is normal on most plants. Trend for the grasses and forbs is stable. Nested frequency of grasses has remained similar even though grass cover has declined sharply. Nested frequency of prairie junegrass declined significantly while frequency of needle-and-thread increased significantly. Frequency of forbs increased slightly but cover was also lower compared to 1992.

browse - stable (0)

grass - stable (0)

forb - stable (0)

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Black sagebrush has a lower population density in 2003 due to plant mortality caused by a fire that burned a portion of the site. Recruitment declined in 2003 and decadence increased slightly. Overall, the population remains healthy. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses declined by 15%, though production was up from 7% of total cover in 1997 to 10%. The trend for forbs is down. The sum of nested frequency of perennial forbs declined by 41%, and production decreased to less than 1% of total cover. These changes are probably drought related and should improve with better precipitation.

browse - slightly down (-1)

grass - slightly down (-1)

forb - down (-2)

#### 2008 TREND ASSESSMENT

Trend for browse is stable. The primary browse species, black sagebrush, population density has remained similar to 2003. Vigor is good in most of the population, and decadence has remained low. Recruitment has improved since 2003 with young plants comprising 13% of the sagebrush population. Trend for grasses is up. Sum of nested frequency of perennial grasses increased by 20% since 2003 and production of perennial grasses increased from 10% of total cover to 14%. There was a significant increase in the frequency of slender wheatgrass and blue grama (*Bouteloua gracilis*), and increases in the frequency of needle-and-thread grass and Letterman needlegrass. Trend for forbs is up. Sum of nested frequency of perennial forbs increased returning to near 1997 frequencies, though the sum of nested frequency of annual forbs also increased. Production of

perennial forbs increased, but is still low at 2% of total cover.

browse - stable (0)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 27 , Study no: 2

| T<br>y<br>p<br>e            | Species                       | Nested Frequency |                  |                   |                   |                   | Average Cover %   |      |      |       |
|-----------------------------|-------------------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|------|------|-------|
|                             |                               | '87              | '92              | '97               | '03               | '08               | '92               | '97  | '03  | '08   |
| G                           | Agropyron dasystachyum        | -                | -                | -                 | 2                 | -                 | -                 | -    | .00  | -     |
| G                           | Agropyron trachycaulum        | <sub>a</sub> 8   | <sub>a</sub> 12  | <sub>ab</sub> 21  | <sub>b</sub> 46   | <sub>c</sub> 105  | .42               | .11  | .62  | 3.49  |
| G                           | Bouteloua gracilis            | <sub>c</sub> 96  | <sub>b</sub> 69  | <sub>b</sub> 64   | <sub>bc</sub> 27  | <sub>a</sub> 67   | <sub>b</sub> 2.23 | .72  | .29  | 1.11  |
| G                           | Bromus inermis                | 2                | -                | -                 | -                 | -                 | -                 | -    | -    | -     |
| G                           | Bromus tectorum (a)           | -                | -                | 3                 | -                 | -                 | -                 | .00  | -    | -     |
| G                           | Koeleria cristata             | <sub>b</sub> 148 | <sub>b</sub> 134 | <sub>a</sub> 89   | <sub>a</sub> 71   | <sub>a</sub> 65   | 3.09              | .98  | .92  | 1.27  |
| G                           | Oryzopsis hymenoides          | -                | -                | -                 | -                 | -                 | .00               | -    | -    | -     |
| G                           | Poa fendleriana               | <sub>a</sub> 129 | <sub>c</sub> 232 | <sub>c</sub> 201  | <sub>bc</sub> 187 | <sub>ab</sub> 161 | 7.53              | 2.88 | 4.38 | 3.37  |
| G                           | Poa pratensis                 | -                | -                | -                 | -                 | 4                 | -                 | -    | -    | .06   |
| G                           | Poa secunda                   | <sub>c</sub> 229 | <sub>a</sub> 5   | <sub>b</sub> 36   | <sub>ab</sub> 23  | <sub>a</sub> 9    | .01               | .81  | .24  | .19   |
| G                           | Stipa columbiana              | -                | -                | -                 | -                 | -                 | -                 | -    | -    | .00   |
| G                           | Stipa comata                  | <sub>b</sub> 130 | <sub>a</sub> 80  | <sub>ab</sub> 111 | <sub>ab</sub> 107 | <sub>b</sub> 138  | 1.95              | 1.31 | 2.99 | 4.44  |
| G                           | Stipa lettermani              | <sub>a</sub> -   | <sub>ab</sub> 29 | <sub>b</sub> 34   | <sub>a</sub> 9    | <sub>ab</sub> 17  | .68               | .58  | .21  | .50   |
| G                           | Vulpia octoflora (a)          | -                | -                | -                 | 3                 | -                 | -                 | -    | .00  | -     |
| Total for Annual Grasses    |                               | 0                | 0                | 3                 | 3                 | 0                 | 0                 | 0.00 | 0.00 | 0     |
| Total for Perennial Grasses |                               | 742              | 561              | 556               | 472               | 566               | 15.94             | 7.42 | 9.67 | 14.46 |
| Total for Grasses           |                               | 742              | 561              | 559               | 475               | 566               | 15.94             | 7.42 | 9.68 | 14.46 |
| F                           | Agoseris glauca               | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> 1    | <sub>b</sub> 36   | <sub>a</sub> 8    | -                 | .00  | .23  | .02   |
| F                           | Alyssum alyssoides (a)        | -                | -                | -                 | -                 | 6                 | -                 | -    | .01  | .07   |
| F                           | Ambrosia sp.                  | -                | 3                | -                 | -                 | -                 | .06               | -    | -    | -     |
| F                           | Antennaria rosea              | 7                | 6                | 8                 | -                 | 3                 | .04               | .33  | -    | .01   |
| F                           | Androsace septentrionalis (a) | -                | <sub>ab</sub> 5  | <sub>a</sub> 3    | <sub>a</sub> -    | <sub>b</sub> 13   | .04               | .00  | -    | .08   |
| F                           | Arabis sp.                    | <sub>a</sub> -   | <sub>b</sub> 6   | <sub>b</sub> 12   | <sub>a</sub> -    | <sub>ab</sub> 2   | .02               | .03  | -    | .03   |
| F                           | Aster chilensis               | -                | -                | 7                 | -                 | -                 | -                 | .01  | -    | -     |
| F                           | Castilleja linariaefolia      | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -    | <sub>b</sub> 8    | <sub>b</sub> 10   | -                 | -    | .02  | .02   |
| F                           | Calochortus nuttallii         | -                | -                | -                 | 2                 | 2                 | -                 | -    | .00  | .00   |
| F                           | Castilleja sp.                | -                | -                | -                 | -                 | -                 | -                 | -    | .00  | -     |
| F                           | Chenopodium leptophyllum(a)   | -                | -                | -                 | 2                 | 1                 | -                 | -    | .00  | .00   |
| F                           | Comandra pallida              | -                | -                | 1                 | -                 | -                 | -                 | .00  | -    | -     |
| F                           | Collinsia parviflora (a)      | -                | -                | -                 | 8                 | 2                 | -                 | -    | .02  | .00   |
| F                           | Crepis acuminata              | -                | -                | -                 | 3                 | -                 | -                 | -    | .00  | -     |

| Type                      | Species                            | Nested Frequency |      |      |      |      | Average Cover % |      |      |      |
|---------------------------|------------------------------------|------------------|------|------|------|------|-----------------|------|------|------|
|                           |                                    | '87              | '92  | '97  | '03  | '08  | '92             | '97  | '03  | '08  |
| F                         | <i>Cryptantha bakeri</i>           | c60              | b12  | b20  | a-   | ab6  | .06             | .05  | -    | .02  |
| F                         | Cruciferae                         | 6                | 3    | -    | -    | -    | .00             | -    | -    | -    |
| F                         | <i>Cymopterus</i> sp.              | -                | -    | 1    | -    | -    | -               | .00  | -    | -    |
| F                         | <i>Descurainia pinnata</i> (a)     | -                | -    | a-   | b35  | a6   | -               | -    | .68  | .01  |
| F                         | <i>Draba</i> sp. (a)               | -                | -    | -    | 2    | -    | -               | -    | .01  | -    |
| F                         | <i>Erigeron eatonii</i>            | abc14            | bc27 | a2   | ab11 | c28  | .33             | .01  | .02  | .19  |
| F                         | <i>Erigeron pumilus</i>            | ab11             | a1   | b22  | ab11 | ab17 | .15             | .20  | .05  | .06  |
| F                         | <i>Eriogonum racemosum</i>         | 6                | 13   | 14   | 8    | 10   | .18             | .16  | .02  | .07  |
| F                         | <i>Eriogonum umbellatum</i>        | 20               | 12   | 18   | 15   | 15   | .11             | .20  | .26  | .17  |
| F                         | <i>Euphorbia robusta</i>           | b11              | ab3  | ab4  | a-   | a-   | .18             | .06  | -    | -    |
| F                         | <i>Gayophytum ramosissimum</i> (a) | -                | -    | 14   | 1    | 4    | -               | .03  | .01  | .01  |
| F                         | <i>Heterotheca villosa</i>         | ab15             | ab3  | a2   | ab5  | b18  | .15             | .03  | .06  | .64  |
| F                         | <i>Holosteum umbellatum</i> (a)    | -                | -    | 3    | -    | -    | -               | .00  | -    | -    |
| F                         | <i>Lappula occidentalis</i> (a)    | -                | -    | a5   | b53  | c81  | -               | .01  | 1.39 | .86  |
| F                         | <i>Lotus utahensis</i>             | b34              | ab21 | a13  | a11  | ab17 | .33             | .25  | .05  | .13  |
| F                         | <i>Lupinus argenteus</i>           | -                | -    | -    | 2    | -    | -               | -    | .00  | -    |
| F                         | <i>Microsteris gracilis</i> (a)    | -                | -    | b61  | a2   | a8   | -               | .17  | .00  | .02  |
| F                         | <i>Oenothera pallida</i>           | -                | -    | 3    | 7    | 11   | -               | .00  | .07  | .09  |
| F                         | <i>Orthocarpus luteus</i> (a)      | a21              | b121 | b111 | a33  | b98  | 2.70            | 1.43 | .19  | 1.43 |
| F                         | <i>Pedicularis centranthera</i>    | -                | -    | -    | -    | 8    | -               | -    | -    | .04  |
| F                         | <i>Penstemon comarrhenus</i>       | b36              | a14  | a12  | a-   | a14  | 1.01            | .05  | -    | .12  |
| F                         | <i>Penstemon</i> sp.               | a-               | a-   | ab8  | a1   | b13  | -               | .07  | .00  | .05  |
| F                         | <i>Phlox longifolia</i>            | a29              | b66  | b72  | a21  | a29  | .30             | .35  | .07  | .16  |
| F                         | <i>Polygonum douglasii</i> (a)     | -                | b25  | b26  | a-   | b37  | .06             | .07  | -    | .09  |
| F                         | <i>Sphaeralcea coccinea</i>        | -                | -    | -    | -    | 2    | -               | -    | -    | .00  |
| F                         | <i>Taraxacum officinale</i>        | a-               | ab7  | b8   | ab2  | ab3  | .39             | .05  | .00  | .06  |
| F                         | <i>Tragopogon dubius</i>           | 2                | -    | 5    | -    | 2    | -               | .01  | -    | .00  |
| F                         | <i>Trifolium kingii</i>            | a-               | ab6  | b9   | ab1  | ab9  | .01             | .02  | .00  | .07  |
| F                         | Unknown forb-perennial             | 1                | -    | -    | -    | -    | -               | -    | -    | -    |
| Total for Annual Forbs    |                                    | 21               | 151  | 223  | 136  | 256  | 2.81            | 1.73 | 2.33 | 2.60 |
| Total for Perennial Forbs |                                    | 252              | 203  | 242  | 144  | 227  | 3.37            | 1.92 | 0.91 | 2.01 |
| Total for Forbs           |                                    | 273              | 354  | 465  | 280  | 483  | 6.18            | 3.65 | 3.24 | 4.61 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 2

| Type             | Species                                      | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |  | '92             | '97 | '03 | '08 | '92             | '97   | '03   | '08   |
| B                | Artemisia nova                               | 98              | 98  | 57  | 61  | 24.25           | 21.39 | 15.10 | 17.68 |
| B                | Chrysothamnus depressus                      | 33              | 31  | 0   | 11  | .67             | .00   | -     | .39   |
| B                | Chrysothamnus viscidiflorus<br>viscidiflorus | 52              | 27  | 62  | 54  | 4.70            | 1.90  | 6.95  | 4.89  |
| B                | Juniperus osteosperma                        | 1               | 2   | 1   | 1   | .15             | .85   | .85   | 1.00  |
| B                | Leptodactylon pungens                        | 49              | 42  | 31  | 32  | 2.34            | .64   | .67   | .39   |
| B                | Opuntia sp.                                  | 2               | 1   | 1   | 1   | .03             | .00   | .00   | .03   |
| B                | Purshia tridentata                           | 5               | 2   | 1   | 1   | .38             | .03   | .00   | .38   |
| B                | Tetradymia canescens                         | 14              | 11  | 12  | 10  | .09             | .24   | .06   | .18   |
| Total for Browse |  | 254             | 214 | 165 | 171 | 32.63           | 25.07 | 23.64 | 24.95 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 2

| Species                                      | Percent Cover |       |       |
|--|---------------|-------|-------|
|  | '97           | '03   | '08   |
| Artemisia nova                               | -             | 15.88 | 23.25 |
| Chrysothamnus viscidiflorus<br>viscidiflorus | -             | 6.90  | 10.76 |
| Juniperus osteosperma                        | 1.60          | 1.96  | 2.20  |
| Leptodactylon pungens                        | -             | .23   | .46   |
| Purshia tridentata                           | -             | .50   | .50   |
| Tetradymia canescens                         | -             | .08   | .20   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 2

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia nova     | 1.6                        | 0.9 |
| Purshia tridentata | 3.0                        | 2.9 |

**BASIC COVER --**

Management unit 27 , Study no: 2

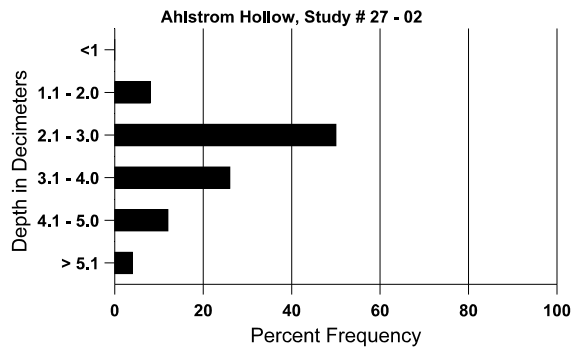
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 5.50            | 47.05 | 38.87 | 38.60 | 49.75 |
| Rock        | 1.25            | 7.93  | .07   | .54   | 1.19  |
| Pavement    | 12.75           | 0     | 7.14  | 4.17  | 5.49  |
| Litter      | 66.25           | 31.65 | 42.92 | 33.63 | 39.04 |
| Cryptogams  | 0               | .41   | .46   | .04   | .05   |
| Bare Ground | 14.25           | 31.40 | 22.36 | 37.97 | 20.20 |

**SOIL ANALYSIS DATA --**

Management unit 27, Study no: 2, Study Name: Ahlstrom Hollow

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 17.6                         | 65.3 (14.8)     | 7.4 | 66.4       | 19.1  | 14.6  | 2.5 | 15.9  | 86.4  | 0.5  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 27 , Study no: 2

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | 30                | 11  | 13  | 47  |
| Elk    | 22                | 7   | 12  | 10  |
| Deer   | 6                 | 14  | 8   | 3   |
| Cattle | 3                 | 6   | 8   | 10  |

| Days use per acre (ha) |         |
|------------------------|---------|
| '03                    | '08     |
| -                      | -       |
| 31 (76)                | 19 (48) |
| 7 (18)                 | 5 (13)  |
| 32 (79)                | 38 (93) |

BROWSE CHARACTERISTICS --  
Management unit 27 , Study no: 2

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia frigida</b>                         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/7                      |
| <b>Artemisia nova</b>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 9532                                  | 2599                                     | 2333  | 6133   | 1066     | -    | 33          | 13      | 11         | -       | 0            | 16/20                     |
| 92   | 16200                                 | 1020                                     | 3400  | 9020   | 3780     | -    | 22          | 2       | 23         | 3       | 4            | -/-                       |
| 97   | 9680                                  | 1140                                     | 1100  | 7220   | 1360     | 420  | 5           | 0       | 14         | 3       | 4            | 16/27                     |
| 03   | 8120                                  | -  | 480   | 6000   | 1640     | 2580 | 9           | 0       | 20         | 4       | 4            | 15/23                     |
| 08   | 7960                                  | 1200                                     | 1040  | 5760   | 1160     | 180  | 7           | 2       | 15         | 5       | 6            | 15/26                     |
| <b>Chrysothamnus depressus</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 3132                                  | 799                                      | 266   | 2733   | 133      | -    | 17          | 15      | 4          | -       | 0            | 4/10                      |
| 92   | 1920                                  | -  | 1000  | 920    | -        | -    | 5           | 1       | 0          | -       | 0            | -/-                       |
| 97   | 1900                                  | -  | 40    | 1860   | -        | -    | 0           | 0       | 0          | -       | 0            | 10/10                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08   | 600                                   | -  | -     | 600    | -        | -    | 47          | 3       | 0          | -       | 0            | 3/8                       |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 3332                                  | 733                                      | 466   | 2533   | 333      | -    | 32          | 4       | 10         | -       | 0            | 16/18                     |
| 92   | 4080                                  | 20                                       | 1600  | 2360   | 120      | -    | 4           | .49     | 3          | .98     | .98          | -/-                       |
| 97   | 900                                   | -  | 20    | 780    | 100      | -    | 0           | 0       | 11         | -       | 2            | 14/20                     |
| 03   | 4300                                  | -  | 20    | 4120   | 160      | -    | 0           | 0       | 4          | .46     | .46          | 12/18                     |
| 08   | 3000                                  | 40                                       | 240   | 1860   | 900      | 20   | 2           | 0       | 30         | 10      | 10           | 14/25                     |
| <b>Juniperus osteosperma</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 20                                    | -  | 20    | -      | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 97   | 40                                    | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |



|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Leptodactylon pungens</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | <b>5040</b>                           | -  | 420   | 4540   | 80       | -    | 0           | 0       | 2          | 1       | 2            | -/-                       |
| 97                           | <b>2780</b>                           | 60                                       | 220   | 2520   | 40       | 80   | 0           | 0       | 1          | 1       | 1            | 6/6                       |
| 03                           | <b>1720</b>                           | -  | 40    | 1580   | 100      | -    | 0           | 0       | 6          | 5       | 5            | 5/7                       |
| 08                           | <b>1200</b>                           | -  | 60    | 1040   | 100      | -    | 0           | 0       | 8          | -       | 0            | 5/8                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>133</b>                            | -  | -     | 133    | -        | -    | 0           | 0       | 0          | -       | 0            | 3/8                       |
| 92                           | <b>120</b>                            | -  | 100   | -      | 20       | -    | 0           | 0       | 17         | -       | 0            | -/-                       |
| 97                           | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | <b>100</b>                            | -  | 80    | 20     | -        | -    | 0           | 60      | 0          | -       | 0            | -/-                       |
| 97                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 50          | 50      | 0          | -       | 0            | 21/43                     |
| 03                           | <b>20</b>                             | -  | -     | -      | 20       | 40   | 0           | 100     | 100        | -       | 0            | 19/59                     |
| 08                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 100     | 0          | -       | 0            | 21/51                     |
| <b>Tetradymia canescens</b>  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>266</b>                            | -  | -     | 266    | -        | -    | 75          | 0       | 0          | -       | 0            | 9/9                       |
| 92                           | <b>420</b>                            | -  | 200   | 200    | 20       | -    | 14          | 5       | 5          | -       | 0            | -/-                       |
| 97                           | <b>400</b>                            | 60                                       | 160   | 240    | -        | -    | 0           | 0       | 0          | -       | 0            | 9/11                      |
| 03                           | <b>300</b>                            | -  | 20    | 260    | 20       | -    | 0           | 0       | 7          | 7       | 7            | 9/12                      |
| 08                           | <b>280</b>                            | -  | 40    | 240    | -        | -    | 0           | 0       | 0          | -       | 0            | 11/17                     |

Trend Study 27-3-08

Study site name: Whiteman Bench .

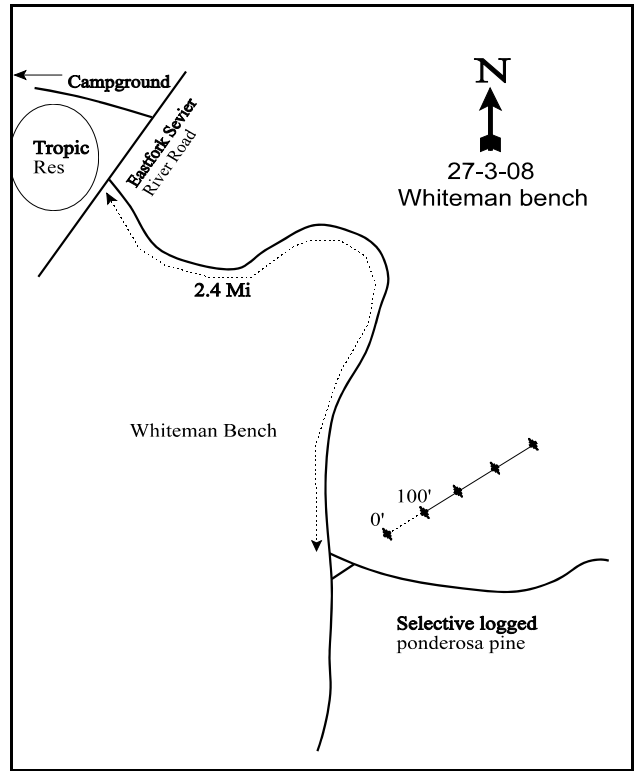
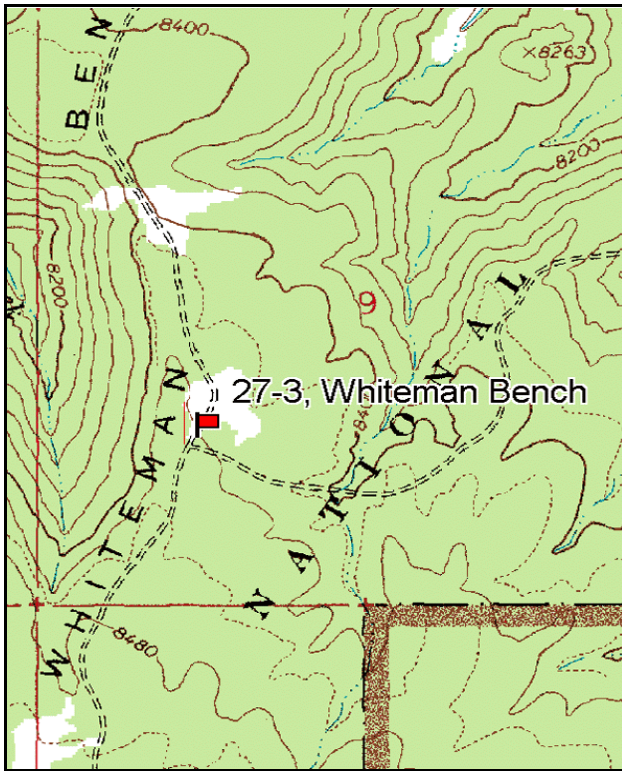
Vegetation type: Selective Logged-Ponderosa .

Compass bearing: frequency baseline 60 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). Rebar: belt 5 on 11ft.

LOCATION DESCRIPTION

East of the Tropic Reservoir Dam on the E. Fork Sevier River Road, take the Whiteman Bench road east for 2.40 miles to a fork in the road. Stop here. Walk east 18 paces to the first stake, a red-painted fencepost 18" high marked with browse tag #7153. The frequency baseline runs NE from here.



Map Name: Bryce Point

Diagrammatic Sketch

Township 37S, Range 4W, Section 9

GPS: NAD 83, UTM 12S 391137 E 4162028 N

## DISCUSSION

### Whiteman Bench - Trend Study No. 27-3

#### Study Information

This study is on a large, level bench area east of Tropic Reservoir [elevation: 8,400 feet (2,560 m), slope: 2%-3%, aspect: northeast]. Most of the bench is covered with ponderosa pine (*Pinus ponderosa*) in varying stages of growth due to logging activities. The study samples a moderate aged stand of ponderosa that was clear cut more than 20 years ago. The understory is a mixture of shrubs and grasses. The area is utilized as summer range by deer and elk. Little livestock use occurs in the timbered areas of the East Fork allotment. Pellet group transect data collected estimated deer use to be moderate in 2003 and 2008 (24 ddu/acre:60 ddu/ha, respectively). Elk use was estimated to be light in 2003 (12 edu/acre:30 edu/ha) and moderate in 2008 (29 edu/acre:73 edu/ha). There was no sign of cattle detected in 2003, and only 1 cattle pat encountered in 2008.

#### Soil

The soil has moderate depth with an effective rooting depth estimated at 13 inches. Soil texture is a clay loam with a considerable amount of cobble rock in the profile. Soils are neutral in reactivity with (pH of 6.9). Phosphorus has marginal availability for plant growth and development at 7.6 ppm (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has been high with 73% in 1992, 71% in 1997 and 2003, and 77% in 2008. Relative bare ground cover has been moderate with 17% in 1992, 16% in 1997, 20% in 2003, and 13% in 2008. The erosion condition rating was classified as stable, in 2003 and 2008.

#### Browse

The ponderosa canopy is fairly open, although the trees appear to have increased in size since the site was first photographed in 1981. Line-intercept canopy cover was estimated at 17% in 2003, and 23% in 2008. The open ponderosa forest is at a relatively low density estimated at 50-60 mature trees/acre in 1997, 2003, and 2008, and appears to have little effect on the shrub understory.

The most abundant and important browse species are black sagebrush (*Artemisia nova*), bitterbrush (*Purshia tridentata*), and dwarf rabbitbrush (*Chrysothamnus depressus*). Dwarf rabbitbrush accounted for half of the total browse cover in 1997, 37% in 2003, and 44% in 2008. Density estimates for dwarf rabbitbrush have been very high ranging from about 11,000-22,000 plants/acre since 1992. These plants are very small averaging only seven inches in height, but vigor has been good in all surveys. Use was mostly light from 1987 to 2003, but was more moderate in 2008.

Bitterbrush provides less than a quarter of the total browse cover, but provides the most preferred forage. Density of bitterbrush has steadily increased from 620 plants/acre in 1997 to 820 plant/acre in 2008. There were few seedlings and young bitterbrush plants encountered in 1997, 2003, and 2008. Decadence of bitterbrush was low from 1987-1997(6%-16%), increasing to 39% in 2003, then decreasing to 17% in 2008. Bitterbrush shows moderate to heavy utilization from the 1987 to 2003 surveys, decreasing to light to moderate use in 2003, and has maintained good vigor. The black sagebrush population remained around 1,400 plants/acre in 1997 and 2003, and increased to 1,760 plants/acre in 2008. The population had fairly low decadence at less than 20% in 1997 and 2003 and showed improving vigor in both years as well. Decadence increased to 43% and plants showing poor vigor increased to 16% in 2008. Utilization of black sagebrush was light to moderate in 1992, but mostly light in all other sampling years. Other browse sampled on the site include Parry rabbitbrush (*Chrysothamnus parryi*), squaw currant (*Ribes cereum* ssp. *inebrians*), snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*).

#### Herbaceous Understory

The herbaceous understory is not particularly abundant on this site. Grasses and forbs combined to produce 16% total cover in 1992, 8% in 1997, 11% in 2003, and 15% in 2008. The most abundant herbaceous species

is by far rock goldenrod (*Petradoria pumila*). This species provided 28% of the total herbaceous cover in 1992, 46% in 1997, 61% in 2003, and 45% in 2008. Mutton bluegrass (*Poa fendleriana*) was very abundant in 1987, but declined in 1992, and again in 1997. Mutton bluegrass frequency and density has remained relatively constant since 1997. Other grasses include thickspike wheatgrass (*Agropyron dasystachyum*), needle-and-thread grass (*Stipa comata*), Letterman needlegrass (*Stipa lettermani*), and a sedge (*Carex* sp.). Other forbs sampled on the site include fendler sandwort (*Arenaria fendleri*), pacific aster (*Aster chilensis*), and redroot eriogonum (*Eriogonum racemosum*).

#### 1992 TREND ASSESSMENT

The browse trend is stable with good vigor for most species. Density differences may be due to different sampling sizes from the last reading. Only black sagebrush has a high rate of decadence, but the young age class makes up 26% of the population. This should compensate for any possible losses in the future. Trend for the grasses is slightly down with a decrease in the sum of nested frequency of perennial grasses. The trend for forbs is up with a large increase in the sum of nested frequency of perennial forbs. Forbs account for 57% of the herbaceous cover.

browse - stable (0)

grass - slightly down (-1)

forb - up (+2)

#### 1997 TREND ASSESSMENT

Trend for browse is slightly down. The three key species on this site, black sagebrush, dwarf rabbitbrush, and bitterbrush, have all declined substantially in population density. Vigor is generally good, and decadence is low. Trend for the grasses and forbs is down. Sum of nested frequency for grasses and forbs has declined substantially since 1992. The only grass species to show an increase in nested frequency since 1992 is thickspike wheatgrass, all others declined. In addition, all forb species showed a decline in nested frequency since 1992.

browse - slightly down (-1)

grass - down (-2)

forb - down (-2)

#### 2003 TREND ASSESSMENT

Trend for browse is stable. Dwarf rabbitbrush, black sagebrush, and bitterbrush all show stable densities. Bitterbrush decadence increased to 39%, but decadence for the other species is low. As this is summer range for big game, the browse component is less important than the herbaceous understory. The trend for grasses is down. The sum of nested frequency of perennial grasses continues to decline and production of perennial grasses was low at just over 2% of total cover. The trend for forbs is stable. The sum of nested frequency of perennial forbs remained similar to 1997, but the dominant forb is rock goldenrod, which is not highly preferred for forage. Production of perennial forbs did increase from around 5% of cover in 1997 to near 8%. The understory is likely suffering the effects of drought, but the abundance of dwarf rabbitbrush and heavy litter accumulations underneath the ponderosa pine are probably also having a negative effect on understory production.

browse - stable (0)

grass - down (-2)

forb - stable (0)

#### 2008 TREND ASSESSMENT

Trend for browse is stable. The preferred browse species, antelope bitterbrush, has been steadily increasing in density since 1997 to a current density of 820 plants/acre. Decadence of bitterbrush decreased from 39% in 2003 to 17%, vigor has remained good in most bitterbrush plants. Recruitment of new bitterbrush remains fairly low with young plants comprising only 5% of the population. Dwarf rabbitbrush density decreased by 26% since 2003 to 11,160 plant/acre. Vigor was good on most plants in the population, but decadence increased to a high of 16%, up from 6% in 2003. Black sagebrush density increased 24% since 2003 to 1,760 plant/acre. Plants displaying poor vigor also increased to 16%, up from 7% in 2003. Decadence increased from 16% in 2003 to 43%. Trend for grasses was up. The sum of nested frequency of perennial grasses

increased, as did production of perennial grasses from 2% of cover in 2003 to almost 6%. The largest change was a significant increase in the frequency of thickspike wheatgrass as well as an increase in its production. The trend for forbs is stable. There was just a slight increase in both the sum of nested frequency and production of perennial forbs, but each remained relatively constant.

browse - stable (0)

grass - up (+2)

forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 3

| T<br>y<br>p<br>e            | Species                       | Nested Frequency |      |      |      |      | Average Cover % |      |      |      |
|-----------------------------|-------------------------------|------------------|------|------|------|------|-----------------|------|------|------|
|                             |                               | '87              | '92  | '97  | '03  | '08  | '92             | '97  | '03  | '08  |
| G                           | Agropyron dasystachyum        | a-               | b36  | c72  | b21  | c74  | .25             | .33  | .21  | 1.07 |
| G                           | Carex sp.                     | 57               | 47   | 35   | 30   | 39   | .64             | .74  | .37  | .72  |
| G                           | Koeleria cristata             | 12               | 31   | 26   | 13   | 19   | .42             | .22  | .12  | .21  |
| G                           | Oryzopsis hymenoides          | b21              | a3   | a-   | a-   | a3   | .01             | -    | -    | .00  |
| G                           | Poa fendleriana               | bc209            | c148 | ab75 | a67  | ab77 | 3.20            | .93  | .70  | 1.18 |
| G                           | Poa secunda                   | -                | -    | 3    | -    | 3    | -               | .00  | -    | .00  |
| G                           | Sitanion hystrix              | c87              | b30  | a9   | ab22 | a3   | .14             | .05  | .13  | .00  |
| G                           | Stipa comata                  | a19              | b57  | b53  | b53  | b50  | 1.04            | .61  | .49  | 1.50 |
| G                           | Stipa sp.                     | 3                | 4    | -    | -    | -    | .03             | -    | -    | -    |
| G                           | Stipa lettermani              | b93              | b88  | a51  | a50  | a46  | .93             | .50  | .40  | 1.11 |
| Total for Annual Grasses    |                               | 0                | 0    | 0    | 0    | 0    | 0               | 0    | 0    | 0    |
| Total for Perennial Grasses |                               | 501              | 444  | 324  | 256  | 314  | 6.68            | 3.42 | 2.43 | 5.83 |
| Total for Grasses           |                               | 501              | 444  | 324  | 256  | 314  | 6.68            | 3.42 | 2.43 | 5.83 |
| F                           | Agoseris glauca               | -                | 2    | -    | 7    | -    | .01             | -    | .07  | -    |
| F                           | Antennaria rosea              | 2                | 7    | 3    | 5    | 6    | .03             | .00  | .01  | .06  |
| F                           | Androsace septentrionalis (a) | -                | a2   | a-   | b17  | a3   | .00             | -    | .03  | .00  |
| F                           | Arabis demissa                | ab10             | b15  | b11  | ab7  | a-   | .04             | .02  | .02  | -    |
| F                           | Arenaria fendleri             | a33              | b93  | ab64 | a40  | a49  | 2.65            | .48  | .54  | .51  |
| F                           | Artemisia ludoviciana         | 5                | 3    | -    | 3    | -    | .03             | -    | .15  | -    |
| F                           | Arabis pulchra                | -                | 11   | -    | -    | -    | .02             | -    | -    | -    |
| F                           | Aster chilensis               | a25              | b71  | a29  | a14  | a17  | .51             | .10  | .11  | .05  |
| F                           | Astragalus humistratus        | b11              | ab6  | a-   | a-   | a-   | .05             | .00  | -    | -    |
| F                           | Calochortus nuttallii         | a-               | ab1  | a-   | b7   | ab2  | .00             | -    | .02  | .00  |
| F                           | Chenopodium leptophyllum(a)   | -                | -    | -    | -    | -    | -               | -    | -    | .00  |
| F                           | Cirsium sp.                   | -                | 1    | 1    | 1    | -    | .03             | .03  | .00  | -    |
| F                           | Crepis acuminata              | -                | 3    | 4    | 3    | 3    | .03             | .01  | .03  | .03  |
| F                           | Cruciferae                    | 8                | -    | -    | -    | -    | -               | -    | -    | -    |
| F                           | Cryptantha sp.                | -                | 1    | -    | 3    | 6    | .00             | -    | .00  | .01  |
| F                           | Descurainia pinnata (a)       | -                | -    | -    | 3    | -    | -               | -    | .00  | -    |

| T<br>y<br>p<br>e          | Species                         | Nested Frequency |                   |                  |                   |                  | Average Cover % |      |      |      |
|---------------------------|---------------------------------|------------------|-------------------|------------------|-------------------|------------------|-----------------|------|------|------|
|                           |                                 | '87              | '92               | '97              | '03               | '08              | '92             | '97  | '03  | '08  |
| F                         | <i>Erysimum asperum</i>         | <sub>b</sub> 18  | <sub>a</sub> -    | <sub>a</sub> -   | <sub>a</sub> -    | <sub>a</sub> -   | -               | -    | -    | -    |
| F                         | <i>Erigeron flagellaris</i>     | <sub>ab</sub> 7  | <sub>b</sub> 19   | <sub>a</sub> 1   | <sub>a</sub> 3    | <sub>ab</sub> 11 | .34             | .00  | .00  | .12  |
| F                         | <i>Erigeron</i> sp.             | 5                | -                 | -                | -                 | -                | -               | -    | -    | -    |
| F                         | <i>Erigeron pumilus</i>         | 5                | -                 | 3                | -                 | 4                | -               | .00  | -    | .01  |
| F                         | <i>Eriogonum racemosum</i>      | <sub>ab</sub> 24 | <sub>b</sub> 38   | <sub>ab</sub> 29 | <sub>a</sub> 17   | <sub>a</sub> 18  | .29             | .15  | .11  | 1.05 |
| F                         | <i>Eriogonum umbellatum</i>     | -                | 3                 | -                | -                 | -                | .03             | -    | -    | -    |
| F                         | <i>Hymenoxys richardsonii</i>   | -                | -                 | -                | -                 | -                | .03             | -    | -    | -    |
| F                         | <i>Ipomopsis aggregata</i>      | 6                | 4                 | 5                | -                 | -                | .01             | .01  | -    | -    |
| F                         | <i>Lappula occidentalis</i> (a) | -                | -                 | <sub>a</sub> -   | <sub>b</sub> 16   | <sub>a</sub> 3   | -               | -    | .49  | .00  |
| F                         | <i>Linum kingii</i>             | -                | -                 | -                | -                 | 1                | -               | -    | -    | .00  |
| F                         | <i>Lychnis drummondii</i>       | -                | 1                 | -                | -                 | -                | .00             | -    | -    | -    |
| F                         | <i>Orthocarpus luteus</i> (a)   | 5                | 21                | 4                | 2                 | 15               | .09             | .01  | .01  | .20  |
| F                         | <i>Penstemon caespitosus</i>    | -                | 7                 | 3                | -                 | 6                | .09             | .00  | .00  | .04  |
| F                         | <i>Pedicularis centranthera</i> | -                | -                 | -                | 8                 | 7                | -               | -    | .07  | .20  |
| F                         | <i>Penstemon</i> sp.            | 5                | 6                 | 3                | 3                 | 3                | .05             | .03  | .03  | .03  |
| F                         | <i>Petradoria pumila</i>        | <sub>a</sub> 88  | <sub>ab</sub> 112 | <sub>a</sub> 95  | <sub>bc</sub> 135 | <sub>c</sub> 147 | 4.47            | 3.85 | 6.59 | 6.41 |
| F                         | <i>Phlox longifolia</i>         | <sub>a</sub> -   | <sub>b</sub> 15   | <sub>a</sub> -   | <sub>a</sub> -    | <sub>a</sub> 3   | .04             | -    | -    | .00  |
| F                         | <i>Potentilla crinita</i>       | <sub>a</sub> -   | <sub>b</sub> 15   | <sub>a</sub> -   | <sub>a</sub> 1    | <sub>a</sub> -   | .19             | -    | .00  | -    |
| F                         | <i>Polygonum douglasii</i> (a)  | -                | <sub>b</sub> 31   | <sub>b</sub> 29  | <sub>a</sub> 8    | <sub>a</sub> 2   | .07             | .11  | .02  | .01  |
| F                         | <i>Senecio multilobatus</i>     | -                | -                 | -                | 1                 | -                | -               | -    | .00  | -    |
| F                         | <i>Taraxacum officinale</i>     | -                | -                 | 1                | -                 | -                | -               | .00  | -    | -    |
| F                         | <i>Tragopogon dubius</i>        | 4                | -                 | -                | -                 | 2                | -               | -    | -    | .00  |
| F                         | Unknown forb-perennial          | 1                | -                 | -                | 1                 | -                | -               | -    | .00  | -    |
| Total for Annual Forbs    |                                 | 5                | 54                | 33               | 46                | 23               | 0.17            | 0.12 | 0.56 | 0.23 |
| Total for Perennial Forbs |                                 | 257              | 434               | 252              | 259               | 285              | 8.98            | 4.74 | 7.80 | 8.56 |
| Total for Forbs           |                                 | 262              | 488               | 285              | 305               | 308              | 9.16            | 4.86 | 8.37 | 8.79 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 3

| Type             | Species                         | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|---------------------------------|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |                                 | '92             | '97 | '03 | '08 | '92             | '97   | '03   | '08   |
| B                | Artemisia nova                  | 35              | 32  | 31  | 34  | 2.03            | 1.16  | 1.49  | .76   |
| B                | Ceanothus fendleri              | 0               | 0   | 1   | 0   | -               | -     | .00   | -     |
| B                | Chrysothamnus depressus         | 98              | 89  | 87  | 81  | 8.31            | 7.23  | 7.58  | 5.68  |
| B                | Chrysothamnus parryi attenuatus | 36              | 3   | 33  | 21  | .41             | .03   | .64   | .63   |
| B                | Gutierrezia sarothrae           | 12              | 1   | 7   | 19  | .04             | .00   | .01   | .43   |
| B                | Mahonia repens                  | 3               | 0   | 0   | 1   | .04             | .00   | -     | .00   |
| B                | Pinus ponderosa                 | 6               | 4   | 4   | 5   | 11.14           | 2.20  | 6.71  | .76   |
| B                | Purshia tridentata              | 39              | 24  | 22  | 27  | 5.21            | 2.91  | 2.89  | 3.98  |
| B                | Ribes cereum inebrians          | 4               | 1   | 1   | 1   | .00             | .00   | .15   | .15   |
| B                | Symphoricarpos oreophilus       | 8               | 9   | 5   | 7   | .85             | .81   | .63   | .38   |
| B                | Tetradymia canescens            | 20              | 8   | 15  | 15  | .24             | .06   | .24   | .19   |
| Total for Browse |                                 | 261             | 171 | 206 | 211 | 28.30           | 14.41 | 20.36 | 12.98 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 3

| Species                         | Percent Cover |       |       |
|---------------------------------|---------------|-------|-------|
|                                 | '97           | '03   | '08   |
| Artemisia nova                  | -             | 1.96  | 1.14  |
| Chrysothamnus depressus         | -             | 6.94  | 9.53  |
| Chrysothamnus parryi attenuatus | -             | .38   | .68   |
| Gutierrezia sarothrae           | -             | .03   | .41   |
| Pinus ponderosa                 | 4.40          | 16.96 | 23.00 |
| Purshia tridentata              | -             | 3.21  | 6.30  |
| Ribes cereum inebrians          | -             | .68   | .56   |
| Symphoricarpos oreophilus       | -             | .16   | .53   |
| Tetradymia canescens            | -             | .10   | .13   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 3

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia nova     | 1.5                        | 0.7 |
| Purshia tridentata | 3.0                        | 2.5 |

POINT-QUARTER TREE DATA --

Management unit 27 , Study no: 3

| Species         | Trees per Acre |     | Average diameter (in) |      |
|-----------------|----------------|-----|-----------------------|------|
|                 | '03            | '08 | '03                   | '08  |
| Pinus ponderosa | 50             | 60  | 9.6                   | 11.1 |

BASIC COVER --

Management unit 27 , Study no: 3

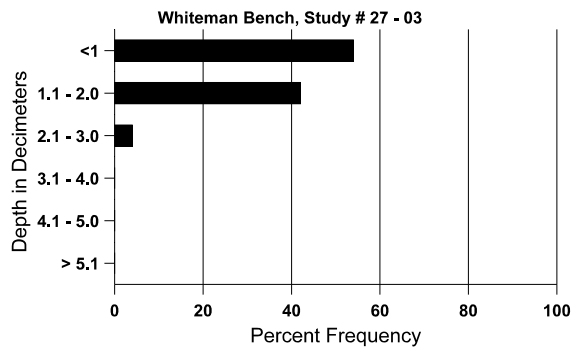
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 2.00            | 42.34 | 29.83 | 28.45 | 28.42 |
| Rock        | 8.75            | 12.57 | 8.37  | 10.07 | 7.85  |
| Pavement    | 4.25            | 0     | 4.80  | .56   | 2.92  |
| Litter      | 75.75           | 49.28 | 47.95 | 51.08 | 59.22 |
| Cryptogams  | .25             | .99   | 1.81  | .03   | .05   |
| Bare Ground | 9.00            | 20.97 | 17.22 | 21.93 | 15.10 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 3, Study Name: Whiteman Bench

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-----------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand     | %silt | %clay |     |       |       |      |
| 13.0                         | 69.7 (6.0)      | 6.9 | 36.4      | 32.1  | 31.6  | 3.6 | 7.6   | 163.2 | 0.6  |

### Stoniness Index





PELLET GROUP DATA --

Management unit 27 , Study no: 3

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | 6                 | -   | 3   | 14  |
| Elk    | 3                 | 8   | 9   | 6   |
| Deer   | 6                 | 7   | 7   | 19  |
| Cattle | -                 | -   | -   | 2   |

| Days use per acre (ha) |         |
|------------------------|---------|
| '03                    | '08     |
| -                      | -       |
| 12 (30)                | 29 (72) |
| 24 (60)                | 26 (65) |
| -                      | 1 (2)   |

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 3

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>2398</b>                           | 133                                      | 299   | 2033   | 66       | -    | 3           | 0       | 3          | -       | 22           | 11/9                      |
| 92                                     | <b>2020</b>                           | 1060                                     | 520   | 720    | 780      | -    | 44          | 3       | 39         | 2       | 19           | -/-                       |
| 97                                     | <b>1380</b>                           | -  | 140   | 980    | 260      | 300  | 0           | 0       | 19         | 9       | 13           | 13/25                     |
| 03                                     | <b>1340</b>                           | -  | 100   | 1020   | 220      | 200  | 1           | 0       | 16         | 7       | 7            | 14/18                     |
| 08                                     | <b>1760</b>                           | 120                                      | 440   | 560    | 760      | 200  | 0           | 0       | 43         | 15      | 16           | 12/18                     |
| <i>Ceanothus fendleri</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>432</b>                            | -  | 199   | 233    | -        | -    | 0           | 0       | -          | -       | 0            | 4/14                      |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 10/48                     |
| 03                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 7/24                      |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/7                       |
| <i>Chrysothamnus depressus</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>8198</b>                           | 133                                      | 799   | 7366   | 33       | -    | 1           | 0       | 0          | -       | .81          | 4/7                       |
| 92                                     | <b>21840</b>                          | 780                                      | 3340  | 16960  | 1540     | -    | 15          | 2       | 7          | .18     | 4            | -/-                       |
| 97                                     | <b>13380</b>                          | 40                                       | 780   | 12320  | 280      | 40   | .14         | 0       | 2          | 1       | 1            | 5/13                      |
| 03                                     | <b>14980</b>                          | -  | 420   | 13680  | 880      | 680  | 10          | 10      | 6          | 2       | 2            | 5/9                       |
| 08                                     | <b>11160</b>                          | 140                                      | 300   | 9120   | 1740     | 60   | 43          | 8       | 16         | 1       | 3            | 4/10                      |
| <i>Chrysothamnus parryi attenuatus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>1132</b>                           | -  | 166   | 966    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/5                       |
| 92                                     | <b>1460</b>                           | 40                                       | 500   | 440    | 520      | -    | 29          | 15      | 36         | -       | 8            | -/-                       |
| 97                                     | <b>80</b>                             | -  | 20    | 40     | 20       | -    | 0           | 0       | 25         | -       | 0            | 7/10                      |
| 03                                     | <b>1220</b>                           | -  | 40    | 1120   | 60       | -    | 8           | 10      | 5          | 3       | 5            | 7/11                      |
| 08                                     | <b>1160</b>                           | -  | -     | 1140   | 20       | -    | 5           | 0       | 2          | -       | 0            | 7/13                      |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Gutierrezia sarothrae</b>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>499</b>                            | -  | -     | 499    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/5                       |
| 92                               | <b>380</b>                            | 40                                       | 20    | 360    | -        | -    | 5           | 0       | 0          | -       | 5            | -/-                       |
| 97                               | <b>60</b>                             | -  | 40    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                               | <b>400</b>                            | -  | 320   | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 5/5                       |
| 08                               | <b>1240</b>                           | 80                                       | 20    | 840    | 380      | 20   | 0           | 0       | 31         | 2       | 2            | 6/8                       |
| <b>Mahonia repens</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>2099</b>                           | 33                                       | 2033  | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 5/9                       |
| 92                               | <b>280</b>                            | 140                                      | 260   | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/5                       |
| 08                               | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 4/6                       |
| <b>Pinus ponderosa</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>165</b>                            | -  | 66    | 99     | -        | -    | 0           | 0       | -          | -       | 20           | 367/144                   |
| 92                               | <b>120</b>                            | 20                                       | 40    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                               | <b>80</b>                             | -  | 20    | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | <b>80</b>                             | -  | 20    | 60     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>1132</b>                           | 233                                      | 433   | 633    | 66       | -    | 68          | 6       | 6          | -       | 6            | 15/23                     |
| 92                               | <b>1820</b>                           | 140                                      | 820   | 820    | 180      | -    | 38          | 19      | 10         | -       | 4            | -/-                       |
| 97                               | <b>620</b>                            | 40                                       | 80    | 440    | 100      | -    | 52          | 6       | 16         | -       | 0            | 14/41                     |
| 03                               | <b>720</b>                            | -  | 20    | 420    | 280      | -    | 36          | 61      | 39         | -       | 0            | 16/38                     |
| 08                               | <b>820</b>                            | 20                                       | 40    | 640    | 140      | -    | 24          | 2       | 17         | -       | 0            | 15/39                     |
| <b>Ribes cereum inebrians</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>99</b>                             | -  | -     | 99     | -        | -    | 0           | 0       | 0          | -       | 0            | 26/29                     |
| 92                               | <b>160</b>                            | 20                                       | 100   | 40     | 20       | -    | 75          | 0       | 13         | -       | 0            | -/-                       |
| 97                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 39/57                     |
| 03                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | 0          | -       | 0            | 45/58                     |
| 08                               | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | 38/49                     |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>99</b>                             | -  | -     | 99     | -        | -    | 0           | 100     | 0          | -       | 0            | 15/20                     |
| 92                               | <b>300</b>                            | 20                                       | 160   | 120    | 20       | -    | 13          | 40      | 7          | -       | 0            | -/-                       |
| 97                               | <b>240</b>                            | -  | 60    | 180    | -        | -    | 8           | 0       | 0          | -       | 0            | 17/41                     |
| 03                               | <b>300</b>                            | -  | 60    | 240    | -        | -    | 33          | 27      | 0          | -       | 0            | 13/25                     |
| 08                               | <b>320</b>                            | -  | 20    | 280    | 20       | -    | 63          | 0       | 6          | -       | 0            | 10/30                     |

|                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Tetradymia canescens |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                   | <b>66</b>                             | -  | 33    | 33     | -        | -    | 0           | 0       | 0          | -       | 50           | 8/6                       |
| 92                   | <b>540</b>                            | 20                                       | 240   | 180    | 120      | -    | 22          | 4       | 22         | -       | 0            | -/-                       |
| 97                   | <b>200</b>                            | -  | 60    | 140    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/8                       |
| 03                   | <b>420</b>                            | -  | 80    | 340    | -        | -    | 0           | 0       | 0          | -       | 0            | 9/11                      |
| 08                   | <b>340</b>                            | 20                                       | 60    | 260    | 20       | -    | 6           | 0       | 6          | -       | 6            | 7/10                      |

Trend Study 27-5-08

Study site name: Podunk Creek.

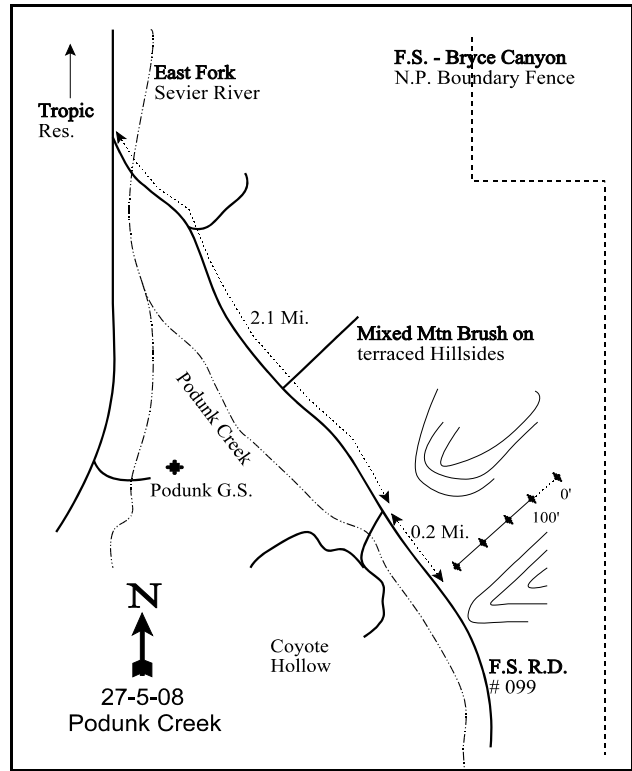
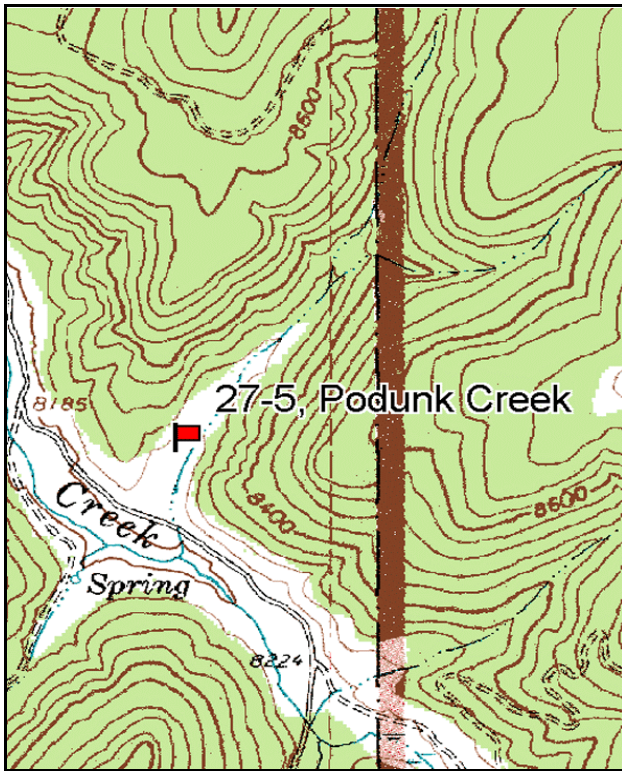
Vegetation type: Dry Meadow.

Compass bearing: frequency baseline 185 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

Travel about 7.0 miles south from Tropic Reservoir on the East Fork of the Sevier River Road to a major fork. Turn left towards Podunk Creek and the park boundary. Travel 2.1 miles SE on the main road up Podunk Creek to a fork at Coyote Hollow. Stay left on USFS road #099 and continue about 0.2 miles to a point in the middle of the valley to the north. The transect is in the bottom of this seeded meadow valley. The end of the baseline can be found 125 feet north of the road. The study is marked by short fenceposts. The 0-foot baseline stake is 375 feet north of the end stake as the study runs from there back to the southwest.



Map Name: Podunk Creek

Diagrammatic Sketch

Township 38S, Range 4W, Section 19

GPS: NAD 83, UTM 12S 387734 E, 4148947 N

## DISCUSSION

### Podunk Creek - Trend Study No. 27-5

#### Study Information

This study is located in a narrow valley off of Podunk Creek, and samples a contour-trenched and seeded dry meadow [elevation: 8,200 feet (2,500 m), slope: 5%, aspect: south]. Due to serious erosion and gully formation caused by overgrazing in the early part of the areas grazing history, watershed rehabilitation treatments were undertaken in the 1960's all along the East Fork of the Sevier River drainage. The treatment here successfully established a dense stand of perennial grasses, stopped overland flows and erosion, and helped heal the adjacent gully. Erosion is now almost non-existent due to the contoured trenching treatment and the dense grass and litter cover. Pellet group counts estimated elk use to be very light in 2003 (4 edu/acre:10 edu/ha) and light in 2008 (11 edu/acre:26 edu/ha). There was no sign of deer encountered in 2003 and very light deer use was estimated in 2008 (3 ddu/acre:7 ddu/ha). This upper part of the East Fork watershed is grazed by cattle in late summer. Cattle use was estimated to be very heavy in 2003 (72 cdu/acre:177 cdu/ha) and moderately heavy in 2008 (36 cdu/acre:90 cdu/ha). Use by cattle has been moderate to heavy over the years due to the water source 200 yards away.

#### Soil

The soil is deep with an effective rooting depth of almost 19 inches. Soil texture analysis indicates it to be a clay loam with a neutral reaction (pH 7.2). Organic matter is relatively high at 4.1%, the highest amount on the unit. Relative combined vegetation and litter cover has been high at 72% in 1992, 74% in 1997, 61% in 2003, and 80% in 2008. Relative bare ground cover was 24% in 1992, 21% in 1997, 31% in 2003, and 16% in 2008. Very little evidence of erosion was present on the site in 1997, 2003, or 2008. The soil erosion condition rating was classified as stable in 2003, and 2008.

#### Browse

Browse is not a significant component of this community. The surrounding hills are dominated by mixed conifer and aspen (*Populus tremuloides*) with no evidence of forest invading into the meadow. The larger sampling method used beginning in 1992 picked up a small number of shrubs. The only fairly common species found are several species of rabbitbrush (*Chrysothamnus* spp.). These shrubs show occasional moderate or heavy use, but most are unutilized.

#### Herbaceous Understory

A very dense stand of grasses characterizes the meadow. Smooth brome (*Bromus inermis*) is the most abundant species having been sampled in nearly every quadrat in all surveys, and providing 87%, 95%, and 87% of the total grass cover in 1997, 2003, and 2008, respectively. Smooth brome is a vigorous, rhizomatous species which is a sod former and provides excellent ground cover. Smooth brome also is an excellent forage plant for livestock and wildlife. Letterman needlegrass (*Stipa lettermani*), Kentucky bluegrass (*Poa pratensis*), and mountain muhly (*Muhlenbergia montana*) were all common prior to the 2003 reading, but all three of these species declined in nested frequency with dry conditions in 2003. The three species rebounded somewhat by the 2008 reading. Due to heavy livestock use in 1987, little seed production was observed that summer. Use was moderate in 1992 and 1997 with grasses showing good seed production. Grass production was only fair in 2003 with the drought, and grasshopper use was noted as being high. Grass production was good and seed production was moderate in 2008, with very little use from wildlife and livestock. Forbs provide a fair forage source on the site as well. The most numerous species have included western aster (*Aster occidentalis*), trailing fleabane (*Erigeron flagellaris*), redroot eriogonum (*Eriogonum racemosum*), and northwest cinquefoil (*Potentilla gracilis*).

### 1992 TREND ASSESSMENT

The trend for browse is not important on this summer range as it only makes up 4% of the total vegetative cover. However, trend for browse for this site appears stable, but almost non-existent. The herbaceous understory is very vigorous and is dominated by 1 species (smooth brome). Trend for grasses is stable and trend for forbs is slightly up with regard to their sum of nested frequency values.

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

### 1997 TREND ASSESSMENT

Trend for the small browse component appears slightly up although not an important aspect on this summer range. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses declined by 25% since 1992 and production declined from 44% in 1992 to 26%. With these statistics, trend for grasses would have been considered down, but most of the change is due to a decrease in frequency and cover of the introduced perennial species Kentucky bluegrass. The nested frequency of the dominant species, smooth brome has not changed significantly since 1987. Trend for forbs is down. The sum of nested frequency of perennial forbs has declined by 41% since 1992 and production decreased from 16% in 1992 to just 6%.

browse - slightly up (+1)

grass - slightly down (-1)

forb - down (-2)

### 2003 TREND ASSESSMENT

Trend for browse is slightly down as the combined density of the rabbitbrush species declined significantly in 2003. However, as stated previously, the browse component is relatively unimportant on this meadow. Trend for the grasses is down. The sum of nested frequency of perennial grasses declined by a further 32% since 1997. There was a significant decrease in the frequency of Letterman needlegrass and mountain muhly and the frequency of Kentucky bluegrass decreased, as well. The decrease in frequency of these three species was probably due to drought conditions. The frequency of the dominant grass species, smooth brome, remained relatively constant, but with the decrease in other species it now comprises 95% of the total grass cover. The trend for forbs is slightly up. Sum of nested frequency and production of perennial forbs increased. All of the increase in forb frequency can be attributed to the low growing increaser trailing fleabane which has little forage value.

browse - slightly down (-1)

grass - down (-2)

forb - slightly up (+1)

### 2008 TREND ASSESSMENT

Trend for browse is stable with an increase in the combined density of rabbitbrush species. As mentioned above, shrubs are minimal on this site and considered unimportant for forage. Trend for grasses is up. Sum of nested frequency and production of perennial grasses increased 34% since 2003. The three species, Letterman needlegrass, mountain muhly, and Kentucky bluegrass, all had increases in nested frequency and cover. The trend for forbs is stable with a constant sum of nested frequency of perennial forbs since 2003. There was a slight increase in production of perennial forbs from just under 8% of total cover in 2003 to over 9%.

browse - stable (0)

grass - up (+2)

forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 5

| Type                        | Species                              | Nested Frequency |                  |                  |                  |                  | Average Cover % |       |       |       |
|-----------------------------|--------------------------------------|------------------|------------------|------------------|------------------|------------------|-----------------|-------|-------|-------|
|                             |                                      | '87              | '92              | '97              | '03              | '08              | '92             | '97   | '03   | '08   |
| G                           | <i>Agropyron intermedium</i>         | <sub>b</sub> 18  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | <sub>ab</sub> 4  | -               | -     | -     | .06   |
| G                           | <i>Bromus inermis</i>                | 356              | 348              | 357              | 343              | 354              | 31.07           | 22.11 | 21.77 | 30.26 |
| G                           | <i>Koeleria cristata</i>             | <sub>ab</sub> 10 | <sub>b</sub> 15  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | .27             | -     | -     | -     |
| G                           | <i>Muhlenbergia montana</i>          | <sub>b</sub> 60  | <sub>b</sub> 75  | <sub>b</sub> 85  | <sub>a</sub> 6   | <sub>b</sub> 66  | 1.50            | 1.56  | .06   | 1.66  |
| G                           | <i>Poa fendleriana</i>               | <sub>ab</sub> 1  | <sub>ab</sub> 2  | <sub>a</sub> -   | <sub>ab</sub> 5  | <sub>b</sub> 16  | .15             | -     | .03   | .10   |
| G                           | <i>Poa pratensis</i>                 | <sub>b</sub> 227 | <sub>b</sub> 248 | <sub>a</sub> 44  | <sub>a</sub> 13  | <sub>a</sub> 41  | 7.19            | .22   | .07   | .26   |
| G                           | <i>Poa secunda</i>                   | 4                | -                | -                | 1                | 11               | -               | -     | .00   | .01   |
| G                           | <i>Stipa columbiana</i>              | -                | 3                | 3                | -                | -                | .03             | .00   | -     | -     |
| G                           | <i>Stipa lettermani</i>              | <sub>b</sub> 152 | <sub>b</sub> 178 | <sub>b</sub> 167 | <sub>a</sub> 79  | <sub>a</sub> 107 | 4.14            | 1.66  | 1.06  | 2.31  |
| Total for Annual Grasses    |                                      | 0                | 0                | 0                | 0                | 0                | 0               | 0     | 0     | 0     |
| Total for Perennial Grasses |                                      | 828              | 869              | 656              | 447              | 599              | 44.36           | 25.55 | 23.01 | 34.68 |
| Total for Grasses           |                                      | 828              | 869              | 656              | 447              | 599              | 44.36           | 25.55 | 23.01 | 34.68 |
| F                           | <i>Antennaria rosea</i>              | -                | 8                | 6                | 4                | 13               | .56             | .30   | .18   | 1.43  |
| F                           | <i>Androsace septentrionalis</i> (a) | -                | <sub>bc</sub> 24 | <sub>a</sub> -   | <sub>c</sub> 32  | <sub>b</sub> 11  | .11             | -     | .10   | .02   |
| F                           | <i>Artemisia dracunculus</i>         | -                | -                | 8                | -                | 1                | -               | .36   | -     | .00   |
| F                           | <i>Arenaria fendleri</i>             | 10               | -                | -                | -                | -                | -               | -     | -     | -     |
| F                           | <i>Astragalus convallarius</i>       | <sub>a</sub> -   | <sub>b</sub> 164 | <sub>a</sub> 1   | <sub>a</sub> -   | <sub>a</sub> -   | 3.01            | .00   | -     | -     |
| F                           | <i>Aster occidentalis</i>            | <sub>b</sub> 40  | <sub>a</sub> -   | <sub>c</sub> 124 | <sub>b</sub> 39  | <sub>c</sub> 113 | -               | 1.39  | .21   | 2.14  |
| F                           | <i>Astragalus</i> sp.                | 2                | -                | -                | 6                | -                | .00             | -     | .06   | -     |
| F                           | <i>Castilleja linariaefolia</i>      | -                | -                | 3                | -                | -                | -               | .00   | -     | -     |
| F                           | <i>Calochortus nuttallii</i>         | -                | -                | -                | -                | 2                | -               | -     | -     | .00   |
| F                           | Cruciferae                           | 5                | -                | -                | -                | -                | -               | -     | -     | -     |
| F                           | <i>Equisetum</i> sp.                 | 2                | -                | -                | -                | -                | -               | -     | -     | -     |
| F                           | <i>Eriogonum alatum</i>              | -                | -                | -                | -                | 3                | -               | -     | -     | .00   |
| F                           | <i>Erigeron flagellaris</i>          | <sub>d</sub> 298 | <sub>c</sub> 194 | <sub>a</sub> 53  | <sub>c</sub> 227 | <sub>b</sub> 139 | 4.52            | .65   | 5.21  | 2.75  |
| F                           | <i>Erigeron</i> sp.                  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 18  | <sub>a</sub> -   | <sub>a</sub> -   | -               | .11   | -     | -     |
| F                           | <i>Eriogonum racemosum</i>           | <sub>ab</sub> 17 | <sub>ab</sub> 18 | <sub>b</sub> 29  | <sub>a</sub> 10  | <sub>ab</sub> 15 | .75             | .64   | .22   | .22   |
| F                           | <i>Hymenoxys richardsonii</i>        | 4                | 6                | -                | -                | 2                | .09             | -     | -     | .00   |
| F                           | <i>Potentilla concinna</i>           | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 44  | <sub>b</sub> 26  | -               | -     | 1.24  | 1.45  |
| F                           | <i>Polygonum douglasii</i> (a)       | -                | -                | <sub>a</sub> 5   | <sub>a</sub> -   | <sub>b</sub> 27  | -               | .02   | -     | .06   |
| F                           | <i>Potentilla gracilis</i>           | <sub>ab</sub> 36 | <sub>ab</sub> 82 | <sub>b</sub> 51  | <sub>a</sub> 15  | <sub>ab</sub> 25 | 6.46            | 2.15  | .46   | 1.34  |
| F                           | <i>Polygonum</i> sp.                 | <sub>a</sub> -   | <sub>b</sub> 14  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | .03             | -     | -     | -     |
| F                           | <i>Senecio douglasii</i>             | -                | -                | -                | -                | 7                | -               | -     | -     | .04   |
| F                           | <i>Senecio spartioides</i>           | 9                | 4                | -                | -                | -                | .01             | -     | -     | -     |

| Type                      | Species                | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|---------------------------|------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|                           |                        | '87              | '92 | '97 | '03 | '08 | '92             | '97  | '03  | '08  |
| F                         | Taraxacum officinale   | 3                | -   | -   | -   | -   | -               | -    | -    | -    |
| F                         | Tragopogon dubius      | 3                | 7   | -   | 10  | 1   | .09             | -    | .02  | .00  |
| F                         | Unknown forb-perennial | 2                | -   | -   | -   | -   | -               | -    | -    | -    |
| F                         | Vicia americana        | -                | 2   | -   | -   | -   | .00             | -    | -    | -    |
| Total for Annual Forbs    |                        | 0                | 24  | 5   | 32  | 38  | 0.10            | 0.01 | 0.10 | 0.09 |
| Total for Perennial Forbs |                        | 431              | 499 | 293 | 355 | 347 | 15.56           | 5.63 | 7.62 | 9.42 |
| Total for Forbs           |                        | 431              | 523 | 298 | 387 | 385 | 15.67           | 5.65 | 7.72 | 9.51 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 5

| Type             | Species                                 | Strip Frequency |     |     |     | Average Cover % |      |      |      |
|------------------|---|-----------------|-----|-----|-----|-----------------|------|------|------|
|                  |   | '92             | '97 | '03 | '08 | '92             | '97  | '03  | '08  |
| B                | Chrysothamnus nauseosus hololeucus      | 0               | 12  | 0   | 0   | -               | 1.09 | -    | -    |
| B                | Chrysothamnus parryi                    | 5               | 0   | 6   | 9   | .78             | .15  | .00  | .31  |
| B                | Chrysothamnus vaseyi                    | 34              | 44  | 4   | 0   | 1.75            | 3.19 | .03  | -    |
| B                | Chrysothamnus viscidiflorus lanceolatus | 6               | 2   | 26  | 39  | .18             | .30  | .78  | 2.43 |
| B                | Gutierrezia sarothrae                   | 1               | 1   | 2   | 0   | .00             | .15  | .00  | -    |
| Total for Browse |   | 46              | 59  | 38  | 48  | 2.71            | 4.88 | 0.81 | 2.74 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 5

| Species                                 | Percent Cover |      |
|---|---------------|------|
|   | '03           | '08  |
| Chrysothamnus parryi                    | -             | .88  |
| Chrysothamnus vaseyi                    | .33           | -    |
| Chrysothamnus viscidiflorus lanceolatus | 1.20          | 2.83 |



**BASIC COVER --**

Management unit 27 , Study no: 5

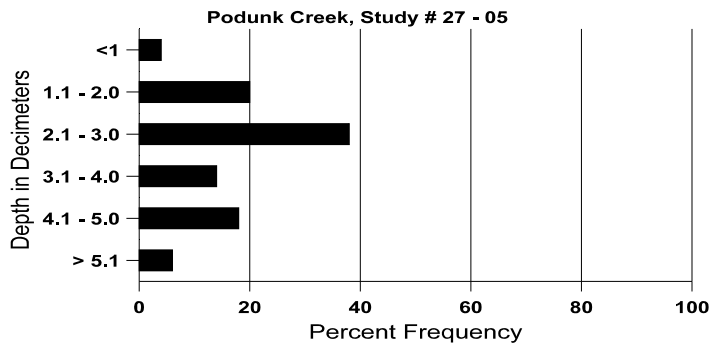
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 19.75           | 53.47 | 39.04 | 32.59 | 48.91 |
| Rock        | 1.25            | 5.67  | .96   | 3.80  | 1.10  |
| Pavement    | 3.50            | 0     | 4.96  | 5.92  | 3.87  |
| Litter      | 52.00           | 28.00 | 39.34 | 34.06 | 40.95 |
| Cryptogams  | 0               | .00   | 0     | 0     | 0     |
| Bare Ground | 23.50           | 27.11 | 22.03 | 33.68 | 17.53 |

**SOIL ANALYSIS DATA --**

Management unit 27, Study no: 5, Study Name: Podunk Creek

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-----------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand     | %silt | %clay |     |       |       |      |
| 18.5                         | 60.0 (18.1)     | 7.2 | 31.7      | 37.7  | 30.6  | 4.1 | 24.5  | 332.8 | 0.7  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 27 , Study no: 5

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | -                 | -   | -   | 4   |
| Elk    | -                 | 3   | -   | 2   |
| Deer   | 3                 | 4   | -   | 2   |
| Cattle | 6                 | 23  | 32  | 36  |

| Days use per acre (ha) |         |
|------------------------|---------|
| '03                    | '08     |
| -                      | -       |
| 4 (10)                 | 11 (26) |
| -                      | 3 (7)   |
| 72 (177)               | 36 (90) |

BROWSE CHARACTERISTICS --  
Management unit 27 , Study no: 5

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus nauseosus hololeucus</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 480                                   | -  | 280   | 200    | -        | -    | 0           | 0       | -          | -       | 0            | 16/19                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Chrysothamnus parryi</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 120                                   | -  | 40    | 40     | 40       | -    | 33          | 0       | 33         | -       | 0            | -/-                       |
| 97   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 19/21                     |
| 03   | 200                                   | -  | -     | 160    | 40       | -    | 40          | 0       | 20         | -       | 20           | 14/18                     |
| 08   | 260                                   | -  | 20    | 160    | 80       | -    | 0           | 0       | 31         | -       | 0            | 17/22                     |
| <b>Chrysothamnus vaseyi</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 2860                                  | -  | 440   | 2180   | 240      | -    | 0           | 0       | 8          | -       | 3            | -/-                       |
| 97   | 4060                                  | -  | 20    | 4040   | -        | -    | 0           | 0       | 0          | -       | 0            | 6/13                      |
| 03   | 100                                   | -  | -     | 100    | -        | -    | 0           | 40      | 0          | -       | 0            | 13/17                     |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Chrysothamnus viscidiflorus lanceolatus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 340                                   | -  | 40    | 180    | 120      | -    | 18          | 0       | 35         | -       | 0            | -/-                       |
| 97   | 80                                    | -  | 40    | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 10/11                     |
| 03   | 1180                                  | -  | -     | 900    | 280      | -    | 0           | 0       | 24         | -       | 0            | 9/14                      |
| 08   | 2840                                  | 180                                      | 100   | 2740   | -        | -    | 8           | .70     | 0          | -       | 0            | 8/15                      |
| <b>Eriogonum microthecum</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 17/18                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Gutierrezia sarothrae</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 97                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 15/20                     |
| 03                           | <b>60</b>                             | -  | -     | 20     | 40       | -    | 0           | 0       | 67         | -       | 0            | 4/4                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |

Trend Study 27-6-08

Study site name: Nephi Pasture I.

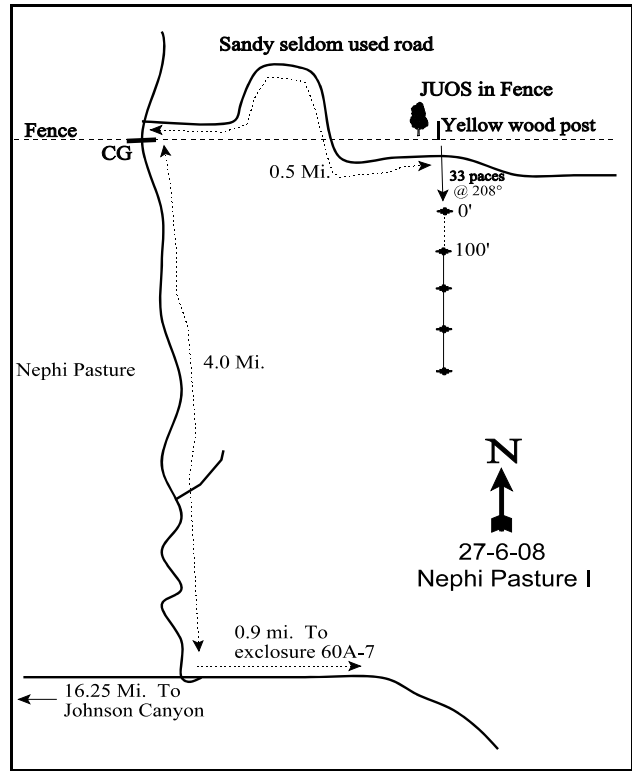
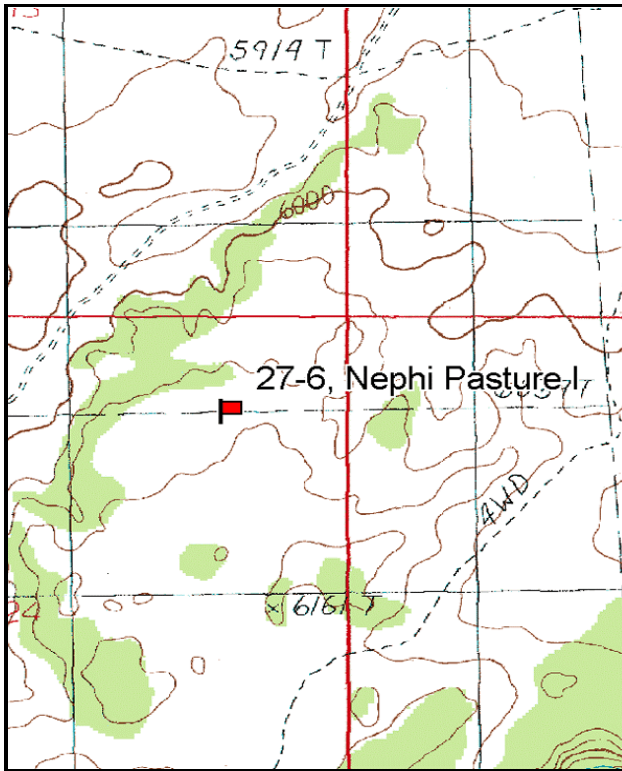
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). No rebar.

LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to the Johnson Canyon turnoff. Turn left and travel up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 3.6 miles to a cattleguard. Go 0.8 miles to a fork, bear right (There are lots of forks, stay on main Nephi Pasture road). Go 1.25 miles to a fork, keep right. Go 0.85 miles to a fork by a cattleguard, continue straight. Continue 1.2 miles to a cattleguard. Continue 4.7 miles to a fork, bear right. Go 0.7 miles to a cattleguard, and continue 2.8 miles to an intersection. Turn left (straight goes to Nephi Point and the Nephi Pasture enclosure) and follow this road 4.0 miles to a cattleguard. Turn right and follow the road up the fence 0.5 miles to a yellow-painted wood post marking the pellet group transect and range trend study. The 0-foot baseline stake is 33 paces at 208 degrees magnetic south of the yellow post. The trend study is marked by short fenceposts, and runs south along the pellet group transect.



Map Name: Buckskin Mountain

Diagrammatic Sketch

Township 41S, Range 4W, Section 24

GPS: NAD 83, UTM 12S 395313 E, 4121659 N

## DISCUSSION

### Nephi Pasture I - Trend Study No. 27-6

#### Study Information

This study samples an important spring-fall range for deer below the White Cliffs that also receives use in light winters [elevation: 6,000 feet (1,830 m), slope: 5%-10%, aspect: northwest]. Most of the area below the White Cliffs consists of either sagebrush-grass or pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland communities. The study samples a basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) community with scattered mixed browse associated with a sparse herbaceous understory. Water is limited in this area in the summer. Although cattle were present in the lower end of Nephi Pasture in 1987, there was little sign or use on the site. Pellet group data estimated deer use to be very heavy in 2003 (72 ddu/acre:177 ddu/ha) and decreasing, but still heavy in 2008 (43 ddu/acre:106 ddu/ha). Cattle use was estimated to be light in 2003 and 2008 (9 cdu/acre:22 cdu/ha and 3 cdu/acre:7 cdu/ha, respectively). There was high use by rabbits noted in 2008.

#### Soil

The soil on the site consists of loose, excessively drained sandy soil with a slightly acidic reaction (pH 6.5) that is susceptible to soil movement as evidenced by gullies in the drainages. Soils are also susceptible to wind erosion. Soil depth on the stabilized dunes is moderately deep with an effective rooting depth of nearly 16 inches. There are some areas with sandstone occurring at a depth of 10 to 12 inches. Organic matter is very low at less than 1%. Relative combined vegetation and litter cover ranged from 60%-66% from 1992 to 2008. Relative bare ground cover ranged from 31%-38% from 1992 to 2008. The high proportion of bare ground is the result of the minimal herbaceous understory. The erosion condition rating was classified as stable in 2003 and slight in 2008.

#### Browse

Basin big sagebrush density was estimated at 3,000 plants/acre in 1992, but has steadily declined with each survey. Density was estimated at 1,200 plants/acre in 2008. Basin big sagebrush provided nearly 70% of the total browse cover on the transect from 1992 to 2003, but had decreased to just 45% in 2008. Along with the steady decline in population density and production since 1992, basin big sagebrush plants displaying poor vigor has increased and reproduction has declined. Decadence, which was high from 1987-1997 at 40-50%, has increased to very high rates of 91% in 2003 and 75% in 2008. Use on basin big sagebrush has been light to moderate with few plants showing heavy use in any year. Annual sagebrush leaders had averaged 2.1 inches in July of 2003 and 1 inch in July of 2008.

The most preferred browse on the site is antelope bitterbrush (*Purshia tridentata*) which is present on the site in low densities. These scattered plants were moderately to heavily used from 1987 to 2003, but mostly lightly used in 2008. Bitterbrush plants have maintained good vigor and moderate to low decadence even during cyclic drought periods during the late 1980's and early 2000's. Bitterbrush density has averaged about 550 plants/acre between 1992-2008. The large serviceberry (*Amelanchier utahensis*) are more scattered, less common and loosely aggregated. With the increased sample size, serviceberry density was estimated at 500 plants/acre in 1992, 300 plant/acre in 1997, 100 plants/acre in 2003, and 540 plant/acre in 2008. The available portions of the serviceberry plants were heavily browsed in 1987, but use has since become mostly light. Bitterbrush and serviceberry leaders averaged 6.0 and 5.6 inches of annual growth, respectively, in 2003, but annual leader growth decreased to about 1.5 inches for both species in 2008. Other woody species sampled on the site include the increaser, broom snakeweed (*Gutierrezia sarothrae*), green ephedra (*Ephedra viridis*), and Utah juniper.

### Herbaceous Understory

The most common grass, Sandhill muhly (*Muhlenbergia pungens*), forms large rings in the open areas. It is of low forage quality and an increaser with heavy grazing. Sandhill muhly accounted for 69% of the grass cover in 1997, increasing to 87% in 2003, and 93% in 2008. However, this species significantly declined in nested frequency and average cover in 2003 which illustrates the limited herbaceous understory on the site. Other grasses sampled on the site include sand dropseed (*Sporobolus cryptandrus*), bottlebrush squirreltail (*Sitanion hystrix*), blue grama (*Bouteloua gracilis*), and Indian ricegrass (*Oryzopsis hymenoides*), but these species occur infrequently. Sixweeks fescue (*Vulpia octoflora*), an annual, had the highest nested frequency value of any grass in 1997 but was not sampled in 2003 with the dry conditions. Forbs are also limited on the site. The most common species are peavine (*Lathyrus brachycalyx*) and bastard toadflax (*Comandra pallida*). Sum of nested frequency values of all perennial herbaceous species declined by more than half from 1997 and 2003.

### 1992 TREND ASSESSMENT

The browse trend is stable. Due to changes in sample size to determine density it is difficult to compare the previous reading. Sagebrush also had a slight increase in decadence from 46% in 1987 to 51%. Recruitment of sagebrush has decreased since 1987 with young plants comprising 8% of the population. The preferred browse species, antelope bitterbrush and serviceberry, had good vigor with low decadence. Recruitment of young plants was also good for both species. The trend for both grasses and forbs is slightly down with a decrease in sum of nested frequency of perennial grasses and perennial forbs. The herbaceous understory is almost nonexistent.

winter range condition (DCI) - fair (53) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

### 1997 TREND ASSESSMENT

Trend for browse is down. The primary browse species, basin big sagebrush, density declined 30% since 1992 to 2,100 plants/acre. Sagebrush plants displaying poor vigor increased from 8% in 1992 to 32%. Recruitment of sagebrush continued to decline with young plants comprising only 3% of the population. The preferred browse species, bitterbrush, has also declined slightly in density to 460 plants/acre. A larger proportion of the shrubs display poor vigor (17%). Decadence of bitterbrush has increased from 33% in 1992 to 39%, and recruitment is poor. Trend for the grasses is stable, yet depleted. The increase in sum of nested frequency for grasses comes from the a significant increase in the nested frequency of the small annual, sixweeks fescue. The trend for forbs is stable. There was a slight increase in the sum of nested frequency and cover of perennial forbs. Unlike other sites on the unit, grass and forb cover values are similar compared to 1992 estimates.

winter range condition (DCI) - poor (45) Mid-level potential scale

browse - down (-2)

grass - stable (0)

forb - stable (0)

### 2003 TREND ASSESSMENT

Trend for browse is down. The primary browse species, basin big sagebrush, has a lower density estimate of 1,620 plants/acre. Recruitment of sagebrush was nonexistent with no seedlings or young plants encountered. Sagebrush also showed a large increase in poor vigor since 1997 (32% to 47%) and decadence (40% to 91%). The preferred browse species, bitterbrush, increased slightly in density in 2003 and shows less decadence and improved vigor. However, density is still low at about 600 plants/acre. Serviceberry continues to decline in density with no young in the population in 2003. These plants are large, and mostly unavailable to browsing deer during winter months. The trend for grasses is down. The sum of nested frequency of perennial grasses decreased by 72% and production of perennial grasses decreased from 4% of total cover in 1997 to less than 1%. The most abundant species, Sandhill muhly declined significantly in nested frequency and cover. Trend for forbs is stable. Sum of nested frequency of perennial forbs decreased slightly, but production of perennial forbs increased slightly. There were also no annual forbs encountered on the site in 2003. Herbaceous production remains poor with total grass and forb cover estimated at only about 3%.

winter range condition (DCI) - very poor (25) Mid-level potential scale  
browse - down (-2)                      grass - down (-2)                      forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is slightly down. The density of the primary browse species, basin big sagebrush, continued to decline to 1,200 plants/acre. Sagebrush plants displaying poor vigor remained high at 52%. Decadence in the sagebrush population decreased, but remained high at 75%. There continued to be no new recruitment of young sagebrush plants. The trend for the preferred browse species, antelope bitterbrush, was stable with no to little change in density, vigor, or decadence. Recruitment of bitterbrush increased slightly. There was an 81% increase in the density of serviceberry to 540 plants/acre. Serviceberry vigor remained good and decadence was low. Recruitment of young serviceberry plants was good. The trend for grasses is stable with little change in the sum of nested frequency or production of perennial grasses. Trend for forbs is slightly down. There was little change in the sum of nested frequency of perennial forbs, but production of perennial forbs decreased slightly to less than 1% of cover. The largest change was the substantial increase in the sum of nested frequency of annual forbs. The herbaceous production remains poor.

winter range condition (DCI) - poor (38) Mid-level potential scale  
browse - slightly down (-1)                      grass - stable (0)                      forb - slightly down (-1)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 6

| T<br>y<br>p<br>e            | Species                 | Nested Frequency |     |      |      |      | Average Cover % |      |      |      |
|-----------------------------|-------------------------|------------------|-----|------|------|------|-----------------|------|------|------|
|                             |                         | '87              | '92 | '97  | '03  | '08  | '92             | '97  | '03  | '08  |
| G                           | Agropyron sp.           | 9                | -   | -    | -    | -    | -               | -    | -    | -    |
| G                           | Bouteloua gracilis      | 3                | -   | 3    | -    | -    | -               | .03  | -    | -    |
| G                           | Muhlenbergia pungens    | c122             | b85 | b97  | a30  | a30  | 3.97            | 3.78 | .59  | 1.13 |
| G                           | Oryzopsis hymenoides    | 1                | 10  | 9    | -    | 3    | .15             | .10  | -    | .00  |
| G                           | Poa secunda             | 6                | 2   | -    | -    | -    | .03             | -    | -    | -    |
| G                           | Sitanion hystrix        | b15              | b17 | b20  | a3   | a-   | .63             | .16  | .03  | -    |
| G                           | Sporobolus cryptandrus  | b19              | ab9 | ab9  | a6   | a4   | .42             | .07  | .06  | .01  |
| G                           | Vulpia octoflora (a)    | -                | a12 | b168 | a-   | a16  | .02             | 1.29 | -    | .06  |
| Total for Annual Grasses    |                         | 0                | 12  | 168  | 0    | 16   | 0.01            | 1.29 | 0    | 0.06 |
| Total for Perennial Grasses |                         | 175              | 123 | 138  | 39   | 37   | 5.20            | 4.15 | 0.68 | 1.16 |
| Total for Grasses           |                         | 175              | 135 | 306  | 39   | 53   | 5.22            | 5.45 | 0.68 | 1.22 |
| F                           | Astragalus sp.          | 3                | -   | -    | -    | -    | -               | -    | -    | -    |
| F                           | Calochortus nuttallii   | 3                | -   | 6    | -    | -    | -               | .01  | -    | -    |
| F                           | Comandra pallida        | b49              | a18 | ab44 | ab41 | ab26 | .16             | .85  | .84  | .11  |
| F                           | Delphinium nuttallianum | -                | -   | 2    | -    | -    | -               | .03  | -    | -    |
| F                           | Descurainia pinnata (a) | -                | a5  | b47  | a-   | b67  | .01             | .35  | -    | .32  |
| F                           | Eriogonum cernuum (a)   | a6               | b70 | a15  | a-   | b69  | .23             | .03  | -    | .13  |
| F                           | Gilia sp. (a)           | -                | -   | 9    | -    | -    | -               | .02  | -    | -    |
| F                           | Lathyrus brachycalyx    | ab65             | b74 | ab58 | a39  | ab49 | .38             | .47  | 1.50 | .67  |

| Type                      | Species                     | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|---------------------------|-----------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|                           |                             | '87              | '92 | '97 | '03 | '08 | '92             | '97  | '03  | '08  |
| F                         | Lappula occidentalis (a)    | -                | -   | 3   | -   | -   | -               | .03  | -    | -    |
| F                         | Navarretia intertexta (a)   | -                | -   | -   | -   | 3   | -               | -    | -    | .00  |
| F                         | Penstemon sp.               | 1                | -   | -   | -   | -   | -               | -    | -    | -    |
| F                         | Ranunculus testiculatus (a) | -                | -   | -   | -   | 3   | -               | -    | -    | .00  |
| F                         | Sphaeralcea parvifolia      | 1                | 3   | -   | -   | -   | .01             | -    | -    | -    |
| F                         | Townsendia sp.              | -                | 1   | -   | -   | -   | .00             | -    | -    | -    |
| Total for Annual Forbs    |                             | 6                | 75  | 74  | 0   | 142 | 0.24            | 0.43 | 0    | 0.46 |
| Total for Perennial Forbs |                             | 122              | 96  | 110 | 80  | 75  | 0.55            | 1.37 | 2.34 | 0.79 |
| Total for Forbs           |                             | 128              | 171 | 184 | 80  | 217 | 0.79            | 1.81 | 2.34 | 1.25 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27 , Study no: 6

| Type             | Species                         | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|---------------------------------|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |                                 | '92             | '97 | '03 | '08 | '92             | '97   | '03   | '08   |
| B                | Amelanchier utahensis           | 8               | 7   | 4   | 8   | 3.50            | 2.25  | 2.64  | 4.56  |
| B                | Artemisia tridentata tridentata | 68              | 59  | 58  | 42  | 19.74           | 14.50 | 13.35 | 9.27  |
| B                | Ephedra viridis                 | 0               | 0   | 0   | 1   | -               | -     | -     | .00   |
| B                | Gutierrezia sarothrae           | 27              | 45  | 13  | 2   | 1.37            | 1.79  | .09   | .07   |
| B                | Juniperus osteosperma           | 2               | 2   | 2   | 3   | .98             | .63   | .82   | 2.49  |
| B                | Opuntia sp.                     | 0               | 2   | 0   | 1   | -               | .00   | -     | .03   |
| B                | Purshia tridentata              | 17              | 17  | 19  | 18  | 2.87            | 2.33  | 2.65  | 3.98  |
| Total for Browse |                                 | 122             | 132 | 96  | 75  | 28.48           | 21.52 | 19.56 | 20.40 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 6

| Species                         | Percent Cover |      |
|---------------------------------|---------------|------|
|                                 | '03           | '08  |
| Amelanchier utahensis           | 7.98          | 8.44 |
| Artemisia tridentata tridentata | 7.31          | 8.86 |
| Ephedra viridis                 | -             | .10  |
| Gutierrezia sarothrae           | .13           | -    |
| Juniperus osteosperma           | 1.36          | 3.73 |
| Purshia tridentata              | 5.75          | 6.19 |



KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 6

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Amelanchier utahensis           | 5.6                        | 1.5 |
| Artemisia tridentata tridentata | 2.1                        | 1.0 |
| Purshia tridentata              | 6.0                        | 1.7 |

BASIC COVER --

Management unit 27 , Study no: 6

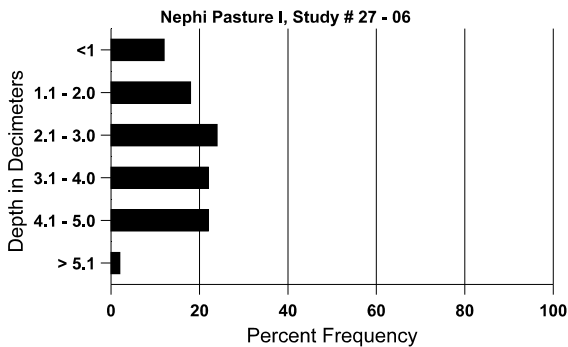
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 8.00            | 33.87 | 29.81 | 21.84 | 23.17 |
| Rock        | .50             | 1.13  | .27   | .59   | .25   |
| Pavement    | 2.00            | 0     | .73   | .88   | .31   |
| Litter      | 60.50           | 48.39 | 43.54 | 47.32 | 53.90 |
| Cryptogams  | 1.00            | 1.53  | 1.53  | .18   | .20   |
| Bare Ground | 28.00           | 39.89 | 34.83 | 43.46 | 40.65 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 6, Study Name: Nephi Pasture I

| Effective rooting depth (in) | Temp °F (depth) | pH  | loamy sand |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 15.8                         | 66.3 (14.6)     | 6.5 | 88.4       | 4.1   | 7.56  | 0.6 | 13.0  | 57.6  | 0.3  |

Stoniness Index



PELLET GROUP DATA --

Management unit 27 , Study no: 6

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | 48                | 27  | 17  | 73  |
| Deer   | 30                | 49  | 21  | 24  |
| Cattle | -                 | 1   | 2   | 3   |

| Days use per acre (ha) |          |
|------------------------|----------|
| '03                    | '08      |
| -                      | -        |
| 72 (177)               | 43 (106) |
| 9 (22)                 | 3 (7)    |

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 6

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Amelanchier utahensis</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 100     | 0          | -       | 0            | 55/59                     |
| 92                                     | <b>500</b>                            | 40                                       | 440   | 40     | 20       | -    | 8           | 0       | 4          | 4       | 36           | -/-                       |
| 97                                     | <b>300</b>                            | -  | 200   | 100    | -        | -    | 7           | 0       | 0          | -       | 0            | 95/111                    |
| 03                                     | <b>100</b>                            | -  | -     | 100    | -        | 20   | 0           | 20      | 0          | -       | 0            | 86/80                     |
| 08                                     | <b>540</b>                            | -  | 260   | 260    | 20       | -    | 0           | 4       | 4          | -       | 0            | 100/111                   |
| <i>Artemisia tridentata tridentata</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>3464</b>                           | 1066                                     | 466   | 1399   | 1599     | -    | 27          | 10      | 46         | 3       | 25           | 44/32                     |
| 92                                     | <b>3000</b>                           | 20                                       | 240   | 1220   | 1540     | -    | 31          | .66     | 51         | 3       | 8            | -/-                       |
| 97                                     | <b>2100</b>                           | 40                                       | 60    | 1200   | 840      | 1180 | 18          | 7       | 40         | 29      | 32           | 39/47                     |
| 03                                     | <b>1620</b>                           | -  | -     | 140    | 1480     | 1180 | 15          | 2       | 91         | 47      | 47           | 36/39                     |
| 08                                     | <b>1200</b>                           | 20                                       | -     | 300    | 900      | 1840 | 25          | 20      | 75         | 48      | 52           | 44/49                     |
| <i>Ceratoides lanata</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 13/13                     |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 40/46                     |
| 08                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 55/67                     |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Gutierrezia sarothrae</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>1399</b>                           | 66                                       | 266   | 1133   | -        | -    | 0           | 0       | 0          | -       | 0            | 8/10                      |
| 92                           | <b>1480</b>                           | 340                                      | 220   | 1220   | 40       | -    | 3           | 1       | 3          | -       | 0            | -/-                       |
| 97                           | <b>3500</b>                           | -  | 120   | 3380   | -        | 40   | 0           | 0       | 0          | -       | 0            | 11/10                     |
| 03                           | <b>320</b>                            | -  | -     | 320    | -        | 20   | 0           | 0       | 0          | -       | 0            | 7/9                       |
| 08                           | <b>40</b>                             | -  | 20    | 20     | -        | 40   | 0           | 0       | 0          | -       | 0            | 4/5                       |
| <i>Juniperus osteosperma</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                           | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/7                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 2/3                       |
| <i>Purshia tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>199</b>                            | -  | 66    | 133    | -        | -    | 100         | 0       | 0          | -       | 0            | 31/22                     |
| 92                           | <b>540</b>                            | 340                                      | 60    | 300    | 180      | -    | 52          | 19      | 33         | -       | 4            | -/-                       |
| 97                           | <b>460</b>                            | -  | 20    | 260    | 180      | -    | 52          | 26      | 39         | 17      | 17           | 30/49                     |
| 03                           | <b>620</b>                            | -  | -     | 500    | 120      | 60   | 32          | 68      | 19         | 6       | 6            | 33/49                     |
| 08                           | <b>620</b>                            | -  | 80    | 420    | 120      | 140  | 19          | 3       | 19         | 3       | 3            | 34/57                     |
| <i>Yucca sp.</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 59/74                     |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 53/44                     |

Trend Study 27-7-08

Study site name: Nephi Pasture Enclosure Outside .

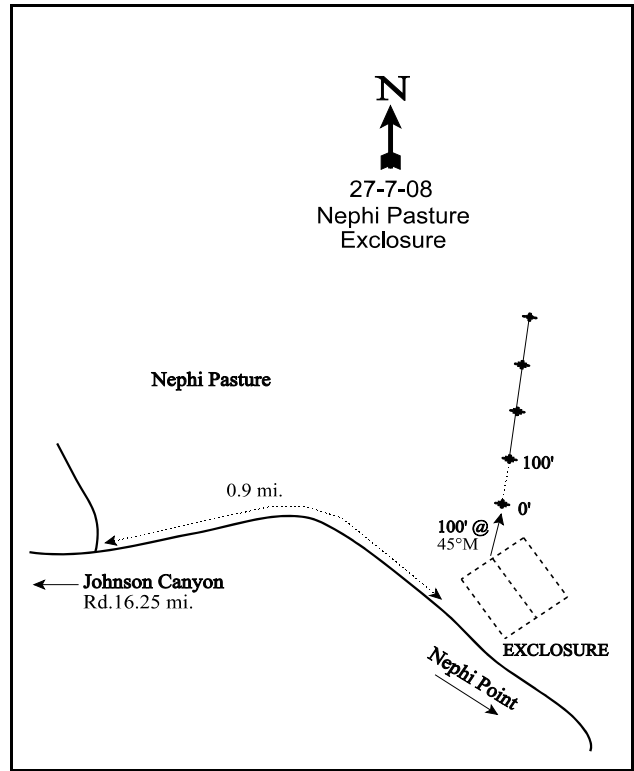
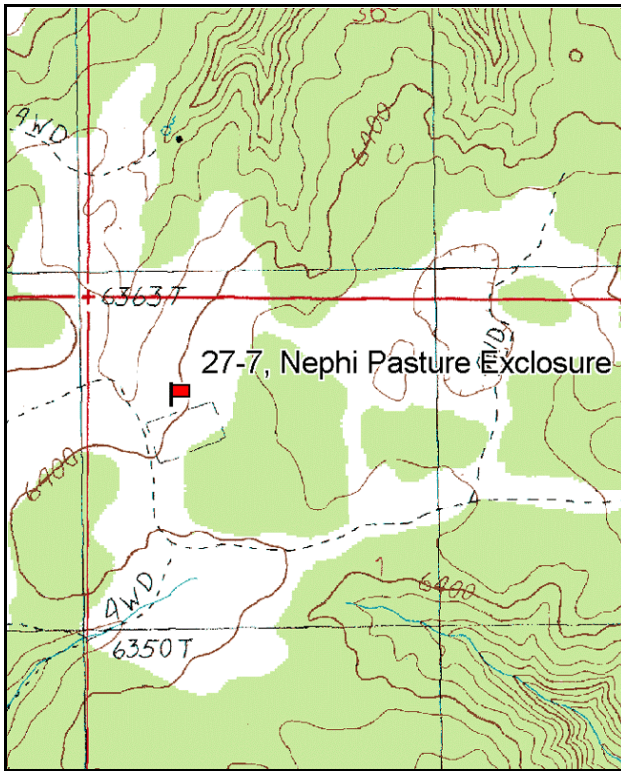
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 4 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 16.25 miles (see 27-6-03 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an enclosure. Walk east along the fence on the north side of the enclosure to the inner fence. From the northeast corner of the tallest fence, walk 100 feet northeast to the 0-foot baseline stake, a cut fencepost tagged #7808.



Map Name: Buckskin Mountain

Diagrammatic Sketch

Township 42S, Range 4W, Section 1

GPS: NAD 83, UTM 12S 394192 E, 4116823 N

## DISCUSSION

### Nephi Pasture Exclosure Outside - Trend Study No. 27-7

#### Study Information

The Nephi Pasture exclosure complex was built in the 1960's and is found approximately 20 miles northeast of Kanab [elevation: 6,400 feet (1,950 m), slope: 5%, aspect: west]. This transect samples the outside of the exclosure which is a basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) community type with a significant bitterbrush (*Purshia tridentata*), and serviceberry (*Amelanchier utahensis*) component. Two other studies were established inside the total exclosure (27R-4) and the livestock exclosure (27R-5) in 1998 as part of a three-way comparison between the different exclosure grazing treatments. For further details on these studies refer to their discussion sections and to the Nephi Pasture Exclosure comparison summary. The area was identified by the BLM as an Upland Sand site (11-13 inches precipitation) and a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)/Indian ricegrass (*Oryzopsis hymenoides*) habitat type. On this study, the sagebrush was identified during the readings as basin big sagebrush, not mountain big sagebrush, because of size and growth form. The area is within the Vermillion-Nephi Pasture allotment which is grazed by cattle during the winter. Deer use this area during mild winters, but utilize areas south of US-89 during severe winters. Pellet group data estimated heavy deer use in 1998 and 2003 (64 ddu/acre:158 ddu/ha and 70 ddu/acre:174 ddu/ha, respectively), and lower, but still moderately heavy use in 2008 (38 ddu/acre:93 ddu/ha). Cattle use was estimated to be lightly moderate in 1998 and 2003 (16 cdu/acre:40 cdu/ha and 23 cdu/acre:57 cdu/ha, respectively), and no cattle use detected in 2008. Elk use was estimated to be minimal in 1998 with 1 elk days use/acre (3 edu/ha), and no sign of elk detected in 2003 or 2008.

#### Soil

Typical of all of the Nephi Pasture area, the soil is composed largely of fine sand, formed by aeolian derived sandstone parent materials. It has a loamy sand texture with a moderately acidic reaction (pH 5.9). The soil is deep with an effective rooting depth estimated at nearly 21 inches. There are no rock fragments apparent in the profile or on the surface. Organic matter is low at only 0.7%. Potassium may be limiting to plant growth and development at just 38.4 ppm (Tiedemann and Lopez 2004). There is evidence of wind and surface water erosion on the site with the soil erosion condition classified as slight in 2003 and 2008.

#### Browse

Serviceberry, basin big sagebrush, and antelope bitterbrush dominate the shrub component. These key species produced 71% of the vegetative cover on the site in 1997, 48% in 1998, 89% in 2003, and 84% in 2008. Mature serviceberry plants were very large, averaging about six feet in height by six feet in width. Available parts of these shrubs had been moderately to heavily hedged during all readings, with the heaviest use reported in 1987 (100% heavy use). The increased density reported in 1992 (265 to 980 plants/acre) appears to have been caused by observer differences in counting stems. Clumps of several stems in the same area were considered one plant in 1997, 1998, 2003, and 2008. Vigor has been good on most plants from 1992 to 2003, but plants displaying poor vigor increased to 22% in 2008. Decadence was fairly low from 1992 to 2003, ranging from 10% to 20% of the plants, but also increased to 33% in 2008. Reproduction has been good in all surveys with young plants comprising 17% to 45% of the population. Annual leader growth of serviceberry averaged five inches in 2003 and 3.5 inches in 2008.

The basin big sagebrush population density remained relatively constant at around 1,800 plants/acre from 1987-1998. Big sagebrush density declined in 2003 to 1,240 plants/acre and was similar in 2008. Reproduction was good from 1987 to 1998 with young plants comprising from 13% to 29% of the population, but decreased to 0% and 3% in 2003 and 2008, respectively. Since 1992, sagebrush has exhibited generally light to moderate use, but vigor has been poor on a large proportion of the population and decadence has been moderately high ranging from 33% to 63%. Basin big sagebrush annual leaders averaged 3.4 inches of growth in 2003 and 2.1 inches in 2008.

Bitterbrush density has steadily declined from 1,700 plants/acre in 1992, to about 1,200 plants/acre in 1997 and 1998, to 960 plants/acre in 2003, and to 880 plants/acre in 2008. Bitterbrush received consistent moderate to heavy use from 1987 to 2003, but mostly light with some moderate to heavy use in 2008. Despite the heavy use, bitterbrush has maintained generally good vigor and low to moderate decadence. The highest decadence estimates for bitterbrush occurred in the 1992, 2003, and 2008 surveys which followed periods of drought in southern Utah. As this is a winter grazing allotment for livestock, bitterbrush likely receives dual use from big game and cattle in at least some years. Many plants are partly unavailable for use due to the extensive hedging over the years. It was noted in 2003 that all of the available forage on bitterbrush came from the current year leaders. Annual leader growth on bitterbrush averaged 7.5 inches in 2003, and 4.0 inches in 2008.

#### Herbaceous Understory

The herbaceous understory had good diversity and fair production from 1987 to 1998. With drought conditions in 2003, very few grasses or forbs were sampled on the site. Grasses decreased further and forbs increased slightly in 2008. The increase in forbs was mostly due to an increase in the frequency of annual forbs. The most abundant perennial grasses prior to the 2003 survey were bottlebrush squirreltail (*Sitanion hystrix*), western wheatgrass (*Agropyron smithii*), sand dropseed (*Sporobolus cryptandrus*), Indian ricegrass, needle-and-thread (*Stipa comata*), and Sandberg bluegrass (*Poa secunda*). Two annual species, cheatgrass (*Bromus tectorum*) and sixweeks fescue (*Vulpia octoflora*), were both moderately abundant in 1997 and 1998, but neither was encountered in 2003, and cheatgrass was only sampled rarely in 2008. Forbs have been nearly as abundant on this site as the grasses. Toadflax (*Comandra pallida*) has been the most abundant perennial forb in all surveys, with all other perennial species being rare. Annual forbs had moderate abundance from 1992 to 1998 and in 2008, with woolly plantain (*Plantago patagonica*) being the most common. There was light grazing on the palatable grasses in 1998, mainly sand dropseed and western wheatgrass.

#### 1992 TREND ASSESSMENT

Because the sample area was increased in 1992, many of the estimates for browse density have increased from the 1987 survey. Therefore, percent decadence, form class, and vigor should be the parameters most important for trend evaluation. The key species for the site in order of dominance (percent of total plant cover) are: serviceberry (33%), basin big sagebrush (32%) and bitterbrush (18%). Basin big sagebrush has the highest decadence, but is not higher than expected with the site potential and condition, along with the length of the current drought. The key species also all have some evidence of reproduction and a good percent young age class of plants. The trend for browse would be considered stable. For the herbaceous understory, annuals in the past were ignored in the surveys. The trend for perennial grasses and forbs is stable. The nested frequency of perennial grasses and perennial forbs has remained similar.

winter range condition (DCI) - fair (59) Mid-level potential scale  
browse - stable (0)                      grass - stable (0)                      forb - stable (0)

#### 1997 TREND ASSESSMENT

Trend for the key browse species is mixed. Bitterbrush and serviceberry appear to be stable with good vigor and low decadence. The increase in density of both species between 1992 and 1997 appear to be observer differences. These rhizomatous shrubs can be difficult to count when in dense clusters. Several stems coming from the same general area were considered one plant in 1997. Basin big sagebrush appears to have a declining trend with a reduced population density, reduced vigor, and increasing decadence. In addition, the large number of dead plants counted in 1997 indicate a die-off. A decline in density can also be seen in all age classes. Since sagebrush accounts for one third of the shrub cover, the browse trend is considered slightly down. The trend for both grasses and forbs is stable but still depleted. Sum of nested frequency for grasses increased, although this was due to a significant increase in the nested frequencies of cheatgrass and sixweeks fescue. The most common native grass, bottlebrush squirreltail, increased slightly. Sum of nested frequency for forbs also increased slightly, due mainly to a significant increase in the nested frequency of toadflax.

winter range condition (DCI) - fair (54) Mid-level potential scale  
browse - slightly down (-1)      grass - stable (0)      forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for the key browse species are similar to 1997 estimates. Utah serviceberry and antelope bitterbrush trends appear stable. Bitterbrush vigor is good, reproduction adequate, and decadence low at only 13%. The sagebrush population has remained at a similar density since 1987, but the population has become increasingly decadent (46%), and 43% of the sagebrush are dead (1,440 plants/acre). This combined with poor reproduction in 1997 and 1998 point to a decline. This decline does not appear to be caused by utilization because the livestock exclosure and total exclosure also show similar trends. Overall browse trend is considered stable since conditions for sagebrush are similar to 1997. However, the sagebrush population should be watched closely. Trend for the grasses and forbs is stable, although in poor condition. Sum of nested frequency for perennial grasses and forbs are similar to 1997 estimates. One negative factor is the significant increase in nested frequency for the annuals; cheatgrass, sixweeks fescue, and woolly plantain.

winter range condition (DCI) - poor (41) Mid-level potential scale  
browse - stable (0)      grass - stable (0)      forb - stable (0)

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. The three key species, serviceberry, bitterbrush, and basin big sagebrush all have lower population densities since 1998, and bitterbrush and basin big sagebrush have much lower young recruitment. Decadence increased for all three species in 2003, although sagebrush is the only species of the three that would be considered as having high decadence. One-third of the basin big sagebrush population showed poor vigor in 2003. Because basin big sagebrush is the least preferred of the key species, the deteriorating condition of this population is not as alarming as it may be on other sites without a good bitterbrush and/or serviceberry component. Trend for the grasses is down and is slightly down for the forbs. Most perennial grass and forb species showed lower individual nested frequency values in 2003 compared to 1998. The sum of nested frequency of perennial grasses declined 76%, though a positive trend was that cheatgrass and sixweeks fescue, both annuals, were not encountered. The sum of nested frequency of all forbs declined by 66%, but again this was largely due to a decrease in annual species. The sum of nested frequency of perennial forbs remained relatively similar to 1998. The decreases in both the browse and herbaceous components is likely an effect of drought.

winter range condition (DCI) - poor (38) Mid-level potential scale  
browse - slightly down (-1)      grass - down (-2)      forb - slightly down (-1)

#### 2008 TREND ASSESSMENT

Trend for the key browse species is stable. The population density of all three species remained relatively constant from 2003. Serviceberry plants displaying poor vigor increased from 7% in 2003 to 22%, decadence was moderate at 33%, and recruitment of young plants remained good in 2008. Bitterbrush plants vigor remained good, decadence remained similar to 2003, though recruitment of young plants remained low. Basin big sagebrush plants displaying poor vigor increased from 37% of the population in 2003 to 51%. Decadence of sagebrush remained similar to 2003, but high at 63%, and recruitment of young plants remained low. The trend for grasses is down. The sum of nested frequency of perennial grasses decreased by 80% from 2003, and cover of perennial grasses was less than 0.05%. The trend for forbs is stable. The sum of nested frequency of all forbs increased by 85% from 2003, primarily due to an increase in annual forb frequency.

winter range condition (DCI) - poor (39) Mid-level potential scale  
browse - stable (0)      grass - down (-2)      forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 7

| T<br>y<br>p<br>e            | Species                    | Nested Frequency |                  |                  |                  |                  |                  | Average Cover % |      |      |      |      |
|-----------------------------|----------------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------|------|------|------|
|                             |                            | '87              | '92              | '97              | '98              | '03              | '08              | '92             | '97  | '98  | '03  | '08  |
| G                           | Agropyron smithii          | ab <sup>24</sup> | a <sup>4</sup>   | bc <sup>48</sup> | c <sup>71</sup>  | a <sup>10</sup>  | a <sup>2</sup>   | .03             | .29  | .50  | .07  | .01  |
| G                           | Bromus tectorum (a)        | -                | a <sup>3</sup>   | b <sup>112</sup> | c <sup>144</sup> | a <sup>-</sup>   | a <sup>6</sup>   | .00             | 2.35 | 3.21 | -    | .01  |
| G                           | Oryzopsis hymenoides       | 11               | 25               | 21               | 14               | 16               | 2                | .34             | .10  | .25  | .21  | .01  |
| G                           | Poa secunda                | 8                | 12               | 16               | 15               | 3                | -                | .10             | .39  | .10  | .01  | -    |
| G                           | Sitanion hystrix           | b <sup>54</sup>  | b <sup>58</sup>  | b <sup>62</sup>  | b <sup>39</sup>  | a <sup>-</sup>   | a <sup>-</sup>   | .51             | .83  | .62  | -    | -    |
| G                           | Sporobolus cryptandrus     | ab <sup>24</sup> | b <sup>33</sup>  | ab <sup>14</sup> | b <sup>31</sup>  | a <sup>9</sup>   | a <sup>5</sup>   | .63             | .06  | .33  | .07  | .01  |
| G                           | Stipa comata               | b <sup>22</sup>  | b <sup>24</sup>  | b <sup>25</sup>  | b <sup>21</sup>  | ab <sup>7</sup>  | a <sup>-</sup>   | .32             | .14  | .16  | .03  | .00  |
| G                           | Vulpia octoflora (a)       | -                | b <sup>27</sup>  | c <sup>73</sup>  | d <sup>144</sup> | a <sup>-</sup>   | a <sup>-</sup>   | .11             | .33  | 1.92 | -    | -    |
| Total for Annual Grasses    |                            | 0                | 30               | 185              | 288              | 0                | 6                | 0.11            | 2.69 | 5.13 | 0    | 0.00 |
| Total for Perennial Grasses |                            | 143              | 156              | 186              | 191              | 45               | 9                | 1.94            | 1.82 | 1.97 | 0.40 | 0.03 |
| Total for Grasses           |                            | 143              | 186              | 371              | 479              | 45               | 15               | 2.06            | 4.51 | 7.10 | 0.40 | 0.04 |
| F                           | Arabis sp.                 | -                | -                | 5                | 3                | -                | -                | -               | .04  | .01  | -    | -    |
| F                           | Astragalus sp.             | 8                | 2                | 1                | 1                | 3                | -                | .00             | .00  | .00  | .00  | -    |
| F                           | Calochortus nuttallii      | -                | -                | 1                | -                | 4                | -                | -               | .01  | -    | .01  | -    |
| F                           | Chaenactis douglasii       | -                | 2                | 1                | 10               | -                | -                | .01             | .00  | .19  | -    | -    |
| F                           | Collomia linearis (a)      | -                | -                | 3                | -                | -                | -                | -               | .00  | -    | -    | -    |
| F                           | Comandra pallida           | ab <sup>72</sup> | a <sup>58</sup>  | b <sup>117</sup> | b <sup>98</sup>  | ab <sup>88</sup> | b <sup>107</sup> | .50             | 1.79 | 1.04 | 1.42 | 2.87 |
| F                           | Collinsia parviflora (a)   | -                | -                | 1                | -                | 2                | 1                | -               | .15  | -    | .03  | .00  |
| F                           | Delphinium nuttallianum    | -                | -                | 3                | -                | -                | -                | -               | .00  | -    | -    | -    |
| F                           | Descurainia sp. (a)        | -                | b <sup>16</sup>  | bc <sup>30</sup> | bc <sup>26</sup> | a <sup>-</sup>   | c <sup>42</sup>  | .40             | .12  | .13  | -    | .23  |
| F                           | Draba sp. (a)              | -                | 16               | -                | 8                | -                | -                | .03             | -    | .04  | -    | -    |
| F                           | Eriogonum cernuum (a)      | -                | b <sup>33</sup>  | a <sup>10</sup>  | a <sup>1</sup>   | a <sup>2</sup>   | b <sup>52</sup>  | .24             | .05  | .00  | .03  | .15  |
| F                           | Erigeron sp.               | -                | -                | 1                | 3                | -                | -                | -               | .00  | .00  | -    | -    |
| F                           | Eriogonum racemosum        | 1                | -                | 7                | 4                | -                | 1                | -               | .04  | .01  | -    | .00  |
| F                           | Euphorbia glyptosperma (a) | b <sup>17</sup>  | ab <sup>8</sup>  | a <sup>-</sup>   | a <sup>-</sup>   | a <sup>-</sup>   | a <sup>-</sup>   | .04             | -    | -    | -    | -    |
| F                           | Frasera speciosa           | -                | -                | 2                | -                | -                | 3                | -               | .00  | -    | -    | .03  |
| F                           | Gilia sp. (a)              | -                | -                | b <sup>24</sup>  | a <sup>-</sup>   | b <sup>11</sup>  | a <sup>-</sup>   | -               | .12  | -    | .28  | -    |
| F                           | Lappula occidentalis (a)   | -                | -                | 4                | -                | -                | -                | -               | .04  | -    | -    | -    |
| F                           | Lupinus argenteus          | -                | -                | 1                | -                | -                | -                | .03             | .03  | -    | -    | -    |
| F                           | Microsteris gracilis (a)   | -                | b <sup>21</sup>  | b <sup>31</sup>  | a <sup>-</sup>   | a <sup>-</sup>   | a <sup>-</sup>   | .04             | .15  | -    | -    | -    |
| F                           | Oenothera pallida          | -                | 3                | -                | 3                | 3                | -                | .03             | -    | .03  | .00  | -    |
| F                           | Penstemon sp.              | a <sup>-</sup>   | b <sup>10</sup>  | a <sup>-</sup>   | ab <sup>8</sup>  | a <sup>-</sup>   | ab <sup>1</sup>  | .22             | -    | .04  | -    | .03  |
| F                           | Phlox austromontana        | a <sup>-</sup>   | ab <sup>14</sup> | b <sup>22</sup>  | ab <sup>14</sup> | ab <sup>9</sup>  | a <sup>2</sup>   | .30             | .20  | .35  | .09  | .03  |
| F                           | Plantago patagonica (a)    | -                | c <sup>88</sup>  | b <sup>46</sup>  | d <sup>195</sup> | a <sup>2</sup>   | ab <sup>23</sup> | .40             | .18  | 5.36 | .03  | .07  |



| T<br>y<br>p<br>e          | Species                        | Nested Frequency |                  |                 |                |                 |                | Average Cover % |      |      |      |      |
|---------------------------|--------------------------------|------------------|------------------|-----------------|----------------|-----------------|----------------|-----------------|------|------|------|------|
|                           |                                | '87              | '92              | '97             | '98            | '03             | '08            | '92             | '97  | '98  | '03  | '08  |
| F                         | <i>Polygonum douglasii</i> (a) | -                | <sub>ab</sub> 15 | <sub>b</sub> 26 | <sub>a</sub> - | <sub>a</sub> -  | <sub>a</sub> 3 | .03             | .04  | -    | -    | .00  |
| F                         | <i>Senecio multilobatus</i>    | 4                | -                | 1               | -              | -               | -              | -               | .00  | -    | -    | -    |
| F                         | <i>Sphaeralcea parvifolia</i>  | <sub>b</sub> 12  | <sub>ab</sub> 3  | <sub>a</sub> 1  | <sub>a</sub> 1 | <sub>ab</sub> 3 | -              | .01             | .00  | .00  | .03  | -    |
| F                         | Unknown forb-annual (a)        | -                | 3                | -               | -              | -               | -              | .01             | -    | -    | -    | -    |
| Total for Annual Forbs    |                                | 17               | 200              | 175             | 230            | 17              | 121            | 1.21            | 0.88 | 5.54 | 0.37 | 0.47 |
| Total for Perennial Forbs |                                | 97               | 92               | 163             | 145            | 110             | 114            | 1.11            | 2.15 | 1.69 | 1.56 | 2.98 |
| Total for Forbs           |                                | 114              | 292              | 338             | 375            | 127             | 235            | 2.32            | 3.04 | 7.24 | 1.93 | 3.45 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27 , Study no: 7

| T<br>y<br>p<br>e | Species                                | Strip Frequency |     |     |     |     | Average Cover % |       |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----|-----------------|-------|-------|-------|-------|
|                  |  | '92             | '97 | '98 | '03 | '08 | '92             | '97   | '98   | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>           | 23              | 13  | 13  | 11  | 13  | 12.05           | 8.44  | 3.32  | 5.71  | 7.00  |
| B                | <i>Artemisia filifolia</i>             | 0               | 0   | 3   | 0   | 0   | -               | -     | .18   | -     | -     |
| B                | <i>Artemisia tridentata tridentata</i> | 58              | 58  | 55  | 46  | 44  | 11.92           | 5.20  | 3.20  | 5.41  | 4.81  |
| B                | <i>Chrysothamnus nauseosus</i>         | 0               | 0   | 0   | 1   | 0   | -               | -     | -     | .00   | -     |
| B                | <i>Chrysothamnus viscidiflorus</i>     | 0               | 1   | 1   | 0   | 0   | -               | .00   | .00   | -     | -     |
| B                | <i>Eriogonum microthecum</i>           | 0               | 0   | 1   | 0   | 0   | -               | -     | .00   | -     | -     |
| B                | <i>Gutierrezia sarothrae</i>           | 34              | 32  | 27  | 4   | 2   | 1.53            | .26   | .68   | .03   | .00   |
| B                | <i>Juniperus osteosperma</i>           | 0               | 0   | 0   | 0   | 0   | -               | -     | -     | -     | .03   |
| B                | <i>Leptodactylon pungens</i>           | 3               | 5   | 0   | 4   | 2   | .06             | .06   | -     | .06   | .01   |
| B                | <i>Opuntia sp.</i>                     | 1               | 0   | 0   | 1   | 1   | .00             | -     | -     | .00   | .00   |
| B                | <i>Purshia tridentata</i>              | 36              | 34  | 37  | 34  | 31  | 6.50            | 6.59  | 7.64  | 7.50  | 6.03  |
| Total for Browse |  | 155             | 143 | 137 | 101 | 93  | 32.08           | 20.58 | 15.03 | 18.73 | 17.90 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 27 , Study no: 7

| Species                         | Percent Cover |       |
|---------------------------------|---------------|-------|
|                                 | '03           | '08   |
| Amelanchier utahensis           | 8.19          | 10.78 |
| Artemisia tridentata tridentata | 8.03          | 5.13  |
| Chrysothamnus nauseosus         | .05           | -     |
| Juniperus osteosperma           | -             | 2.83  |
| Purshia tridentata              | 7.71          | 10.06 |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 27 , Study no: 7

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Amelanchier utahensis           | 3.9                        | 3.5 |
| Artemisia tridentata tridentata | 2.2                        | 2.1 |
| Purshia tridentata              | 6.1                        | 4.0 |

POINT-QUARTER TREE DATA --  
 Management unit 27 , Study no: 7

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 6              | <18 | 22  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 8.5                   | -   | 3.8 |

BASIC COVER --  
 Management unit 27 , Study no: 7

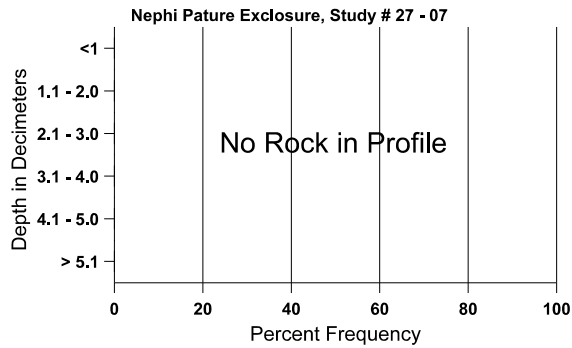
| Cover Type  | Average Cover % |       |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '98   | '03   | '08   |
| Vegetation  | .75             | 34.50 | 27.35 | 34.91 | 20.50 | 22.11 |
| Rock        | 0               | .04   | .05   | 0     | .03   | .02   |
| Pavement    | 0               | 0     | .02   | .04   | .01   | .11   |
| Litter      | 59.75           | 54.40 | 47.79 | 48.41 | 47.10 | 54.87 |
| Cryptogams  | 1.00            | 2.00  | 1.93  | 8.56  | .67   | .26   |
| Bare Ground | 38.50           | 26.89 | 35.68 | 30.71 | 45.26 | 34.79 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 7, Study Name: Nephi Pasture Exclosure

| Effective rooting depth (in) | Temp °F (depth) | pH  | loamy sand |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 20.8                         | 65.0 (18.1)     | 5.9 | 87.0       | 7.4   | 5.6   | 0.7 | 11.9  | 38.4  | 0.2  |

Stoniness Index



PELLET GROUP DATA --

Management unit 27, Study no: 7

| Type   | Quadrat Frequency |     |     |     |     |
|--------|-------------------|-----|-----|-----|-----|
|        | '92               | '97 | '98 | '03 | '08 |
| Rabbit | 49                | 20  | 25  | 8   | 77  |
| Elk    | -                 | -   | -   | -   | -   |
| Deer   | 26                | 32  | 27  | 23  | 9   |
| Cattle | 3                 | 5   | 5   | 5   | 4   |

| Days use per acre (ha) |          |         |
|------------------------|----------|---------|
| '98                    | '03      | '08     |
| -                      | -        | -       |
| 1 (2)                  | -        | -       |
| 64 (158)               | 70 (174) | 38 (93) |
| 16 (40)                | 23 (57)  | -       |

BROWSE CHARACTERISTICS --  
Management unit 27 , Study no: 7

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>265</b>                            | 66                                       | 66    | 133    | 66       | -    | 0           | 100     | 25         | 8       | 25           | 60/56                     |
| 92                                     | <b>980</b>                            | 120                                      | 440   | 440    | 100      | -    | 18          | 18      | 10         | 6       | 10           | -/-                       |
| 97                                     | <b>340</b>                            | -  | 100   | 200    | 40       | 20   | 47          | 18      | 12         | 12      | 12           | 83/86                     |
| 98                                     | <b>380</b>                            | 20                                       | 120   | 220    | 40       | -    | 26          | 21      | 11         | -       | 0            | 66/73                     |
| 03                                     | <b>300</b>                            | -  | 80    | 160    | 60       | 20   | 60          | 7       | 20         | 7       | 7            | 70/72                     |
| 08                                     | <b>360</b>                            | -  | 60    | 180    | 120      | -    | 33          | 17      | 33         | 6       | 22           | 78/75                     |
| <b>Artemisia filifolia</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                     | <b>260</b>                            | 60                                       | 140   | 120    | -        | -    | 0           | 0       | -          | -       | 0            | 9/15                      |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Artemisia tridentata tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>1865</b>                           | 66                                       | 466   | 1266   | 133      | -    | 54          | 21      | 7          | -       | 0            | 34/35                     |
| 92                                     | <b>2720</b>                           | 200                                      | 800   | 1020   | 900      | -    | 15          | 1       | 33         | 22      | 24           | -/-                       |
| 97                                     | <b>1700</b>                           | 20                                       | 320   | 600    | 780      | 1200 | 53          | 11      | 46         | 41      | 46           | 36/45                     |
| 98                                     | <b>1880</b>                           | 100                                      | 240   | 780    | 860      | 1440 | 40          | 9       | 46         | 22      | 23           | 31/37                     |
| 03                                     | <b>1240</b>                           | -  | -     | 460    | 780      | 1500 | 15          | 0       | 63         | 37      | 37           | 31/34                     |
| 08                                     | <b>1260</b>                           | -  | 40    | 420    | 800      | 1360 | 17          | 10      | 63         | 49      | 51           | 39/40                     |
| <b>Chrysothamnus nauseosus</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                                    |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                               | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Chrysothamnus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                 | <b>133</b>                            | 66                                       | 133   | -      | -        | -    | 0           | 0       | -          | -       | 50           | -/-                       |
| 92                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                 | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 7/7                       |
| 98                                 | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 18/13                     |
| 03                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Eriogonum microthecum</i>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                 | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | -/-                       |
| 03                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Gutierrezia sarothrae</i>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                 | <b>3932</b>                           | 66                                       | -     | 3866   | 66       | -    | 0           | 0       | 2          | -       | 0            | 9/12                      |
| 92                                 | <b>1180</b>                           | 200                                      | 120   | 1040   | 20       | -    | 0           | 0       | 2          | -       | 0            | -/-                       |
| 97                                 | <b>1280</b>                           | 20                                       | 180   | 1060   | 40       | 60   | 0           | 0       | 3          | -       | 0            | 11/12                     |
| 98                                 | <b>1280</b>                           | 20                                       | 40    | 1240   | -        | -    | 0           | 0       | 0          | -       | 0            | 11/13                     |
| 03                                 | <b>120</b>                            | -  | 40    | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 11/14                     |
| 08                                 | <b>40</b>                             | 40                                       | -     | 40     | -        | 20   | 0           | 0       | 0          | -       | 0            | 6/5                       |
| <i>Leptodactylon pungens</i>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                 | <b>598</b>                            | 533                                      | 133   | 399    | 66       | -    | 0           | 0       | 11         | -       | 0            | 5/6                       |
| 92                                 | <b>340</b>                            | -  | 20    | 320    | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 97                                 | <b>280</b>                            | -  | -     | 280    | -        | 20   | 0           | 0       | 0          | -       | 7            | 18/20                     |
| 98                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                 | <b>180</b>                            | -  | -     | 180    | -        | 20   | 0           | 0       | 0          | -       | 0            | 5/7                       |
| 08                                 | <b>80</b>                             | -  | -     | 20     | 60       | 40   | 0           | 75      | 75         | 25      | 25           | 2/3                       |
| <i>Opuntia sp.</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                 | <b>40</b>                             | -  | 20    | -      | 20       | -    | 0           | 0       | 50         | -       | 50           | -/-                       |
| 97                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                                 | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 4/13                      |
| 03                                 | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 2/3                       |
| 08                                 | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 4/12                      |

|                             |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                        | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Purshia tridentata</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                          | <b>1464</b>                           | -  | 399   | 999    | 66       | -    | 0           | 100     | 5          | -       | 0            | 12/41                     |
| 92                          | <b>1700</b>                           | 40                                       | 420   | 840    | 440      | -    | 13          | 80      | 26         | 13      | 16           | -/-                       |
| 97                          | <b>1240</b>                           | -  | 80    | 1060   | 100      | 40   | 35          | 55      | 8          | 5       | 8            | 21/43                     |
| 98                          | <b>1220</b>                           | -  | 120   | 940    | 160      | 40   | 18          | 75      | 13         | 2       | 2            | 20/43                     |
| 03                          | <b>960</b>                            | -  | -     | 640    | 320      | 60   | 29          | 71      | 33         | 8       | 8            | 20/38                     |
| 08                          | <b>880</b>                            | -  | 20    | 620    | 240      | 220  | 18          | 23      | 27         | 7       | 7            | 25/45                     |
| <b>Ribes sp.</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 30/25                     |
| 03                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Tetradymia canescens</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 19/7                      |
| 08                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 27-8-08

Study site name: Fivemile Mountain .

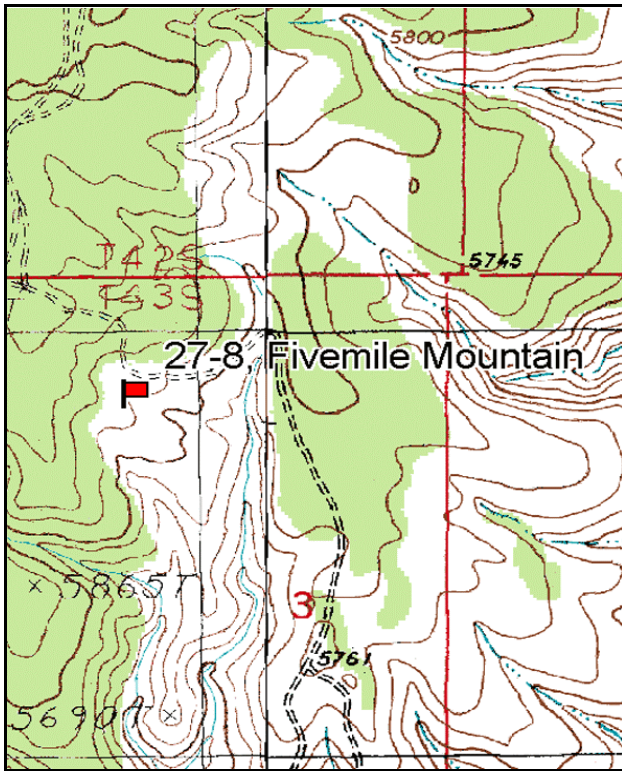
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 125 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

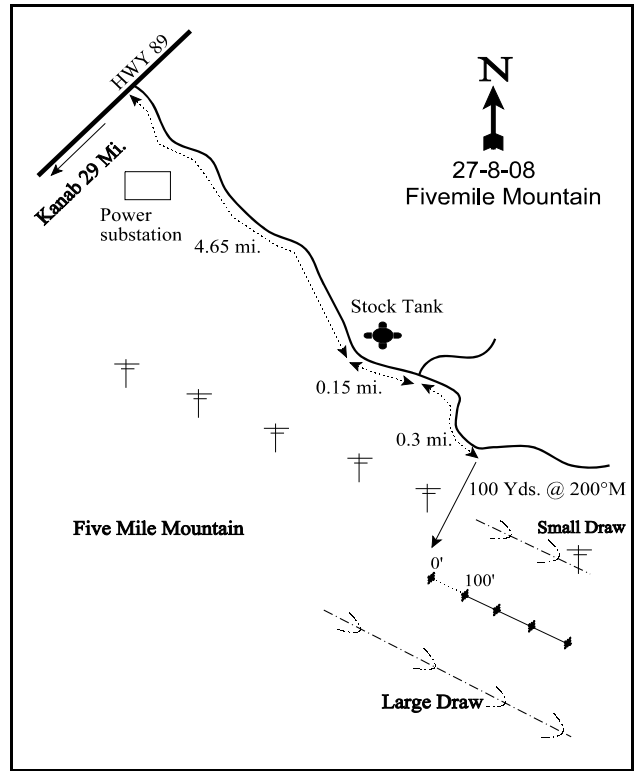
LOCATION DESCRIPTION

From the 90° turn in US 89 in the center of Kanab, go 29.0 miles south on US 89 to the turnoff to Fivemile Mountain. Turn right (southeast) and travel 4.6 miles on the graded road (BLM Rd #710) to a stock tank. Continue on a dirt road 0.15 miles to a fork, bear right. Continue up and over the mountain for 0.3 miles to a bend in the road. Stop here and walk about 100 yards south to the crest of a small ridge and the 0-foot baseline stake. The study runs E-SE down the ridge.



Map Name: Buckskin Mountain

Township 43S , Range 2W , Section 3



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 410777 E, 4107025 N

## DISCUSSION

### Fivemile Mountain - Trend Study No. 27-8

#### Study Information

This study is located on the south slope of Fivemile Mountain, a low plateau that is important for mule deer during severe winters when they drop off of the Vermillion Cliffs [elevation: 5,850 feet (1,783 m), slope: 7%, aspect: east-southeast]. The range type is black sagebrush (*Artemisia nova*) interspersed with Utah juniper (*Juniperus osteosperma*). Pellet group transect data estimated deer use to be moderate in 2003 and 2008 (27 ddu/acre:66 ddu/ha and 35 ddu/acre:86 ddu/ha, respectively). Cattle use was estimated to be light with 5 days use/acre (13 cdu/ha) estimated in both 2003 and 2008.

#### Soil

In conjunction with low precipitation the shallow rocky soils are a limiting factor for vegetation on this site. Soil texture is a sandy clay loam with a neutral reaction (pH 7.2). Relative combined vegetation and litter cover decreased from 53% in 1992, to 50% in 1997 and 2003, to 46% in 2008. Relative combined rock and pavement cover ranged from 36%-41% from 1992 to 2008. Relative bare ground cover ranged from 7%-12% from 1992 to 2008. The erosion condition rating was classified as stable in 2003 and 2008.

#### Browse

The dominant browse species is black sagebrush which has accounted for more than 75% of the browse cover since 1992. Density estimates increased between 1987 and 1992, primarily due to the much larger sample used beginning in the 1992 field season. The black sagebrush population was estimated at 5,980 plants/acre in 1992, decreasing to 4,420 plants/acre in 1997, increasing to 5,260 plants/acre in 2003, and decreasing to 4,800 plants/acre in 2008. Utilization was moderate to heavy on sagebrush sampled in 1987 and 2008, but more light to moderate in all other samples. Sagebrush displaying poor vigor was relatively low in most sample years except for 2003 when it increased to 30%. Decadence ranged from 24%-32% from 1987 to 1997, but increased to around 60% in 2003 and 2008. Recruitment of sagebrush has remained low with young plants comprising 2% of the population in 1997, 2003, and 2008. A high number of dead plants were counted in 1997, 2003, and 2008 without a large decrease in density, suggesting a rather rapid turnover of black sagebrush. Increases in decadence and poor vigor as well as low reproduction can be attributed to the dry conditions experienced prior to and including the 2008.

If it was more common, Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) could be a key browse species. Scattered large plants are found west of the study site. These shrubs average 10 feet in height and have been hedged, but not severely. There are occasional seedling and young plants along the ridge. Juniper on the site exhibit the harshness of the growing conditions by their stunted, twisted forms. Some individual juniper trees are highlined. Point-center quarter data estimated 42 juniper trees/acre in 2003 and 46 trees/acre in 2008. There are a few young pinyon pine (*Pinus edulis*) scattered around as well. Other common shrubs are the increasers broom snakeweed (*Gutierrezia sarothrae*) and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*).

#### Herbaceous Understory

The herbaceous understory is poor and has at times been dominated by cheatgrass (*Bromus tectorum*), which had significantly increased in nested frequency from 1992 to 2003, but significantly decreased in 2008. Cheatgrass accounted for 49% of the grass cover in 1997, increasing to 66% in 2003, and decreasing to 17% in 2008. Perennial species are infrequent and have a lower combined sum of nested frequency value than cheatgrass. Perennial grasses that have been sampled include blue grama (*Bouteloua gracilis*), needle-and-thread (*Stipa comata*), Sandberg bluegrass (*Poa secunda*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*). Perennial forbs are very rare in all surveys. Only longleaf phlox (*Phlox longifolia*) has been encountered in all sample years, and then only at low frequencies.



### 1992 TREND ASSESSMENT

The trend for browse is stable. Decadence of black sagebrush has decreased somewhat, from 16% in 1987 to 9%. Density sampling methods were changed since the last reading so density can't be compared since 1987. The trend for both the grasses and forbs is slightly up. There was a slight increase in nested frequency values for the perennial grasses and forbs, but the herbaceous understory is still in very poor condition.

winter range condition (DCI) - good (48) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

### 1997 TREND ASSESSMENT

Trend for the primary browse species, black sagebrush, is slightly down. Sagebrush population density has declined 26% since 1992 to 4,420 plants/acre. Sagebrush plants showing poor vigor increased from 9% in 1992 to 13%, and decadence increased from 24% in 1992 to 31%. Recruitment of sagebrush is low with young plants comprising only 2% of the population. This is probably not adequate to replace the decadent/dying plants, indicating a continued decline in density unless more favorable conditions for seedling establishment return to the area. Trend for the grasses is slightly down. Sum of nested frequency and cover of perennial grasses has remained similar to 1992 levels, but the invasive annual, cheatgrass, has significantly increased in nested frequency and substantially increased in cover. The trend for forbs is stable. The sum of nested frequency of perennial forbs has declined slightly, but there was a large decrease in the sum of nested frequency and cover of annual forbs as well.

winter range condition (DCI) - poor-fair (26) Low potential scale

browse - slightly down (-1)

grass - slightly down (-1)

forb - stable (0)

### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Although the population density estimate for black sagebrush is slightly higher than in 1997 at 5,260 plants/acre, most of the key population parameters show negative changes. The most notable changes are the increase in decadence from 31% in 1997 to 61% and the increase in the proportion of the population showing poor vigor from 13% in 1997 to 30%. Recruitment from young plants remains very low at 2%, and far below the level needed to replace the decadent and dying individuals in the population. The number of dead sagebrush plants also increased in 2003 to 1,480 dead plants/acre. Trend for both the grasses and forbs is down. Sum of nested frequency values for perennial grasses declined by 41%, though total cover of perennial grasses remained similar to 1997 values. Cheatgrass continues to dominate the site constituting 66% of the total grass cover, and showed increases in both nested frequency and total cover. The sum of nested frequency of perennial forbs declined since 1997, but total cover of perennial forbs increased from less than 0.25% of total cover in 1997 to just over 1%. The sum of nested frequency and total cover of annual forbs increased substantially since 1997. The negative trends for black sagebrush and declining number of perennial grasses and forbs may be attributed to drier precipitation patterns prior to and including the 2003 survey.

winter range condition (DCI) - poor (14) Low potential scale

browse - slightly down (-1)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of the primary browse species, black sagebrush, decreased slightly, but was similar to 2003 at 4,800 plants/acre. Sagebrush plants displaying poor vigor decreased from 30% in 2003 to 18%, and decadence remained similar to 2003 values at 60%. Recruitment has remained constant, but low, with young sagebrush plants comprising only 2% of the population. Trend for both the grasses and forbs is slightly up. Sum of nested frequency and total cover of perennial grasses has remained similar, but the frequency and total cover of cheatgrass has significantly decreased. Forbs show a similar trend with little change in the sum of nested frequency and total cover of perennial forbs, but a large decrease in the sum of

nested frequency and total cover of annual forbs. The herbaceous understory remains in very poor condition, however.

winter range condition (DCI) - poor (22) Low potential scale  
browse - stable (0)                      grass - slightly up (+1)                      forb - slightly up (+1)

HERBACEOUS TRENDS --  
 Management unit 27 , Study no: 8

| T<br>y<br>p<br>e            | Species                             | Nested Frequency |      |      |      |     | Average Cover % |      |      |      |
|-----------------------------|-------------------------------------|------------------|------|------|------|-----|-----------------|------|------|------|
|                             |                                     | '87              | '92  | '97  | '03  | '08 | '92             | '97  | '03  | '08  |
| G                           | <i>Bouteloua gracilis</i>           | a15              | b42  | b42  | b40  | b37 | 1.25            | .91  | 1.39 | .82  |
| G                           | <i>Bromus tectorum</i> (a)          | -                | a18  | c180 | c202 | b75 | .07             | 2.44 | 6.59 | .51  |
| G                           | <i>Hilaria jamesii</i>              | -                | 3    | -    | 3    | -   | .03             | -    | .15  | -    |
| G                           | <i>Oryzopsis hymenoides</i>         | ab12             | c38  | bc31 | a10  | a10 | .51             | .21  | .16  | .03  |
| G                           | <i>Poa fendleriana</i>              | -                | 3    | 3    | 3    | 1   | .03             | .00  | .00  | .03  |
| G                           | <i>Poa secunda</i>                  | a-               | b14  | c35  | a6   | a7  | .08             | .40  | .06  | .02  |
| G                           | <i>Sitanion hystrix</i>             | b51              | a22  | a15  | a2   | a20 | .15             | .41  | .03  | .26  |
| G                           | <i>Stipa comata</i>                 | 48               | 25   | 40   | 32   | 40  | .39             | .28  | .47  | 1.09 |
| G                           | <i>Stipa speciosa</i>               | -                | 1    | 4    | 5    | 1   | .00             | .15  | .15  | .15  |
| G                           | <i>Vulpia octoflora</i> (a)         | -                | c107 | b58  | c104 | a8  | .34             | .12  | .96  | .02  |
| Total for Annual Grasses    |                                     | 0                | 125  | 238  | 306  | 83  | 0.41            | 2.56 | 7.55 | 0.53 |
| Total for Perennial Grasses |                                     | 126              | 148  | 170  | 101  | 116 | 2.46            | 2.38 | 2.42 | 2.41 |
| Total for Grasses           |                                     | 126              | 273  | 408  | 407  | 199 | 2.87            | 4.95 | 9.98 | 2.94 |
| F                           | <i>Alyssum alyssoides</i> (a)       | -                | -    | a-   | b15  | a-  | -               | -    | .06  | -    |
| F                           | <i>Astragalus</i> sp.               | b13              | c40  | b20  | a-   | b10 | .12             | .07  | -    | .03  |
| F                           | <i>Calochortus nuttallii</i>        | -                | 9    | 3    | 1    | -   | .02             | .01  | .00  | .00  |
| F                           | <i>Collinsia parviflora</i> (a)     | -                | -    | 2    | 5    | 3   | -               | .00  | .01  | .00  |
| F                           | Cruciferae                          | -                | 6    | -    | -    | -   | .04             | -    | -    | -    |
| F                           | <i>Descurainia pinnata</i> (a)      | -                | 8    | 4    | 10   | -   | .02             | .01  | .05  | -    |
| F                           | <i>Draba cuneifolia</i> (a)         | -                | b19  | a-   | ab8  | a1  | .09             | -    | .02  | .00  |
| F                           | <i>Eriogonum cernuum</i> (a)        | -                | 2    | 1    | -    | 10  | .03             | .00  | -    | .02  |
| F                           | <i>Erodium cicutarium</i> (a)       | -                | -    | a12  | b31  | a-  | -               | .19  | 1.74 | -    |
| F                           | <i>Erigeron pumilus</i>             | b23              | a2   | ab13 | a-   | a-  | .03             | .02  | -    | -    |
| F                           | <i>Gilia inconspicua</i> (a)        | -                | c139 | a16  | b57  | a-  | .48             | .03  | 1.11 | -    |
| F                           | <i>Lappula occidentalis</i> (a)     | -                | b146 | a6   | a-   | a15 | .48             | .01  | -    | .05  |
| F                           | <i>Lomatium</i> sp.                 | -                | 5    | 1    | -    | 2   | .03             | .03  | -    | .01  |
| F                           | <i>Mentzelia</i> sp.                | a-               | a-   | a-   | b14  | ab7 | -               | -    | 1.01 | .06  |
| F                           | <i>Penstemon thompsoniae</i>        | -                | 1    | 1    | -    | -   | .03             | .00  | -    | -    |
| F                           | <i>Phlox longifolia</i>             | a3               | b25  | ab15 | a5   | ab6 | .25             | .06  | .06  | .02  |
| F                           | <i>Sphaeralcea grossulariifolia</i> | -                | 3    | -    | -    | -   | .00             | -    | .01  | -    |

| Type                      | Species                 | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|---------------------------|-------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|                           |                         | '87              | '92 | '97 | '03 | '08 | '92             | '97  | '03  | '08  |
| F                         | Unknown forb-annual (a) | -                | 5   | -   | -   | -   | .01             | -    | -    | -    |
| F                         | Zigadenus paniculatus   | -                | 1   | -   | -   | -   | .00             | -    | -    | -    |
| Total for Annual Forbs    |                         | 0                | 319 | 41  | 126 | 29  | 1.11            | 0.25 | 3.00 | 0.09 |
| Total for Perennial Forbs |                         | 39               | 92  | 53  | 20  | 25  | 0.54            | 0.21 | 1.09 | 0.12 |
| Total for Forbs           |                         | 39               | 411 | 94  | 146 | 54  | 1.65            | 0.46 | 4.09 | 0.21 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27 , Study no: 8

| Type             | Species                                  | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |  | '92             | '97 | '03 | '08 | '92             | '97   | '03   | '08   |
| B                | Artemisia nova                           | 86              | 79  | 80  | 79  | 22.60           | 13.00 | 12.19 | 14.75 |
| B                | Ceratoides lanata                        | 1               | 2   | 2   | 0   | .00             | .00   | .00   | -     |
| B                | Chrysothamnus viscidiflorus stenophyllus | 25              | 20  | 21  | 23  | 2.09            | 1.18  | .72   | 1.26  |
| B                | Gutierrezia sarothrae                    | 4               | 8   | 6   | 4   | .19             | .01   | .33   | .03   |
| B                | Juniperus osteosperma                    | 2               | 2   | 2   | 2   | 2.49            | .00   | 1.92  | 2.69  |
| B                | Opuntia sp.                              | 1               | 2   | 5   | 5   | .00             | .38   | .38   | .21   |
| B                | Sclerocactus sp.                         | 5               | 3   | 5   | 6   | .18             | .15   | .06   | .07   |
| Total for Browse |  | 124             | 116 | 121 | 119 | 27.55           | 14.72 | 15.61 | 19.02 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 8

| Species                                  | Percent Cover |       |       |
|--|---------------|-------|-------|
|  | '97           | '03   | '08   |
| Artemisia nova                           | -             | 14.50 | 18.20 |
| Chrysothamnus viscidiflorus stenophyllus | -             | .63   | 1.14  |
| Juniperus osteosperma                    | 3.00          | 2.56  | 1.46  |
| Opuntia sp.                              | -             | .03   | -     |
| Sclerocactus sp.                         | -             | .05   | .05   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 8

| Species        | Average leader growth (in) |     |
|----------------|----------------------------|-----|
|                | '03                        | '08 |
| Artemisia nova | 0.9                        | 1.4 |

POINT-QUARTER TREE DATA --

Management unit 27 , Study no: 8

| Species               | Trees per Acre |     | Average diameter (in) |      |
|-----------------------|----------------|-----|-----------------------|------|
|                       | '03            | '08 | '03                   | '08  |
| Juniperus osteosperma | 42             | 46  | 9.0                   | 11.7 |

BASIC COVER --

Management unit 27 , Study no: 8

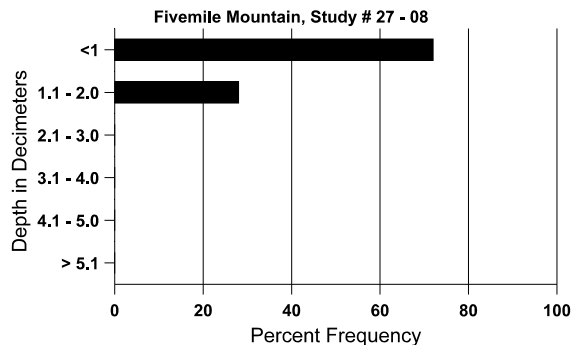
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '97   | '03   | '08   |
| Vegetation  | 2.75            | 30.85 | 23.60 | 30.53 | 23.50 |
| Rock        | 19.50           | 44.86 | 18.30 | 21.68 | 21.56 |
| Pavement    | 28.00           | 0     | 18.18 | 21.40 | 24.89 |
| Litter      | 36.00           | 29.56 | 28.00 | 26.07 | 28.59 |
| Cryptogams  | 5.25            | 1.31  | 2.51  | .76   | 1.20  |
| Bare Ground | 8.50            | 8.08  | 12.39 | 11.49 | 14.12 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 8, Study Name: Fivemile Mountain

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |       |       | %0M | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-----------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand           | %silt | %clay |     |       |       |      |
| 10.7                         | 74.0 (10.0)     | 7.2 | 58.4            | 19.1  | 22.6  | 2.1 | 16.0  | 115.2 | 0.7  |

Stoniness Index



PELLET GROUP DATA --

Management unit 27 , Study no: 8

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '97 | '03 | '08 |
| Rabbit | 8                 | 9   | 8   | 44  |
| Deer   | 16                | 28  | 26  | 29  |
| Cattle | -                 | 2   | 2   | 1   |

| Days use per acre (ha) |         |
|------------------------|---------|
| '03                    | '08     |
| -                      | -       |
| 27 (66)                | 35 (86) |
| 5 (13)                 | 5 (13)  |

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 8

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i>                           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87  | <b>2531</b>                           | 133                                      | 66    | 1666   | 799      | -    | 37          | 11      | 32         | 2       | 16           | 12/20                     |
| 92  | <b>5980</b>                           | 160                                      | 740   | 3800   | 1440     | -    | 22          | 0       | 24         | 7       | 9            | -/-                       |
| 97  | <b>4420</b>                           | 100                                      | 80    | 2980   | 1360     | 1040 | 32          | 2       | 31         | 13      | 13           | 16/28                     |
| 03  | <b>5260</b>                           | -  | 80    | 1980   | 3200     | 1480 | 6           | 0       | 61         | 30      | 30           | 13/23                     |
| 08  | <b>4800</b>                           | 120                                      | 80    | 1860   | 2860     | 1460 | 42          | 25      | 60         | 12      | 18           | 16/28                     |
| <i>Atriplex canescens</i>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 27/27                     |
| <i>Ceratoides lanata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92  | <b>20</b>                             | 20                                       | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97  | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 9/7                       |
| 03  | <b>40</b>                             | -  | -     | 40     | -        | -    | 50          | 0       | -          | -       | 0            | 11/8                      |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 18/13                     |
| <i>Chrysothamnus viscidiflorus stenophyllus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87  | <b>932</b>                            | -  | -     | 533    | 399      | -    | 0           | 0       | 43         | 4       | 43           | 10/9                      |
| 92  | <b>780</b>                            | -  | 40    | 640    | 100      | -    | 0           | 0       | 13         | 3       | 10           | -/-                       |
| 97  | <b>660</b>                            | -  | 20    | 420    | 220      | 40   | 0           | 0       | 33         | 9       | 9            | 11/21                     |
| 03  | <b>560</b>                            | -  | -     | 300    | 260      | -    | 0           | 0       | 46         | 25      | 29           | 12/22                     |
| 08  | <b>740</b>                            | -  | 20    | 520    | 200      | 20   | 0           | 0       | 27         | 3       | 16           | 13/21                     |

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Cowania mexicana stansburiana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 0                                     | 66                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 78/101                    |
| 08                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 66/85                     |
| <i>Gutierrezia sarothrae</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 1198                                  | 399                                      | 66    | 1066   | 66       | -    | 0           | 0       | 6          | -       | 6            | 7/7                       |
| 92                                   | 100                                   | 80                                       | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 97                                   | 220                                   | -  | -     | 180    | 40       | 80   | 0           | 0       | 18         | -       | 0            | 7/7                       |
| 03                                   | 140                                   | -  | -     | 140    | -        | 20   | 0           | 0       | 0          | -       | 0            | 7/7                       |
| 08                                   | 140                                   | 20                                       | 20    | 80     | 40       | 40   | 0           | 0       | 29         | 14      | 29           | 8/12                      |
| <i>Juniperus osteosperma</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 66                                    | -  | -     | -      | 66       | -    | 0           | 0       | 100        | -       | 0            | -/-                       |
| 92                                   | 40                                    | -  | 20    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 97                                   | 40                                    | -  | 20    | 20     | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                   | 40                                    | -  | -     | 40     | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                   | 40                                    | -  | 20    | 20     | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 97                                   | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 9/27                      |
| 03                                   | 100                                   | -  | 20    | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 10/23                     |
| 08                                   | 100                                   | -  | 20    | 40     | 40       | -    | 0           | 0       | 40         | 20      | 20           | 9/15                      |
| <i>Sclerocactus sp.</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 0                                     | 66                                       | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                   | 100                                   | -  | 40    | 40     | 20       | -    | 0           | 0       | 20         | 20      | 20           | -/-                       |
| 97                                   | 60                                    | -  | 20    | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 5/8                       |
| 03                                   | 100                                   | -  | 20    | 40     | 40       | -    | 0           | 0       | 40         | 40      | 40           | 4/5                       |
| 08                                   | 120                                   | -  | 20    | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 5/6                       |
| <i>Yucca sp.</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 97                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 19/25                     |
| 08                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 21/22                     |

Trend Study 27-9-08

Study site name: Buckskin Mountain.

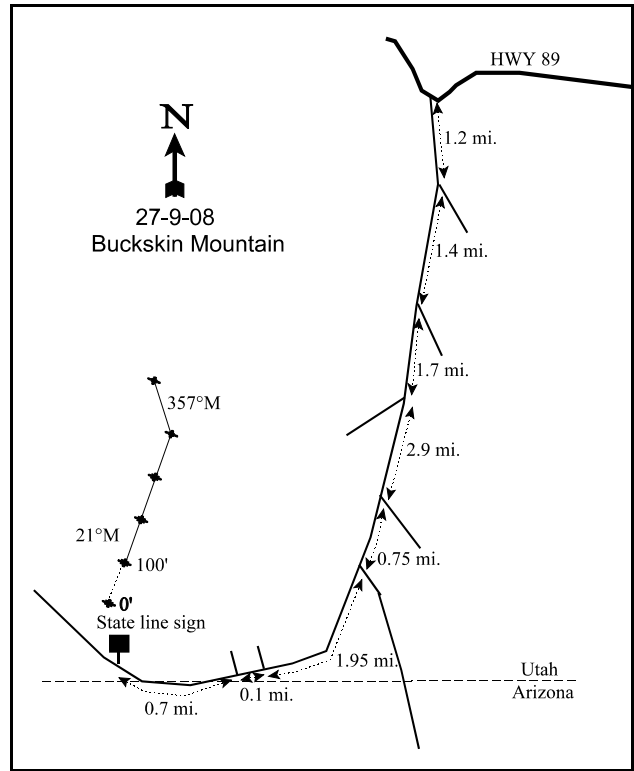
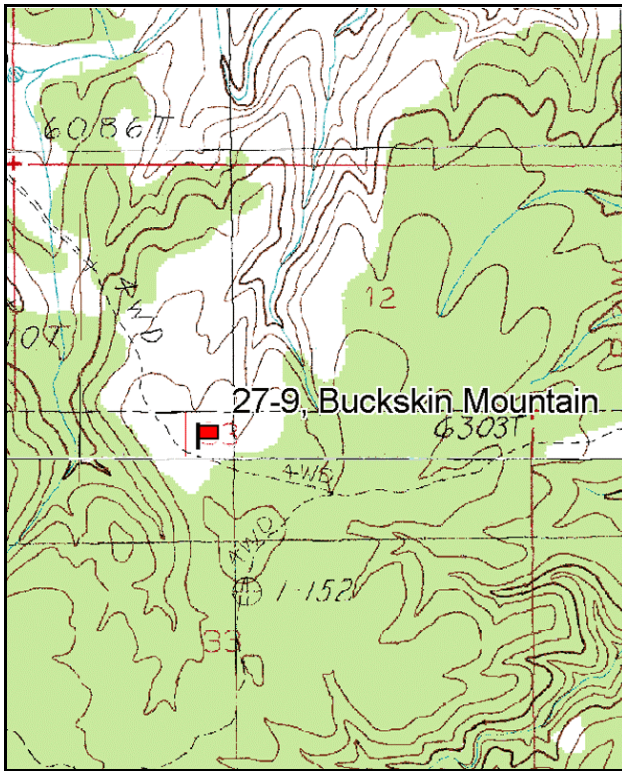
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 21 degrees magnetic. (Line 5 357°M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From Kanab, head east on U.S. 89 to mile marker 44. Go 0.6 miles south of the mile marker to a road on the right (BLM Rd. #730). Drive 1.2 miles to a fork on the right. Go right (main road) for 1.4 miles to a left turn (BLM Rd. #723). Go 1.7 miles to another fork and go straight (left). Drive 2.9 miles to another fork. Stay on the main road (right) for 0.75 miles to a fork. Go straight at the fork for 1.95 miles to another right fork. Go 0.1 miles to a right fork. Continue 0.7 miles to the Arizona\Utah border sign. From this sign, walk 50 feet at 326 degrees magnetic to the 0-foot stake. The study is marked by steel, green fenceposts approximately 12-18 inches in height.



Map name: Telegraph Flat

Diagrammatic Sketch

Township 44S, Range 3W, Section 12

GPS: NAD 83, UTM 12S 403845 E, 4095437 N

## DISCUSSION

### Buckskin Mountain - Trend Study No. 27-9

#### Study Information

This study was established in 1997 and is located south of U.S. 89, west of Kaibab Gulch, and just south of Pine Hollow Canyon on the Utah-Arizona border [elevation: 6,300 feet (1,920 m), slope: 4%, aspect: north]. This site was established to better sample critical winter range south of the Vermillion Cliffs. It samples a low flat ridge which supports a Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and Utah juniper (*Juniperus osteosperma*) overstory with a basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and grass understory. Pellet group transect data estimated deer use to be extremely heavy in 2003 and 2008 (98 ddu/acre:243 ddu/ha and 100 ddu/acre:248 ddu/ha, respectively). There was only one elk pellet group encountered in both 2003 and 2008. Cattle use was estimated to be light in 2003 and 2008 (4 cdu/acre:11 cdu/ha and 3 cdu/acre:7 cdu/ha, respectively).

#### Soil

Soils at this site are very similar to those at Fivemile Mountain. Soil texture is a loam with a slight alkaline reaction (pH 7.4). Pavement and rock are abundant in the un-vegetated areas of the surface and throughout the soil profile. Relative combined vegetation and litter cover ranged from 69%-76% from 1997 to 2008. Relative rock and pavement cover ranged from 17%-23% from 1997 to 2008. Relative bare ground cover was low at a range of 5%-7% from 1997 to 2008. The erosion condition rating was classified as stable in 2003 and 2008.

#### Browse

The key browse on the site are basin big sagebrush and Stansbury cliffrose. Sagebrush accounted for 52%-61% of the total shrub cover from 1997 to 2008. Basin big sagebrush density was estimated at 2,920 plants/acre in 1997, decreasing to 2,180 plants/acre in 2003, and 1,700 plants/acre in 2008. Recruitment of young sagebrush plants in the population has declined from 25% in 1997 to no young sagebrush plants sampled in the population in 2008. Decadence in the sagebrush population has steadily increased from 34% in 1997, to 44%, in 2003, and 75% in 2008. Most of the sagebrush displayed normal vigor in 1997 and 2008, but 53% of the population had poor vigor in 2008. Utilization of sagebrush was light to moderate with a few individuals receiving heavy use in 1997 and 2008, but very little utilization was evident in 2003. Annual leaders on basin big sagebrush averaged 1.5 inches of growth in 2003, and 1.8 inches in 2008.

Cliffrose density was estimated at 240 plants/acre in 1997, 360 plants/acre in 2003, and 220 plants/acre in 2008. This population is mostly mature. There was moderately low decadence in 1997 and 2003, but decadence increased to 73% in 2008. About half of the mature plants were partially unavailable to browsing in all three surveys, resulting in mostly light to moderate use overall. Mature cliffrose average nearly eight feet in height with line-intercept canopy cover ranging from 6%-11% from 1997 to 2008. The number of cliffrose plants displaying poor vigor was low in 1997 and 2003, but increased to 55% in 2008. There has been little recruitment of cliffrose in any of the sample years. Cliffrose leaders had averaged 3.6 inches of annual growth in 2003, and 2.8 inches growth in 2008.

Broom snakeweed (*Gutierrezia sarothrae*) was present on the site with a density of about 1,000 plants/acre in 1997, but was not sampled in 2008. Pinyon pine (*Pinus edulis*) and juniper trees had an estimated combined density of about 140 trees/acre in 2003 and 2008.

#### Herbaceous Understory

The herbaceous understory is very poor. A total of 10 perennial grasses and forbs were sampled on the transect in the 1997, 2003, and 2008 surveys. Perennial herbaceous species provided less than 0.5% total cover in 1997, and only around 0.05% cover in 2003 and 2008. Cheatgrass (*Bromus tectorum*) dominates the



understory as it provided 99% of the grass cover and nearly half of the total vegetation cover in all three survey years. Cheatgrass had an average cover value of over 20% in 1997 and 2003, but decreased to around 8% in 2008. Because of the high production, the fire hazard created by cheatgrass is very high. A wildfire would be devastating to this important winter range as both basin big sagebrush and cliffrose are fire intolerant species. The abundance of cheatgrass also presents a severe competition problem for seedling and young shrubs, as well as perennial grasses and forbs, that will have a difficult time with establishment and survival in this system.

#### 1997 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - poor (23) Low potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Basin big sagebrush has a lower density estimate from 1997 of 2,180 plants/acre, a decrease of 25%. The sagebrush population showed an increase in decadence from 34% in 1997 to 44%. Recruitment in sagebrush was also down with young plants comprising 10% of the population. Cliffrose showed a slight density increase to 360 plants/acre. Decadence remains quite low (17%), and the entire population had normal vigor. Although cliffrose reproduction is low, these plants are long lived and appear to be maintaining themselves at the present time. The herbaceous understory continues to be in very poor condition. The trend for grasses is down. Though already low, the sum of nested frequency and total cover of perennial grasses declined sharply. Cheatgrass continues to dominate the understory although it significantly declined in nested frequency. Cheatgrass cover averaged over 20% in 2003 which creates a serious fire hazard to the key browse species on the site. The trend for forbs is slightly down. The sum of nested frequency of perennial forbs decreased slightly, but the sum of nested frequency and total cover of annual forbs increased substantially.

winter range condition (DCI) - very poor-poor (9) Low potential scale

browse - slightly down (-1)

grass - down (-2)

forb - slightly down (-1)

#### 2008 TREND ASSESSMENT

Trend for browse is down. The density of basin big sagebrush decreased slightly to 1,700 plants/acre, but vigor and decadence declined substantially. Sagebrush plants displaying poor vigor increased from 12% in 2003 to 53%, and decadence increased to 75%. Recruitment in sagebrush was minimal with no young sagebrush plants sampled in the population. The density of cliffrose declined 39% from 2003 to 220 plants/acre. Cliffrose plants displaying poor vigor increased from none in 2003 to 55%, and decadence increased to 73%. Both quadrat cover and line intercept cover have shown steady declines in the average cover of cliffrose since 1998. It appears that cliffrose cover might be underestimated by the quadrat cover method on this site. Trend for grasses is stable, but the condition of grasses is still very poor. Sum of nested frequency of perennial and annual grasses remained relatively constant, but the total cover of cheatgrass did decline to around 8% of the total cover. The trend for forbs is stable, but in very poor condition. Sum of nested frequency of perennial and annual forbs declined slightly and total cover of annual forbs declined substantially, but forbs are still very rare. Drought conditions are probably the primary driver in the decrease in total cover of the shrubs and herbaceous species.

winter range condition (DCI) - very poor (-3) Low potential scale

browse - down (-2)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 9

| T<br>y<br>p<br>e            | Species                             | Nested Frequency |                  |                  | Average Cover % |       |      |
|-----------------------------|-------------------------------------|------------------|------------------|------------------|-----------------|-------|------|
|                             |                                     | '97              | '03              | '08              | '97             | '03   | '08  |
| G                           | <i>Bouteloua gracilis</i>           | 1                | -                | -                | .00             | -     | -    |
| G                           | <i>Bromus tectorum</i> (a)          | <sub>b</sub> 453 | <sub>a</sub> 368 | <sub>a</sub> 352 | 25.61           | 20.39 | 7.65 |
| G                           | <i>Festuca ovina</i>                | 7                | 1                | -                | .03             | .00   | -    |
| G                           | <i>Poa fendleriana</i>              | 6                | -                | -                | .21             | -     | -    |
| G                           | <i>Poa secunda</i>                  | 10               | 5                | 3                | .01             | .03   | .03  |
| G                           | <i>Sitanion hystrix</i>             | <sub>b</sub> 26  | <sub>a</sub> 1   | <sub>a</sub> 5   | .10             | .00   | .01  |
| G                           | <i>Vulpia octoflora</i> (a)         | <sub>a</sub> -   | <sub>b</sub> 38  | <sub>a</sub> 4   | -               | .16   | .00  |
| Total for Annual Grasses    |                                     | 453              | 406              | 356              | 25.61           | 20.55 | 7.66 |
| Total for Perennial Grasses |                                     | 50               | 7                | 8                | 0.35            | 0.03  | 0.04 |
| Total for Grasses           |                                     | 503              | 413              | 364              | 25.96           | 20.59 | 7.70 |
| F                           | <i>Agoseris glauca</i>              | -                | -                | 1                | -               | -     | .00  |
| F                           | <i>Calochortus nuttallii</i>        | 6                | -                | -                | .01             | -     | -    |
| F                           | <i>Descurainia pinnata</i> (a)      | -                | 5                | -                | -               | .02   | -    |
| F                           | <i>Draba</i> sp. (a)                | <sub>a</sub> -   | <sub>b</sub> 46  | <sub>a</sub> -   | -               | .27   | -    |
| F                           | <i>Erodium cicutarium</i> (a)       | <sub>a</sub> -   | <sub>b</sub> 25  | <sub>a</sub> -   | -               | 1.04  | -    |
| F                           | <i>Erigeron</i> sp.                 | 6                | -                | -                | .01             | -     | -    |
| F                           | <i>Gilia</i> sp. (a)                | <sub>a</sub> 11  | <sub>b</sub> 138 | <sub>a</sub> 7   | .01             | 2.66  | .02  |
| F                           | <i>Holosteum umbellatum</i> (a)     | -                | 2                | 1                | -               | .00   | .00  |
| F                           | <i>Lappula occidentalis</i> (a)     | <sub>a</sub> -   | <sub>b</sub> 23  | <sub>a</sub> 7   | -               | .11   | .01  |
| F                           | <i>Microsteris gracilis</i> (a)     | <sub>a</sub> 2   | <sub>b</sub> 16  | <sub>ab</sub> 8  | .00             | .06   | .02  |
| F                           | <i>Phlox longifolia</i>             | 5                | -                | 1                | .01             | -     | .00  |
| F                           | <i>Plantago patagonica</i> (a)      | -                | 2                | -                | -               | .00   | -    |
| F                           | <i>Ranunculus testiculatus</i> (a)  | <sub>a</sub> 1   | <sub>b</sub> 28  | <sub>c</sub> 60  | .00             | .12   | .16  |
| F                           | <i>Sphaeralcea grossulariifolia</i> | 1                | 10               | -                | .00             | .01   | -    |
| F                           | Unknown forb-annual (a)             | -                | 6                | -                | -               | .04   | -    |
| F                           | <i>Zigadenus paniculatus</i>        | -                | -                | 3                | -               | -     | .00  |
| Total for Annual Forbs      |                                     | 14               | 291              | 83               | 0.02            | 4.35  | 0.22 |
| Total for Perennial Forbs   |                                     | 18               | 10               | 5                | 0.03            | 0.01  | 0.01 |
| Total for Forbs             |                                     | 32               | 301              | 88               | 0.06            | 4.36  | 0.23 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 9

| Type             | Species                         | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|---------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                 | '97             | '03 | '08 | '97             | '03   | '08   |
| B                | Artemisia tridentata tridentata | 76              | 65  | 54  | 12.19           | 8.77  | 6.38  |
| B                | Cowania mexicana stansburiana   | 9               | 10  | 9   | 6.55            | 2.82  | .77   |
| B                | Ephedra viridis                 | 3               | 0   | 2   | .06             | .38   | .38   |
| B                | Gutierrezia sarothrae           | 27              | 15  | 0   | 1.08            | .11   | -     |
| B                | Juniperus osteosperma           | 7               | 5   | 6   | 3.57            | 3.43  | 2.85  |
| B                | Opuntia sp.                     | 3               | 2   | 2   | .00             | .03   | .00   |
| Total for Browse |                                 | 125             | 97  | 73  | 23.48           | 15.56 | 10.39 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 9

| Species                         | Percent Cover |      |      |
|---------------------------------|---------------|------|------|
|                                 | '97           | '03  | '08  |
| Artemisia tridentata tridentata | -             | 7.31 | 7.11 |
| Cowania mexicana stansburiana   | 10.80         | 8.36 | 5.59 |
| Ephedra viridis                 | -             | -    | .06  |
| Gutierrezia sarothrae           | -             | .06  | -    |
| Juniperus osteosperma           | 5.19          | 7.19 | 9.30 |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 9

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 1.5                        | 1.8 |
| Cowania mexicana stansburiana   | 3.6                        | 2.8 |

POINT-QUARTER TREE DATA --

Management unit 27 , Study no: 9

| Species                       | Trees per Acre |     |
|-------------------------------|----------------|-----|
|                               | '03            | '08 |
| Cowania mexicana stansburiana | 61             | 67  |
| Juniperus osteosperma         | 78             | 74  |

| Average diameter (in) |      |
|-----------------------|------|
| '03                   | '08  |
| 10.2                  | 12.1 |
| 6.8                   | 7.9  |

**BASIC COVER --**

Management unit 27 , Study no: 9

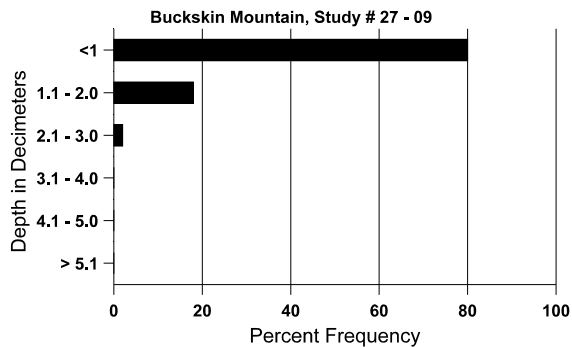
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '97             | '03   | '08   |
| Vegetation  | 38.47           | 37.72 | 20.11 |
| Rock        | 4.40            | 5.34  | 5.23  |
| Pavement    | 19.59           | 21.29 | 13.80 |
| Litter      | 48.10           | 43.54 | 67.65 |
| Cryptogams  | .61             | .04   | .25   |
| Bare Ground | 5.84            | 8.61  | 7.96  |

**SOIL ANALYSIS DATA --**

Management unit 27, Study no: 9, Study Name: Buckskin Mountain

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam  |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 9.8                          | 70.0 (10.6)     | 7.4 | 41.7  | 32.7  | 25.6  | 2.6 | 25.7  | 121.6 | 0.4  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 27 , Study no: 9

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '97               | '03 | '08 |
| Rabbit | 24                | 14  | 69  |
| Elk    | 5                 | 1   | -   |
| Deer   | 49                | 31  | 28  |
| Cattle | 1                 | 3   | 1   |

| Days use per acre (ha) |           |
|------------------------|-----------|
| '03                    | '08       |
| -                      | -         |
| 1 (2)                  | 1 (2)     |
| 98 (243)               | 100 (248) |
| 4 (11)                 | 3 (7)     |

BROWSE CHARACTERISTICS --  
Management unit 27 , Study no: 9

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata tridentata</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>2920</b>                           | 640                                      | 740   | 1200   | 980      | 1360 | 30          | 9       | 34         | 15      | 15           | 29/37                     |
| 03                                     | <b>2180</b>                           | -  | 220   | 1000   | 960      | 1480 | 4           | 0       | 44         | 12      | 12           | 27/29                     |
| 08                                     | <b>1700</b>                           | -  | -     | 420    | 1280     | 1760 | 25          | 18      | 75         | 36      | 53           | 33/36                     |
| <i>Cowania mexicana stansburiana</i>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>240</b>                            | 20                                       | 20    | 180    | 40       | -    | 17          | 0       | 17         | 8       | 8            | 94/95                     |
| 03                                     | <b>360</b>                            | -  | 20    | 280    | 60       | -    | 6           | 17      | 17         | -       | 0            | 93/97                     |
| 08                                     | <b>220</b>                            | -  | 20    | 40     | 160      | -    | 18          | 0       | 73         | 45      | 55           | 84/79                     |
| <i>Ephedra viridis</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 28/30                     |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 35/47                     |
| 08                                     | <b>40</b>                             | -  | -     | 20     | 20       | -    | 50          | 0       | 50         | -       | 0            | 37/53                     |
| <i>Gutierrezia sarothrae</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>1120</b>                           | -  | 60    | 960    | 100      | 520  | 0           | 0       | 9          | 9       | 9            | 8/11                      |
| 03                                     | <b>860</b>                            | 400                                      | 440   | 420    | -        | 40   | 0           | 0       | 0          | -       | 0            | 6/7                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Juniperus osteosperma</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>140</b>                            | -  | 20    | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                     | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                     | <b>120</b>                            | -  | 20    | 80     | 20       | -    | 0           | 0       | 17         | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>80</b>                             | -  | 40    | 40     | -        | 20   | 0           | 0       | -          | -       | 0            | 6/15                      |
| 03                                     | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 6/18                      |
| 08                                     | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 4/5                       |
| <i>Opuntia whipplei</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 15/23                     |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/26                     |
| <i>Pediocactus simpsonii</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 7/24                      |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Purshia tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/26                     |
| <b>Sclerocactus sp.</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 9/24                      |
| <b>Yucca sp.</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 24/34                     |
| 03                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 30/40                     |
| 08                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 22/30                     |

Trend Study 27-10-08

Study site name: Telegraph Flat .

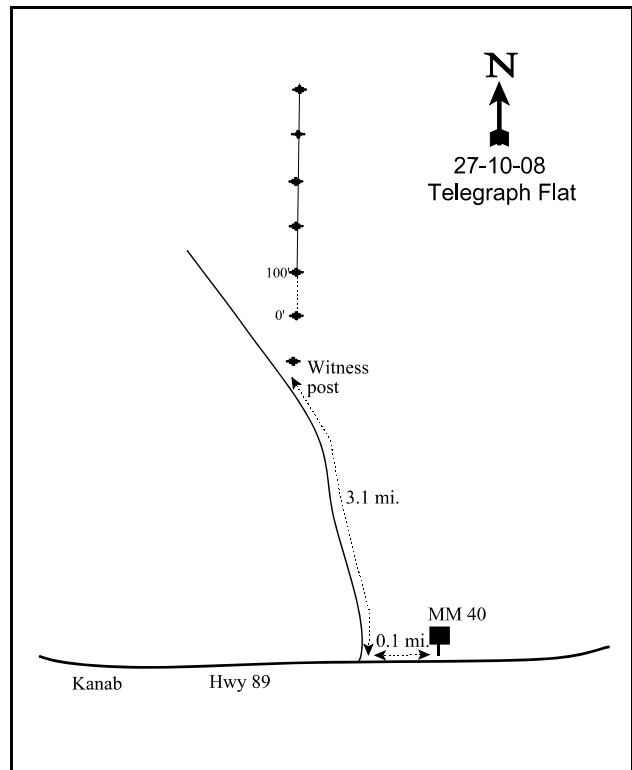
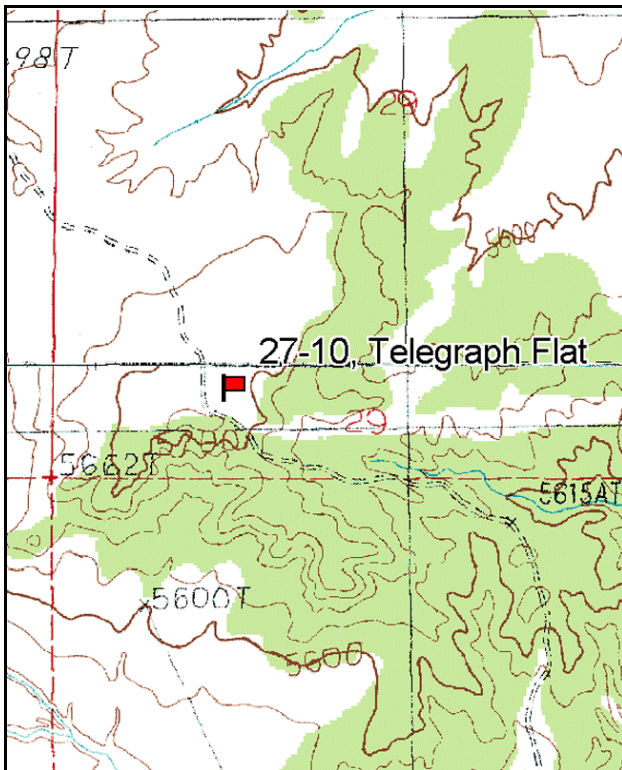
Vegetation type: Cliffrose, Pinyon-Juniper .

Compass bearing: frequency baseline 358 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From mile marker #40 on Highway 89 east of Kanab, go 0.1 mile east to a road on the north. Go north 2.7 miles to a witness post on the right side of the road. From the witness post walk 14 paces at 0 degrees magnetic to the 0' stake. The study runs north and is marked by green, steel fenceposts approximately 12-18 inches in height.



Map name: Telegraph Flat

Diagrammatic Sketch

Township 42S, Range 3W, Section 29

GPS: NAD 83, UTM 12S 397490 E, 4109268 N

## DISCUSSION

### Telegraph Flat - Trend Study No. 27-10

#### Study Information

This study was established in 1997 and is located east of Telegraph Wash and west of Clay Hole Wash [elevation: 5,700 feet (1,737 m), slope: 2%, aspect: northwest]. The site samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community with a Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and pinyon pine (*Pinus edulis*)/Utah juniper (*Juniperus osteosperma*) overstory. This area was chained and seeded in 1963. Pellet group transect data estimated moderate deer use of 28 and 29 days use/acre (69 and 71 ddu/ha) in 2003 and 2008, respectively. Cattle use was estimated to be lightly moderate in 2003 (17 cdu/acre:41 cdu/ha) and light in 2008 (2 cdu/acre:5 cdu/ha). A few elk pellets were found in the quadrat sampling in 1997, and rabbit pellets were moderately abundant in 1997 and 2003.

#### Soil

Soil on the site has a sandy loam texture with a neutral reaction (pH 7.2). There is no rock and little pavement on the surface or in the profile. There are numerous gullies near the site which have been caused by high intensity summer storms. Relative combined vegetation and litter cover ranged from 49%-53% from 1997 to 2008. Relative bare ground was high at 42%-47% from 1997 to 2008. The erosion condition class assessment rated soils as stable in 2003 and 2008.

#### Browse

The key browse species is Wyoming big sagebrush which accounted for about 66% of the total browse cover in 1997, 2003, and 2008. Population density of sagebrush was estimated at 12,760 plants/acre in 1997, declining to 8,340 plants/acre in 2003, and increasing slightly to 9,180 plants/acre in 2008. Recruitment was excellent in 1997 with half of the population consisting of young sagebrush plants, decreasing to only 1% in 2003, and then increasing to 12% in 2008. About 67% of the sagebrush showed moderate or heavy use in 1997, declining to 43% in 2003, and increasing to 78% in 2008. Decadence has increased in the sagebrush population from 10% in 1997, to 42% in 2003, and 50% in 2008. Plants displaying poor vigor increased from 4% in 1997 to 21% in 2003, then decreased to 10% in 2008. Annual sagebrush leaders averaged 1.7 inches of annual growth in 2003, but just under an inch of growth in 2008.

Cliffrose density has averaged about 350 plants/acre for the three sample years. Mature plants are large averaging nearly five feet in height, resulting in a portion of the cliffrose forage being unavailable to browsing. As with Wyoming big sagebrush, young cliffrose were abundant in 1997, accounting for 55% of the population, declining to a more moderate level of 25% in 2003, and further to only 5% in 2008. Utilization on cliffrose was moderate in 1997, and mostly heavy in 2003 and 2008. Vigor of cliffrose was normal in 1997 and 2003, but plants displaying poor vigor increased to 21% in 2008. Decadence was also low in 1997 and 2003 at 5% and 19%, respectively, but increased to 68% of the population in 2008. Cliffrose leaders averaged 3.8 inches of growth in 2003 and 5.5 inches of growth in 2008. Pinyon and juniper had a combined estimated density of about 64 trees/acre on the site in 2003 and 2008.

#### Herbaceous Understory

The herbaceous understory is very poor on this site. Five perennial and two annual grass species were sampled on the site in 1997, but only two perennial grasses and one annual grass were sampled in 2008. Crested wheatgrass (*Agropyron cristatum*) was the only common species as it provided 90% of the herbaceous cover and was initially sampled in 83% of the quadrats in 1997, but was not encountered at all in either 2003 or 2008. Perhaps crested wheatgrass was "droughted out", which is surprising as this species is typically thought of as drought tolerant. Forbs were rare in all three surveys and provide very little to the site. Cover for both forbs and grasses could be considered insignificant in 2008.



## 1997 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (57) Low potential scale

### 2003 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush showed a large decline in total density from 12,760 plants/acre in 1997 to 8,340 plants/acre. Recruitment in sagebrush declined drastically as the number of young plants decreased to only 1% of the population. Sagebrush displaying poor vigor increased from 4% in 1997 to 21%, and decadence increased to 42%. Cliffrose remains healthy overall with little change in its density, good vigor, and low decadence. Trend for the grasses is down. Crested wheatgrass was the only abundant herbaceous species in 1997, but was not sampled on the site in 2003. Crested wheatgrass is typically quite drought and grazing tolerant and the absence from the site in 2003 was surprising. This trend has been seen in other areas of the region where crested wheatgrass has been seeded on sandy soils and declined significantly during drought. The trend for forbs is stable, but in very poor condition. The sum of nested frequency and total cover of perennial forbs changed little from 1997. The sum of nested frequency and total cover of annual forbs increased substantially, but are still so rare that they don't provide a substantial component to the site.

winter range condition (DCI) - poor-fair (27) Low potential scale

browse - down (-2)

grass - down (-2)

forb - stable (0)

### 2008 TREND ASSESSMENT

Trend for browse is slightly up. Density of the primary browse species, Wyoming big sagebrush, increased slightly to 9,180 plants/acre. Recruitment of sagebrush improved with young plants comprising 12% of the population. The number of plants displaying poor vigor decreased to 10%, but decadence increased slightly to 50%. The density of cliffrose increased slightly, as well, to 380 plant/acre. Recruitment of young cliffrose decreased, however, from 25% of the population in 2003 to only 5%. Plants displaying poor vigor increased to 21%, and decadence increased from 19% in 2003 to 68%. Trend for grasses is slightly down and in extremely poor condition. Only three grass species, Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), and sixweeks fescue (*Vulpia octoflora*), were encountered on the site and at such low frequency that they didn't provide a notable amount of cover to the total vegetative cover. The sum of nested frequency and total cover of perennial grasses continued to decline. The trend for forbs is stable, but also in extremely poor condition. The sum of nested frequency of perennial forbs had little change, though the sum of nested frequency of annual forbs decreased substantially. As with the grasses, the frequency of forbs was so low that they did not contribute a notable amount to the total cover.

winter range condition (DCI) - poor-fair (24) Low potential scale

browse - slightly up (+1)

grass - slightly down (-1)

forb - stable (0)

HERBACEOUS TRENDS --  
 Management unit 27 , Study no: 10

| T<br>y<br>p<br>e            | Species                      | Nested Frequency |                 |                 | Average Cover % |      |      |
|-----------------------------|------------------------------|------------------|-----------------|-----------------|-----------------|------|------|
|                             |                              | '97              | '03             | '08             | '97             | '03  | '08  |
| G                           | Agropyron cristatum          | <sub>b</sub> 252 | <sub>a</sub> -  | <sub>a</sub> -  | 5.83            | -    | -    |
| G                           | Aristida purpurea            | <sub>a</sub> 8   | <sub>b</sub> 21 | <sub>a</sub> -  | .20             | .24  | -    |
| G                           | Bromus tectorum (a)          | 2                | -               | -               | .00             | -    | -    |
| G                           | Festuca ovina                | 8                | -               | -               | .01             | -    | -    |
| G                           | Oryzopsis hymenoides         | 8                | 6               | 1               | .06             | .03  | .00  |
| G                           | Sitanion hystrix             | 3                | 6               | 12              | .03             | .01  | .10  |
| G                           | Vulpia octoflora (a)         | 10               | -               | 4               | .04             | -    | .00  |
| Total for Annual Grasses    |                              | 12               | 0               | 4               | 0.05            | 0    | 0.00 |
| Total for Perennial Grasses |                              | 279              | 33              | 13              | 6.15            | 0.29 | 0.10 |
| Total for Grasses           |                              | 291              | 33              | 17              | 6.20            | 0.29 | 0.11 |
| F                           | Agoseris glauca              | 1                | -               | -               | .00             | -    | -    |
| F                           | Astragalus sp.               | 5                | -               | -               | .03             | -    | -    |
| F                           | Calochortus nuttallii        | -                | 3               | -               | .00             | .01  | -    |
| F                           | Castilleja sp.               | 1                | -               | -               | .00             | -    | -    |
| F                           | Eriogonum umbellatum         | -                | 1               | 1               | -               | .00  | .03  |
| F                           | Gilia sp. (a)                | <sub>a</sub> 2   | <sub>b</sub> 29 | <sub>a</sub> -  | .00             | 1.01 | -    |
| F                           | Holosteum umbellatum (a)     | 3                | -               | -               | .00             | -    | -    |
| F                           | Machaeranthera canescens     | -                | 1               | -               | -               | .00  | -    |
| F                           | Microsteris gracilis (a)     | 3                | -               | 2               | .00             | -    | .00  |
| F                           | Navarretia intertexta (a)    | <sub>a</sub> -   | <sub>b</sub> 89 | <sub>a</sub> 18 | -               | 2.49 | .03  |
| F                           | Phlox austromontana          | 3                | 7               | -               | .15             | .06  | -    |
| F                           | Phlox hoodii                 | 5                | -               | -               | .03             | -    | -    |
| F                           | Sphaeralcea grossulariifolia | -                | 1               | -               | -               | .00  | -    |
| F                           | Stephanomeria exigua (a)     | -                | 2               | -               | -               | .03  | -    |
| F                           | Swertia albomarginata        | -                | -               | 4               | -               | -    | .01  |
| F                           | Unknown forb-annual (a)      | 3                | -               | -               | .03             | -    | -    |
| Total for Annual Forbs      |                              | 11               | 120             | 20              | 0.04            | 3.53 | 0.03 |
| Total for Perennial Forbs   |                              | 15               | 13              | 5               | 0.23            | 0.08 | 0.03 |
| Total for Forbs             |                              | 26               | 133             | 25              | 0.28            | 3.62 | 0.07 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 10

| Type             | Species                                  | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '97             | '03 | '08 | '97             | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>             | 0               | 0   | 0   | .03             | -     | -     |
| B                | <i>Artemisia tridentata wyomingensis</i> | 85              | 89  | 93  | 11.60           | 13.33 | 13.44 |
| B                | <i>Chrysothamnus nauseosus</i>           | 1               | 0   | 0   | .00             | -     | -     |
| B                | <i>Cowania mexicana stansburiana</i>     | 15              | 14  | 15  | 1.90            | 2.35  | 1.52  |
| B                | <i>Ephedra viridis</i>                   | 0               | 1   | 1   | -               | .00   | .03   |
| B                | <i>Gutierrezia sarothrae</i>             | 3               | 8   | 4   | .00             | .19   | .00   |
| B                | <i>Juniperus osteosperma</i>             | 4               | 3   | 4   | 1.26            | 2.00  | 3.15  |
| B                | <i>Pinus edulis</i>                      | 2               | 2   | 1   | 1.66            | 2.62  | 2.90  |
| B                | <i>Yucca sp.</i>                         | 0               | 0   | 0   | .38             | -     | -     |
| Total for Browse |  | 110             | 117 | 118 | 16.84           | 20.52 | 21.06 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 10

| Species                                  | Percent Cover |       |       |
|--|---------------|-------|-------|
|  | '97           | '03   | '08   |
| <i>Artemisia tridentata wyomingensis</i> | -             | 13.56 | 19.48 |
| <i>Cowania mexicana stansburiana</i>     | 2.20          | 3.90  | 4.36  |
| <i>Juniperus osteosperma</i>             | 3.59          | 2.59  | 3.38  |
| <i>Pinus edulis</i>                      | 1.79          | 4.00  | 4.41  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 10

| Species                                  | Average leader growth (in) |     |
|--|----------------------------|-----|
|  | '03                        | '08 |
| <i>Artemisia tridentata wyomingensis</i> | 1.7                        | 0.9 |
| <i>Cowania mexicana stansburiana</i>     | 3.8                        | 5.5 |

POINT-QUARTER TREE DATA --  
Management unit 27 , Study no: 10

| Species               | Trees per Acre |     |
|-----------------------|----------------|-----|
|                       | '03            | '08 |
| Juniperus osteosperma | 36             | 35  |
| Pinus edulis          | 28             | 28  |

| Average diameter (in) |     |
|-----------------------|-----|
| '03                   | '08 |
| 2.7                   | 6.4 |
| 5.4                   | 5.1 |

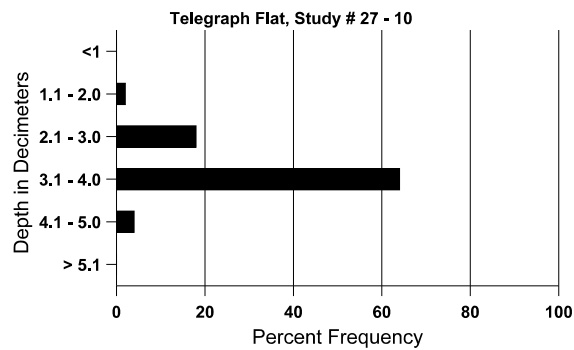
BASIC COVER --  
Management unit 27 , Study no: 10

| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '97             | '03   | '08   |
| Vegetation  | 22.68           | 24.62 | 21.70 |
| Pavement    | .06             | .05   | .10   |
| Litter      | 28.17           | 34.32 | 38.67 |
| Cryptogams  | 4.69            | 6.74  | 3.29  |
| Bare Ground | 49.65           | 48.52 | 49.61 |

SOIL ANALYSIS DATA --  
Management unit 27, Study no: 10, Study Name: Telegraph Flat

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 14.4                         | 73.3 (13.9)     | 7.2 | 62.4       | 19.1  | 18.6  | 1.3 | 20.2  | 124.8 | 0.6  |

### Stoniness Index



PELLET GROUP DATA --

Management unit 27 , Study no: 10

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '97               | '03 | '08 |
| Sheep  | 1                 | -   | -   |
| Rabbit | 18                | 19  | 78  |
| Elk    | 3                 | -   | 1   |
| Deer   | 19                | 24  | 20  |
| Cattle | -                 | 7   | 7   |

| Days use per acre (ha) |         |
|------------------------|---------|
| '03                    | '08     |
| -                      | -       |
| -                      | -       |
| -                      | -       |
| 28 (69)                | 29 (71) |
| 17 (41)                | 2 (5)   |

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 10

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Amelanchier utahensis</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 12/11                     |
| <i>Artemisia tridentata wyomingensis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>12760</b>                          | 140                                      | 6400  | 5060   | 1300     | 180  | 55          | 12      | 10         | 4       | 4            | 20/31                     |
| 03                                       | <b>8340</b>                           | -  | 80    | 4740   | 3520     | 520  | 13          | 30      | 42         | 20      | 21           | 17/23                     |
| 08                                       | <b>9180</b>                           | 1480                                     | 1140  | 3420   | 4620     | 1000 | 48          | 30      | 50         | 7       | 10           | 21/27                     |
| <i>Chrysothamnus nauseosus</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>80</b>                             | -  | 80    | -      | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Cowania mexicana stansburiana</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>400</b>                            | -  | 220   | 160    | 20       | 20   | 60          | 0       | 5          | -       | 0            | 59/68                     |
| 03                                       | <b>320</b>                            | -  | 80    | 180    | 60       | 80   | 13          | 69      | 19         | -       | 0            | 54/66                     |
| 08                                       | <b>380</b>                            | -  | 20    | 100    | 260      | 120  | 26          | 68      | 68         | 16      | 21           | 47/54                     |
| <i>Ephedra viridis</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 22/16                     |
| 08                                       | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | 23/14                     |
| <i>Gutierrezia sarothrae</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                                       | <b>100</b>                            | -  | -     | 80     | 20       | -    | 0           | 0       | 20         | -       | 0            | 9/10                      |
| 03                                       | <b>280</b>                            | -  | 20    | 260    | -        | 40   | 0           | 0       | 0          | -       | 0            | 9/12                      |
| 08                                       | <b>100</b>                            | -  | 20    | 60     | 20       | 60   | 0           | 0       | 20         | -       | 0            | 8/8                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Juniperus osteosperma</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>80</b>                             | -  | 20    | 60     | -        | 40   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>80</b>                             | -  | 40    | 40     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/9                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus edulis</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Yucca sp.</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 19/24                     |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 21/23                     |

Trend Study 27-11-08

Study site name: Crocodile.

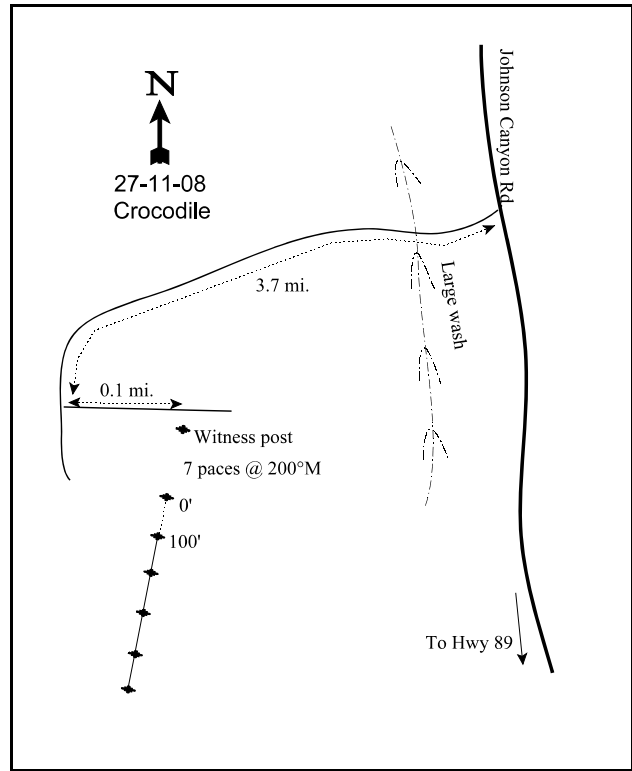
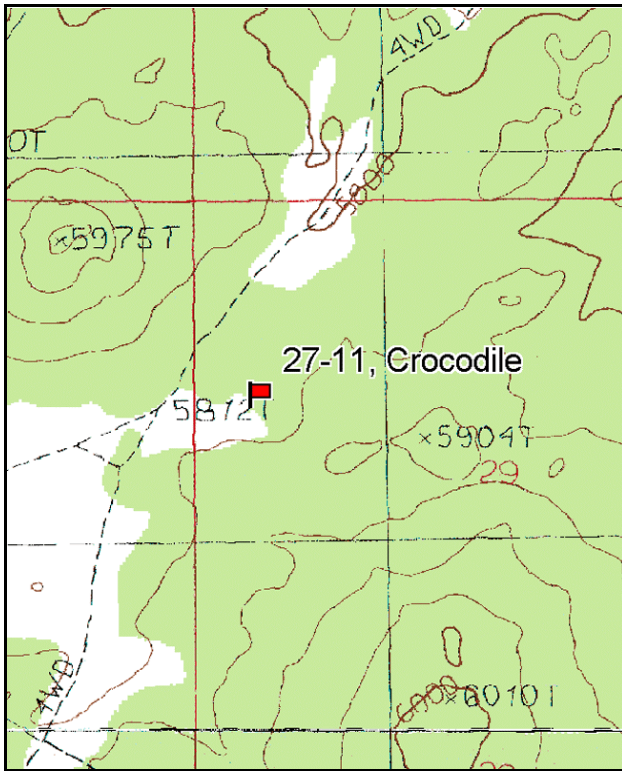
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 192 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the LDS church in Alton, travel south 10.8 miles. At this intersection turn left and head towards Kanab. Continue 6.8 miles to another intersection. Turn south on the pavement and go 9.8 miles to another intersection. Turn right (west) and go 0.1 miles to a left fork. Take this fork and go 3.7 miles across a large wash to a two track on the left. Go 0.1 miles to a witness post on the right (south) side of the road. From the witness post, walk 7 paces at 200 degrees magnetic to the 0-foot stake.



Map name: Cutler Point

Diagrammatic Sketch

Township 42S, Range 5W, Section 29

GPS: NAD 83, UTM 12S 371555 E, 4110527 N

## DISCUSSION

### Crocodile - Trend Study No. 27-11

#### Study Information

This study is located west of the Johnson Valley Road along the Wygaret Terrace about one and a half miles north of the head of Dairy Canyon [elevation: 5,800 feet (1,767 m), slope: 3%-10%, aspect: north]. The site was established in 1997 to sample critical winter range on the Paunsaugunt unit. The study samples a basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) community with a scattered Utah juniper (*Juniperus osteosperma*) overstory that was seeded with crested wheatgrass (*Agropyron cristatum*) in the mid-1960's. The vicinity is a concentration area for wintering deer. A pellet group transect read along the baseline estimated deer use to be very heavy in 1997 and 2003 (128 ddu/acre:316 ddu/ha and 88 ddu/acre:218 ddu/ha, respectively), and moderate in 2008 (21 ddu/acre:53 ddu/ha). Cattle use was estimated to be moderate in 1997 (28 cdu/acre:69 cdu/ha), declining to light in 2003 and 2008 (12 cdu/acre:30 cdu/ha and 6 cdu/acre:14 cdu/ha, respectively). Most of the herbaceous vegetation was heavily utilized at the time the transect was established on August 19, 1997, and a watering trough was found about a quarter of a mile to the west of the study area.

#### Soil

Soils at the study site are very deep with an effective rooting depth estimated at nearly 35 inches. Soil texture is a fine sand, and is moderately acidic (pH 5.8). Rock and pavement are rare on the surface or in the profile. Relative combined vegetation and litter cover ranged from 49%-53% from 1997 to 2008. Relative bare ground cover has been fairly high ranging from 46%-51% from 1997 to 2008. The soil erosion condition was classified as slight in 2003 primarily due to pedestaling around plants, but was classified as stable in 2008.

#### Browse

Basin big sagebrush and antelope bitterbrush (*Purshia tridentata*) represent the key browse on the site. Big sagebrush accounted for an average of about 55% of the total shrub cover in 1997, 2003, and 2008. Bitterbrush provided an average of just under 35% of the browse cover in the same years. Basin big sagebrush had an estimated population density of 2,860 plants/acre in 1997, 2,340 plants/acre in 2003, and 1,860 plants/acre in 2008. Along with the slight decline in density, a major age class shift also occurred in the basin big sagebrush population in 2003. Recruitment of young sagebrush steadily declined from 28% of the population in 1997, to 13% in 2003, and 5% in 2008. Utilization of sagebrush has been mostly moderate, with poor vigor being found on 8% of the population in 1997, increasing to 26% in 2003, and decreasing to 18% in 2008. Annual leader growth for sagebrush averaged 2.5 inches in 2003 and 1.7 inches in 2008.

Bitterbrush density was estimated at 900 plants/acre in 1997, increasing to 1,160 in 2003, and decreasing to 780 plants/acre in 2008. This population consists of mostly heavily hedged, mature plants that have both upright and prostrate growth forms. Decadence was low in 1997 at 2%, increasing to 28% in 2003, and to 49% in 2008. Both basin big sagebrush and bitterbrush had good seed total cover in 2003. Annual leader growth for bitterbrush averaged 4.5 inches in 2003 and 3.9 inches in 2008. Other browse species that have been sampled on the site include broom snakeweed (*Gutierrezia sarothrae*), rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), prickly phlox (*Leptodactylon pungens*), sand sagebrush (*Artemisia filifolia*), and yucca (*Yucca* sp.).

#### Herbaceous Understory

The herbaceous understory is lacking. Grasses and forbs provide fair diversity but low total cover. Eight perennial grasses and one annual grass have been sampled on the site with needle-and-thread (*Stipa comata*), sandhill muhly (*Muhlenbergia pungens*), Indian ricegrass (*Oryzopsis hymenoides*), and blue grama (*Bouteloua gracilis*) being the most abundant. The area was seeded with crested wheatgrass in the 1960's, and this species was sampled in 20 quadrats in 1997. As with the Telegraph Flat study, crested wheatgrass was not sampled at all in 2003, and may have been "droughted out". Most of the cool season grasses had been heavily utilized by



livestock prior to sampling in 1997, but there was no noticeable use on grasses in 2003 or 2008. Forbs are nearly nonexistent with four annual and seven perennial species being sampled between all three surveys. Forbs combined to produce a high of about 1% average cover in 2003.

#### 1997 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (50) Low potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is down. The most abundant browse, basin big sagebrush, declined in density from 2,860 plants/acre in 1997 to 2,340 plants/acre. Recruitment declined from young sagebrush comprising 28% of the population 1997 to 13%. Sagebrush displaying poor vigor increased from 8% in 1997 to 26%, and decadence increased from 12% in 1997 to 57%. Bitterbrush density slightly increased, but recruitment was poor with young plants comprising only 2% of the population. Decadence increased from 2% in 1997 to 28%, vigor remained mostly normal for bitterbrush. Trend for the grasses is down and in very poor condition. Perennial grasses significantly declined in sum of nested frequency and in total cover. Crested wheatgrass was not sampled in 2003 and sandhill muhly, needle-and-thread, and sand dropseed (*Sporobolus cryptandrus*) all declined individually in nested frequency. Trend for forbs is slightly up. The sum of nested frequency and total cover of perennial forbs increased slightly, but remain very low. Forbs are rare and provide little forage or diversity on this site.

winter range condition (DCI) - fair (32) Low potential scale

browse - down (-2)

grass - down (-2)

forb - slightly up (+1)

#### 2008 TREND ASSESSMENT

Trend for browse is down. The primary browse species, basin big sagebrush, continued to decline in density to 1,860 plants/acre. Recruitment of sagebrush continued to decline, as well, with young plants comprising only 5% of the population. Plants displaying poor vigor decreased since 2003 to 18%, and decadence decreased slightly to 42%, but is still high. The density of the other preferred browse species, bitterbrush, declined since 2003 to 780 plants/acre. Recruitment of young bitterbrush plants remains similar to 2003. Bitterbrush plants displaying poor vigor has increased to 36% since 2003, and decadence has increased to 49%. The trend for grasses is down and is in very poor condition. The sum of nested frequency and total cover of perennial grasses continued to decline, with a significant decline in the frequency of needle-and-thread grass. The trend for forbs is down. Only three species of forbs were sampled on the site. The frequency and total cover of forbs was so low as to be almost nonexistent on the site.

winter range condition (DCI) - poor-fair (26) Low potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 11

| Type                        | Species                             | Nested Frequency |                 |                  | Average Cover % |      |      |
|-----------------------------|-------------------------------------|------------------|-----------------|------------------|-----------------|------|------|
|                             |                                     | '97              | '03             | '08              | '97             | '03  | '08  |
| G                           | <i>Agropyron cristatum</i>          | <sub>b</sub> 43  | <sub>a</sub> -  | <sub>a</sub> -   | .30             | -    | -    |
| G                           | <i>Aristida purpurea</i>            | -                | 2               | -                | -               | .03  | -    |
| G                           | <i>Bouteloua gracilis</i>           | 19               | 15              | 13               | .11             | .26  | .11  |
| G                           | <i>Muhlenbergia pungens</i>         | <sub>b</sub> 49  | <sub>a</sub> 26 | <sub>ab</sub> 39 | 1.64            | .43  | .57  |
| G                           | <i>Oryzopsis hymenoides</i>         | <sub>a</sub> -   | <sub>b</sub> 31 | <sub>b</sub> 17  | .00             | .40  | .15  |
| G                           | <i>Sitanion hystrix</i>             | 10               | 2               | 1                | .12             | .06  | .03  |
| G                           | <i>Sporobolus cryptandrus</i>       | <sub>b</sub> 60  | <sub>a</sub> 8  | <sub>a</sub> 10  | .43             | .01  | .05  |
| G                           | <i>Stipa comata</i>                 | <sub>b</sub> 106 | <sub>b</sub> 73 | <sub>a</sub> 13  | 1.47            | 1.31 | .07  |
| G                           | <i>Vulpia octoflora</i> (a)         | <sub>b</sub> 54  | <sub>a</sub> -  | <sub>a</sub> -   | .15             | -    | -    |
| Total for Annual Grasses    |                                     | 54               | 0               | 0                | 0.15            | 0    | 0    |
| Total for Perennial Grasses |                                     | 287              | 157             | 93               | 4.10            | 2.51 | 0.99 |
| Total for Grasses           |                                     | 341              | 157             | 93               | 4.25            | 2.51 | 0.99 |
| F                           | <i>Astragalus convallarius</i>      | -                | 3               | -                | -               | .03  | -    |
| F                           | <i>Astragalus</i> sp.               | <sub>b</sub> 14  | <sub>a</sub> -  | <sub>a</sub> -   | .02             | -    | -    |
| F                           | <i>Comandra pallida</i>             | <sub>ab</sub> 6  | <sub>b</sub> 10 | <sub>a</sub> -   | .06             | .34  | -    |
| F                           | <i>Cryptantha</i> sp.               | -                | -               | 1                | -               | -    | .00  |
| F                           | <i>Eriogonum cernuum</i> (a)        | 3                | -               | -                | .00             | -    | -    |
| F                           | <i>Gilia</i> sp. (a)                | -                | 12              | 1                | -               | .09  | .00  |
| F                           | <i>Lappula occidentalis</i> (a)     | 3                | -               | -                | .01             | -    | -    |
| F                           | <i>Lotus utahensis</i>              | 4                | 6               | -                | .01             | .01  | .03  |
| F                           | <i>Oenothera pallida</i>            | <sub>a</sub> -   | <sub>b</sub> 10 | <sub>a</sub> -   | -               | .21  | -    |
| F                           | <i>Plantago patagonica</i> (a)      | <sub>a</sub> 5   | <sub>b</sub> 27 | <sub>a</sub> -   | .01             | .32  | -    |
| F                           | <i>Sphaeralcea grossulariifolia</i> | <sub>a</sub> 3   | <sub>b</sub> 19 | <sub>a</sub> 2   | .03             | .10  | .00  |
| Total for Annual Forbs      |                                     | 11               | 39              | 1                | 0.02            | 0.41 | 0.00 |
| Total for Perennial Forbs   |                                     | 27               | 48              | 3                | 0.12            | 0.70 | 0.03 |
| Total for Forbs             |                                     | 38               | 87              | 4                | 0.15            | 1.12 | 0.04 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 11

| Type             | Species                            | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                    | '97             | '03 | '08 | '97             | '03   | '08   |
| B                | Artemisia filifolia                | 2               | 4   | 2   | .15             | .85   | .38   |
| B                | Artemisia tridentata tridentata    | 65              | 60  | 62  | 7.94            | 8.96  | 9.60  |
| B                | Chrysothamnus nauseosus hololeucus | 15              | 10  | 9   | .28             | .15   | .30   |
| B                | Gutierrezia sarothrae              | 33              | 25  | 24  | 1.04            | .11   | .09   |
| B                | Leptodactylon pungens              | 3               | 5   | 3   | .04             | .06   | .00   |
| B                | Opuntia sp.                        | 3               | 0   | 0   | .03             | -     | -     |
| B                | Purshia tridentata                 | 28              | 33  | 30  | 6.02            | 5.97  | 4.59  |
| B                | Yucca sp.                          | 1               | 1   | 1   | .15             | .15   | .38   |
| Total for Browse |                                    | 150             | 138 | 131 | 15.66           | 16.25 | 15.36 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 11

| Species                            | Percent Cover |       |
|------------------------------------|---------------|-------|
|                                    | '03           | '08   |
| Artemisia filifolia                | .56           | .65   |
| Artemisia tridentata tridentata    | 11.61         | 14.39 |
| Chrysothamnus nauseosus hololeucus | .71           | 1.41  |
| Chrysothamnus viscidiflorus        | .43           | -     |
| Gutierrezia sarothrae              | -             | .08   |
| Leptodactylon pungens              | .01           | -     |
| Purshia tridentata                 | 10.00         | 8.69  |
| Yucca sp.                          | .66           | .58   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 11

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 2.5                        | 1.7 |
| Purshia tridentata              | 4.5                        | 3.9 |

POINT-QUARTER TREE DATA --  
Management unit 27 , Study no: 11

| Species             | Trees per Acre |     |     |
|---------------------|----------------|-----|-----|
|                     | '97            | '03 | '08 |
| Juniper osteosperma | 10             | <18 | <18 |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '97                   | '03 | '08 |
| 13.4                  | -   | -   |

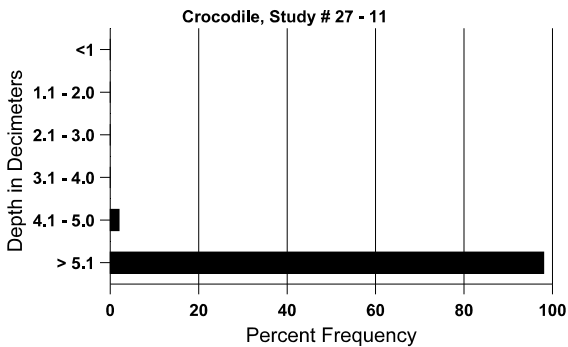
BASIC COVER --  
Management unit 27 , Study no: 11

| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '97             | '03   | '08   |
| Vegetation  | 18.82           | 20.57 | 17.27 |
| Rock        | .02             | .06   | .05   |
| Pavement    | .08             | .04   | .26   |
| Litter      | 34.13           | 39.60 | 44.00 |
| Cryptogams  | .28             | 1.09  | .48   |
| Bare Ground | 54.99           | 55.61 | 53.47 |

SOIL ANALYSIS DATA --  
Management unit 27, Study no: 11, Study Name: Crocodile

| Effective rooting depth (in) | Temp °F (depth) | pH  | sand  |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 34.8                         | 70.7 (18.1)     | 5.8 | 91.6  | 2.4   | 5.9   | 0.3 | 9.6   | 19.2  | 0.2  |

### Stoniness Index



PELLET GROUP DATA --

Management unit 27 , Study no: 11

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '97               | '03 | '08 |
| Rabbit | 29                | 16  | 81  |
| Elk    | 8                 | -   | -   |
| Deer   | 44                | 37  | 33  |
| Cattle | 6                 | 2   | 2   |

| Days use per acre (ha) |          |         |
|------------------------|----------|---------|
| '97                    | '03      | '08     |
| -                      | -        | -       |
| 1 (2)                  | -        | -       |
| 86 (212)               | 88 (218) | 21 (53) |
| 20 (49)                | 12 (30)  | 6 (14)  |

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 11

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia filifolia</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 20/19                     |
| 03  | <b>120</b>                            | -  | -     | 80     | 40       | -    | 0           | 0       | 33         | -       | 0            | 23/18                     |
| 08  | <b>80</b>                             | -  | -     | 20     | 60       | -    | 100         | 0       | 75         | -       | 0            | 34/34                     |
| <i>Artemisia tridentata tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>2860</b>                           | 280                                      | 800   | 1720   | 340      | 420  | 32          | 7       | 12         | 7       | 8            | 46/49                     |
| 03  | <b>2340</b>                           | -  | 300   | 700    | 1340     | 680  | 53          | .85     | 57         | 26      | 26           | 33/35                     |
| 08  | <b>1860</b>                           | 40                                       | 100   | 980    | 780      | 440  | 31          | 5       | 42         | 17      | 18           | 40/48                     |
| <i>Chrysothamnus nauseosus hololeucus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>400</b>                            | -  | 60    | 280    | 60       | 40   | 0           | 0       | 15         | 5       | 5            | 23/27                     |
| 03  | <b>280</b>                            | -  | -     | 160    | 120      | -    | 0           | 0       | 43         | 7       | 7            | 28/31                     |
| 08  | <b>240</b>                            | -  | -     | -      | 240      | 60   | 25          | 8       | 100        | 17      | 17           | 33/45                     |
| <i>Chrysothamnus viscidiflorus</i>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 22/23                     |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 44/46                     |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 55/72                     |
| <i>Gutierrezia sarothrae</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97  | <b>1620</b>                           | -  | 140   | 1380   | 100      | 260  | 0           | 0       | 6          | 6       | 6            | 8/11                      |
| 03  | <b>1020</b>                           | -  | 740   | 240    | 40       | -    | 0           | 0       | 4          | -       | 0            | 9/10                      |
| 08  | <b>680</b>                            | -  | 40    | 460    | 180      | 540  | 15          | 3       | 26         | 24      | 24           | 5/6                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Leptodactylon pungens</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>120</b>                            | -  | -     | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/3                       |
| 03                           | <b>340</b>                            | -  | -     | 340    | -        | -    | 0           | 0       | 0          | -       | 0            | 5/6                       |
| 08                           | <b>80</b>                             | -  | 20    | 40     | 20       | -    | 0           | 0       | 25         | 25      | 25           | -/-                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 3/6                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/9                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>900</b>                            | -  | 80    | 800    | 20       | 20   | 36          | 56      | 2          | 2       | 2            | 71/81                     |
| 03                           | <b>1160</b>                           | -  | 20    | 820    | 320      | 20   | 10          | 86      | 28         | 10      | 10           | 35/52                     |
| 08                           | <b>780</b>                            | -  | 60    | 340    | 380      | 160  | 23          | 10      | 49         | 36      | 36           | 32/54                     |
| <b>Yucca sp.</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 20/37                     |
| 03                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 39/57                     |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 40/42                     |

Trend Study 27-12-08

Study site name: Moons Landing .

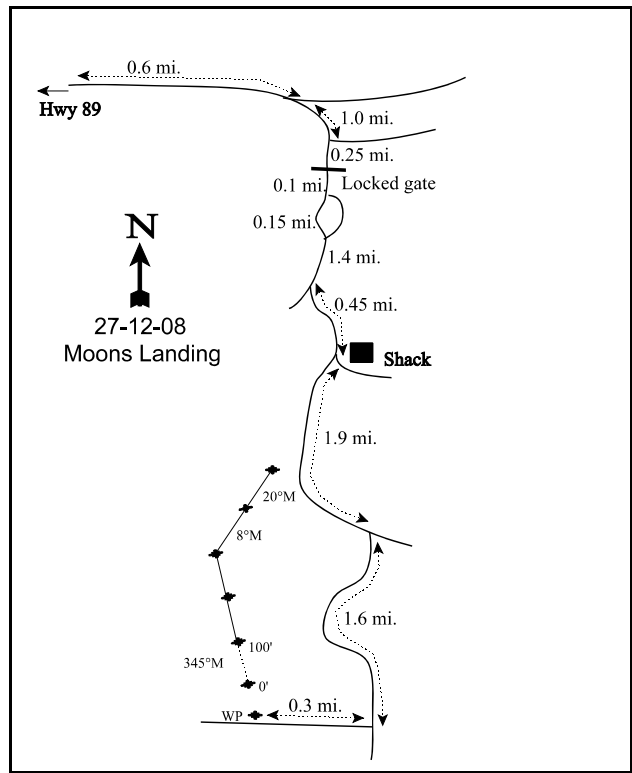
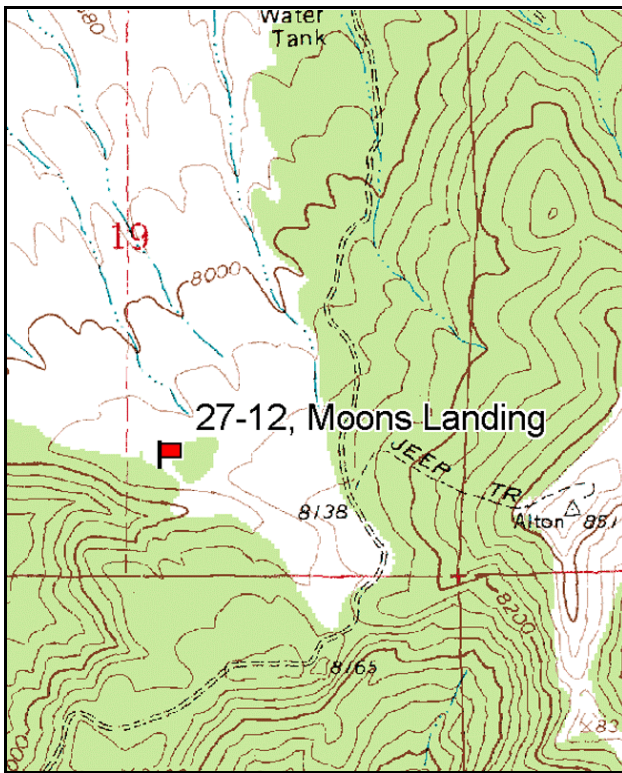
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 345 degrees magnetic. (Line 4-8°M, line 5-20°M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 2 on 6ft, belt 3 on 4ft, belt 4 on 1ft, belt 5 on 2ft.

LOCATION DESCRIPTION

From U. S. 89, go approximately 0.4 miles south of mile marker #111 to a road on the left. Go 0.6 miles to a fork. Stay on Bryce Woodland Road (right) and go 1.0 mile to a fork. Stay right on the two track and go 0.25 to a locked gate (get combination). Go through the gate and go 1.65 miles, staying on the main road, to a fork. Go left 0.45 miles to another fork with a shack on the left. Go right for 1.9 miles to a fork. Turn right and go 1.6 miles to a two track road on the right. Go 0.3 miles on the two track to a witness post on the right (north). The 0-foot stake is 15 feet north of the witness post. The study is marked by green, steel fenceposts approximately 12-18 inches in height.



Map name: Alton

Diagrammatic Sketch

Township 38S, Range 5W, Section 19

GPS: NAD 83, UTM 12S 371047 E, 4149892 N

## DISCUSSION

### Moons Landing - Trend Study No. 27-12

#### Study Information

This site was established in 1997 to monitor transitional/summer range on the west side of the Paunsaugunt wildlife management area [elevation: 8,100 feet (2,470 m), slope: 4%-7%, aspect: northwest]. It samples a mountain brush type two miles east of U.S. 89 and about four miles north of Alton. The land is privately owned and part of the Heaton private hunting unit. Pellet group transect data estimated very heavy deer use on the area in 1997, 2003, and 2008 (192 ddu/acre:474 ddu/ha, 96 ddu/acre:238 ddu/ha, and 127 ddu/acre:312 ddu/ha, respectively). Several deer were seen in the area during study establishment in 1997. Elk also use the area but to a much lesser extent. Elk use was estimated to be light in 1997 and 2008 (14 edu/acre:35 edu/ha and 10 edu/acre:25 edu/ha, respectively), with no elk pellets being sampled in 2003. Cattle use was estimated to be moderately heavy in 1997 and 2008 (43 cdu/acre:106 cdu/ha and 31 cdu/acre:77 cdu/ha, respectively) and light in 2003 (15 cdu/acre:36 cdu/ha). Cattle were present on the site during the 1997 and 2003 readings. A deer fawn and a sage grouse were seen on the site in 2003.

#### Soil

Soil texture is a sandy clay loam with a moderately acidic reaction (pH 5.9). Rocks and pavement are not abundant on the surface or in the profile. Relative combined vegetation and litter cover was high with a range of 78%-91% from 1997 to 2008. Relative bare ground was low at 6% in 1997, and increasing to 19% in 2003 and 15% in 2008. Erosion on the ridge is minimal due to the abundant vegetation and litter cover combined with the gentle terrain. The erosion condition class was rated as stable in 2003 and 2008.

#### Browse

The site supports a variety of useful browse species including serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and snowberry (*Symphoricarpos oreophilus*). There are also some gamble oak (*Quercus gambelii*) clones nearby which provide cover and additional forage. The most important shrub on the site is bitterbrush which provided around 40% of the browse cover in 1997, 2003, and 2008. Bitterbrush density was estimated at 1,860 plants/acre in 1997, increasing to 2,160 plants/acre in 2003, and to 2,400 plants/acre in 2008. The population is comprised primarily of mature plants that have had mostly heavy use from 1997 to 2008. These shrubs have been severely hedged to the point where many are partly or totally unavailable due to hedging. Decadence was low in both 1997 and 2003 at 6% and 11%, respectively, but was moderate at 23% in 2008. Most plants still have good leader growth and seed production, and vigor was normal in all three surveys.

Black sagebrush and mountain big sagebrush are both found on the site in moderate numbers. Many of the sagebrush plants on the site are likely hybrids between the two species, but were split according to growth form. Black sagebrush density numbered 980 plants/acre in 1997, 1,540 plants/acre in 2003, and 1,660 plant/acre in 2008. Mountain big sagebrush density was estimated at 560 plants/acre in 1997, 880 plants/acre in 2003, and 900 plants/acre in 2008. Both sagebrush populations showed mostly light use, good vigor, and low decadence in 1997, 2003, and 2008. Snowberry provides about one-quarter of the browse cover on the site. Mature plants are fairly large averaging about two feet in height with an average crown diameter of just over three feet. Snowberry usually receives little use on most areas, but here, some plants displayed moderate to heavy utilization. Serviceberry are rare but heavily hedged.

Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), an increaser, is widespread on the site with an estimated density around 2,000 plants/acre. The population appears stable with a majority of the plants being mature in all three sample years. The increaser species, broom snakeweed (*Gutierrezia sarothrae*), was found in limited numbers at the outset of the study, but density had increased to 2,140



plants/acre in 2008. A small number of dwarf rabbitbrush (*Chrysothamnus depressus*) and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*) also persist on the site.

#### Herbaceous Understory

The herbaceous understory is diverse with a fairly abundant perennial grass component. Letterman needlegrass (*Stipa lettermani*) was the most common grass in all three sample years, though it significantly decreased between the 1997 and 2003 surveys. Other fairly common species include mutton bluegrass (*Poa fendleriana*), Sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comata*). Needle-and-thread grass nested frequency has changed little over the sample period, mutton bluegrass increased significantly in nested frequency from 1997 to 2003, while Sandberg bluegrass nested frequency significantly declined in both 2003 and 2008. Cattle use has been high on most of the grasses in the open areas. Less abundant grasses include slender wheatgrass (*Agropyron trachycaulum*), thickspike wheatgrass (*Agropyron dasystachyum*), blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria cristata*), and bottlebrush squirreltail (*Sitanion hystrix*). Both blue grama and prairie junegrass increased significantly in nested frequency from 2003 to 2008. Forbs are also diverse with 32 species being sampled between the three surveys. Perennial forbs are more abundant than annual varieties with redroot eriogonum (*Eriogonum racemosum*), longleaf phlox (*Phlox longifolia*), and Louisiana sagebrush (*Artemisia ludoviciana*). Total forb cover was about 4% in all sample years.

#### 1997 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - excellent (93) Mid-level potential scale

#### 2003 TREND ASSESSMENT

Trend for the browse is slightly up. All of the preferred species show increases in density, and maintain normal vigor and low decadence. Bitterbrush continues to demonstrate good leader growth and seed production. Trend for grasses is slightly down as the sum of nested frequency and total cover of perennial grasses has declined since 1997. Trend for forbs is slightly up as the sum of nested frequency of perennial forbs increased since 1997. The increase in forb frequency is somewhat surprising with drought conditions experienced prior to and including the 2003 survey.

winter range condition (DCI) - good (74) Mid-level potential scale

browse - slightly up (+1)      grass - slightly down (-1)      forb - slightly up (+1)

#### 2008 TREND ASSESSMENT

The trend for browse is slightly up. The density of all of the preferred browse species continued to show an increase since 2003. The primary browse species, antelope bitterbrush, increased in density from 2,160 plants/acre in 2003 to 2,400 plants/acre. Vigor remained normal on most of the bitterbrush population, but decadence increased from 11% in 2003 to 23%. There were slight increases in the density of the other preferred browse species black and mountain sagebrush, serviceberry, snowberry, and woods rose (*Rosa woodsii*). Vigor and decadence remained normal on most of these species populations, though black sagebrush decadence increased from 5% in 2003 to 20%. Gamble oak and dwarf rabbitbrush had a large increases in their densities. Gamble oak increased from 480 plants/acre in 2003 to 1,440 plants/acre. Vigor and decadence remained normal for the oak population. Dwarf rabbitbrush increased from 380 plants/acre in 2003 to 1,720 plants/acre. Vigor remained normal, but decadence increased to 24%. The trend for the grasses is slightly up. Sum of nested frequency and total cover of perennial grasses has increased. The composition of grass species has shifted with a significant increase in the frequency of blue grama and prairie junegrass, and a significant decrease in the frequency of Sandberg bluegrass. Trend for the forbs is slightly up. Sum of nested frequency and total cover of perennial forbs has increased since 2003. Sum of nested frequency and total cover of annual forbs has decreased slightly.

winter range condition (DCI) - good-excellent (79) Mid-level potential scale

browse - slightly up (+1)      grass - slightly up (+1)      forb - slightly up (+1)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 12

| T<br>y<br>p<br>e            | Species                       | Nested Frequency |                  |                  | Average Cover % |      |       |
|-----------------------------|-------------------------------|------------------|------------------|------------------|-----------------|------|-------|
|                             |                               | '97              | '03              | '08              | '97             | '03  | '08   |
| G                           | Agropyron dasystachyum        | b <sub>50</sub>  | ab <sub>42</sub> | a <sub>25</sub>  | .77             | .24  | .24   |
| G                           | Agropyron trachycaulum        | 7                | 7                | 2                | .18             | .09  | .01   |
| G                           | Bouteloua gracilis            | ab <sub>31</sub> | a <sub>25</sub>  | b <sub>53</sub>  | .91             | .16  | 1.41  |
| G                           | Bromus carinatus              | 2                | 2                | 6                | .00             | .03  | .03   |
| G                           | Carex sp.                     | 19               | 3                | 13               | .06             | .03  | .18   |
| G                           | Koeleria cristata             | a <sub>24</sub>  | a <sub>29</sub>  | b <sub>70</sub>  | .24             | .30  | 1.25  |
| G                           | Poa fendleriana               | a <sub>47</sub>  | b <sub>114</sub> | b <sub>144</sub> | 1.34            | 1.34 | 2.67  |
| G                           | Poa pratensis                 | -                | 3                | 5                | -               | .01  | .06   |
| G                           | Poa secunda                   | c <sub>133</sub> | b <sub>80</sub>  | a <sub>35</sub>  | 1.30            | 1.40 | .36   |
| G                           | Sitanion hystrix              | 32               | 20               | 10               | .30             | .32  | .10   |
| G                           | Stipa comata                  | 95               | 133              | 109              | 1.57            | 2.22 | 1.31  |
| G                           | Stipa lettermani              | b <sub>305</sub> | b <sub>157</sub> | a <sub>248</sub> | 11.75           | 3.38 | 4.82  |
| Total for Annual Grasses    |                               | 0                | 0                | 0                | 0               | 0    | 0     |
| Total for Perennial Grasses |                               | 745              | 615              | 720              | 18.45           | 9.55 | 12.50 |
| Total for Grasses           |                               | 745              | 615              | 720              | 18.45           | 9.55 | 12.50 |
| F                           | Agoseris glauca               | a <sub>3</sub>   | b <sub>31</sub>  | a <sub>4</sub>   | .00             | .29  | .03   |
| F                           | Alyssum alyssoides (a)        | -                | 6                | 2                | -               | .09  | .00   |
| F                           | Allium sp.                    | 4                | 1                | 2                | .01             | .00  | .00   |
| F                           | Antennaria rosea              | 1                | 3                | 1                | .00             | .18  | .15   |
| F                           | Androsace septentrionalis (a) | a <sub>-</sub>   | b <sub>33</sub>  | a <sub>4</sub>   | -               | .41  | .00   |
| F                           | Arabis sp.                    | -                | 2                | 4                | -               | .00  | .01   |
| F                           | Artemisia dracunculus         | 3                | 5                | -                | .03             | .19  | -     |
| F                           | Artemisia ludoviciana         | 88               | 76               | 94               | 1.41            | .63  | 1.07  |
| F                           | Astragalus sp.                | -                | -                | 1                | -               | -    | .00   |
| F                           | Balsamorhiza sagittata        | 1                | 2                | 1                | .15             | .15  | .03   |
| F                           | Calochortus nuttallii         | -                | 4                | -                | -               | .01  | -     |
| F                           | Cirsium sp.                   | 4                | 4                | 2                | .03             | .06  | .06   |
| F                           | Crepis acuminata              | a <sub>-</sub>   | b <sub>9</sub>   | ab <sub>3</sub>  | -               | .05  | .15   |
| F                           | Descurainia pinnata (a)       | -                | -                | -                | -               | .00  | -     |
| F                           | Epilobium brachycarpum (a)    | a <sub>1</sub>   | b <sub>23</sub>  | a <sub>-</sub>   | .00             | .03  | -     |
| F                           | Erigeron eatonii              | a <sub>-</sub>   | a <sub>-</sub>   | b <sub>18</sub>  | -               | .00  | .03   |
| F                           | Erigeron flagellaris          | 15               | 7                | 2                | .36             | .06  | .00   |
| F                           | Eriogonum racemosum           | 118              | 80               | 94               | 1.52            | 1.19 | 1.39  |
| F                           | Eriogonum umbellatum          | 6                | 17               | 15               | .18             | .23  | .42   |

| T<br>y<br>p<br>e          | Species                  | Nested Frequency |                 |                  | Average Cover % |      |      |
|---------------------------|--------------------------|------------------|-----------------|------------------|-----------------|------|------|
|                           |                          | '97              | '03             | '08              | '97             | '03  | '08  |
| F                         | Lappula occidentalis (a) | -                | 1               | -                | -               | .00  | -    |
| F                         | Lomatium sp.             | 5                | 8               | -                | .01             | .01  | -    |
| F                         | Lychnis drummondii       | 4                | 2               | 1                | .03             | .01  | .00  |
| F                         | Microsteris gracilis (a) | -                | 4               | -                | -               | .01  | -    |
| F                         | Orthocarpus luteus (a)   | -                | 3               | 2                | -               | .03  | .03  |
| F                         | Phlox longifolia         | <sub>a</sub> 33  | <sub>b</sub> 80 | <sub>c</sub> 140 | .10             | .17  | .59  |
| F                         | Polygonum douglasii (a)  | <sub>b</sub> 62  | <sub>a</sub> 4  | <sub>b</sub> 44  | .18             | .01  | .09  |
| F                         | Potentilla gracilis      | 1                | 2               | 2                | .03             | .03  | .03  |
| F                         | Senecio douglasii        | -                | -               | 4                | -               | -    | .30  |
| F                         | Senecio sp.              | -                | -               | -                | -               | .00  | -    |
| F                         | Stellaria jamesiana      | -                | 2               | -                | -               | .00  | -    |
| F                         | Taraxacum officinale     | 5                | -               | 12               | .06             | -    | .09  |
| F                         | Tragopogon dubius        | 6                | 9               | -                | .02             | .04  | -    |
| Total for Annual Forbs    |                          | 63               | 74              | 52               | 0.18            | 0.61 | 0.13 |
| Total for Perennial Forbs |                          | 297              | 344             | 400              | 3.97            | 3.35 | 4.41 |
| Total for Forbs           |                          | 360              | 418             | 452              | 4.16            | 3.96 | 4.55 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --  
 Management unit 27 , Study no: 12

| T<br>y<br>p<br>e | Species  | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '97             | '03 | '08 | '97             | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>                     | 0               | 2   | 2   | -               | .15   | .15   |
| B                | <i>Artemisia nova</i>                            | 14              | 20  | 23  | 2.55            | 2.40  | 4.71  |
| B                | <i>Artemisia tridentata vaseyana</i>             | 15              | 25  | 24  | 2.17            | 2.33  | 3.38  |
| B                | <i>Chrysothamnus depressus</i>                   | 12              | 8   | 19  | .73             | 1.28  | .96   |
| B                | <i>Chrysothamnus nauseosus hololeucus</i>        | 10              | 3   | 4   | .51             | .18   | .03   |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 53              | 47  | 43  | 5.56            | 4.54  | 3.10  |
| B                | <i>Gutierrezia sarothrae</i>                     | 0               | 10  | 22  | -               | .10   | 1.04  |
| B                | <i>Mahonia repens</i>                            | 4               | 3   | 2   | .00             | .00   | .00   |
| B                | <i>Purshia tridentata</i>                        | 58              | 60  | 64  | 17.35           | 15.26 | 15.72 |
| B                | <i>Quercus gambelii</i>                          | 4               | 4   | 4   | 1.16            | 1.16  | .71   |
| B                | <i>Ribes sp.</i>                                 | 2               | 2   | 1   | .15             | .15   | .00   |
| B                | <i>Rosa woodsii</i>                              | 0               | 2   | 2   | .15             | .03   | .03   |
| B                | <i>Symphoricarpos oreophilus</i>                 | 30              | 32  | 32  | 10.24           | 7.28  | 9.31  |
| B                | <i>Tetradymia canescens</i>                      | 2               | 4   | 4   | .00             | .03   | .15   |
| Total for Browse |  | 204             | 222 | 246 | 40.59           | 34.93 | 39.32 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 27 , Study no: 12

| Species  | Percent Cover |       |       |
|--|---------------|-------|-------|
|  | '97           | '03   | '08   |
| <i>Amelanchier utahensis</i>                     | -             | .06   | .63   |
| <i>Artemisia nova</i>                            | -             | 5.25  | 7.33  |
| <i>Artemisia tridentata vaseyana</i>             | -             | 2.90  | 5.18  |
| <i>Chrysothamnus depressus</i>                   | -             | .56   | .40   |
| <i>Chrysothamnus nauseosus hololeucus</i>        | -             | .18   | -     |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> | -             | 7.71  | 6.11  |
| <i>Gutierrezia sarothrae</i>                     | -             | .21   | 1.58  |
| <i>Mahonia repens</i>                            | -             | -     | .03   |
| <i>Purshia tridentata</i>                        | -             | 17.45 | 18.76 |
| <i>Quercus gambelii</i>                          | 2.20          | 2.79  | 2.51  |
| <i>Ribes</i> sp.                                 | -             | .66   | -     |
| <i>Symphoricarpos oreophilus</i>                 | -             | 8.19  | 9.14  |
| <i>Tetradymia canescens</i>                      | -             | .16   | .05   |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 27 , Study no: 12

| Species                              | Average leader growth (in) |     |
|--------------------------------------|----------------------------|-----|
|                                      | '03                        | '08 |
| <i>Artemisia tridentata vaseyana</i> | 1.3                        | 2.8 |
| <i>Purshia tridentata</i>            | 2.8                        | 2.0 |

BASIC COVER --  
 Management unit 27 , Study no: 12

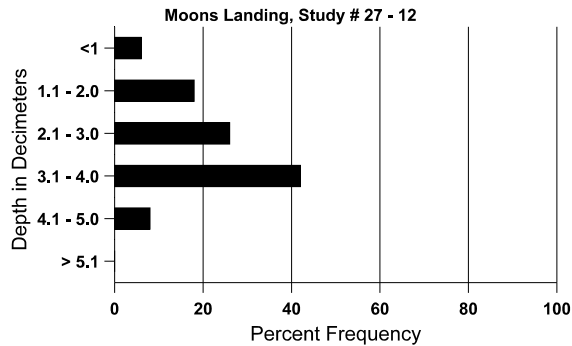
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '97             | '03   | '08   |
| Vegetation  | 62.22           | 49.17 | 54.87 |
| Rock        | 1.33            | 2.29  | 2.25  |
| Pavement    | 1.18            | .93   | 2.17  |
| Litter      | 55.81           | 42.33 | 42.34 |
| Cryptogams  | .49             | .03   | .36   |
| Bare Ground | 7.05            | 21.55 | 17.62 |

SOIL ANALYSIS DATA --

Management unit 27, Study no: 12, Study Name: Moons Landing

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 15.4                         | 64.0 (9.5)      | 5.9 | 64.0       | 16.1  | 19.9  | 2.7 | 19.1  | 134.4 | 0.4  |

Stoniness Index



PELLET GROUP DATA --

Management unit 27, Study no: 12

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '97               | '03 | '08 |
| Rabbit | 3                 | 11  | 24  |
| Elk    | 8                 | -   | 13  |
| Deer   | 45                | 34  | 55  |
| Cattle | 14                | 4   | 10  |

| Days use per acre (ha) |           |
|------------------------|-----------|
| '03                    | '08       |
| -                      | -         |
| -                      | 10 (25)   |
| 96 (238)               | 127 (312) |
| 15 (36)                | 31 (77)   |

BROWSE CHARACTERISTICS --

Management unit 27, Study no: 12

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 93/78                     |
| 03                           | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 50      | -          | -       | 0            | 4/17                      |
| 08                           | <b>80</b>                             | -  | -     | 80     | -        | -    | 25          | 75      | -          | -       | 0            | 57/47                     |
| <b>Artemisia nova</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                           | <b>980</b>                            | 420                                      | 460   | 440    | 80       | 80   | 14          | 4       | 8          | 4       | 6            | 18/36                     |
| 03                           | <b>1540</b>                           | -  | 500   | 960    | 80       | 20   | 1           | 1       | 5          | -       | 0            | 22/26                     |
| 08                           | <b>1660</b>                           | 780                                      | 320   | 1000   | 340      | 40   | 18          | 0       | 20         | 2       | 7            | 20/30                     |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>560</b>                            | 100                                      | 280   | 240    | 40       | 60   | 14          | 0       | 7          | 4       | 4            | 26/38                     |
| 03   | <b>880</b>                            | 40                                       | 380   | 400    | 100      | 40   | 14          | 5       | 11         | 2       | 5            | 25/29                     |
| 08   | <b>900</b>                            | 220                                      | 400   | 400    | 100      | 20   | 13          | 7       | 11         | -       | 0            | 24/36                     |
| <i>Chrysothamnus depressus</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>760</b>                            | -  | 180   | 580    | -        | -    | 0           | 0       | 0          | -       | 0            | 4/8                       |
| 03   | <b>380</b>                            | -  | -     | 380    | -        | -    | 47          | 53      | 0          | -       | 0            | 6/10                      |
| 08   | <b>1720</b>                           | -  | 80    | 1220   | 420      | -    | 14          | 38      | 24         | 2       | 2            | 3/10                      |
| <i>Chrysothamnus nauseosus hololeucus</i>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>360</b>                            | -  | 20    | 340    | -        | -    | 0           | 0       | 0          | -       | 0            | 12/16                     |
| 03   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 12/17                     |
| 08   | <b>380</b>                            | -  | 20    | 340    | 20       | -    | 0           | 0       | 5          | -       | 0            | 13/12                     |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>2080</b>                           | -  | 260   | 1820   | -        | 40   | 0           | 0       | 0          | -       | 0            | 19/27                     |
| 03   | <b>2220</b>                           | -  | 80    | 2120   | 20       | 20   | 0           | 0       | 1          | -       | 0            | 19/26                     |
| 08   | <b>1840</b>                           | -  | -     | 1800   | 40       | -    | 7           | 0       | 2          | -       | 2            | 16/23                     |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | <b>460</b>                            | -  | -     | 460    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/7                       |
| 08   | <b>2140</b>                           | -  | 20    | 1960   | 160      | 20   | 0           | 0       | 7          | 3       | 3            | 7/9                       |
| <i>Mahonia repens</i>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>200</b>                            | -  | -     | 200    | -        | -    | 0           | 0       | -          | -       | 0            | 3/6                       |
| 03   | <b>140</b>                            | -  | -     | 140    | -        | -    | 0           | 0       | -          | -       | 0            | 3/6                       |
| 08   | <b>340</b>                            | -  | -     | 340    | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| <i>Purshia tridentata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>1860</b>                           | 20                                       | 260   | 1480   | 120      | 100  | 25          | 70      | 6          | 1       | 1            | 23/70                     |
| 03   | <b>2160</b>                           | -  | 80    | 1840   | 240      | 40   | 16          | 78      | 11         | 2       | 2            | 20/46                     |
| 08   | <b>2400</b>                           | 160                                      | 80    | 1760   | 560      | 60   | 13          | 77      | 23         | 5       | 6            | 17/45                     |
| <i>Quercus gambelii</i>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>500</b>                            | 80                                       | 360   | 120    | 20       | -    | 32          | 0       | 4          | 4       | 4            | 98/32                     |
| 03   | <b>480</b>                            | -  | 100   | 380    | -        | -    | 8           | 54      | 0          | -       | 0            | 70/29                     |
| 08   | <b>1440</b>                           | 200                                      | 480   | 920    | 40       | 280  | 0           | 0       | 3          | -       | 0            | 42/38                     |
| <i>Ribes sp.</i>                                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>40</b>                             | -  | -     | 40     | -        | -    | 50          | 0       | 0          | -       | 0            | 46/61                     |
| 03   | <b>40</b>                             | -  | -     | 20     | 20       | -    | 50          | 50      | 50         | -       | 0            | 53/52                     |
| 08   | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | 48/54                     |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b>Rosa woodsii</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 97                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                               | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 16/9                      |  |
| 08                               | <b>140</b>                            | -  | -     | 140    | -        | -    | 0           | 0       | -          | -       | 0            | 9/7                       |  |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 97                               | <b>880</b>                            | -  | 60    | 820    | -        | -    | 59          | 9       | 0          | -       | 0            | 25/57                     |  |
| 03                               | <b>1280</b>                           | -  | 80    | 1140   | 60       | -    | 11          | 9       | 5          | 2       | 2            | 20/40                     |  |
| 08                               | <b>1420</b>                           | -  | 200   | 1140   | 80       | 20   | 3           | 7       | 6          | -       | 0            | 17/39                     |  |
| <b>Tetradymia canescens</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 97                               | <b>80</b>                             | 20                                       | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 10/13                     |  |
| 03                               | <b>160</b>                            | -  | 60    | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 15/16                     |  |
| 08                               | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 13/8                      |  |



Trend Study 27-13-08

Study site name: Heaton .

Vegetation type: Black Sagebrush .

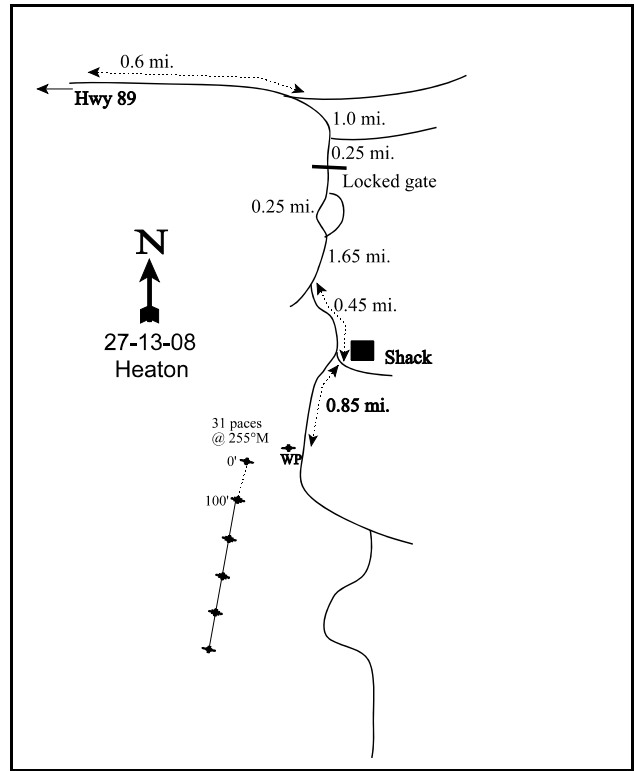
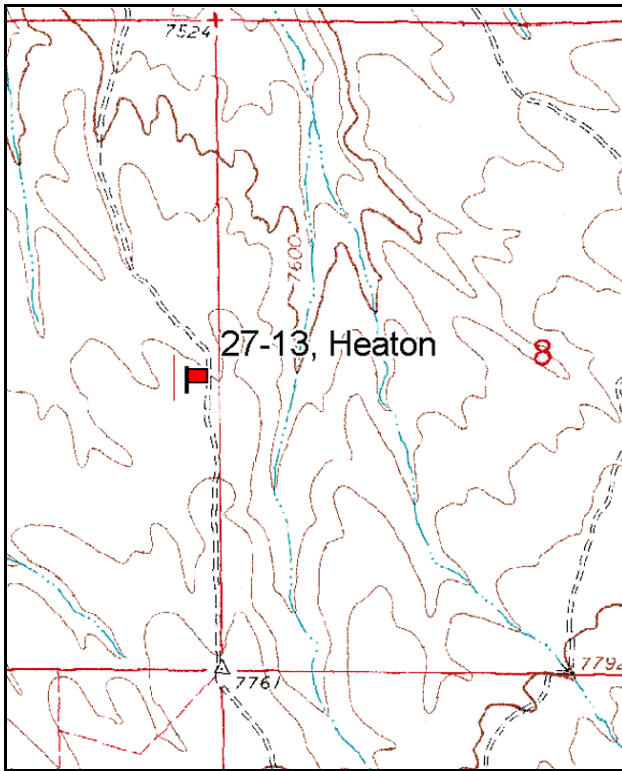
Compass bearing: frequency baseline 195 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From U. S. 89 go approximately 0.4 miles south of mile marker 111 to a road on the left. Go 0.6 miles to a fork. Stay on Bryce Woodland Road (right) and go 1 mile to a fork. Continue straight and go 0.25 to a locked gate (get combination). Go through the gate and go 1.65 miles, staying on the main road, to a fork. Go left 0.45 miles to another fork with a shack on the left. Go right for 0.85 miles to a witness post on the right (west). From the witness post walk 31 paces at 255 degrees magnetic to the 0-foot stake. The 0-foot stake is marked by browse tag #289. The study is marked by green, steel fenceposts approximately 12-18 inches in height.

\*Land owners- Raymond Heaton: (435) 648-2124, (435) 691-2829 (cell)  
Wade Heaton: (435) 648-2028, (435) 691-1997 (cell)



Map name: George Mountain

Diagrammatic Sketch

Township 38S, Range 5W, Section 7

GPS: NAD 83, UTM 12S 371748 E, 4153528 N

## DISCUSSION

### Heaton - Trend Study No. 27-13

#### Study Information

This study was established in 1997 in conjunction with the Moons Landing study to monitor transitional range on the west side of the Paunsaugunt Plateau [elevation: 7,700 feet (2,347 m), slope: 3%, aspect: north]. The study site is found east of U.S. 89 about two miles north of the Moons Landing study site and samples a black sagebrush (*Artemisia tridentata*) and antelope bitterbrush (*Purshia tridentata*) community. The study area is on private land owned by the Heaton family and is part of the Heaton private hunting unit. Pellet group data estimated deer use to be very heavy in 1997 and 2008 (113 ddu/acre:279 ddu/ha and 83 ddu/acre:205 ddu/ha, respectively), and substantially lower, but still heavy, use in 2003 (45 ddu/acre:111 ddu/ha). Elk use was estimated to be light in 1997, 2003, and 2008 (5 edu/acre:12 edu/ha, 2 edu/acre:5 edu/ha, and 7 edu/acre:17 edu/ha, respectively). Cattle grazing on the site was very heavy in 1997 and 2008 (79 cdu/acre:195 cdu/ha and 92 cdu/acre:227 cdu/ha, respectively), and moderate in 2003 (25 cdu/acre:61 cdu/ha). This site was aerated between the initial reading in 1997 and the 2003 survey, with the last four belts on the transect being effected.

#### Soil

Soil texture is a sandy loam with a slightly acidic pH (6.1). There is little rock on the surface or in the profile. Erosion is not a problem locally due to the gentle terrain and adequate vegetation and litter cover. Relative combined vegetation and litter cover was high in 1997 at 81%, but decreased to 69% and 73% in 2003 and 2008, respectively. Relative bare ground cover increased from 16% in 1997 to 26% in both 2003 and 2008. The aerator treatment, coupled with drought, likely accounts for an increase in bare ground and decrease in litter and vegetation cover after 1997. The erosion condition class was considered to be stable in 2003 and 2008.

#### Browse

Sagebrush on the site is a hybrid between black sagebrush and mountain big sagebrush as determined by a florescence test under a black light. Sagebrush provided 69% of the total browse cover in 1997 and 2008, and 75% in 2003 respectively. Total browse cover, including sagebrush cover, declined from 1997 to 2008 primarily due to the aerator treatment. However, the most abundant browse species either increased or remained stable in overall density. Sagebrush density was estimated at 8,800 plants/acre in 1997, increased to 11,140 plants/acre in 2003, and decreased to 8520 plants/acre in 2008. Decadence in sagebrush has remained normal in all three sample years, though it increased to a high of 23% in 2008. Sagebrush vigor has also been relatively good, although poor vigor increased in 2003 to 29% as some of the plants that had been aerated were in poor condition. Use was light on sagebrush in all three years.

The other primary browse species, antelope bitterbrush, has a stable population at nearly 1,300 plants/acre. Use on bitterbrush was moderate to heavy in all three sample years, but decadence was low. Poor vigor increased to 53% in 2003 with the aerator treatment effecting a lot of the bitterbrush on the site, but decreased to 6% in 2008. Although total browse cover declined from 35% in 1997, to 21% in 2003, and further to 16% in 2008, shrub density remained stable or slightly increased.

#### Herbaceous Understory

The herbaceous understory accounted for 28% of the total vegetation cover on the site in 1997, 33% in 2003, and 47% in 2008. Nine species of perennial grasses have been sampled between the three surveys, with mutton bluegrass (*Poa fendleriana*), prairie Junegrass (*Koeleria cristata*), needle-and-thread (*Stipa comata*), and blue grama (*Bouteloua gracilis*) being the most common. As a group, perennial grasses showed a large decline in sum of nested frequency between 1997 and 2003, but increased again in 2008. Forbs are diverse on the site but not abundant. Twenty-nine species were sampled on the site between 1997 and 2008. Perennial forbs also declined in sum of nested frequency between 1997 and 2003, but increased above 1997 values in

2008.

1997 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good-excellent (82) Mid-level potential scale

2003 TREND ASSESSMENT

Trend for browse is stable. Black sagebrush increased in density even with the aerator treatment that was done on the site. Bitterbrush density remained stable. Decadence is low for both species, although vigor was reduced in both populations with the treatment. Black sagebrush is still very abundant, and this site will recover quickly. Trend for both the grasses and forbs is down. Perennial grasses and forbs both showed declined sum of nested frequency values. A combination of the mechanical treatment and drought likely account for this loss.

winter range condition (DCI) - good (68) Mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable. Black sagebrush density decreased to around 1997 estimates. It appears the sagebrush population may be in a period of turnover as young plants comprised nearly half of the population and a large number of dead plants were sampled. Decadence in sagebrush increased from 9% in 2003 to 23%, and plants displaying poor vigor decreased from 29% in 2003 to 14%. Bitterbrush density did not change, and decadence in bitterbrush remained about the same. Vigor improved in bitterbrush with a decrease in the number of plants displaying poor vigor from 53% in 2003 to 6%. The trend for both grasses and forbs is up. The sum of nested frequency of perennial grasses increased, with significant increases in the nested frequency of four of the eight grass species sampled. There has been a change in species composition with prairie junegrass decreasing in frequency and cover since 1997, and a significant increase in the frequency and cover of blue grama since 2003. Sum of nested frequency and cover of perennial forbs increased to higher than pretreatment values recorded in 1997.

winter range condition (DCI) - good (71) Mid-level potential scale

browse - stable (0)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 27 , Study no: 13

| T<br>y<br>p<br>e | Species             | Nested Frequency |      |      | Average Cover % |      |      |
|------------------|---------------------|------------------|------|------|-----------------|------|------|
|                  |                     | '97              | '03  | '08  | '97             | '03  | '08  |
| G                | Agropyron cristatum | a4               | ab6  | b13  | .53             | .30  | .18  |
| G                | Agropyron smithii   | 23               | 26   | 31   | .07             | .45  | .38  |
| G                | Bouteloua gracilis  | a35              | a15  | b83  | .28             | .11  | 2.54 |
| G                | Koeleria cristata   | b155             | a92  | a80  | 2.65            | 1.73 | 1.00 |
| G                | Poa fendleriana     | b273             | a194 | a140 | 6.67            | 4.59 | 2.82 |
| G                | Poa secunda         | a6               | a4   | b22  | .15             | .00  | .17  |
| G                | Sitanion hystrix    | a-               | a2   | b8   | -               | .06  | .11  |
| G                | Stipa comata        | a90              | a103 | b158 | 1.12            | 1.64 | 3.94 |
| G                | Stipa lettermani    | b29              | a-   | a-   | .59             | -    | -    |

| Type                        | Species                             | Nested Frequency         |      |       | Average Cover % |       |     |
|-----------------------------|-------------------------------------|--------------------------|------|-------|-----------------|-------|-----|
|                             |                                     | '97                      | '03  | '08   | '97             | '03   | '08 |
|                             |                                     | Total for Annual Grasses | 0    | 0     | 0               | 0     | 0   |
| Total for Perennial Grasses | 615                                 | 442                      | 535  | 12.09 | 8.90            | 11.18 |     |
| Total for Grasses           | 615                                 | 442                      | 535  | 12.09 | 8.90            | 11.18 |     |
| F                           | <i>Agoseris glauca</i>              | a-                       | b13  | a-    | -               | .03   | -   |
| F                           | <i>Alyssum alyssoides</i> (a)       | -                        | 9    | -     | -               | .01   | -   |
| F                           | <i>Allium</i> sp.                   | 1                        | -    | -     | .00             | -     | -   |
| F                           | <i>Antennaria rosea</i>             | a13                      | a1   | b22   | .21             | .00   | .09 |
| F                           | <i>Arabis</i> sp.                   | 2                        | -    | -     | .00             | -     | -   |
| F                           | <i>Astragalus</i> sp.               | b41                      | a-   | b21   | .37             | -     | .53 |
| F                           | <i>Calochortus nuttallii</i>        | 1                        | -    | -     | .00             | -     | -   |
| F                           | <i>Castilleja</i> sp.               | 2                        | 1    | -     | .00             | .00   | -   |
| F                           | <i>Chenopodium leptophyllum</i> (a) | -                        | -    | 11    | -               | -     | .02 |
| F                           | <i>Cirsium</i> sp.                  | 5                        | -    | 3     | .00             | -     | .03 |
| F                           | <i>Collinsia parviflora</i> (a)     | a12                      | b123 | a35   | .05             | .52   | .11 |
| F                           | <i>Crepis acuminata</i>             | -                        | 2    | -     | -               | .00   | -   |
| F                           | <i>Eriogonum racemosum</i>          | ab31                     | a20  | b41   | .37             | .29   | .53 |
| F                           | <i>Eriogonum umbellatum</i>         | 7                        | 13   | -     | .03             | .08   | -   |
| F                           | <i>Gayophytum ramosissimum</i> (a)  | a-                       | a5   | b68   | -               | .04   | .57 |
| F                           | <i>Gilia</i> sp. (a)                | 8                        | -    | -     | .04             | -     | -   |
| F                           | <i>Lomatium</i> sp.                 | 3                        | -    | 2     | .03             | -     | .00 |
| F                           | <i>Lotus utahensis</i>              | b45                      | a6   | a15   | .22             | .01   | .09 |
| F                           | <i>Lychnis drummondii</i>           | -                        | 2    | -     | -               | .00   | -   |
| F                           | <i>Microsteris gracilis</i> (a)     | a-                       | b14  | a4    | -               | .09   | .01 |
| F                           | <i>Oenothera</i> sp.                | 1                        | -    | -     | .00             | -     | -   |
| F                           | <i>Orthocarpus luteus</i> (a)       | 3                        | 7    | 1     | .01             | .06   | .00 |
| F                           | <i>Penstemon comarrhenus</i>        | a-                       | a-   | b24   | -               | -     | .14 |
| F                           | <i>Penstemon</i> sp.                | b22                      | a2   | a-    | .09             | .01   | -   |
| F                           | <i>Penstemon pachyphyllus</i>       | -                        | -    | 2     | -               | -     | .00 |
| F                           | <i>Phlox longifolia</i>             | a43                      | a51  | b130  | .14             | .09   | .66 |
| F                           | <i>Polygonum douglasii</i> (a)      | b44                      | a9   | b48   | .08             | .01   | .13 |
| F                           | <i>Potentilla gracilis</i>          | -                        | -    | 2     | -               | -     | .03 |
| F                           | <i>Stellaria jamesiana</i>          | -                        | -    | 3     | -               | -     | .00 |
| Total for Annual Forbs      | 67                                  | 167                      | 167  | 0.19  | 0.75            | 0.85  |     |
| Total for Perennial Forbs   | 217                                 | 111                      | 265  | 1.51  | 0.54            | 2.15  |     |
| Total for Forbs             | 284                                 | 278                      | 432  | 1.70  | 1.29            | 3.01  |     |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 27 , Study no: 13

| Type             | Species                                   | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|---|-----------------|-----|-----|-----------------|-------|-------|
|                  |   | '97             | '03 | '08 | '97             | '03   | '08   |
| B                | Amelanchier utahensis                     | 1               | 2   | 1   | .03             | .00   | .00   |
| B                | Artemisia nova                            | 96              | 98  | 88  | 24.60           | 15.75 | 11.00 |
| B                | Chrysothamnus depressus                   | 8               | 1   | 1   | .24             | .03   | .00   |
| B                | Chrysothamnus nauseosus hololeucus        | 1               | 0   | 0   | .00             | -     | -     |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 22              | 29  | 37  | .55             | .66   | 1.08  |
| B                | Gutierrezia sarothrae                     | 1               | 12  | 2   | .00             | .39   | .03   |
| B                | Opuntia sp.                               | 6               | 3   | 6   | .18             | .00   | .03   |
| B                | Purshia tridentata                        | 43              | 44  | 44  | 10.25           | 4.25  | 3.89  |
| B                | Rosa woodsii                              | 1               | 0   | 0   | .00             | -     | -     |
| B                | Symphoricarpos oreophilus                 | 0               | 1   | 0   | -               | .00   | -     |
| B                | Tetradymia canescens                      | 1               | 2   | 1   | .00             | .06   | .00   |
| Total for Browse |   | 180             | 192 | 180 | 35.86           | 21.14 | 16.04 |

CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 13

| Species                                   | Percent Cover |       |
|---|---------------|-------|
|   | '03           | '08   |
| Artemisia nova                            | 17.88         | 10.56 |
| Chrysothamnus depressus                   | .23           | -     |
| Chrysothamnus viscidiflorus viscidiflorus | .85           | 1.85  |
| Gutierrezia sarothrae                     | -             | .36   |
| Opuntia sp.                               | -             | .03   |
| Purshia tridentata                        | 3.76          | 6.15  |
| Tetradymia canescens                      | .11           | -     |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27 , Study no: 13

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia nova     | 1.1                        | 1.1 |
| Purshia tridentata | 2.7                        | 0.8 |

**BASIC COVER --**

Management unit 27 , Study no: 13

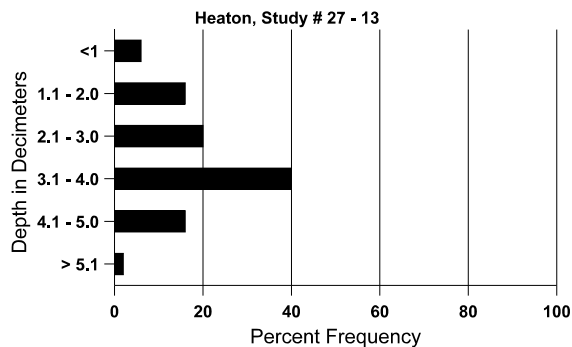
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '97             | '03   | '08   |
| Vegetation  | 49.70           | 32.78 | 28.83 |
| Rock        | .14             | .22   | .30   |
| Pavement    | 3.04            | 3.96  | 1.67  |
| Litter      | 53.33           | 42.73 | 51.95 |
| Cryptogams  | .06             | .03   | .15   |
| Bare Ground | 20.90           | 28.71 | 28.53 |

**SOIL ANALYSIS DATA --**

Management unit 27, Study no: 13, Study Name: Heaton

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 16.5                         | 65.3 (10.6)     | 6.1 | 65.0       | 19.2  | 15.8  | 2.1 | 13.4  | 131.2 | 0.4  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 27 , Study no: 13

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '97               | '03 | '08 |
| Rabbit | 3                 | 2   | 39  |
| Elk    | 8                 | 2   | 5   |
| Deer   | 51                | 19  | 42  |
| Cattle | 13                | 5   | 16  |

| Days use per acre (ha) |          |
|------------------------|----------|
| '03                    | '08      |
| -                      | -        |
| 2 (5)                  | 7 (17)   |
| 45 (111)               | 83 (205) |
| 25 (61)                | 92 (227) |

BROWSE CHARACTERISTICS --  
Management unit 27 , Study no: 13

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>20</b>                             | 20                                       | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | -/-                       |
| 03   | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 50      | -          | -       | 50           | 26/33                     |
| 08   | <b>20</b>                             | 40                                       | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 12/19                     |
| <b>Artemisia nova</b>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>8800</b>                           | 2180                                     | 2820  | 4940   | 1040     | 700  | 10          | 2       | 12         | 6       | 7            | 15/28                     |
| 03   | <b>11140</b>                          | 20                                       | 2820  | 7360   | 960      | 300  | 4           | 2       | 9          | 3       | 29           | 15/21                     |
| 08   | <b>8520</b>                           | 2900                                     | 4040  | 2560   | 1920     | 5340 | 9           | 3       | 23         | 11      | 14           | 11/16                     |
| <b>Chrysothamnus depressus</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>240</b>                            | -  | 20    | 220    | -        | -    | 0           | 0       | -          | -       | 0            | 6/10                      |
| 03   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 100     | -          | -       | 0            | 6/8                       |
| 08   | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 100     | -          | -       | 0            | 3/4                       |
| <b>Chrysothamnus nauseosus hololeucus</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 24/30                     |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/6                       |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>1060</b>                           | -  | 120   | 940    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/11                      |
| 03   | <b>1440</b>                           | -  | 80    | 1320   | 40       | -    | 0           | 0       | 3          | 3       | 14           | 7/12                      |
| 08   | <b>2480</b>                           | -  | 80    | 2020   | 380      | 120  | 8           | 0       | 15         | 4       | 11           | 8/16                      |
| <b>Gutierrezia sarothrae</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | <b>360</b>                            | -  | -     | 360    | -        | -    | 0           | 0       | 0          | -       | 6            | 5/10                      |
| 08   | <b>60</b>                             | -  | -     | -      | 60       | -    | 0           | 0       | 100        | -       | 100          | 5/11                      |
| <b>Opuntia sp.</b>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>160</b>                            | -  | 40    | 100    | 20       | -    | 0           | 0       | 13         | 13      | 13           | 4/13                      |
| 03   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 3/8                       |
| 08   | <b>140</b>                            | 20                                       | -     | 140    | -        | -    | 0           | 0       | 0          | -       | 0            | 4/13                      |
| <b>Purshia tridentata</b>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97   | <b>1220</b>                           | 180                                      | 140   | 1000   | 80       | -    | 61          | 21      | 7          | 3       | 3            | 22/51                     |
| 03   | <b>1280</b>                           | -  | 60    | 1080   | 140      | -    | 36          | 61      | 11         | 2       | 53           | 16/32                     |
| 08   | <b>1280</b>                           | 60                                       | 40    | 1080   | 160      | 60   | 23          | 63      | 13         | 6       | 6            | 18/37                     |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Rosa woodsii</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                               | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | -/-                       |
| 03                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 8/6                       |
| 08                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 7/5                       |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | 12/17                     |
| 08                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Tetradymia canescens</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 97                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                               | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/10                      |
| 08                               | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 100          | 8/11                      |



Trend Study 27R-4-08

Study site name: Nephi Pasture Total Enclosure .

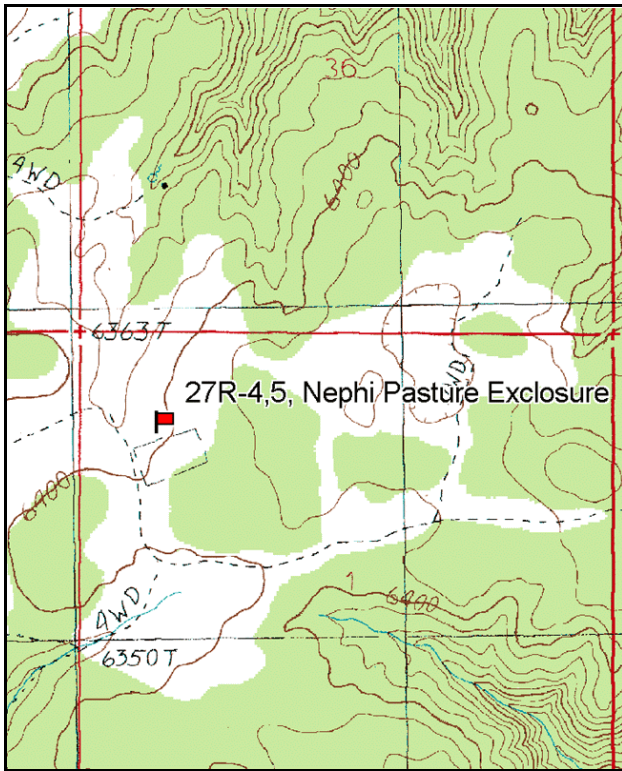
Vegetation type: P-J/ Big Sagebrush .

Compass bearing: frequency baseline 142 degrees magnetic.

Frequency belt placement: line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34 ft & 71 ft). No rebar.

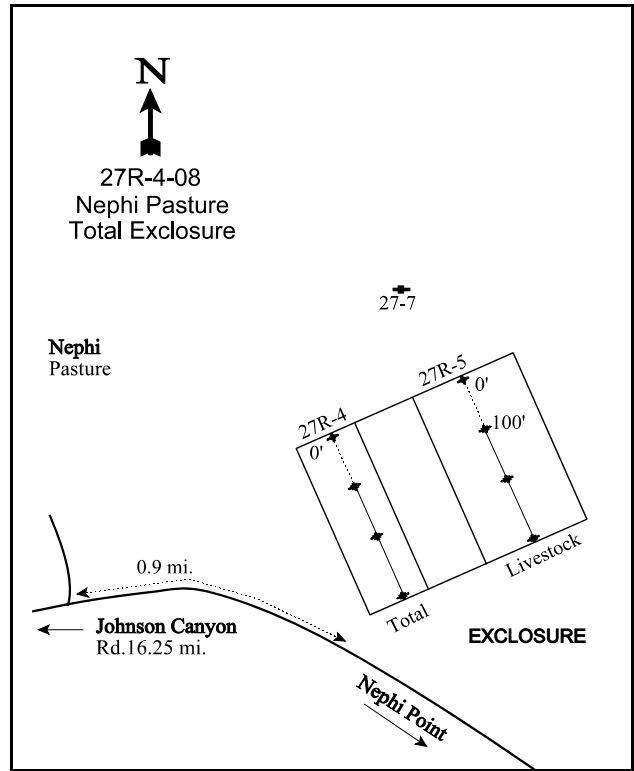
LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right and go 16.25 miles (see 27-6-03 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an enclosure. From the northwest corner of the enclosure, count up five posts to the 0 foot baseline on the inside of the enclosure. The baseline runs at 142 degrees magnetic.



Map Name: Nephi Point

Township 42S , Range 4W , Section 1



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 394135 E, 4116780 N

## DISCUSSION

### Nephi Pasture Total Exclosure - Trend Study No. 27R-4

#### Study Information

The Nephi Pasture exclosure complex was built in the 1960's and is found approximately 20 miles northeast of Kanab [elevation: 6,400 feet (1,950 m), slope: 11%-13%, aspect: northwest]. This transect was established inside the total exclosure in 1998 as part of a three-way comparison between the different exclosure grazing treatments; no grazing in the total exclosure, wildlife use in the livestock exclosure, and open to all grazing animals outside the exclosure. The area supports a mixed shrub community with a scattered overstory of pinyon pine (*Pinus edulis*) and Utah juniper trees (*Juniperus osteosperma*). Deer generally utilize the area at high levels during the winter. The total exclosure is supposed to exclude all animals, but due to a hole in the fence, some deer had gotten into the exclosure prior to both the 1998 and 2003 surveys, and had moderately hedged many of the preferred shrubs.

#### Soil

Soils inside the exclosure are very deep, sandy loam in texture, and moderately acidic (pH 5.9). Effective rooting depth was estimated at almost 23 inches in 1998. Phosphorus is low on the site at 8.2 ppm and may have marginal availability for plant growth. Potassium may be limiting to plant growth at 25.6 ppm (Tiedemann and Lopez 2004). There is virtually no rock or pavement on the surface or within the soil profile. Relative combined vegetation and litter cover was high with a range of 68%-71% from 1998 to 2008. Relative bare ground cover was 20% in 1998, increasing to 30% in 2003, and decreasing to 25% in 2008. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

The total exclosure supports a moderately dense stand of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) with a population that numbered 2,820 plants/acre in 1998, declining to 1,780 plants/acre in 2003, and 1,500 plants/acre in 2008. An increase in the number of dead individuals as well as a decline in young recruitment resulted in a population decrease in 2003 and 2008. Decadence in sagebrush has been high with an average of 62% over the three sample years. Plants displaying poor vigor was high in 1998 at 46%, declining to 18% in 2003, and increasing again to 31% in 2008. Antelope bitterbrush (*Purshia tridentata*) density has averaged around 850 plants/acre over the three sample years. Young bitterbrush made up 20% of the population in 1998, but none were sampled in 2003 or 2008. Bitterbrush decadence has increased steadily over the study going from 2% in 1998, increasing to 30% in 2003, and 63% in 2008. Vigor was normal throughout the population in all three surveys. A few large serviceberry (*Amelanchier utahensis*) are present inside the total exclosure, but in far lower numbers compared to the livestock exclosure and outside.

#### Herbaceous Understory

The herbaceous understory was moderately productive in 1998 providing 17% cover. Diversity is only fair however, and cheatgrass (*Bromus tectorum*) accounted for over half of the total. With drought in 2003, the grass component virtually disappeared and produced less than 1% cover. Cheatgrass was not sampled in 2003, and the three most abundant perennial grasses, western wheatgrass (*Agropyron smithii*), Sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comata*), all had lower nested frequency values from 1998. Grasses decreased to almost nonexistent in 2008 producing less than 0.05% of the total cover. The forb component was dominated by bastard toadflax (*Comandra pallida*) in 1998, 2003, and 2008.

#### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - poor (46) Mid-level potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is down. Basin big sagebrush has a lower density, decreased reproduction, and a large

increase in the number of dead plants in the population. Although decadence improved, it still remains high at 54%. Bitterbrush also showed a population decline due to the increase in dead plants and less young in 2003. Bitterbrush decadence increased to 30% in 2003, but vigor remains mostly normal. Trend for the grasses is down. With drought conditions in 2003, grasses virtually disappeared. Cheatgrass was by far the most abundant herbaceous species in 1998, but was not sampled at all in 2003. Western wheatgrass, Sandberg bluegrass, and needle-and-thread all had lower nested frequency values in 2003. Trend for forbs is slightly down. Sum of nested frequency of perennial forbs decreased by 15% from 1999. Bastard toadflax was the only abundant forb in either 1998 or 2003 and it declined significantly. All of these downward trends are likely due to the dry precipitation cycle that southern Utah was in prior to, and including the 2003 survey.

winter range condition (DCI) - very poor-poor (35) Mid-level potential scale  
browse - down (-2)                      grass - down (-2)                      forb - slightly down (-1)

**2008 TREND ASSESSMENT**

Trend for browse is slightly down. The density of the primary browse species, basin big sagebrush, decreased slightly to 1,500 plants/acre. Sagebrush decadence increased from 54% in 2003 to 69%, and plants displaying poor vigor increased from 18% in 2003 to 31%. There was an increase in the number of dead sagebrush plants sampled, but recruitment of young plants has remained low. Bitterbrush density increased slightly to 860 plants/acre, but decadence also increased from 30% in 2003 to 63%. Serviceberry density has steadily declined from 1998 to a current density of 40 plants/acre. Serviceberry decadence has also increased steadily to 50%. Trend for grasses is down. With the continued drought, grasses were almost nonexistent on the site and the dominant species were cheatgrass and sixweeks fescue (*Vulpia octoflora*), both annuals and both rare on the site. Trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased and the frequency of the dominant forb species, bastard toadflax, increased significantly.

winter range condition (DCI) - very poor (33) Mid-level potential scale  
browse - slightly down (-1)                      grass - down (-2)                      forb - slightly up (+1)

**HERBACEOUS TRENDS --**  
Management unit 27R, Study no: 4

| Type                               | Species                | Nested Frequency |                 |                 | Average Cover % |             |             |
|------------------------------------|------------------------|------------------|-----------------|-----------------|-----------------|-------------|-------------|
|                                    |                        | '98              | '03             | '08             | '98             | '03         | '08         |
| G                                  | Agropyron smithii      | <sub>b</sub> 56  | <sub>b</sub> 29 | <sub>a</sub> -  | .76             | .26         | -           |
| G                                  | Agropyron spicatum     | 2                | -               | -               | .03             | -           | -           |
| G                                  | Bromus tectorum (a)    | <sub>b</sub> 321 | <sub>a</sub> -  | <sub>a</sub> 7  | 7.44            | -           | .01         |
| G                                  | Oryzopsis hymenoides   | 3                | 6               | -               | .18             | .23         | -           |
| G                                  | Poa secunda            | <sub>b</sub> 37  | <sub>a</sub> 8  | <sub>a</sub> 1  | .43             | .05         | .00         |
| G                                  | Sitanion hystrix       | 8                | -               | 1               | .04             | -           | .00         |
| G                                  | Sporobolus cryptandrus | 3                | 5               | -               | .06             | .03         | -           |
| G                                  | Stipa comata           | <sub>b</sub> 60  | <sub>a</sub> 12 | <sub>a</sub> 2  | 1.92            | .27         | .00         |
| G                                  | Vulpia octoflora (a)   | <sub>b</sub> 144 | <sub>a</sub> -  | <sub>a</sub> 11 | 1.41            | -           | .02         |
| <b>Total for Annual Grasses</b>    |                        | <b>465</b>       | <b>0</b>        | <b>18</b>       | <b>8.85</b>     | <b>0</b>    | <b>0.03</b> |
| <b>Total for Perennial Grasses</b> |                        | <b>169</b>       | <b>60</b>       | <b>4</b>        | <b>3.44</b>     | <b>0.85</b> | <b>0.01</b> |
| <b>Total for Grasses</b>           |                        | <b>634</b>       | <b>60</b>       | <b>22</b>       | <b>12.29</b>    | <b>0.85</b> | <b>0.04</b> |

| T<br>y<br>p<br>e          | Species                  | Nested Frequency |                       |      | Average Cover % |      |      |
|---------------------------|--------------------------|------------------|-----------------------|------|-----------------|------|------|
|                           |                          | '98              | '03                   | '08  | '98             | '03  | '08  |
|                           |                          | F                | Calochortus nuttallii | a-   | b11             | a-   | -    |
| F                         | Comandra pallida         | b167             | a132                  | b179 | 3.32            | 2.77 | 4.65 |
| F                         | Collinsia parviflora (a) | -                | -                     | 3    | -               | -    | .00  |
| F                         | Descurainia pinnata (a)  | a11              | a-                    | b68  | .07             | -    | .72  |
| F                         | Eriogonum cernuum (a)    | a5               | a-                    | b35  | .03             | -    | .10  |
| F                         | Erigeron sp.             | 6                | -                     | -    | .06             | -    | -    |
| F                         | Eriogonum racemosum      | -                | 8                     | -    | -               | .04  | -    |
| F                         | Euphorbia sp.            | -                | -                     | 13   | -               | -    | .02  |
| F                         | Gilia sp. (a)            | -                | b42                   | a2   | -               | 1.23 | .00  |
| F                         | Lappula occidentalis (a) | -                | -                     | 6    | -               | -    | .02  |
| F                         | Lupinus sp.              | 5                | -                     | -    | .18             | .15  | -    |
| F                         | Microsteris gracilis (a) | 6                | 6                     | -    | .03             | .04  | -    |
| F                         | Penstemon sp.            | -                | -                     | 2    | -               | -    | .01  |
| F                         | Phlox austromontana      | 4                | 5                     | -    | .03             | .04  | -    |
| F                         | Plantago patagonica (a)  | b66              | a1                    | a16  | .76             | .00  | .04  |
| F                         | Polygonum douglasii (a)  | a3               | a-                    | b25  | .00             | -    | .06  |
| F                         | Sphaeralcea coccinea     | 1                | -                     | 1    | .00             | -    | .00  |
| Total for Annual Forbs    |                          | 91               | 49                    | 155  | 0.90            | 1.27 | 0.95 |
| Total for Perennial Forbs |                          | 183              | 156                   | 195  | 3.60            | 3.06 | 4.69 |
| Total for Forbs           |                          | 274              | 205                   | 350  | 4.51            | 4.34 | 5.65 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27R, Study no: 4

| T<br>y<br>p<br>e | Species                         | Strip Frequency |                       |     | Average Cover % |       |       |
|------------------|---------------------------------|-----------------|-----------------------|-----|-----------------|-------|-------|
|                  |                                 | '98             | '03                   | '08 | '98             | '03   | '08   |
|                  |                                 | B               | Amelanchier utahensis | 4   | 3               | 2     | 1.03  |
| B                | Artemisia tridentata tridentata | 73              | 54                    | 48  | 10.35           | 7.36  | 8.64  |
| B                | Gutierrezia sarothrae           | 35              | 2                     | 1   | 1.42            | .15   | .00   |
| B                | Juniperus osteosperma           | 2               | 3                     | 3   | .00             | .63   | 2.00  |
| B                | Opuntia sp.                     | 1               | 0                     | 0   | .03             | -     | -     |
| B                | Purshia tridentata              | 30              | 27                    | 27  | 7.90            | 6.50  | 7.02  |
| Total for Browse |                                 | 145             | 89                    | 81  | 20.73           | 18.40 | 20.80 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 27R, Study no: 4

| Species                         | Average Line Intercept |       |
|---------------------------------|------------------------|-------|
|                                 | '03                    | '08   |
| Amelanchier utahensis           | 5.36                   | 4.31  |
| Artemisia tridentata tridentata | 8.63                   | 11.94 |
| Gutierrezia sarothrae           | .06                    | -     |
| Juniperus osteosperma           | .98                    | 3.95  |
| Purshia tridentata              | 5.80                   | 8.35  |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 27R, Study no: 4

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Amelanchier utahensis           | 5.5                        | 3.3 |
| Artemisia tridentata tridentata | 2.0                        | 1.8 |
| Purshia tridentata              | 4.0                        | 3.9 |

BASIC COVER --  
 Management unit 27R, Study no: 4

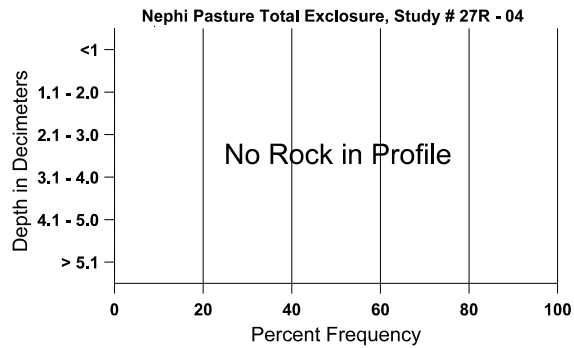
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 41.18           | 23.88 | 27.64 |
| Rock        | 0               | 0     | .04   |
| Pavement    | .01             | 0     | .12   |
| Litter      | 41.79           | 54.27 | 59.02 |
| Cryptogams  | 11.46           | 2.98  | 2.63  |
| Bare Ground | 23.23           | 34.92 | 29.29 |

SOIL ANALYSIS DATA --

Management unit 27R, Study no: 4, Study Name: Nephi Pasture Total Exclosure

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 22.7                         | 68.8 (17.7)     | 5.9 | 74.2       | 18.0  | 7.8   | 0.7 | 8.2   | 25.6  | 0.4  |

### Stoniness Index



PELLET GROUP DATA --

Management unit 27R, Study no: 4

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 14                | 31  | 88  |
| Elk    | 1                 | -   | -   |
| Deer   | 22                | 14  | 10  |

BROWSE CHARACTERISTICS --  
Management unit 27R, Study no: 4

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>80</b>                             | -  | 20    | 40     | 20       | -    | 0           | 0       | 25         | -       | 0            | 88/103                    |
| 03                                     | <b>60</b>                             | -  | -     | 40     | 20       | 20   | 33          | 0       | 33         | -       | 0            | 84/90                     |
| 08                                     | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 0            | 83/87                     |
| <b>Artemisia tridentata tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>2820</b>                           | -  | 340   | 680    | 1800     | 2020 | 32          | 0       | 64         | 46      | 46           | 32/37                     |
| 03                                     | <b>1780</b>                           | -  | -     | 820    | 960      | 3680 | 2           | 0       | 54         | 18      | 18           | 35/37                     |
| 08                                     | <b>1500</b>                           | 360                                      | 80    | 380    | 1040     | 4660 | 8           | 1       | 69         | 23      | 31           | 40/43                     |
| <b>Cercocarpus montanus</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 39/49                     |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 52/41                     |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Gutierrezia sarothrae</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>1580</b>                           | -  | 80    | 1460   | 40       | 20   | 0           | 0       | 3          | 3       | 3            | 10/11                     |
| 03                                     | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 11/12                     |
| 08                                     | <b>20</b>                             | -  | 20    | -      | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Juniperus osteosperma</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>60</b>                             | -  | 20    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>60</b>                             | -  | 20    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>920</b>                            | -  | 180   | 720    | 20       | 60   | 28          | 0       | 2          | 2       | 2            | 35/51                     |
| 03                                     | <b>740</b>                            | -  | -     | 520    | 220      | 320  | 14          | 5       | 30         | 3       | 3            | 33/53                     |
| 08                                     | <b>860</b>                            | -  | -     | 320    | 540      | 160  | 21          | 0       | 63         | 7       | 14           | 32/50                     |

Trend Study 27R-5-08

Study site name: Nephi Pasture Livestock Enclosure.

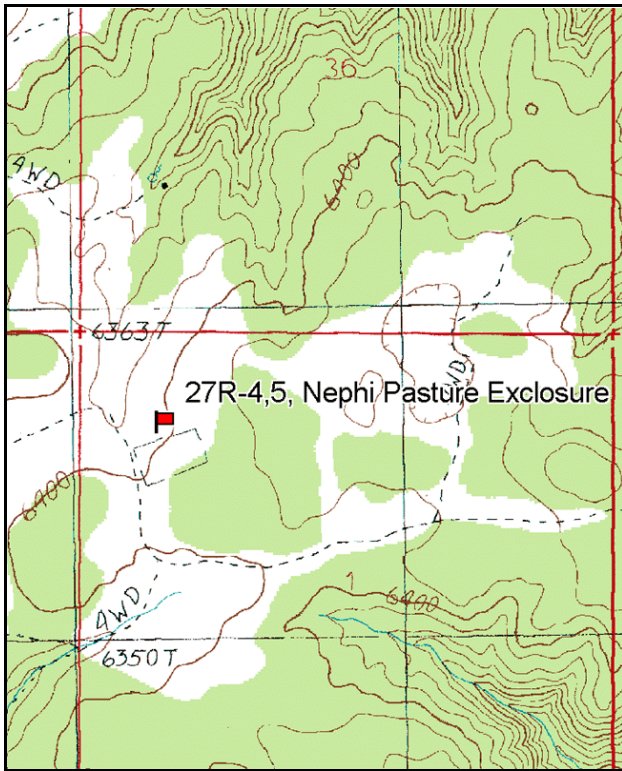
Vegetation type: P-J/ Big Sagebrush .

Compass bearing: frequency baseline 147 degrees magnetic.

Frequency belt placement: line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34ft & 71 ft). No rebar.

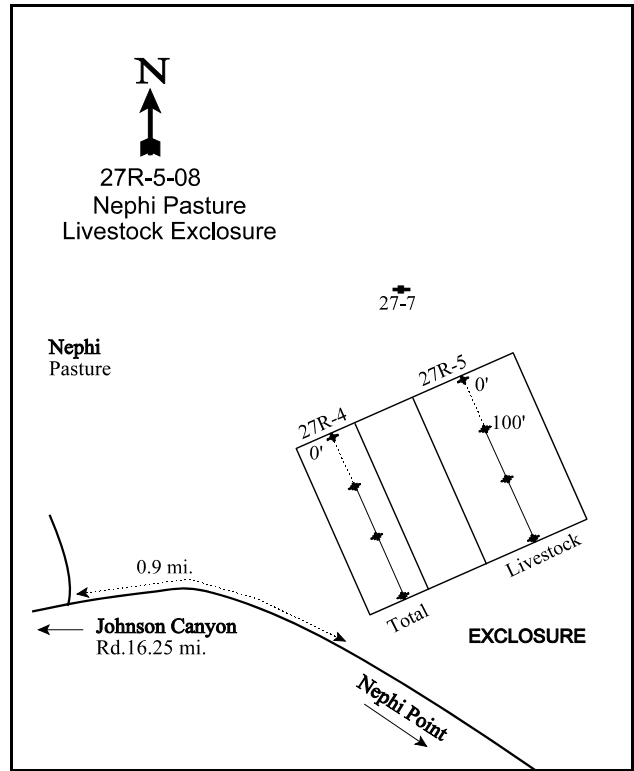
LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right and go 16.25 miles (see 27-6-03 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an enclosure. Walk east along the fence on the north side of the enclosure to the beginning of the livestock enclosure (lower fence). From here, walk down to the midpoint of the fenceposts. The baseline starts on the inside of the livestock enclosure at the midpoint, and runs at an azimuth of 147 degrees magnetic.



Map Name: Nephi Point

Township 42S, Range 4W, Section 1



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 394255 E, 4116822 N



## DISCUSSION

### Nephi Pasture Livestock Exclosure - Trend Study No. 27R-5

#### Study Information

The Nephi Pasture exclosure complex was built in the 1960's and is found approximately 20 miles northeast of Kanab [elevation: 6,400 feet (1,950 m), slope: 5%-10%, aspect: northwest]. This transect was established inside the livestock exclosure in 1998 as part of a three-way comparison between the different exclosure grazing treatments. This transect is within 300 feet of the original Nephi Pasture study that samples outside the exclosure complex (27-7). The livestock exclosure is approximately 200 feet by 300 ft in size (about 1.4 acres). Deer utilize this exclosure heavily and use was estimated to be very heavy in 1998, 2003, and 2008 (111 ddu/acre:274 ddu/ha, 169 ddu/acre:418 ddu/ha, and 76 ddu/acre:187 ddu/ha, respectively).

#### Soil

Soils inside the livestock exclosure are deep, sandy in texture, and moderately acidic (pH of 5.8). Phosphorus and potassium may be limiting to plant development and growth at 6.9 ppm and 12.8 ppm, respectively (Tiedemann and Lopez 2004). Rock and pavement are rare on the surface and within the profile. Relative vegetation and litter cover was high at 82% in 1998, decreasing to 71% and 75% in 2003 and 2008. Relative bare ground cover was moderate at 17% in 1998, increasing to 28% and 24% in 2003 and 2008, respectively. The decrease in vegetation and litter cover and increase in bare ground cover is likely mostly due to drought conditions. The soil erosion condition was classified as slight in 2003, primarily due to pedestaling of plants, and was classified as stable in 2008.

#### Browse

The livestock exclosure supports more shrub cover than either the total exclosure or outside the exclosure complex. The key species are basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Utah serviceberry (*Amelanchier utahensis*), and antelope bitterbrush (*Purshia tridentata*). Sagebrush is the most abundant of the three species, but has the lowest preference for deer. Density of sagebrush was estimated at 3,340 plants/acre in 1998, decreasing to 2,420 plants/acre in 2003 and to 1,820 plants/acre in 2008. In 1998, recruitment in sagebrush was high with an abundant young age class making up 22% of the population. Sagebrush recruitment declined to 2% in 2003 and to 1% in 2008. Sagebrush decadence was normal in 1998 at 34%, but nearly doubled inside the livestock exclosure in 2003 and 2008 to around 65%. Utilization on sagebrush was light to moderate with 13% of the plants displaying heavy use in 1998. Use was much lighter on sagebrush inside the livestock exclosure in 2003 and 2008. The proportion of the sagebrush population displaying poor vigor in 1998 was estimated at 18%, increasing to 51% in 2003, and decreasing to 24% in 2008.

Serviceberry numbered 740 plants/acre in 1998, declining to 540 plants/acre in 2003, and increasing to 1,000 plants/acre in 2008. This population showed good recruitment in 1998, 2003, and 2008 at 27%, 22%, and 26%, respectively. Serviceberry decadence was low in 1998 and 2003 at 11% and 7%, respectively, but increased slightly to 22% in 2008. Serviceberry vigor has remained normal in all three sample years. These serviceberry plants are large averaging over five feet in height in 2003 and 2008. Because of their size, a lot of the mature plants are partly unavailable to browsing which explains the relatively light use overall on serviceberry.

Bitterbrush density has increased from 800 plants/acre in 1998 to 980 plants/acre in 2008. These plants showed light to moderate use in 1998 and 2008, and mostly heavy use in 2003. Bitterbrush vigor was mostly normal in 1998 and 2003, but plants displaying poor vigor increased to 31% in 2008. Bitterbrush decadence was low in 1998 and 2003, but increased to 49% in 2008.

The only other common shrub in the livestock exclosure in 1998 was broom snakeweed (*Gutierrezia sarothrae*) which had an estimated density of 1,780 mostly mature plants/acre. Snakeweed density decreased

to only 120 plants/acre in 2003 and 20 plants/acre in 2008. Point-centered quarter data estimated 20 pinyon pine (*Pinus edulis*) and 27 juniper (*Juniperus osteosperma*) trees/acre in 1998. Average basal diameter was 7.4 inches for pinyon and 6.8 inches for juniper. Most of these trees were in the 12 to 20 foot tall range.

#### Herbaceous Understory

The herbaceous understory inside the livestock enclosure provided 18% cover to the site in 1998. Several perennial grasses were sampled including western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*). Cheatgrass (*Bromus tectorum*) was the single most abundant species on the site in 1998 being sampled in just over half of the quadrats and providing 35% of the total grass cover. Sixweeks fescue (*Vulpia octoflora*) was also abundant in 1998. With drought prior to and including the 2003 sampling year, all six of the perennial species listed above significantly decreased in nested frequency, and cheatgrass and sixweeks fescue were not sampled. In 2008, grasses were almost nonexistent on the site, and cheatgrass and sixweeks fescue were the dominant grass species. Total grass cover was under 0.05%, and there was only one perennial grass, Sandberg bluegrass (*Poa secunda*), sampled. Bastard toadflax (*Comandra pallida*) was the most abundant forb from 1998 to 2008, and represented over 50% of the forb cover in all three surveys. Toadflax had a significant decline in frequency from 1998 to 2003, and a significant increase from 2003 to 2008. Combined sum of nested frequency for perennial herbaceous species declined markedly from 1998 to 2003, but changed little in 2008.

#### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (67) Mid-Level potential scale

#### 2003 TREND ASSESSMENT

Bitterbrush remained stable in density, and maintains good vigor and low decadence. The proportion of young bitterbrush declined from 28% to 7%. Serviceberry density declined from 740 plants/acre to 540 plants/acre in 2003, but young recruitment remains good at 22%, and vigor is normal on most plants. Changes in the sagebrush population are much worse than either serviceberry or bitterbrush. Sagebrush density declined by 28% in 2003, decadence increased to 66%. The number of dead in the population nearly doubled in 2003, and young recruitment declined from 22% to 2%. Half of the sagebrush sampled in 2003 also displayed poor vigor. Individually, bitterbrush and serviceberry have stable trends while basin big sagebrush is down. Collectively, browse trend is down. Trend for both the grasses and forbs is down. Perennial herbaceous sum of nested frequency declined six-fold. The six most abundant perennial grasses sampled in 1998 all significantly declined in 2003 with drought. The one positive change for the understory that often accompanies drought was that cheatgrass was not sampled in 2003.

winter range condition (DCI) - poor (44) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

#### 2008 TREND ASSESSMENT

Trend for browse is slightly down. The primary browse species, basin big sagebrush, density decreased by 25% to 1,820 plants/acre. Sagebrush displaying poor vigor decreased from 51% in 2003 to 24%. Decadence in the sagebrush population stayed constant, but high at 65%. Recruitment in sagebrush was low with young plants comprising only 1% of the population. Bitterbrush density increased slightly to 980 plants/acre. Bitterbrush plants displaying poor vigor increased from 5% in 2003 to 31%, and decadence increased from 17% to 49%. There was no new recruitment of young bitterbrush plants and no seedlings were encountered. Serviceberry density had a 46% increase from 2003 to 1,000 plants/acre. Serviceberry vigor remained normal, but decadence increased from 7% in 2003 to 22%. Recruitment of new serviceberry was good with 26% of the population comprised of young plants. Trend for grasses is down. The sum of nested frequency and cover of perennial grasses fell to nearly nothing. Cheatgrass and sixweeks fescue are the only species with any notable frequency, but the combined cover of these species is still less than 0.05%. The trend for forbs is slightly up,

but still lacking. There was an increase in the sum of nested frequency and cover of perennial forbs, primarily due to a significant increase in the frequency of bastard toadflax. The lack in the herbaceous understory is likely primarily due to persistent drought conditions.

winter range condition (DCI) - very poor-poor (36) Mid-level potential scale  
browse - slightly down (-1)      grass - down (-2)      forb - slightly up (+1)

HERBACEOUS TRENDS --  
 Management unit 27R, Study no: 5

| Type                        | Species                  | Nested Frequency |                 |                 | Average Cover % |      |      |
|-----------------------------|--------------------------|------------------|-----------------|-----------------|-----------------|------|------|
|                             |                          | '98              | '03             | '08             | '98             | '03  | '08  |
| G                           | Agropyron smithii        | <sub>b</sub> 99  | <sub>a</sub> 9  | <sub>a</sub> -  | 2.82            | .04  | -    |
| G                           | Agropyron spicatum       | <sub>b</sub> 20  | <sub>a</sub> -  | <sub>a</sub> -  | .60             | -    | -    |
| G                           | Bromus tectorum (a)      | <sub>b</sub> 177 | <sub>a</sub> -  | <sub>a</sub> 10 | 4.69            | -    | .02  |
| G                           | Oryzopsis hymenoides     | <sub>b</sub> 28  | <sub>a</sub> 2  | <sub>a</sub> -  | .59             | .15  | -    |
| G                           | Poa fendleriana          | <sub>b</sub> 41  | <sub>a</sub> 8  | <sub>a</sub> -  | 2.07            | .48  | -    |
| G                           | Poa secunda              | -                | -               | 1               | -               | -    | .00  |
| G                           | Sitanion hystrix         | <sub>b</sub> 23  | <sub>a</sub> 1  | <sub>a</sub> -  | .69             | .00  | -    |
| G                           | Sporobolus cryptandrus   | 1                | -               | -               | .00             | .00  | -    |
| G                           | Stipa comata             | <sub>b</sub> 14  | <sub>a</sub> -  | <sub>a</sub> -  | .07             | .03  | -    |
| G                           | Vulpia octoflora (a)     | <sub>b</sub> 124 | <sub>a</sub> -  | <sub>a</sub> 12 | 1.99            | -    | .02  |
| Total for Annual Grasses    |                          | 301              | 0               | 22              | 6.68            | 0    | 0.04 |
| Total for Perennial Grasses |                          | 226              | 20              | 1               | 6.87            | 0.71 | 0.00 |
| Total for Grasses           |                          | 527              | 20              | 23              | 13.55           | 0.71 | 0.04 |
| F                           | Arabis sp.               | 5                | -               | -               | .01             | -    | -    |
| F                           | Astragalus sp.           | 7                | -               | -               | .01             | -    | -    |
| F                           | Calochortus nuttallii    | -                | 5               | -               | -               | .01  | -    |
| F                           | Comandra pallida         | <sub>c</sub> 143 | <sub>a</sub> 47 | <sub>b</sub> 78 | 3.15            | .68  | 1.53 |
| F                           | Descurainia pinnata (a)  | <sub>c</sub> 11  | <sub>a</sub> -  | <sub>c</sub> 15 | .10             | -    | .07  |
| F                           | Draba sp. (a)            | 7                | -               | -               | .01             | -    | -    |
| F                           | Eriogonum cernuum (a)    | <sub>a</sub> -   | <sub>a</sub> -  | <sub>b</sub> 14 | -               | -    | .03  |
| F                           | Erigeron sp.             | 3                | -               | -               | .00             | -    | -    |
| F                           | Eriogonum racemosum      | 5                | -               | -               | .01             | -    | -    |
| F                           | Gilia sp. (a)            | <sub>a</sub> -   | <sub>b</sub> 17 | <sub>a</sub> -  | -               | .67  | -    |
| F                           | Lappula occidentalis (a) | 5                | -               | 5               | .04             | -    | .01  |
| F                           | Lupinus argenteus        | 8                | -               | -               | .57             | -    | -    |
| F                           | Microsteris gracilis (a) | 11               | -               | -               | .02             | -    | -    |
| F                           | Penstemon sp.            | <sub>b</sub> 14  | <sub>a</sub> -  | <sub>ab</sub> 4 | .05             | -    | .06  |
| F                           | Plantago patagonica (a)  | <sub>b</sub> 45  | <sub>a</sub> -  | <sub>a</sub> 12 | .64             | -    | .02  |
| F                           | Polygonum douglasii (a)  | 1                | -               | 2               | .00             | -    | .01  |

| Type                      | Species                     | Nested Frequency |     |     | Average Cover % |      |      |
|---------------------------|-----------------------------|------------------|-----|-----|-----------------|------|------|
|                           |                             | '98              | '03 | '08 | '98             | '03  | '08  |
| F                         | <i>Sphaeralcea coccinea</i> | -                | -   | 3   | -               | -    | .00  |
| Total for Annual Forbs    |                             | 80               | 17  | 48  | 0.82            | 0.67 | 0.14 |
| Total for Perennial Forbs |                             | 185              | 52  | 85  | 3.81            | 0.69 | 1.59 |
| Total for Forbs           |                             | 265              | 69  | 133 | 4.64            | 1.37 | 1.74 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27R, Study no: 5

| Type             | Species                                | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>           | 23              | 17  | 28  | 6.46            | 8.65  | 6.52  |
| B                | <i>Artemisia tridentata tridentata</i> | 81              | 67  | 54  | 10.81           | 7.75  | 9.94  |
| B                | <i>Gutierrezia sarothrae</i>           | 36              | 5   | 1   | 2.20            | .06   | .00   |
| B                | <i>Juniperus osteosperma</i>           | 3               | 3   | 3   | 1.72            | 1.21  | 1.20  |
| B                | <i>Opuntia sp.</i>                     | 1               | 0   | 0   | .03             | -     | -     |
| B                | <i>Pinus edulis</i>                    | 0               | 0   | 0   | .15             | .15   | -     |
| B                | <i>Purshia tridentata</i>              | 26              | 27  | 32  | 5.34            | 5.19  | 3.89  |
| B                | <i>Ribes sp.</i>                       | 1               | 0   | 0   | .00             | -     | -     |
| Total for Browse |  | 171             | 119 | 118 | 26.72           | 23.02 | 21.57 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 5

| Species                                | '03   | '08   |
|--|-------|-------|
| <i>Amelanchier utahensis</i>           | 10.30 | 10.89 |
| <i>Artemisia tridentata tridentata</i> | 7.88  | 14.16 |
| <i>Gutierrezia sarothrae</i>           | .11   | -     |
| <i>Juniperus osteosperma</i>           | 2.86  | 4.84  |
| <i>Purshia tridentata</i>              | 4.76  | 6.75  |

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 27R, Study no: 5

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Amelanchier utahensis           | 2.6                        | 2.0 |
| Artemisia tridentata tridentata | 2.3                        | 1.2 |
| Purshia tridentata              | 5.2                        | 3.7 |

POINT-QUARTER TREE DATA --  
Management unit 27R, Study no: 5

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 20             | <18 | <18 |
| Pinus edulis          | 27             | <18 | <18 |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 6.8                   | -   | -   |
| 7.5                   | -   | -   |

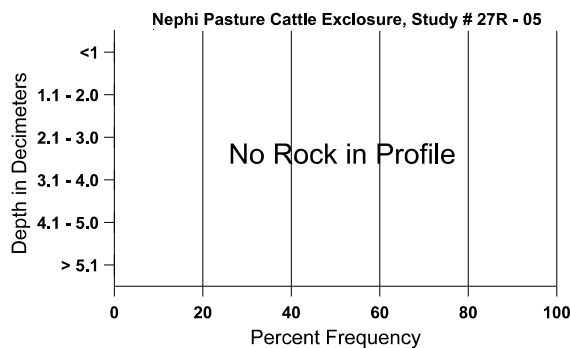
BASIC COVER --  
Management unit 27R, Study no: 5

| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 47.41           | 25.80 | 24.88 |
| Rock        | 0               | .00   | 0     |
| Pavement    | 0               | 0     | .03   |
| Litter      | 66.72           | 58.25 | 60.66 |
| Cryptogams  | 1.73            | 1.35  | .24   |
| Bare Ground | 23.45           | 32.59 | 27.82 |

SOIL ANALYSIS DATA --  
Management unit 27R, Study no: 5, Study Name: Nephi Pasture Livestock Exclosure

| Effective rooting depth (in) | Temp °F (depth) | pH  | sand  |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 20.5                         | 70.5 (17.7)     | 5.8 | 90.2  | 2.0   | 7.8   | 0.8 | 6.9   | 12.8  | 0.2  |

Stoniness Index



PELLET GROUP DATA --  
 Management unit 27R, Study no: 5

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 28                | 23  | 73  |
| Elk    | 1                 | -   | -   |
| Deer   | 39                | 34  | 34  |

| Days use per acre (ha) |           |          |
|------------------------|-----------|----------|
| '98                    | '03       | '08      |
| -                      | -         | -        |
| -                      | -         | -        |
| 111 (274)              | 169 (418) | 76 (187) |

BROWSE CHARACTERISTICS --  
 Management unit 27R, Study no: 5

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              | Average Height Crown (in) |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor |                           |
| <i>Amelanchier utahensis</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>740</b>                            | 100                                      | 200   | 460    | 80       | 120  | 30          | 3       | 11         | 5       | 8            | 49/56                     |
| 03                                     | <b>540</b>                            | 40                                       | 120   | 380    | 40       | 80   | 7           | 22      | 7          | 4       | 4            | 61/64                     |
| 08                                     | <b>1000</b>                           | -  | 260   | 520    | 220      | 60   | 20          | 12      | 22         | 4       | 4            | 61/56                     |
| <i>Artemisia tridentata tridentata</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>3340</b>                           | 180                                      | 740   | 1460   | 1140     | 1480 | 27          | 13      | 34         | 17      | 18           | 29/30                     |
| 03                                     | <b>2420</b>                           | -  | 60    | 760    | 1600     | 2560 | 12          | 4       | 66         | 51      | 51           | 32/34                     |
| 08                                     | <b>1820</b>                           | 80                                       | 20    | 620    | 1180     | 2320 | 15          | 5       | 65         | 20      | 24           | 43/43                     |
| <i>Gutierrezia sarothrae</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>1780</b>                           | 40                                       | 40    | 1740   | -        | -    | 0           | 0       | 0          | -       | 0            | 11/12                     |
| 03                                     | <b>120</b>                            | -  | -     | 100    | 20       | -    | 0           | 0       | 17         | 17      | 17           | 11/11                     |
| 08                                     | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 7/5                       |
| <i>Juniperus osteosperma</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>60</b>                             | -  | 60    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                     | <b>60</b>                             | -  | 40    | -      | 20       | -    | 0           | 0       | 33         | -       | 0            | -/-                       |
| 08                                     | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/4                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Purshia tridentata</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>800</b>                            | 20                                       | 220   | 500    | 80       | 20   | 38          | 0       | 10         | 8       | 8            | 33/48                     |
| 03                                     | <b>840</b>                            | -  | 60    | 640    | 140      | 20   | 29          | 69      | 17         | 5       | 5            | 30/46                     |
| 08                                     | <b>980</b>                            | -  | -     | 500    | 480      | 180  | 31          | 14      | 49         | 31      | 31           | 26/35                     |

|           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Ribes sp. |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98        | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 65/45                     |

## NEPHI PASTURE EXCLOSURE COMPARISON SUMMARY

### Utilization

Pellet group transect data shows that deer use was high in the area. Deer use was higher inside of the livestock enclosure (27R-5) than outside of the enclosure (27-7) in all of the sample years (Table 1). Due to a hole in the fence, there was moderate browsing noted in the total enclosure (27R-4) in 1998 and 2003.

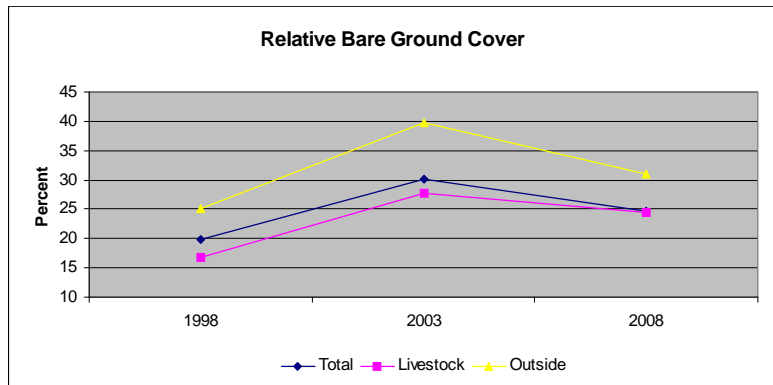
**Table 1. Pellet group transect data estimated use for the Nephi pasture enclosure complex.**

| Study Name                     | Year | Deer<br><i>days use/acre (ha)</i> | Cattle<br><i>days use/acre (ha)</i> |
|--------------------------------|------|-----------------------------------|-------------------------------------|
| Livestock Enclosure<br>(27R-5) | 1998 | 111 (274)                         | --                                  |
|                                | 2003 | 169 (418)                         | --                                  |
|                                | 2008 | 76 (187)                          | --                                  |
| Outside of Enclosure<br>(27-7) | 1998 | 64 (158)                          | 16 (40)                             |
|                                | 2003 | 70 (174)                          | 23 (57)                             |
|                                | 2008 | 38 (93)                           | --                                  |

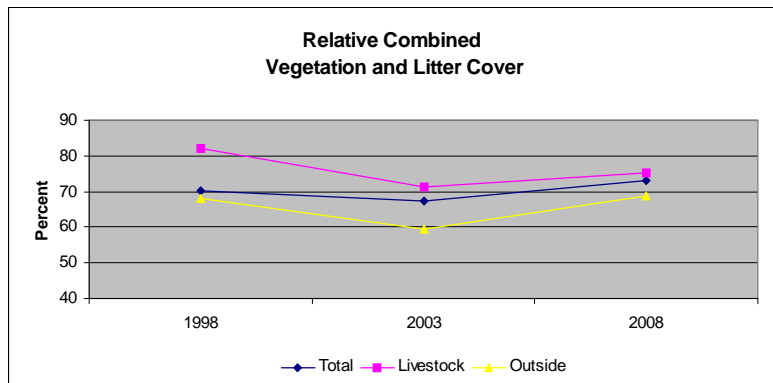
### Ground Cover and Erosion

Relative bare ground cover was highest outside of the enclosure, but was moderate in all three studies. The trend of bare ground cover was similar in all three studies, increasing between 1998 and 2003, and decreasing slightly but remaining high in 2008 (Figure 1). Relative combined vegetation and litter cover was inverses, but showed similar trends (Figure 2). Relative cryptogam cover was high in the total enclosure and outside the enclosure in 1998, but relative cover of cryptogams decreased markedly for both studies in 2003 and remained low in all three studies in 2008 (Figure 3). There is little to no rock or pavement cover on any of the studies.

The erosion condition of the total enclosure was classified as stable in 2003, while both the livestock enclosure and outside the enclosure were classified as slight. Both the livestock and total enclosure erosion condition was stable in 2008, and the soil erosion condition outside the enclosure was classified as slight.



**Figure 1.** Relative bareground cover of the three grazing studies, Total Enclosure (27R-4), Livestock Enclosure (27R-5), and Outside of Enclosure (27-7), at the Nephi pasture enclosure complex.

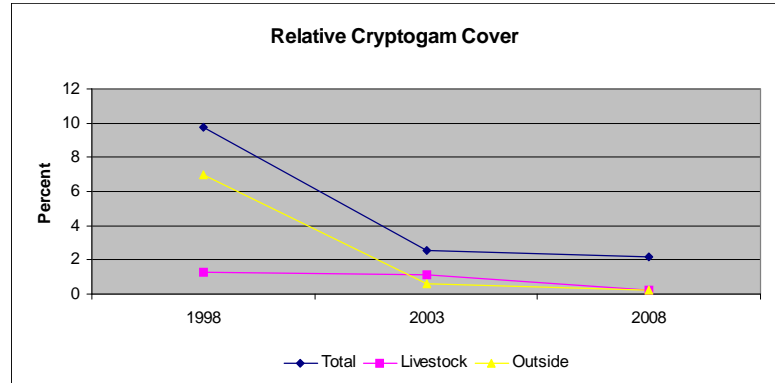


**Figure 2.** Relative combined vegetation and litter cover of the three grazing studies, Total Enclosure (27R-4), Livestock Enclosure (27R-5), and Outside of Enclosure (27-7), at the Nephi pasture enclosure complex.



### Browse

All three studies support good stands of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*). Sagebrush density was highest in the total and livestock enclosure studies, but density decreased on all studies from 1998 to 2008. Serviceberry density and cover is lowest in the total enclosure and highest in the livestock enclosure. Bitterbrush density and cover is similar in all three studies (Table 2). Decadence of all of the preferred browse species has been moderate to high in all three studies in all sample years.



**Figure 3.** Relative cryptogam cover of the three grazing studies, Total Enclosure (27R-4), Livestock Enclosure (27R-5), and Outside of Enclosure (27-7), at the Nephi pasture enclosure complex.

### Herbaceous Understory

Grass species were abundant and diverse at the outset of the study in 1998 in all three studies. The sum of nested frequency of grasses declined drastically in 2003 across the studies, and grasses continued to be extremely rare in 2008 (Table 3). Perennial grasses that were sampled in all three studies included western wheatgrass (*Agropyron smithii*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), sand dropseed (*Sporobolus cryptandrus*), and needle-and-thread (*Stipa comata*). The annual grasses, cheatgrass (*Bromus tectorum*) and sixweeks fescue (*Vulpia octoflora*), were common in all three studies in 1998, but were very rare in 2003 and 2008 (Table 3).

Forbs on the site did not have the same expansive decline over the studies that grasses had. Species diversity (number of species sampled) for forbs was highest outside of the enclosure. However, sum of nested frequency and cover of perennial forbs was highest in the total enclosure (Table 4). The only common perennial forb on all three studies was bastard toadflax (*Comandra pallida*). Toadflax provided nearly all of the cover for perennial forbs on all three studies. The annual forbs on all three studies that were fairly common were woolly plantain (*Plantago patagonica*), tansymustard (*Descurainia pinnata*), and nodding eriogonum (*Eriogonum cernuum*).

| Study Name           | Year | Basin Big Sagebrush      |                  | Utah Serviceberry        |                  | Antelope Bitterbrush     |                  |
|----------------------|------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|
|                      |      | Density<br>(plants/acre) | Percent<br>Cover | Density<br>(plants/acre) | Percent<br>Cover | Density<br>(plants/acre) | Percent<br>Cover |
| Total Exclosure      | 1998 | 2,820                    | 10.35            | 80                       | 1.03             | 920                      | 7.90             |
| (29R-1)              | 2003 | 1,780                    | 7.36             | 60                       | 3.75             | 740                      | 6.50             |
|                      | 2008 | 1,500                    | 8.64             | 40                       | 3.12             | 860                      | 7.02             |
| Livestock Exclosure  | 1998 | 3,340                    | 10.81            | 740                      | 6.46             | 800                      | 5.34             |
| (29R-2)              | 2003 | 2,420                    | 7.75             | 540                      | 8.65             | 840                      | 5.19             |
|                      | 2008 | 1,820                    | 9.94             | 1,000                    | 6.52             | 980                      | 3.89             |
| Outside of Exclosure | 1998 | 1,880                    | 3.20             | 380                      | 3.32             | 1,220                    | 7.64             |
| (29R-3)              | 2003 | 1,240                    | 5.41             | 300                      | 5.71             | 960                      | 7.50             |
|                      | 2008 | 1,260                    | 4.81             | 360                      | 7.00             | 880                      | 6.03             |

**Table 2.** Estimated density and quadrat cover of the preferred browse species in the three exclosure studies at the Nephi Pasture exclosure complex.

| Study Name          | Year | Perennial Grass Species |                            |               | Annual Grass Species |                            |               |
|---------------------|------|-------------------------|----------------------------|---------------|----------------------|----------------------------|---------------|
|                     |      | <i>n</i>                | Sum of Nested<br>Frequency | Percent Cover | <i>n</i>             | Sum of Nested<br>Frequency | Percent Cover |
| Total Exclosure     | 1998 | 7                       | 169                        | 3.44          | 2                    | 465                        | 8.85          |
| (29R-1)             | 2003 | 5                       | 60                         | 0.85          | 0                    | 0                          | 0             |
|                     | 2008 | 3                       | 4                          | 0.01          | 2                    | 18                         | 0.03          |
| Livestock Exclosure | 1998 | 7                       | 226                        | 6.87          | 2                    | 301                        | 6.68          |
| (29R-2)             | 2003 | 4                       | 20                         | 0.71          | 0                    | 0                          | 0             |
|                     | 2008 | 1                       | 1                          | 0.00          | 2                    | 22                         | 0.04          |
| Outside Exclosure   | 1998 | 6                       | 191                        | 1.97          | 2                    | 288                        | 5.13          |
| (29R-3)             | 2003 | 5                       | 45                         | 0.40          | 0                    | 0                          | 0             |
|                     | 2008 | 3                       | 9                          | 0.03          | 1                    | 6                          | 0             |

**Table 3.** Number of species sampled, sum of nested frequency, and cover of perennial grasses and annual grasses in the three studies at the Nephi Pasture exclosure complex.

| Study Name          | Year | Perennial Forb Species |                                |                      | Annual Forb Species |                                |                      |
|---------------------|------|------------------------|--------------------------------|----------------------|---------------------|--------------------------------|----------------------|
|                     |      | <i>n</i>               | <i>Sum of Nested Frequency</i> | <i>Percent Cover</i> | <i>n</i>            | <i>Sum of Nested Frequency</i> | <i>Percent Cover</i> |
| Total Exclosure     | 1998 | 5                      | 183                            | 3.60                 | 5                   | 91                             | 0.90                 |
| (29R-1)             | 2003 | 4                      | 156                            | 3.06                 | 3                   | 49                             | 1.27                 |
|                     | 2008 | 4                      | 195                            | 4.69                 | 7                   | 155                            | 0.95                 |
| Livestock Exclosure | 1998 | 7                      | 185                            | 3.81                 | 6                   | 80                             | 0.82                 |
| (29R-2)             | 2003 | 2                      | 52                             | 0.69                 | 1                   | 17                             | 0.67                 |
|                     | 2008 | 3                      | 85                             | 1.59                 | 5                   | 48                             | 0.14                 |
| Outside Exclosure   | 1998 | 10                     | 145                            | 1.69                 | 4                   | 230                            | 5.54                 |
| (29R-3)             | 2003 | 6                      | 110                            | 1.56                 | 4                   | 17                             | 0.37                 |
|                     | 2008 | 5                      | 114                            | 2.98                 | 5                   | 121                            | 0.47                 |

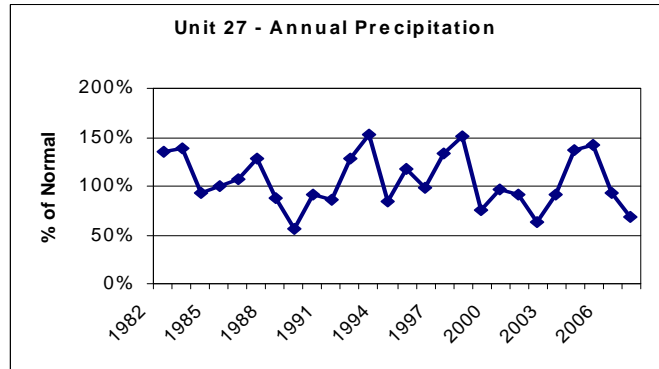
**Table 4.** Number of species sampled, sum of nested frequency, and cover of perennial forbs and annual forbs in the three studies at the Nephi Pasture exclosure complex.

## SUMMARY

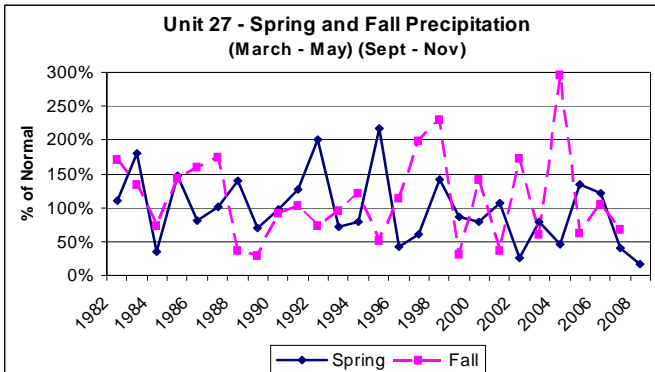
### WILDLIFE MANAGEMENT UNIT 27 - PAUNSAUGUNT

#### Community Types

Fourteen trend studies were sampled in 2008. Six studies sampled Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) communities (27-6, 27-7, 27-9, 27-11, 27R-4, and 27R-5), three studies sampled black sagebrush (*Artemisia nova*) communities (27-2, 27-8, and 27-13), two studies sampled mountain brush communities (27-1 and 27-12), one study sampled a ponderosa pine (*Pinus ponderosa*) community (27-3), one study sampled a dry meadow community (27-5), and one study sampled a pinyon-juniper chaining with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Three of the studies (27-7, 27R-4, and 27R-5) consist of studies that monitor trends in a livestock enclosure, a total enclosure, and outside of the enclosures.



**Figure 1.** Annual precipitation data for unit 27. Precipitation data were collected at Bryce Canyon National Park, Alton, Orderville, and Kanab weather stations (Utah Climate Summaries 2008).

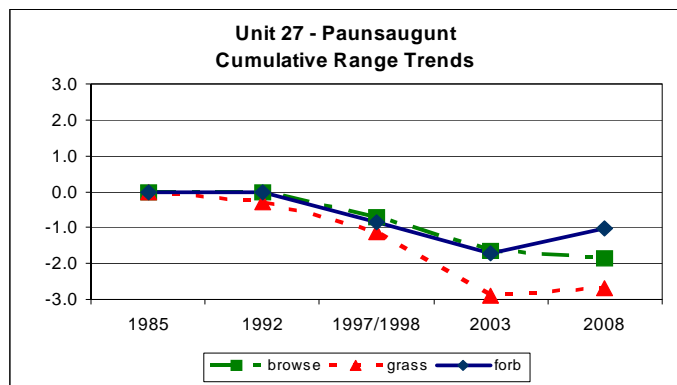


**Figure 2.** Annual spring (March-May) and fall (Sept.-Nov.) precipitation for unit 27. Precipitation data were collected at the Bryce Canyon National Park, Alton, Orderville, and Kanabe weather stations (Utah Climate Summaries 2008).

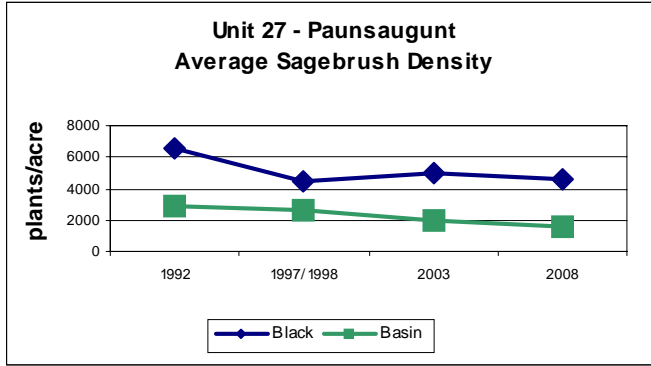
(Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

#### Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Bryce Canyon National Park, Alton, Orderville, and Kanab weather stations (Figures 1 and 2). The units annual precipitation was below 75% of normal (drought conditions) in 1989, 2002, and 2007 (Figure 1). Spring precipitation for the unit was below 75% of normal in 1989, 1993, 1996, and 1997, near or below 50% of normal in 1984, 2004, and 2007, and near or below 25% of normal in 2002 and 2008 (Figure 2). Fall precipitation was below 75% of normal in 1984, 1992, 2003, 2005, and 2007, near or below 50% in 1988, 1989, 1995, 1999, and 2001



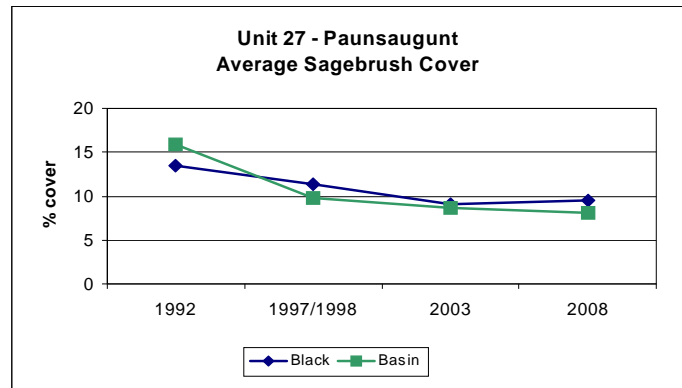
**Figure 3.** Cumulative range trends for unit 27, Paunsaugunt.



**Figure 4.** Average density of black sagebrush and Basin big sagebrush for unit 27, Paunsaugunt.

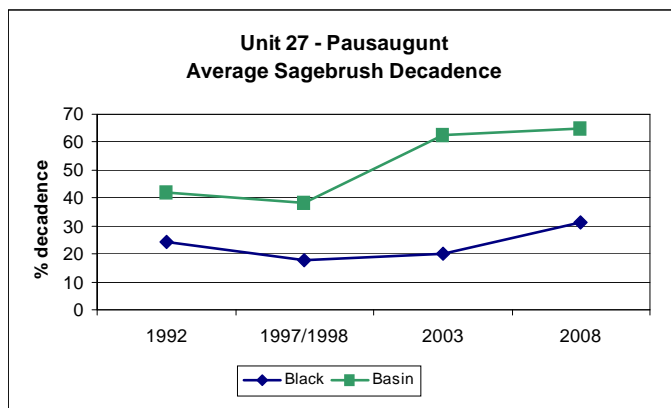
around 9% in 2003 and 2008 (Figure 5). Average decadence of black sagebrush decreased slightly from 24% in 1992 to 18% in 2003, before increasing to 20% in 2003 and further to 32% in 2008 (Figure 6).

Basin big sagebrush was sampled the Nephi Pasture I (27-6), Nephi Pasture Exclosure Outside (27-7), Buckskin Mountain (27-9), Crocodile (27-11), Nephi Pasture Total Exclosure (27R-4), and Nephi Pasture Livestock Exclosure (27R-5) study sites. Average density of Basin big sagebrush decreased steadily over the sample years from 2,860 plants/acre in 1992 to about 1,550 plants/acre in 2008 (Figure 4). Following the decline in density, cover of Basin big sagebrush decreased from 16% in 1992 to 10% in 1997/1998, then remained fairly constant at 8%-9% in 2003 and 2008 (Figure 5). Decadence of Basin big sagebrush increased from around 40% in the 1992 and 1997/1998 sample years to over 60% in the 2003 and 2008 sample years (Figure 6).



**Figure 5.** Average cover of black sagebrush and Basin big sagebrush for unit 27, Paunsaugunt.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Wyoming sagebrush were sampled in just one study each in this unit, so summary statistics were not calculated for these species. Mountain big sagebrush was sampled at the Moons Landing (27-12) study site, and Wyoming big sagebrush was sampled at the Telegraph Flat (27-10) study site. For more information on trends for these species refer to the discussion section.



**Figure 6.** Average decadence of black sagebrush and Basin big sagebrush from unit 27, Paunsaugunt.

### Browse

The average browse trend increased slightly from 1985 to 1992, then steadily decreased until 2003, and remained fairly constant in 2008 (Figure 3). Black sagebrush was sampled at the Proctor Canyon (27-1), Ahlstrom Hollow (27-2), Whiteman Bench (27-3), Fivemile Mountain (27-8), Moons Landing (27-12), and Heaton (27-13) study sites. Average density of black sagebrush decreased slightly from about 6,500 plants/acre in 1992 to about 4,500 plants/acre in 1997/1998, then stayed fairly constant through 2008 (Figure 4). The average cover of black sagebrush decreased slightly from 14% in 1992 to 11% in 1997/1998, then decreased further to

Grass

The cumulative grass trend was relatively stable from 1985 to 1992, decreased slightly in 1997/1998, decreased drastically in 2003, and stayed similar in 2008 (Figure 3). The average sum of nested frequency of perennial grasses had a similar trend. The sum of nested frequency of perennial grasses decreased by 48% from 1992 to 2003, increased by 12% in 2008 (Figure 7). The average cover of perennial grasses decreased from 14% in 1992 to 8% in 1997/1998, slightly decreased to 5% in 2003, and increased slightly to 7% in 2008 (Figure 8). There was a large increase in both frequency and cover of cheatgrass (*Bromus tectorum*) between the

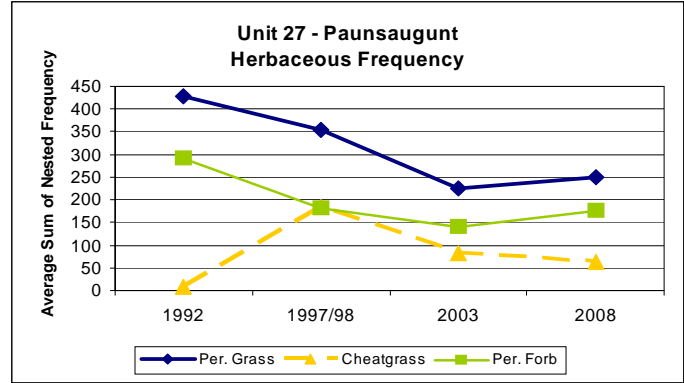


Figure 7. Average herbaceous sum of nested frequencies for unit 27, Paunsaugunt.

1992 and 1997/1998 sample years, then a decrease in frequency and cover of cheatgrass in 2003 and 2008 (Figure 7 and Figure 8).

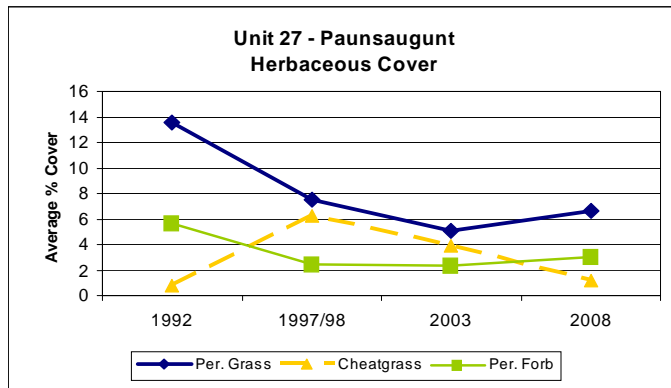


Figure 8. Average herbaceous cover for unit 27, Paunsaugunt.

Forb

The cumulative forb trend was similar from 1985 to 1992, then decreased steadily until 2003 before increasing slightly in 2008 (Figure 3). The average sum of nested frequency of perennial forbs decreased from 1992 to 2003, then increased slightly in 2008 (Figure 7). The average cover of perennial forbs decreased from 6% in 1992 to 2% in 1997/1998, and remained around 2%-3% in 2003 and 2008 (Figure 8).

Desirable Components Index

Four studies in this herd unit were considered to be in the low potential scale for the Desirable Components Index (DCI): Fivemile Mountain (27-8), Buckskin Mountain (27-9), Telegraph Flat (27-10), and Crocodile (27-11). The average DCI rating for the low potential scale was fair (39) in 1997/1998, decreased to poor (21 and 18) in 2003 and 2008, respectively (Figure 9). The six remaining winter range studies were in the mid-level scale for the DCI: Nephi Pasture I (27-6), Nephi Pasture Exclosure Outside (27-7), Moons Landing (27-12), Heaton (27-13), Nephi Pasture Total Exclosure (27R-4), and Nephi Pasture Livestock Exclosure (27R-5). The average DCI rating for mid-potential scale was fair (61) in 1997/1998, decreasing to poor-fair (48 and 49) in 2003 and 2008, respectively (Figure 9). The four remaining studies, Proctor Canyon (27-1), Ahlstrom Hollow (27-2), Whiteman Bench (27-3), and Podunk Creek (27-4), are considered to be summer range and do not meet the criteria for a DCI rating.

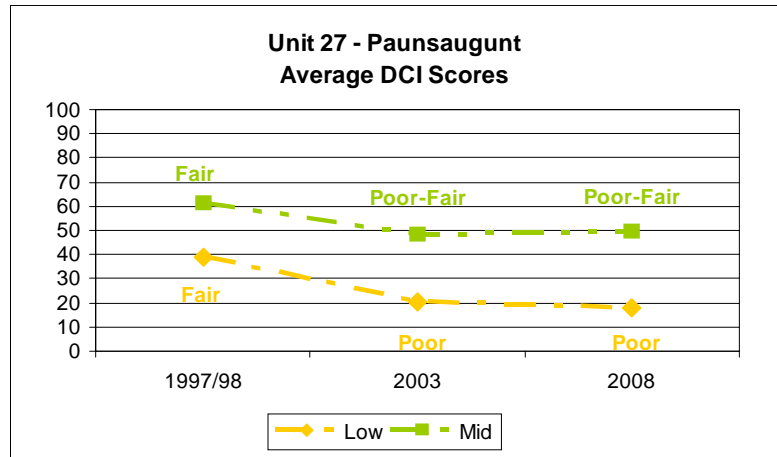
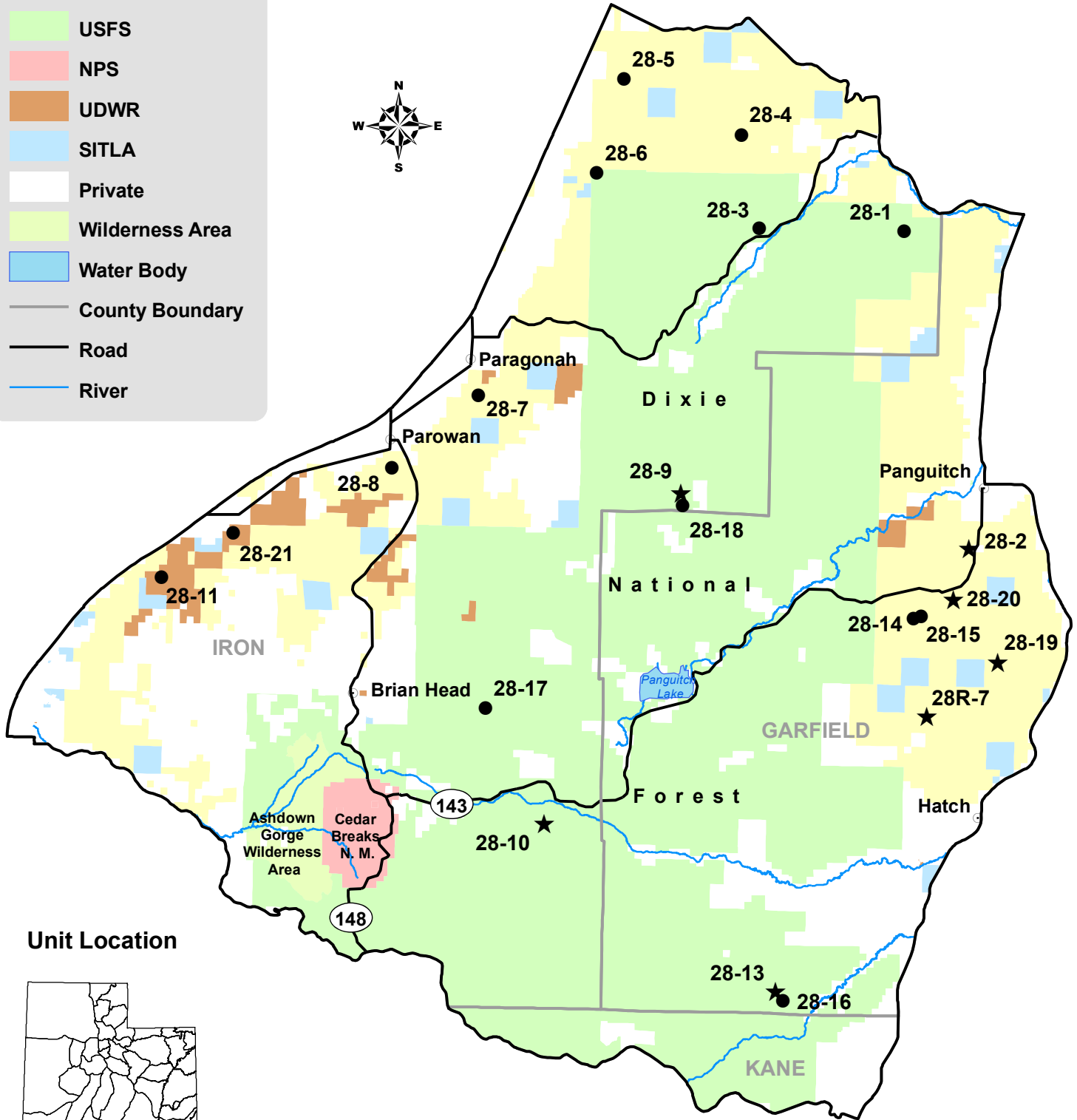
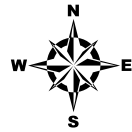
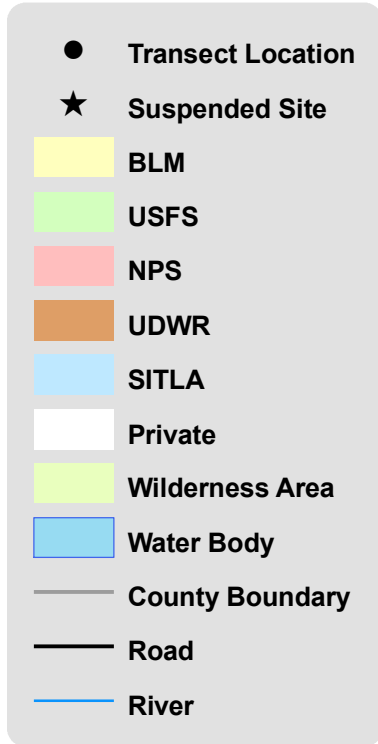
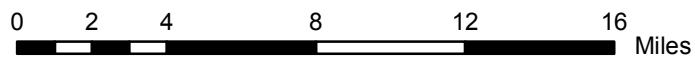
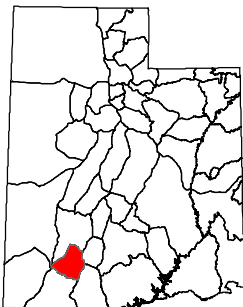


Figure 9. Unit 27, Paunsaugunt, average Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high.

# Management Unit 28



## Unit Location



## WILDLIFE MANAGEMENT UNIT 28 - PANGUITCH LAKE

### Boundary Description

**Iron, Kane, and Garfield counties** - Boundary begins at Highway SR-14 and Highway US-89; then north on US-89 to Highway SR-20; then west on SR-20 to Interstate 15; then south on I-15 to Highway SR-14; then east on SR-14 to US-89 and beginning point.

### Management Unit Description

Total useable mule deer and elk range on this unit is 540,457 and 402,473 acres respectively (DWR 1998). Mule deer range consists of 63% summer and 37% winter range, while elk range is 78% summer and 22% winter range. Guinta (1982) presents a complete description of the summer and winter range on the Panguitch Lake unit. The winter range on the eastern portion of the unit is higher in elevation and experiences colder temperatures than on the Parowan side; and consequently, far fewer deer winter on the Panguitch side. Key areas that were identified on the winter range on the eastern side of the unit include the following: pinyon-juniper woodlands south of Panguitch, seeded range at the north end of Upper Bear Valley, the mixed brush type in Buckskin Valley, and the pinyon-juniper chainings in the Three Creeks drainage. These study sites range in elevation from 7,100 to 7,600 feet and represent key areas within the limits of normal winter range on the east side. The only severe winter range available on the unit is located on the pinyon-juniper slopes below the Hurricane Cliffs and on the sagebrush flats that extend from the slopes to I-15. During severe winters the deer on this herd unit are packed into the narrow area between the cliffs and the interstate. Habitat availability is effectively reduced by 80% during these severe winters. The key areas that were identified by the local interagency committee for this area include the Wyoming big sagebrush type west of Swayback Knoll, a Wyoming big sagebrush type in the mouth of Cottonwood Creek, a pinyon-juniper chaining east of Paragonah, a big sagebrush/ pinyon-juniper ecotone in Grass Valley south of Parowan, and a mountain big sagebrush/pinyon-juniper ecotone in Elliker Basin. The importance of each of these areas for deer has increased over the years as sagebrush flats have been converted to sprinkler irrigated agricultural lands; mainly from Highway U-20 to Parowan. Due to depredation problems, deer fences were constructed around many of these fields. In addition, the deer-proof fence along the I-15 corridor severely limits the winter range available to deer on the west side of the freeway. Urbanization of former winter range is continuing, especially in the Fiddler's Canyon area north of Cedar City. Of particular concern is the fact that much of the severe winter range from U-20 to Cedar City is privately owned. Additional habitat losses are to be expected on these privately owned parcels of land. Summer range is not considered a limiting factor for this deer herd. Summer range on the northern portion of the unit generally lies between 8,000 and 9,000 feet and consists largely of gentle rolling terrain. Summer ranges on the south side of the unit reach elevations of over 10,000 feet bordering Cedar Breaks National Park.

### Livestock Grazing on Key Areas

**The following discussion comes from the 1998 Range Trend Report and grazing information was current in 1998. Actual dates and numbers of grazing animals may have changed since.**

#### Eastern Portion - Normal Winter Deer Range

The Three Creeks study site is located in the USFS Three Creeks Cattle Allotment. A rest-rotation grazing system is used to manage livestock on this unit. The allotment is grazed from 6/1 to 10/15, with use on the study site occurring during the spring. The Upper Bear Valley site is located within the USFS Red Creek Cattle Allotment. This area was grazed by sheep and cattle prior to 1940. Since then, cattle have used the area exclusively. A deferred-rotation grazing system is used to manage livestock on the allotment. The season of use is from 6/16 to 10/15. The Buckskin Valley site is located in the BLM administered Buckskin Mountain Allotment. The unit is grazed annually during the late spring by sheep and cattle. No grazing system is in use.



The active preference for livestock has been set at 582 AUMs.

#### Western Portion - Severe Winter Deer Range

The Swayback Knoll site lies within the BLM, Bone Hollow Cattle Allotment. Recently, a 3 pasture rotation system has been implemented on this unit. This is one of the few allotments in the area that permits winter grazing on crucial deer winter range. The Paragonah study site is in an unallotted area of BLM land. Use by cattle does occur since forage production has been enhanced by an old chaining and seeding project. No monitoring of livestock use is carried out by BLM on this area. The Cottonwood site is located in the same allotment as the Upper Bear Valley site. This site is located in a unit that is grazed during the spring in most years.

The Grass Valley study is located in the P-Hill Allotment and is used by cattle from spring to mid-summer. The allotment is used season-long on an annual basis with no provision for deferred or rested pastures. The Elliker Basin study is located on DWR land which was acquired by way of a trade from the BLM.

#### High Elevation - Summer Range

Cattle are managed on a deferred-rotation system in both allotments. The season of use runs from 7/6 to 9/20 on the Red Desert Allotment and from 6/1 to 10/15 in Little Valleys allotment. Suitable range appears to be twice as productive on the Little Valleys Allotment (5 acres/AUM) than on the Red Desert Allotment (11 acres/AUM). Asay Knoll, which was also suspended and replaced in 2003, occurs on the large Uinta Flat burn. It is located within the Buck Knoll pasture of the Asay Knoll Grazing Allotment. This area is allotted for 266 cattle for about one month beginning on June 16th. They are then moved to another pasture.

#### Herd Unit Management Objectives

The objective for this unit is to maintain winter deer herd size of 8,500 animals. Herd composition calls for 15 bucks/100 does with 30% of the bucks being 3-point or better. To achieve this level of harvest it will be necessary to maintain the amount of acreage providing severe winter deer range habitat on the west side of the unit (approximately 44,500 acres). As winter range habitat is lost to other land uses on private land, it will be necessary to increase the carrying capacity of key areas on public lands. Elk management objectives call for a target winter herd size of 900 animals with a bull to cow ratio of 20:100. At least half of the bulls are to be 2 ½ years of age or older. A more detailed discussion of deer and elk herd unit objectives can be found in the Division's big game management plans.

#### Trend Study Description

Range trend studies were initially established in 1987 and resurveyed in 1992, 1998, and 2003. Two additional studies were established in 1998 in the Sheep Hollow area south of Panguitch, and 5 studies were established in 2003 to replace 4 of the original trend studies that were suspended. 1 study, the South Summit WMA, was added in 2008.

Trend Study 28-1-08

Study site name: Three Creeks .

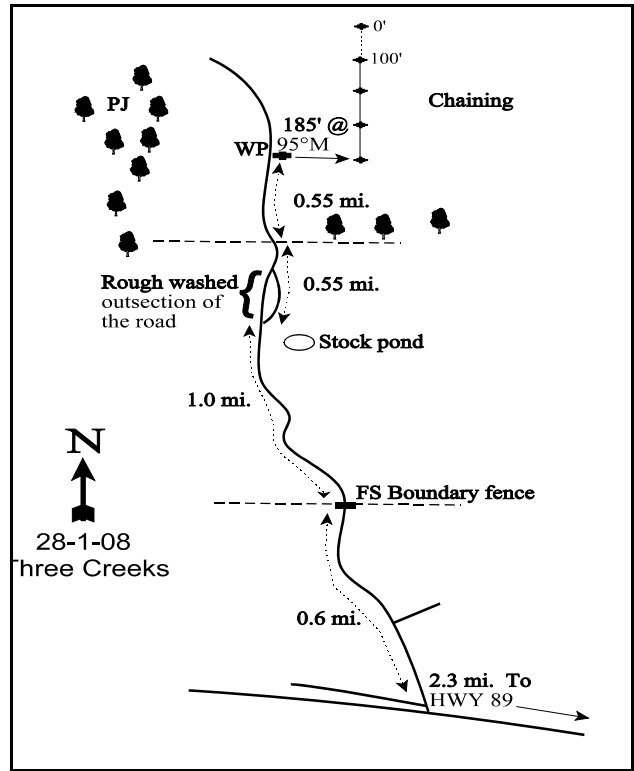
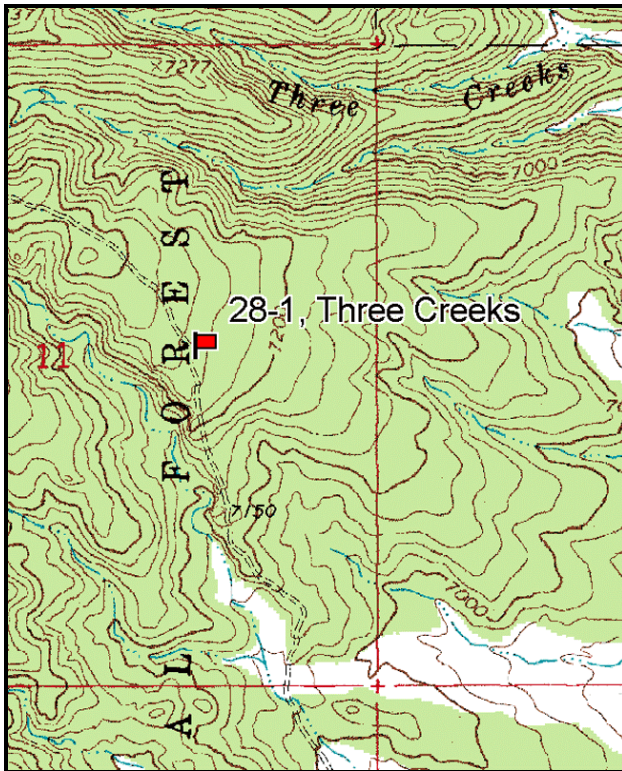
Vegetation type: Burn-Chained, Seeded P-J .

Compass bearing: frequency baseline 167 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). Rebar: belt 4 on 2ft, belt 2 on 1ft.

LOCATION DESCRIPTION

From the SR 20-US 89 junction, proceed south on US 89 for 3.1 miles to the Three Creeks road. Travel west on this road (do not take north fork by gate) for 0.5 miles to a fork. Bear right and go 1.85 miles to Three Forks taking the right most one. Travel 0.6 miles to a cattleguard. Continue 1.0 mile to a stockpond. Proceed up the washed out road for 0.55 miles to a fence taking a right fork at 0.3 miles. Continue 0.55 miles up to the chaining and to the witness post which is a short yellow fencepost. From the witness post by the road, walk 185 feet east to the 400-foot stake. The 0-foot baseline stake is 400 feet north, and the short green fencepost is marked by browse tag #7164.



Map Name: Panguitch NW

Diagrammatic Sketch

Township 33S, Range 6W, Section 11

GPS: NAD 83, UTM 12S 368985 E, 4201060 N

## DISCUSSION

### Three Creeks - Trend Study No. 28-1

#### Study Information

This study is found on the northeast edge of the Markagunt Plateau and drains easterly into the Sevier River [elevation: 7,200 feet (2,195 m), slope: 8%-10%, aspect: east]. Numerous intermittent streams are nearby with a stock pond one mile to the south. The area is utilized by deer in light winters, by an expanding elk herd, and grazed in the summer by cattle. The study area was chained and seeded in 1967, and converted to a sagebrush-grass type with scattered pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees. Due to an increase in the size of pinyon and juniper trees, a follow up treatment on these trees was done with chainsaws between 1987 and 1992. The site was also prescribed burned prior to the 2003 reading. Use of the site by wildlife was relatively low in 2003 at an estimated 15 deer and 9 elk days use/acre (38 ddu/ha and 21 edu/ha). Livestock use was estimated at 29 days use/acre (72 cdu/ha) in 2003. In 2008 pellet data estimated 7 elk days use/acre (18 edu/ha), 16 deer day use/acre (40 ddu/ha), and 10 cow day use/acre (25 cdu/ha).

#### Soils

The soil is tightly compacted with a high percentage of coarse fragments throughout the soil profile. Soil analysis indicates a sandy loam texture with a neutral pH (7.1). Phosphorus has only marginal availability for plant growth and development at 7.3 ppm, and potassium has low availability for vegetative growth and development at 28.8 ppm (Tiedmann and Lopez 2004). During the 1987 reading, it was observed that the road and washes nearby showed signs of severe gully erosion and signs of minor sheet erosion on the study site. At that time, soil movement was detectable and some grasses were pedestaled. Relative combined vegetation and litter cover was high at 67% in 1998, but decreased to 38% and 48% in 2003 and 2008, respectively. Relative combined rock and pavement cover has been low at 6%-8% since 1998. Relative combined bare ground cover increased from 25% in 1998 to 57% and 44% in 2003 and 2008, respectively. Even with the increase in bare ground and the corresponding decline in protective cover from vegetation and litter, the erosion condition was classified as stable in 2003 and 2008.

#### Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant shrub species, although hybridization with basin big sagebrush (*A. tridentata* ssp. *tridentata*) is occurring on the site making identification difficult. In 1987, most of the sagebrush was classified as basin big sagebrush while the majority of the sagebrush was determined to be mountain big sagebrush in all other surveys. The mountain big sagebrush population steadily declined from 1,760 plants/acre in 1992 to 700 plants/acre in 2003, then increased more than a two fold again to 1,600 plants/acre (3,952 plants/acre) in 2008. The decline in mountain big sagebrush in 2003 was a result of a large decline in the number of young plants in the population as well as an increase in the number of dead, of which, some of the dead plants had been burned. In 1987 and 1992, utilization was moderate with a few individual plants displaying heavy hedging. Utilization was mostly light from 1998-2008. Vigor has been normal for most of the population in all surveys, however, decadence increased to 26% in 2003. Basin big sagebrush density was estimated at about 100 plants/acre in 1992 and 1998 although none of the sagebrush on the site was classified as basin big sagebrush in 2003. As of 2008 basin big sagebrush density was estimated at 20/acre, all classified as mature.

Another important browse species on the site is bitterbrush (*Purshia tridentata*), although density is very low at around 100 plants/acre. The bitterbrush population has shown moderate to heavy utilization in all readings and low reproduction. Vigor has been good except in 1992 when 67% of the population was classified with poor vigor. Decadence was estimated at 25% in 2003 while no decadent plants were sampled in any other year. Broom snakeweed (*Gutierrezia sarothrae*), a subshrub that is considered an increaser, was very abundant in 1987 and 1992, decreasing in 1998 and 2003, and rebounding again in 2008.

Pinyon and juniper trees are scattered throughout the site. Combined quadrat cover of pinyon and juniper has been low at around 1% from 1992 to 2003, decreasing to 0% in 2008. Point-center quarter data estimated pinyon density to be 53 trees/acre in 1992, 59 trees/acre in 1998, 34 trees/acre in 2003, and 23 trees/acre in 2008. Juniper density was estimated at 43 trees/acre in 1992, 42 trees/acre in 1998, 25 trees/acre in 2003, and 21 trees in 2008. Fifty-five percent of the junipers sampled in 1992 were tipped trees that were still growing. These were taken out during the followup chainsaw treatment.

#### Herbaceous Understory

The herbaceous understory is dominated by crested wheatgrass (*Agropyron cristatum*), which was seeded onto the site as part of the original chaining treatment. Crested wheatgrass maintained a high nested frequency value during the first 3 readings, but significantly declined in 2003. However, it rebounded to 1992 levels in 2008. Crested wheatgrass was moderately utilized in 1998, but showed no sign of use in 2003. Several other perennial grasses have been sampled on the site including intermediate wheatgrass (*Agropyron intermedium*), western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread grass (*Stipa comata*). These species are important but occur in limited densities. Cheatgrass (*Bromus tectorum*) was encountered in one quadrat in 1998 and six quadrats in 2008, but was not sampled in any other year. Grass cover decreased from 21% in 1998 to 5% in 2003, but has rebounded to 14% in 2008. Forb diversity is high, but most species are rare. Silvery lupine (*Lupinus argenteus*) is the most abundant forb on the site, and it has accounted for the majority of the forb cover in all readings. Other important perennial forbs include lobeleaf groundsel (*Senecio multilobatus*), longleaf phlox (*Phlox longifolia*), and scarlet globemallow (*Sphaeralcea coccinea*).

#### 1992 TREND ASSESSMENT

Browse trend is slightly up. Density changes may have been related to the larger sample area in 1992; therefore the trend was determined using other parameters. The key browse species are basin big sagebrush and mountain big sagebrush. Decadence has increased slightly for both species, but vigor remains good in the population. Recruitment of young has increased markedly for mountain big sagebrush. The trend for the grasses is up. The sum of nested frequency of perennial grass has increased. Intermediate wheatgrass, western wheatgrass, and Indian ricegrass had a significant increase in their nested frequency. The nested frequency of crested wheatgrass declined significantly. Trend for the forbs is stable. There was a slight decline in the sum of nested frequency of perennial forbs.

winter range condition (DCI) - good (70) Mid-level potential scale

browse - slightly up (+1)

grass - up (+2)

forb - stable (0)

#### 1998 TREND ASSESSMENT

The browse trend is stable. The mountain big sagebrush population density has decreased 24% since 1992 from 1,760 plants/acre to 1,340 plants/acre, but decadence declined from 13% in 1992 to just 1%. The age structure has changed very little since 1992 with a mostly mature population and moderate recruitment by the young age class. The bitterbrush population is also stable. Broom snakeweed density has greatly declined since 1992 from 4,300 plants/acre to 900 plants/acre, probably due to annual precipitation patterns. The trend for both grasses and forbs is stable. Crested wheatgrass dominates the site with a significant increase of nested frequency since 1992. Perennial grass sum of nested frequency has changed little since 1992. Perennial forb sum of nested frequency shows a slight increase, but forbs are currently a minor component of the herbaceous understory.

winter range condition (DCI) - good (76) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is down. Some of the sagebrush sampled were burned. No data was found on the fire and not all sagebrush were burned. Mountain big sagebrush density declined from 1,340 plants/acre in 1998 to 700 plants/acre. The proportion of young plants in the population, which was moderately high in both 1992 and 1998, declined to only 6%. Decadence increased from 1% in 1998 to 26%. Bitterbrush density remained stable, but this species is in low abundance on the site. The trend for grasses is down. Perennial grass sum of nested frequency declined 58%. Four of the perennial grass species that were sampled on the site significantly declined in nested frequency, crested wheatgrass, intermediate wheatgrass, sedge (*Carex sp.*), and mutton bluegrass (*Poa fendleriana*). Trend for forbs is stable. There was a slight decrease in the sum of nested frequency of perennial forbs, but perennial forbs remain limited on the site.

winter range condition (DCI) - very poor (20) Mid-level potential scale  
browse - down (-2)                      grass - down (-2)                      forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is up. The density of the preferred browse species, mountain big sagebrush, has increased 56% from 2003 to 1,600 plants/acre. Decadence has declined from 2003 to 6%, and vigor remains good. Recruitment improved with the proportion of young plants in the population increasing to 35%. Antelope bitterbrush continued to display good vigor, although density is low. Invasive tree species such as juniper and pinyon pine have been recently cut and their density has declined. Trend for the grasses is up. The sum of nested frequency of perennial grasses increased two-fold from 2003. There was a significant increase in the nested frequency of crested wheatgrass, western wheatgrass, sedge, and needle-and-thread grass. Crested wheatgrass is still the dominant grass, accounting for 61% of grasses. The trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased by 58%, but forbs remain a small component of the site.

winter range condition (DCI) - poor (40) Mid-level potential scale  
browse - up (+2)                      grass - up (+2)                      forb - slightly up (+1)

HERBACEOUS TRENDS --  
 Management unit 28 , Study no: 1

| T<br>y<br>p<br>e | Species               | Nested Frequency |      |      |      |      | Average Cover % |       |      |      |
|------------------|-----------------------|------------------|------|------|------|------|-----------------|-------|------|------|
|                  |                       | '87              | '92  | '98  | '03  | '08  | '92             | '98   | '03  | '08  |
| G                | Agropyron cristatum   | c288             | b216 | c281 | a107 | b235 | 12.81           | 17.80 | 3.30 | 8.81 |
| G                | Agropyron intermedium | b45              | c143 | b60  | a7   | a8   | 4.77            | 1.26  | .02  | .18  |
| G                | Agropyron smithii     | a-               | b39  | b35  | b52  | c82  | 1.27            | .66   | .84  | 1.91 |
| G                | Agropyron spicatum    | -                | 4    | 8    | -    | -    | .63             | .05   | -    | -    |
| G                | Bouteloua gracilis    | ab27             | b53  | ab51 | a28  | ab36 | 2.32            | .62   | .51  | 1.95 |
| G                | Bromus tectorum (a)   | -                | -    | a2   | a-   | b13  | -               | .00   | -    | .06  |
| G                | Carex sp.             | a3               | ab12 | bc22 | a-   | c36  | .27             | .31   | -    | .55  |
| G                | Elymus junceus        | -                | 4    | -    | -    | 3    | .06             | -     | -    | .00  |
| G                | Oryzopsis hymenoides  | a-               | b27  | ab12 | a3   | ab16 | .63             | .06   | .01  | .20  |
| G                | Poa fendleriana       | a-               | a4   | b13  | a1   | a1   | .03             | .06   | .00  | .15  |
| G                | Poa secunda           | -                | -    | 4    | 3    | -    | -               | .01   | .00  | -    |
| G                | Sitanion hystrix      | -                | 6    | 14   | -    | -    | .33             | .10   | -    | -    |

| Type | Species                            | Nested Frequency |                  |                 |                  |                  | Average Cover % |       |      |       |
|------|------------------------------------|------------------|------------------|-----------------|------------------|------------------|-----------------|-------|------|-------|
|      |                                    | '87              | '92              | '98             | '03              | '08              | '92             | '98   | '03  | '08   |
| G    | <i>Stipa comata</i>                | a <sup>9</sup>   | a <sup>7</sup>   | a <sup>6</sup>  | a <sup>13</sup>  | b <sup>28</sup>  | .24             | .22   | .28  | .71   |
|      | Total for Annual Grasses           | 0                | 0                | 2               | 0                | 13               | 0               | 0.00  | 0    | 0.06  |
|      | Total for Perennial Grasses        | 372              | 515              | 506             | 214              | 445              | 23.39           | 21.17 | 5.00 | 14.47 |
|      | Total for Grasses                  | 372              | 515              | 508             | 214              | 458              | 23.39           | 21.17 | 5.00 | 14.53 |
| F    | <i>Alyssum alyssoides</i> (a)      | -                | -                | 3               | -                | -                | -               | .00   | -    | -     |
| F    | <i>Amaranthus</i> sp.              | -                | -                | -               | 3                | -                | -               | -     | .03  | -     |
| F    | <i>Arabis</i> sp.                  | 11               | -                | -               | -                | -                | -               | -     | -    | -     |
| F    | <i>Astragalus argophyllus</i>      | 1                | -                | -               | -                | -                | -               | -     | -    | -     |
| F    | <i>Astragalus convallarius</i>     | -                | -                | 2               | 5                | -                | -               | .03   | .06  | -     |
| F    | <i>Astragalus</i> sp.              | 2                | 1                | -               | -                | -                | .00             | -     | -    | -     |
| F    | <i>Castilleja chromosa</i>         | -                | 3                | 3               | 3                | 3                | .03             | .03   | .03  | .15   |
| F    | <i>Calochortus nuttallii</i>       | -                | -                | -               | 1                | -                | -               | -     | .00  | -     |
| F    | <i>Cryptantha fulvocanescens</i>   | b <sup>15</sup>  | ab <sup>13</sup> | a <sup>5</sup>  | a <sup>-</sup>   | ab <sup>8</sup>  | .07             | .04   | .00  | .04   |
| F    | <i>Cymopterus</i> sp.              | -                | -                | -               | -                | -                | -               | -     | .00  | -     |
| F    | <i>Descurainia</i> sp. (a)         | -                | b <sup>16</sup>  | a <sup>-</sup>  | a <sup>-</sup>   | a <sup>3</sup>   | .23             | -     | -    | .00   |
| F    | <i>Draba</i> sp. (a)               | -                | -                | 1               | -                | -                | -               | .00   | -    | -     |
| F    | <i>Erigeron pumilus</i>            | 4                | -                | -               | -                | -                | -               | -     | -    | -     |
| F    | <i>Gayophytum ramosissimum</i> (a) | -                | -                | -               | -                | 3                | -               | -     | -    | .01   |
| F    | <i>Ipomopsis aggregata</i>         | 7                | 3                | -               | -                | 1                | .00             | -     | -    | .00   |
| F    | <i>Lappula occidentalis</i> (a)    | -                | -                | a <sup>3</sup>  | a <sup>1</sup>   | b <sup>25</sup>  | -               | .00   | .00  | .12   |
| F    | <i>Lomatium</i> sp.                | -                | -                | -               | 2                | 2                | -               | -     | .03  | .00   |
| F    | <i>Lupinus argenteus</i>           | ab <sup>46</sup> | b <sup>49</sup>  | b <sup>51</sup> | a <sup>18</sup>  | ab <sup>34</sup> | 2.59            | 2.61  | 2.07 | 1.45  |
| F    | <i>Lygodesmia spinosa</i>          | -                | 2                | 2               | 5                | 6                | .00             | .03   | .30  | .21   |
| F    | <i>Machaeranthera canescens</i>    | 3                | -                | 4               | -                | -                | -               | .01   | -    | -     |
| F    | <i>Microsteris gracilis</i> (a)    | -                | -                | -               | -                | 2                | -               | -     | -    | .00   |
| F    | <i>Oenothera</i> sp.               | -                | -                | -               | -                | 2                | -               | -     | -    | .00   |
| F    | <i>Penstemon</i> sp.               | 11               | 5                | 4               | -                | 5                | .06             | .00   | -    | .01   |
| F    | <i>Phlox longifolia</i>            | a <sup>8</sup>   | ab <sup>11</sup> | c <sup>39</sup> | bc <sup>25</sup> | ab <sup>14</sup> | .08             | .17   | .08  | .04   |
| F    | <i>Polygonum douglasii</i> (a)     | -                | -                | 3               | -                | 7                | -               | .01   | -    | .01   |
| F    | <i>Senecio integerrimus</i>        | -                | -                | -               | 1                | -                | -               | -     | .00  | -     |
| F    | <i>Senecio multilobatus</i>        | ab <sup>13</sup> | a <sup>4</sup>   | a <sup>3</sup>  | b <sup>30</sup>  | c <sup>55</sup>  | .01             | .03   | .39  | .46   |
| F    | <i>Sphaeralcea coccinea</i>        | a <sup>-</sup>   | a <sup>6</sup>   | a <sup>5</sup>  | a <sup>6</sup>   | b <sup>21</sup>  | .09             | .01   | .09  | .14   |
| F    | <i>Streptanthus cordatus</i>       | 3                | -                | -               | 1                | 1                | -               | -     | .00  | .00   |
| F    | <i>Tragopogon dubius</i>           | -                | -                | -               | -                | 6                | -               | .00   | -    | .09   |
| F    | <i>Trifolium</i> sp.               | -                | -                | 1               | -                | 2                | -               | .00   | -    | .01   |
| F    | Unknown forb-annual (a)            | -                | 2                | -               | -                | -                | .03             | -     | -    | -     |

| Type                      | Species                | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|---------------------------|------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|                           |                        | '87              | '92 | '98 | '03 | '08 | '92             | '98  | '03  | '08  |
| F                         | Unknown forb-perennial | -                | 3   | 6   | -   | -   | .00             | .01  | -    | -    |
| F                         | Zigadenus paniculatus  | -                | -   | -   | 1   | -   | -               | -    | .00  | .01  |
| Total for Annual Forbs    |                        | 0                | 18  | 10  | 1   | 40  | 0.26            | 0.03 | 0.00 | 0.15 |
| Total for Perennial Forbs |                        | 124              | 100 | 125 | 101 | 160 | 2.96            | 3.00 | 3.12 | 2.64 |
| Total for Forbs           |                        | 124              | 118 | 135 | 102 | 200 | 3.22            | 3.03 | 3.12 | 2.79 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 1

| Type             | Species                                   | Strip Frequency |     |     |     | Average Cover % |      |      |      |
|------------------|---|-----------------|-----|-----|-----|-----------------|------|------|------|
|                  |   | '92             | '98 | '03 | '08 | '92             | '98  | '03  | '08  |
| B                | Artemisia nova                            | 1               | 1   | 0   | 0   | .00             | .00  | -    | -    |
| B                | Artemisia tridentata tridentata           | 5               | 5   | 0   | 1   | 2.77            | 1.29 | -    | .41  |
| B                | Artemisia tridentata vaseyana             | 33              | 45  | 23  | 45  | 4.02            | 6.34 | 2.74 | 3.77 |
| B                | Chrysothamnus nauseosus                   | 0               | 0   | 0   | 1   | -               | -    | -    | .00  |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 1               | 1   | 1   | 0   | .00             | .00  | .00  | .38  |
| B                | Gutierrezia sarothrae                     | 53              | 24  | 44  | 70  | .51             | .42  | 1.18 | .96  |
| B                | Juniperus osteosperma                     | 6               | 4   | 1   | 0   | 1.13            | .84  | .00  | -    |
| B                | Opuntia sp.                               | 12              | 5   | 9   | 6   | .33             | .06  | .06  | .00  |
| B                | Pinus edulis                              | 5               | 6   | 0   | 0   | .15             | .18  | 1.00 | -    |
| B                | Purshia tridentata                        | 2               | 5   | 4   | 4   | .18             | .68  | .01  | .30  |
| Total for Browse |   | 118             | 96  | 82  | 127 | 9.11            | 9.83 | 4.99 | 5.83 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 1

| Species                         | Percent Cover |      |
|---------------------------------|---------------|------|
|                                 | '03           | '08  |
| Artemisia tridentata tridentata | -             | 1.20 |
| Artemisia tridentata vaseyana   | 5.01          | 6.86 |
| Gutierrezia sarothrae           | .88           | 1.20 |
| Pinus edulis                    | .13           | -    |
| Purshia tridentata              | -             | .05  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 1

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.3                        | 2.3 |

POINT-QUARTER TREE DATA --

Management unit 28 , Study no: 1

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 41             | 25  | 21  |
| Pinus edulis          | 59             | 34  | 23  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 2.7                   | 3.2 | 1.4 |
| 1.6                   | 1.9 | 1.3 |

BASIC COVER --

Management unit 28 , Study no: 1

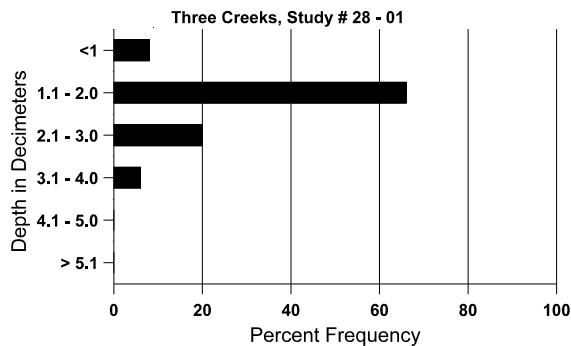
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 4.75            | 31.85 | 35.06 | 13.53 | 24.72 |
| Rock        | 3.25            | 12.85 | 3.88  | 3.44  | 3.15  |
| Pavement    | 11.00           | 0     | 5.90  | 2.87  | 5.46  |
| Litter      | 54.25           | 36.66 | 46.38 | 27.10 | 27.34 |
| Cryptogams  | .75             | .03   | .25   | .00   | .03   |
| Bare Ground | 26.00           | 35.43 | 30.17 | 61.03 | 47.73 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 1, Study Name: Three Creeks

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %0M | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 13.7                         | 62.7 (14.6)     | 7.1 | 54.2       | 38.0  | 7.8   | 2.2 | 7.3   | 28.8  | 0.5  |

Stoniness Index





PELLET GROUP DATA --

Management unit 28 , Study no: 1

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Rabbit | 61                | 29  | 31  | 87  |
| Elk    | -                 | 7   | 15  | 6   |
| Deer   | 18                | 18  | 15  | 5   |
| Cattle | 5                 | 16  | 22  | 12  |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| 9 (22)                 | 9 (22)  | 7 (18)  |
| 11 (27)                | 15 (38) | 16 (40) |
| 45 (111)               | 29 (72) | 10 (25) |

BROWSE CHARACTERISTICS --

Management unit 28 , Study no: 1

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia nova</b>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 100     | -          | -       | 0            | -/-                       |
| 98                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 18/30                     |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Artemisia tridentata tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>399</b>                            | 33                                       | 133   | 266    | -        | -    | 67          | 17      | 0          | -       | 0            | 31/31                     |
| 92                                     | <b>100</b>                            | -  | 60    | 20     | 20       | -    | 20          | 0       | 20         | -       | 0            | -/-                       |
| 98                                     | <b>120</b>                            | -  | 40    | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 44/64                     |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                     | <b>20</b>                             | 20                                       | -     | 20     | -        | 20   | 0           | 0       | 0          | -       | 0            | 51/69                     |
| <b>Artemisia tridentata vaseyana</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>33</b>                             | -  | -     | 33     | -        | -    | 100         | 0       | 0          | -       | 0            | 9/11                      |
| 92                                     | <b>1760</b>                           | 20                                       | 620   | 920    | 220      | -    | 67          | 8       | 13         | -       | 2            | -/-                       |
| 98                                     | <b>1340</b>                           | 20                                       | 400   | 920    | 20       | 160  | 10          | 0       | 1          | -       | 0            | 22/30                     |
| 03                                     | <b>700</b>                            | -  | 40    | 480    | 180      | 460  | 11          | 6       | 26         | 3       | 6            | 20/28                     |
| 08                                     | <b>1600</b>                           | 2180                                     | 560   | 940    | 100      | 440  | 8           | 0       | 6          | 1       | 1            | 22/33                     |
| <b>Chrysothamnus nauseosus</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                     | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 9/12                      |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 19/42                     |
| 03   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 19/27                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 13/21                     |
| <b>Gutierrezia sarothrae</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>5131</b>                           | -  | 366   | 4699   | 66       | -    | 0           | 0       | 1          | -       | 0            | 9/9                       |
| 92   | <b>4300</b>                           | 320                                      | 2040  | 2260   | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98   | <b>900</b>                            | 120                                      | 160   | 720    | 20       | -    | 0           | 0       | 2          | -       | 0            | 9/7                       |
| 03   | <b>1640</b>                           | -  | 60    | 1280   | 300      | 740  | 0           | 0       | 18         | 5       | 5            | 9/9                       |
| 08   | <b>5460</b>                           | 1260                                     | 740   | 4300   | 420      | 380  | 12          | 3       | 8          | .73     | .73          | 8/8                       |
| <b>Juniperus osteosperma</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>120</b>                            | -  | 80    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>80</b>                             | -  | 60    | 20     | -        | 80   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>20</b>                             | -  | 20    | -      | -        | 140  | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | 40   | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Leptodactylon pungens</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>333</b>                            | -  | -     | 333    | -        | -    | 0           | 0       | -          | -       | 0            | 6/7                       |
| 92   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/10                      |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 7/9                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 5/6                       |
| <b>Opuntia sp.</b>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>266</b>                            | -  | 33    | 233    | -        | -    | 0           | 0       | 0          | -       | 13           | 4/14                      |
| 92   | <b>400</b>                            | -  | 80    | 240    | 80       | -    | 0           | 0       | 20         | 20      | 20           | -/-                       |
| 98   | <b>140</b>                            | -  | -     | 120    | 20       | 20   | 0           | 0       | 14         | -       | 0            | 5/8                       |
| 03   | <b>220</b>                            | -  | -     | 220    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/11                      |
| 08   | <b>120</b>                            | -  | -     | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | 5/11                      |
| <b>Pinus edulis</b>                              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>33</b>                             | -  | 33    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>100</b>                            | -  | 80    | 20     | -        | -    | 0           | 40      | -          | -       | 0            | -/-                       |
| 98   | <b>120</b>                            | -  | 80    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | 60   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Purshia tridentata</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                        | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 100     | 0          | -       | 0            | 6/18                      |
| 92                        | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 33      | 0          | -       | 67           | -/-                       |
| 98                        | <b>100</b>                            | -  | 20    | 80     | -        | -    | 60          | 20      | 0          | -       | 0            | 15/27                     |
| 03                        | <b>80</b>                             | -  | -     | 60     | 20       | -    | 25          | 75      | 25         | -       | 0            | 7/24                      |
| 08                        | <b>100</b>                            | -  | -     | 100    | -        | -    | 20          | 80      | 0          | -       | 0            | 18/37                     |

Trend Study 28-3-08

Study site name: Bear Valley .

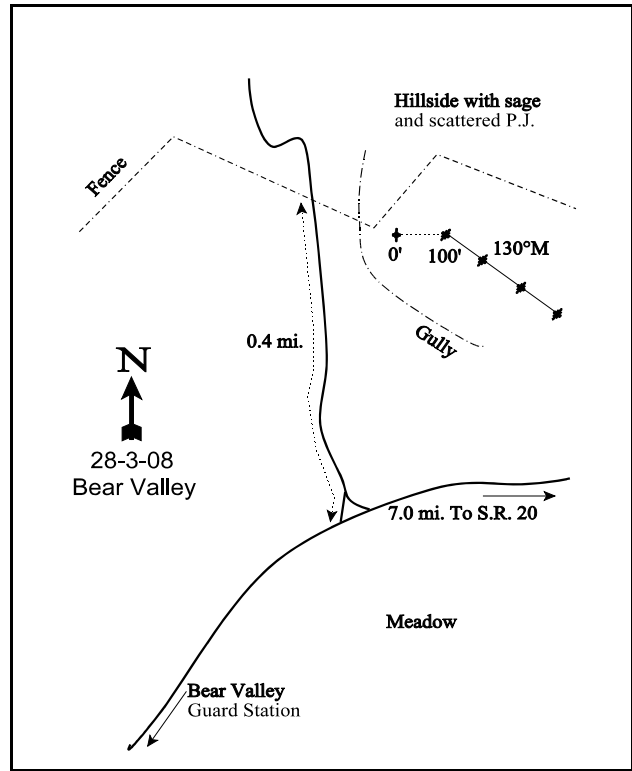
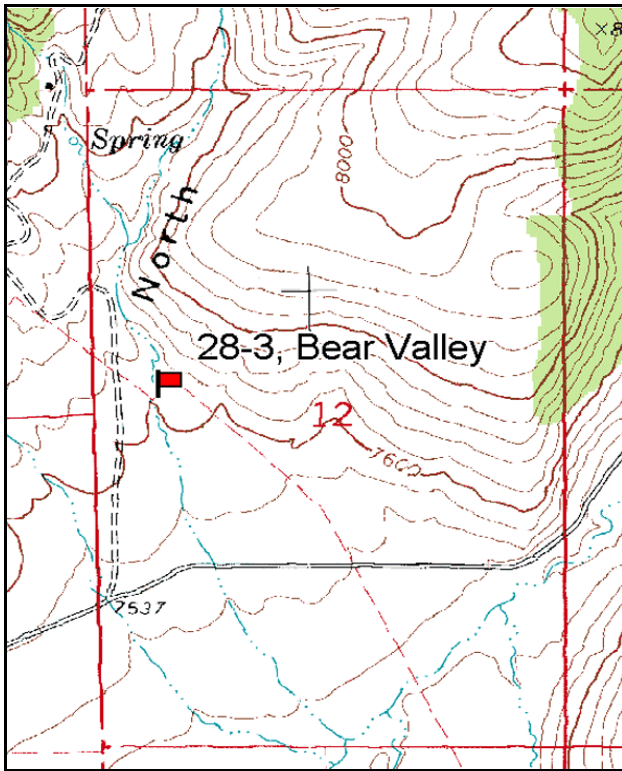
Vegetation type: Chained Shrubland .

Compass bearing: frequency baseline 77 degrees magnetic. (Lines 2-4 130°M).

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From the US 89-SR 20 Junction, go approximately 7.0 miles west on SR 20 to a corral past mile marker 14. Turn left on the Little Creek Road that leads to Bear Valley. Travel 7.0 miles south on the main road to a minor fork. Turn right and go 0.4 miles to a fence and wire gate. Stop here and walk east along the fenceline to the corner. Walk 4 paces east from the fence corner to a short red fencepost tagged #7163 which is the 0-foot baseline stake. The 100-foot stake is rebar.



Map name: Little Creek Peak

Diagrammatic Sketch

Township 33S, Range 6 1/2W, Section 5

GPS: NAD 83, UTM 12S 360496 E, 4202117 N

## DISCUSSION

### Bear Valley - Trend Study No. 28-3

#### Study Information

This study samples a seeded range in the bottom of a large valley at the north end of Upper Bear Valley [elevation: 7,600 feet (2,316 m), slope: 3%-5%, aspect: southeast]. The area is at the upper limits of normal deer winter range and is also used by elk. Several cabins can be found a few miles from the transect and a stream and stock pond are found within a half mile. Pellet group transect data collected on site in 1998 estimated 3 elk, 19 deer, and 65 cow days use/acre (7 ddu/ha, 47 edu/ha, and 161 cdu/ha). Deer use remained low in 2003 at an estimated 11 days use/acre (28 ddu/ha) while cattle declined to only 22 days use/acre (56 cdu/ha). Pellet data in 2008 estimated 3 elk day use/acre (8 edu/ha), 5 deer days/acre (12 ddu/ha), 11 cow day use/acre (27 cdu/ha), and 17 sage grouse pellets/acre. Rabbit pellets were very abundant on the site in 2003 and were sampled in 82% of the sampling quadrats.

#### Soil

Soil analysis indicates a sandy loam texture with a moderately acidic pH (5.8). The soil is fairly deep with an average effective rooting depth of more than 17 inches (43 cm). Since 1998, relative combined vegetation and litter cover ranged from 59%-66%, and relative combined rock and pavement cover has been 5%-10%. Relative bare ground cover has ranged from 25%-36% since 1998. An erosion condition class assessment rated soils to be stable in 2003 and 2008.

#### Browse

Browse is not a prominent forage component on this seeding. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the only preferred browse species on the site. Sagebrush increased in density between 1992 and 1998 due to the abundance of young plants in the population (1,200 plants/acre) in 1998. With drought prior to and including 2003, the number of young declined to only 20 plants/acre, and overall sagebrush density declined with an increase in decadence in the population. In 2008, sagebrush density decreased further to 700 plants/acre, but recruitment and decadence improved. Use was mostly light to moderate in all sample years. Big sagebrush is much more abundant on the slopes that surround this seeded valley bottom.

Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is the most abundant browse on the site. Density has decreased from a high of 17,080 plants/acre in 1992 to 5,880 plants/acre in 2008. Stickyleaf low rabbitbrush plants are vigorous and most show light use. Other shrubs sampled on the site in low densities include rubber rabbitbrush (*Chrysothamnus nauseosus*), gray horsebrush (*Tetrademia canescens*), and broom snakeweed (*Gutierrezia sarothrae*).

#### Herbaceous Understory

As mentioned above, mountain big sagebrush is abundant on the slopes that surround the valley bottom, although the transect samples the valley bottom which is dominated by seeded grasses, primarily crested wheatgrass (*Agropyron cristatum*). Crested wheatgrass has maintained a nearly stable frequency over the years and has been sampled in 98-100% of the quadrats in all readings. Crested wheatgrass has provided at least 90% of the total grass cover on the site since 1992. Western wheatgrass (*Agropyron smithii*) is second in abundance to crested wheatgrass. The wheatgrasses were noted as being large and vigorous with light to moderate utilization in 1998. Blue grama (*Bouteloua gracilis*) and a sedge (*Carex* sp.) are scattered throughout the site and both show a significant decline in nested frequency since 1987.

Forbs were diverse and moderately abundant from 1987-1998. In 2003, with drought conditions, perennial forbs declined in sum of nested frequency by nearly 90%, and annual forbs declined by nearly 98%. Forbs showed a slight recovery in 2008 with an increase in the sum of nested frequency of perennial forbs and the total forb cover increasing from 1% in 2003 to 4%. Although forbs are less important as winter forage, silvery

lupine (*Lupinus argenteus*), yellow salsify (*Tragopogon dubius*), lobeleaf groundsel (*Senecio multilobatus*), and dandelion (*Taraxacum officinale*) provide desirable spring and summer feed.

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Density differences may be related to the larger sample area used in 1992; therefore trend for browse was determined using different parameters. The vigor of mountain big sagebrush remains good and decadence was low. The less desirable stickyleaf low rabbitbrush has a high density of 17,080 plants/acre and maintains a dynamic young class. Trend for both the grasses and forbs is stable. The sums of nested frequency of perennial grasses and perennial forbs showed little change.

winter range condition (DCI) - poor (38) Mid-level potential scale  
browse - stable (0)                      grass - stable (0)                      forb - stable (0)

#### 1998 TREND ASSESSMENT

The browse trend is slightly up. The mountain big sagebrush density has increased 92% since 1992 from 120 plants/acre to 1,540 plants/acre, but this is a mostly young population that still needs to become established. The proportion of sagebrush plants displaying poor vigor increased to 21% from 1992, but there were no decadent plants sampled. The stickyleaf low rabbitbrush population density declined by 34% since 1992 to 11,320 plants/acre. The trend for grasses is slightly down. The sum of nested frequency of perennial grasses increased slightly from 1992, but cover remained similar. There was a significant increase in the nested frequency of Kentucky bluegrass (*Poa pratensis*) and a significant decrease in the nested frequency of needle-and-thread grass (*Stipa comata*). The trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased nearly two-fold since 1992, though the sum of nested frequency of annual forbs increased markedly as well. There were significant increases in the nested frequency of silvery lupine, longleaf phlox (*Phlox longifolia*), and yellow salsify.

winter range condition (DCI) - poor (40) Mid-level potential scale  
browse - slightly up (+1)                      grass - slightly down (-1)                      forb - slightly up (+2)

#### 2003 TREND ASSESSMENT

Trend for browse is down. The mountain big sagebrush population declined in density from 1998 to 940 plants/acre, and decadence increased to 40%. Recruitment into the population by young plants was very high in 1998 at 78%, but declined to only 2%. Trend for the grasses is stable. Perennial grasses have changed little in sum of nested frequency, though production of perennial grasses increased as average cover increased from 19% in 1998 to 27%. There was a significant decrease in the nested frequency of Kentucky bluegrass. Trend for forbs is down. The sum of nested frequency declined 88% from 1998, and production of perennial forbs declined from 5% total cover in 1998 to 1%. Yellow salsify, dandelion, and silvery lupine declined significantly in nested frequency with only silvery lupine being sampled. These are important species that provide spring and summer forage.

winter range condition (DCI) - very poor - poor (35) Mid-level potential scale  
browse - down (-2)                      grass - stable (0)                      forb - down (-2)

#### 2008 TREND ASSESSMENT

Trend for browse is slightly up. Mountain big sagebrush density declined by 26% from 2003 to 700 plants/acre, but decadence also declined to 11% and vigor remained good in the population. Sagebrush cover has increased to 4% and plants have grown larger as the population matures. Recruitment improved with young plants comprising 23% of the population. The density of the other dominant shrub, stickyleaf low rabbitbrush, has decreased to 5,880 plants/acre, the lowest density since sampling began. Trend for grasses is stable. The sum of nested frequency of perennial grasses changed little from 2003. Trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased slightly from 2003, and production of perennial

forbs increased to 3% of the total cover. Forbs are still somewhat rare however.

winter range condition (DCI) - poor (40) Mid-level potential scale  
browse - slightly up (+1)      grass - stable (0)      forb - slightly up (+1)

HERBACEOUS TRENDS --  
 Management unit 28 , Study no: 3

| T<br>y<br>p<br>e            | Species                       | Nested Frequency |      |      |      |     | Average Cover % |       |       |       |
|-----------------------------|-------------------------------|------------------|------|------|------|-----|-----------------|-------|-------|-------|
|                             |                               | '87              | '92  | '98  | '03  | '08 | '92             | '98   | '03   | '08   |
| G                           | Agropyron cristatum           | 320              | 297  | 299  | 318  | 322 | 17.26           | 17.40 | 25.88 | 28.31 |
| G                           | Agropyron smithii             | ab41             | b73  | ab58 | ab42 | a29 | .31             | .45   | .34   | .71   |
| G                           | Bouteloua gracilis            | c32              | bc25 | ab7  | a3   | a4  | .43             | .21   | .15   | .03   |
| G                           | Bromus inermis                | -                | -    | -    | -    | 5   | -               | -     | -     | .18   |
| G                           | Bromus tectorum (a)           | -                | -    | a18  | a38  | b72 | -               | .52   | .76   | .58   |
| G                           | Carex sp.                     | b19              | ab10 | a-   | a3   | a-  | .02             | -     | .00   | -     |
| G                           | Elymus junceus                | 3                | 1    | 2    | 3    | -   | .00             | .00   | .15   | -     |
| G                           | Poa pratensis                 | ab5              | a2   | b12  | ab-  | b16 | .03             | .37   | -     | .16   |
| G                           | Stipa comata                  | ab27             | b44  | a13  | a9   | a15 | 1.10            | .37   | .26   | .44   |
| Total for Annual Grasses    |                               | 0                | 0    | 18   | 38   | 72  | 0               | 0.52  | 0.76  | 0.58  |
| Total for Perennial Grasses |                               | 447              | 452  | 391  | 378  | 391 | 19.17           | 18.82 | 26.78 | 29.84 |
| Total for Grasses           |                               | 447              | 452  | 409  | 416  | 463 | 19.17           | 19.34 | 27.54 | 30.42 |
| F                           | Agoseris glauca               | a-               | a-   | a2   | a2   | b39 | -               | .00   | .03   | .23   |
| F                           | Androsace septentrionalis (a) | -                | b15  | c162 | a-   | b13 | .03             | 2.82  | -     | .14   |
| F                           | Arabis sp.                    | 2                | -    | -    | -    | -   | -               | -     | -     | -     |
| F                           | Artemisia ludoviciana         | 11               | 3    | 11   | 3    | 6   | .00             | .56   | .00   | .06   |
| F                           | Astragalus panguicensis       | 3                | 8    | 2    | -    | 5   | .02             | .01   | -     | .01   |
| F                           | Castilleja linariaefolia      | -                | -    | -    | 10   | -   | -               | -     | .18   | -     |
| F                           | Chaenactis douglasii          | 3                | -    | -    | -    | -   | -               | -     | -     | -     |
| F                           | Cirsium sp.                   | -                | 8    | 4    | 5    | 8   | .04             | .15   | .04   | .36   |
| F                           | Collinsia parviflora (a)      | -                | -    | 112  | -    | 85  | -               | .91   | -     | .21   |
| F                           | Crepis acuminata              | -                | -    | 4    | -    | -   | -               | .01   | -     | -     |
| F                           | Delphinium nuttallianum       | -                | -    | -    | -    | 2   | -               | -     | -     | .00   |
| F                           | Descurainia pinnata (a)       | -                | -    | 2    | 1    | -   | -               | .00   | .00   | -     |
| F                           | Dracocephalum parviflorum     | -                | -    | 3    | -    | -   | -               | .01   | -     | -     |
| F                           | Epilobium brachycarpum (a)    | -                | -    | 1    | -    | -   | -               | .00   | -     | -     |
| F                           | Eriogonum cernuum (a)         | -                | 4    | -    | -    | 1   | .01             | -     | -     | .00   |
| F                           | Erigeron flagellaris          | 1                | -    | -    | -    | -   | -               | -     | -     | -     |
| F                           | Erigeron pumilus              | -                | -    | -    | 2    | -   | -               | -     | .00   | -     |
| F                           | Euphorbia sp.                 | -                | -    | 3    | -    | -   | -               | .03   | -     | -     |

| Type                      | Species                    | Nested Frequency |      |      |      |      | Average Cover % |       |      |      |
|---------------------------|----------------------------|------------------|------|------|------|------|-----------------|-------|------|------|
|                           |                            | '87              | '92  | '98  | '03  | '08  | '92             | '98   | '03  | '08  |
| F                         | Gayophytum ramosissimum(a) | -                | -    | a-   | a-   | b110 | -               | -     | -    | .81  |
| F                         | Ipomopsis aggregata        | -                | -    | 1    | -    | -    | -               | .00   | -    | -    |
| F                         | Lappula occidentalis (a)   | -                | a12  | c116 | a12  | b35  | .03             | 1.89  | .04  | .17  |
| F                         | Lactuca serriola           | -                | -    | -    | -    | 1    | -               | -     | -    | .00  |
| F                         | Lepidium sp. (a)           | -                | 2    | -    | -    | -    | .00             | -     | -    | -    |
| F                         | Lupinus argenteus          | c91              | b70  | c109 | a7   | a9   | 2.97            | 1.35  | .30  | .04  |
| F                         | Lygodesmia spinosa         | a10              | b16  | ab14 | ab12 | ab11 | .27             | .39   | .39  | .60  |
| F                         | Microsteris gracilis (a)   | -                | a3   | c216 | a3   | b125 | .00             | 2.27  | .00  | .45  |
| F                         | Oenothera coronopifolia    | -                | -    | 10   | -    | -    | -               | .07   | -    | -    |
| F                         | Oenothera pallida          | b35              | a9   | ab27 | a-   | a4   | .05             | .31   | -    | .01  |
| F                         | Penstemon sp.              | -                | -    | 1    | -    | -    | -               | .00   | -    | -    |
| F                         | Phlox longifolia           | b50              | b61  | c140 | a7   | b67  | .15             | .86   | .16  | .48  |
| F                         | Polygonum douglasii (a)    | -                | bc31 | c94  | a-   | b13  | .07             | 1.00  | -    | .03  |
| F                         | Senecio douglasii          | b30              | b27  | a-   | a-   | b19  | .54             | -     | -    | .70  |
| F                         | Senecio multilobatus       | -                | -    | 1    | -    | 2    | -               | .00   | -    | .03  |
| F                         | Sphaeralcea coccinea       | -                | -    | 9    | -    | 2    | -               | .07   | -    | .00  |
| F                         | Taraxacum officinale       | b11              | ab5  | b12  | a-   | a-   | .01             | .06   | -    | .00  |
| F                         | Tragopogon dubius          | b18              | ab1  | c55  | a-   | a-   | .00             | .62   | -    | -    |
| F                         | Unknown forb-annual (a)    | -                | -    | 37   | -    | -    | -               | .12   | -    | -    |
| Total for Annual Forbs    |                            | 0                | 67   | 740  | 16   | 382  | 0.15            | 9.05  | 0.04 | 1.84 |
| Total for Perennial Forbs |                            | 265              | 208  | 408  | 48   | 175  | 4.06            | 4.56  | 1.12 | 2.57 |
| Total for Forbs           |                            | 265              | 275  | 1148 | 64   | 557  | 4.21            | 13.61 | 1.17 | 4.41 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 3

| Type             | Species                                   | Strip Frequency |     |     |     | Average Cover % |       |      |      |
|------------------|---|-----------------|-----|-----|-----|-----------------|-------|------|------|
|                  |   | '92             | '98 | '03 | '08 | '92             | '98   | '03  | '08  |
| B                | Artemisia tridentata vaseyana             | 5               | 31  | 19  | 21  | .13             | 1.25  | 2.79 | 4.26 |
| B                | Chrysothamnus nauseosus                   | 1               | 19  | 0   | 0   | .15             | 1.25  | -    | -    |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 99              | 99  | 86  | 78  | 4.56            | 10.96 | 2.63 | 2.57 |
| B                | Gutierrezia sarothrae                     | 0               | 0   | 2   | 3   | -               | -     | .00  | .03  |
| B                | Tetradymia canescens                      | 5               | 6   | 5   | 8   | .44             | .21   | .30  | .33  |
| Total for Browse |   | 110             | 155 | 112 | 110 | 5.28            | 13.68 | 5.73 | 7.20 |



CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 3

| Species                                   | Percent Cover |      |
|---|---------------|------|
|   | '03           | '08  |
| Artemisia tridentata vaseyana             | 1.31          | 4.91 |
| Chrysothamnus viscidiflorus viscidiflorus | 2.08          | 2.98 |
| Tetradymia canescens                      | .05           | .16  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 3

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.2                        | 2.6 |

BASIC COVER --

Management unit 28 , Study no: 3

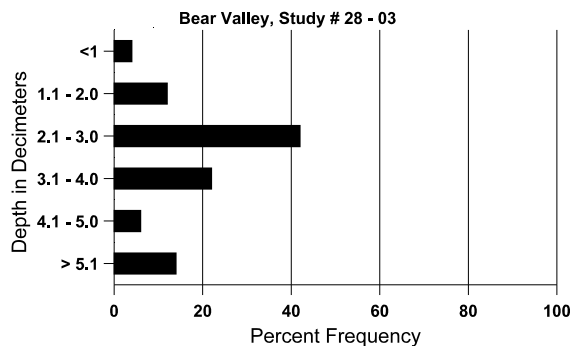
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 7.00            | 28.50 | 45.32 | 34.58 | 42.25 |
| Rock        | 4.75            | 6.33  | .26   | .27   | .03   |
| Pavement    | 11.50           | 0     | 11.18 | 5.51  | 7.40  |
| Litter      | 58.50           | 25.89 | 48.66 | 24.17 | 34.70 |
| Cryptogams  | 0               | 0     | .00   | 0     | .03   |
| Bare Ground | 18.25           | 37.15 | 28.85 | 42.65 | 27.33 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 3, Study Name: Bear Valley

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K  | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|--------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |        |      |
| 17.3                         | 62.0 (12.9)     | 5.8 | 64.2       | 20.0   | 15.8   | 2.3 | 19.9  | 1542.4 | 0.3  |

Stoniness Index



PELLET GROUP DATA --  
 Management unit 28 , Study no: 3

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Rabbit | 88                | 19  | 82  | 96  |
| Elk    | -                 | 2   | -   | 1   |
| Deer   | 10                | 23  | 9   | 2   |
| Cattle | 3                 | 29  | 8   | 25  |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| 3 (7)                  | -       | 3 (8)   |
| 19 (47)                | 11 (28) | 5 (12)  |
| 65 (161)               | 23 (56) | 11 (27) |

BROWSE CHARACTERISTICS --  
 Management unit 28 , Study no: 3

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y  | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>932</b>                            | -  | 333   | 599    | -        | -    | 36          | 7       | 0          | -       | 7            | 7/6                       |
| 92   | <b>120</b>                            | 40                                       | 20    | 100    | -        | -    | 50          | 0       | 0          | -       | 0            | -/-                       |
| 98   | <b>1540</b>                           | 160                                      | 1200  | 340    | -        | 40   | 9           | 0       | 0          | -       | 21           | 21/28                     |
| 03   | <b>940</b>                            | 20                                       | 20    | 540    | 380      | 60   | 26          | 17      | 40         | 2       | 2            | 22/27                     |
| 08   | <b>700</b>                            | 60                                       | 160   | 460    | 80       | 140  | 3           | 6       | 11         | 3       | 9            | 25/34                     |
| <i>Chrysothamnus nauseosus</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>265</b>                            | -  | 66    | 199    | -        | -    | 0           | 0       | -          | -       | 0            | 20/13                     |
| 92   | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 100          | -/-                       |
| 98   | <b>560</b>                            | -  | 100   | 460    | -        | -    | 0           | 0       | -          | -       | 0            | 11/17                     |
| 03   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | 24/34                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 38/56                     |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>10664</b>                          | 133                                      | 6466  | 3599   | 599      | -    | .62         | 0       | 6          | -       | 6            | 17/12                     |
| 92   | <b>17080</b>                          | 480                                      | 9060  | 7500   | 520      | -    | 12          | 1       | 3          | .23     | .93          | -/-                       |
| 98   | <b>11320</b>                          | 160                                      | 4260  | 6860   | 200      | 140  | 3           | 0       | 2          | .35     | 2            | 14/16                     |
| 03   | <b>6580</b>                           | 20                                       | 920   | 4800   | 860      | 180  | 2           | 11      | 13         | 4       | 4            | 9/8                       |
| 08   | <b>5880</b>                           | 80                                       | 980   | 3920   | 980      | 40   | 12          | 10      | 17         | 3       | 3            | 9/11                      |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 3/4                       |
| 08   | <b>100</b>                            | -  | 20    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | 3/3                       |

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b><i>Symphoricarpos oreophilus</i></b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 87                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 16/14                     |  |
| 03                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 37/82                     |  |
| 08                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 32/61                     |  |
| <b><i>Tetradymia canescens</i></b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 87                                      | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |  |
| 92                                      | <b>240</b>                            | -  | 80    | 140    | 20       | -    | 8           | 0       | 8          | -       | 0            | -/-                       |  |
| 98                                      | <b>180</b>                            | -  | 20    | 160    | -        | -    | 11          | 0       | 0          | -       | 0            | 14/21                     |  |
| 03                                      | <b>200</b>                            | -  | -     | 140    | 60       | -    | 10          | 10      | 30         | -       | 0            | 11/13                     |  |
| 08                                      | <b>320</b>                            | -  | 60    | 200    | 60       | -    | 6           | 0       | 19         | -       | 0            | 9/12                      |  |

Trend Study 28-4-08

Study site name: Buckskin Valley .

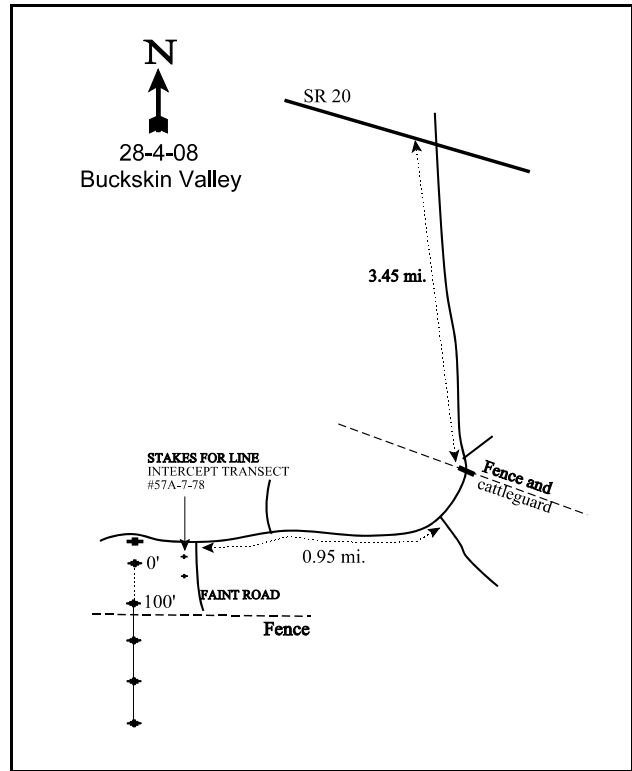
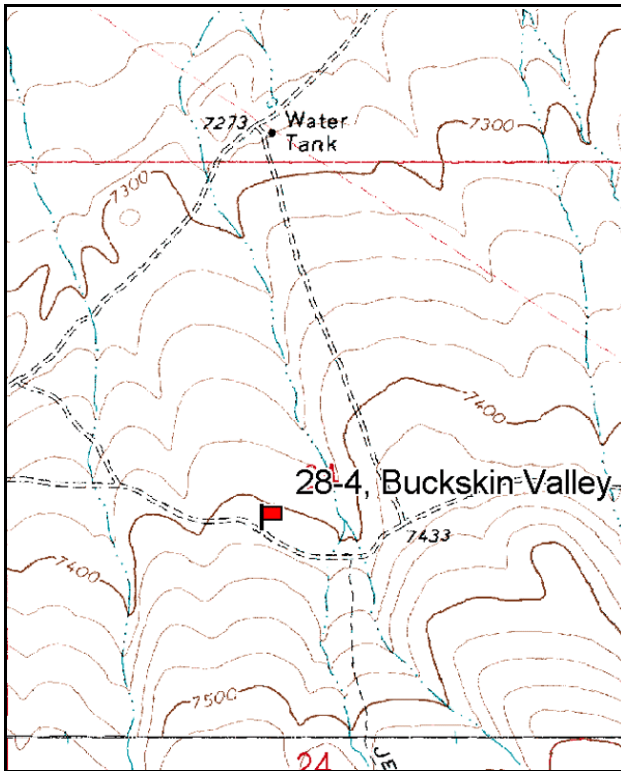
Vegetation type: Mixed Mountain Brush .

Compass bearing: frequency baseline 182 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). Rebar: belt 4 on 10ft.

LOCATION DESCRIPTION

From SR 20 just west of mile marker 7, turn south onto the Buckskin Valley road. Travel 3.45 miles to a cattleguard. Just beyond the fence and cattleguard, bear right and proceed west 0.95 miles to an intersection where a very faint road goes to the south. About 60 feet west of this intersection is the witness post on the south (left) side of the road. The 0-foot stake is 6 feet southeast of the witness post. The 0-foot stake is a 2 foot tall green fencepost marked by a red browse tag #9005. The frequency baseline runs south-southwest from here. The old line-intercept transect 57A-7-78 is marked by a red-painted steel fencepost 10 feet east of this study.



Map Name: Burnt Peak

Diagrammatic Sketch

Township 32S, Range 7W, Section 24

GPS: NAD 83, UTM 12S 359445 E, 4207552 N

## DISCUSSION

### Buckskin Valley - Trend Study No. 28-4

#### Study Information

Buckskin Valley, located on the northern end of the unit, is important big game transitional range and winter range in mild winters [elevation: 7,400 feet (2,256 m), slope: 5%, aspect: northeast]. This study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated community. The lower areas have been extensively treated by the BLM to enhance livestock grazing. The area where the transect is located, in the upper part of the valley, is a cattle-sheep allotment used for late spring grazing, although cattle were on the site during the 1992 reading in early August. A pellet group transect read on the study site in 1998 estimated 49 deer days use/acre (121 ddu/ha) and 7 cow days use/acre (17 cdu/ha). Pellet group transect data collected in 2003 estimated 51 deer, 1 cow, and 12 sheep days use/acre (126 ddu/ha, 2 cdu/ha, and 30 sdu/ha). Pellet data from 2008 estimated 43 deer days use/acre (106 ddu/ha), 1 elk day use/acre (3 edu/ha) and 6 cow days use/acre (14 cdu/ha).

#### Soils

Soil analysis indicates a loam texture with a moderately acidic pH (5.9). The effective rooting depth was estimated at just over 14 inches (36 cm). The soil is dark in color and rocks are fairly common on the surface. There is evidence of compaction and crusting due to the relatively high clay content (26%). Since 1992, relative combined vegetation and litter cover has been 68%-76% , and relative combined rock and pavement cover has been 3%-5%. Relative bare ground cover has been moderate ranging from 19%-29% since 1992. However, the erosion condition was classified as stable rating in 2003 and 2008.

#### Browse

The preferred shrubs on the site include dense stand of mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Density of sagebrush declined from its high in 1992 of 8,980 plants/acre to an average of around 5,000 plants/acre from 1998 to 2008. The population is overly mature with moderate to high decadence in all years. The proportion of the population made up of seedling and young plants has been low in all readings. Utilization of sagebrush was moderate to heavy in 1987 and 1992, moderate in 1998, and mostly light in 2003 and 2008. Sagebrush vigor has been normal on the majority of the population in all years.

Interspersed in the dense sagebrush canopy are highly preferred bitterbrush plants. Bitterbrush density declined from its high in 1992 of 3,080 plants/acre to an average of around 1,800 plants/acre from 1998 to 2008. Young plants were very abundant in 1987 and 1992 as they made up 50% and 34% of the population, respectively. The proportion of young in the population steadily declined since 1992 at 15% in 1998, 3% in 2003, and no young plants were sampled in 2008. Moderate to heavy use on bitterbrush has occurred in all sample years as a result of use by big game and sheep. Other browse species that occur in low densities include Gambel oak (*Quercus gambelii*), snowberry (*Symphoricarpos oreophilus*), and prickly pear cactus (*Opuntia* sp.).

#### Herbaceous Understory

Sheltered by the dense shrub overstory is a variety of fairly abundant herbaceous species. Western wheatgrass (*Agropyron smithii*), bottlebrush squirreltail (*Sitanion hystrix*), Letterman needlegrass (*Stipa lettermani*), mutton bluegrass (*Poa fendleriana*), and Kentucky bluegrass (*Poa pratensis*) are the predominant perennial grasses. Cheatgrass (*Bromus tectorum*) is also fairly abundant and was sampled in over half of the quadrats in 1998, 2003, and 2008, a significant increase since 1992. Cheatgrass does not pose a serious fire hazard yet, but with further increases it could. Western wheatgrass is the most abundant grass followed by cheatgrass. Forbs have had high diversity and abundance on this site in all readings, but showed a moderate decline in sum of nested frequency and average cover in 2003 with drought. The most abundant perennial forbs included milkvetch (*Astragalus* sp.), douglas chaenactis (*Chaenactis douglasii*), Wheeler's thistle (*Cirium wheeleri*),

redroot eriogonum (*Eriogonum racemosum*), silvery lupine (*Lupinus argenteus*), longleaf phlox (*Phlox longifolia*), clover (*Trifolium* sp.), and foothill death camas (*Zigadenus paniculatus*). The annual, blue-eyed Mary (*Collinsia parviflora*), was very abundant in 1998, 2003, and 2008. This species accounted for 69% of the total forb cover in 2003 and 35% in 2008. Foothill death camas was the only other forb with notable cover.

#### 1992 TREND ASSESSMENT

Browse trend is considered slightly down. Density differences may be related to the larger sample area used in 1992, therefore, the trend for browse was determined using other parameters. Decadence of mountain big sagebrush increased from 36% in 1987 to 56%, and plants displaying poor vigor increased from 7% in 1987 to 16%. Recruitment of young plants declined from 11% of the population in 1987 to 3%. Antelope bitterbrush decadence increased to 10%, but vigor remained good. Recruitment of young bitterbrush declined from 50% in 1987 to 34%. The trend for grasses is slightly up. Grasses account for 18% of the total vegetation cover. The sum of nested frequency of perennial grasses increased by 23% from 1987. Mutton bluegrass (*Poa fendleriana*) and needle-and-thread grass (*Stipa comata*) increased significantly in nested frequency from 1987. Trend for forbs is stable. There was little change in the sum of nested frequency of perennial forbs.

winter range condition (DCI) - fair-good (63) Mid-level potential scale  
browse - slightly down (-1)      grass - slightly up (+1)      forb - stable (0)

#### 1998 TREND ASSESSMENT

The browse trend is stable. Density of mountain big sagebrush has declined 43% from 1992 to 5,160 plants/acre, but it appears as though the population has thinned itself. Cover has remained similar to 1992. Many of the decadent plants from the 1992 survey have died. Sagebrush decadence declined to 26%, and plants displaying poor vigor declined to 8%. Recruitment of young sagebrush plants remained poor. The antelope bitterbrush density declined 38% since 1992 to 1,900 plants/acre, but cover increased to 8%. Bitterbrush decadence declined to 3%, and vigor remained good. Recruitment of young bitterbrush plants declined to 15% of the population. The trend for grasses is slightly down. The sum of nested frequency of perennial grasses decreased 16%, and cover of perennial grasses declined slightly. There was a significant decrease in the nested frequency of needle-and-thread grass, while cheatgrass has significantly increased in nested frequency since 1992. The trend for forbs is slightly down. The sum of nested frequency of perennial forbs decreased by 30%, though cover of perennial forbs remained similar to 1992. There was a significant decrease in the nested frequency of longleaf phlox.

winter range condition (DCI) - fair-good (63) Mid-level potential scale  
browse - slightly down (-1)      grass - slightly down (-1)      forb - slightly down (-1)

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. The density of mountain big sagebrush remained similar to 1998 levels at 4,620 plants/acre. Sagebrush decadence increased to 44% and plants displaying poor vigor increased to 13%. Recruitment of young sagebrush plants declined to only 1% of the population. The density of bitterbrush remained similar to 1998 levels at 1,860 plants/acre. Decadence of bitterbrush increased to 24%, but vigor remained good in the population. Recruitment of young bitterbrush declined to 3%. Trend for the grasses and forbs is down. Parameter of perennial grasses and perennial forbs nearly mirrored one another. Sum of nested frequency of both perennial grasses and forbs declined by 41%, and production of both perennial grasses and forbs declined from 6% total cover in 1998 to 3%. There was a significant decrease in nested frequency of Letterman needlegrass, Kentucky bluegrass, and longleaf phlox.

winter range condition (DCI) - poor (44) Mid-level potential scale  
browse - slightly down (-1)      grass - down (-2)      forb - (-2)

2008 TREND ASSESSMENT

The trend for browse is slightly down. The density of mountain big sagebrush increased by 22% since 2003 to 5,620 plants/acre. Decadence of sagebrush increased to 51% and plants displaying poor vigor increased to 17% of the population. Recruitment of young sagebrush improved slightly, but is still low. Line-intercept canopy cover of sagebrush decreased from 35% in 2003 to 31%. Bitterbrush density has remained similar to 2003 at 1,760 plants/acre, but decadence increased to 32%. Vigor of bitterbrush remained good, but recruitment was poor with few bitterbrush seedlings and no young plants sampled. Trend for both grasses and forbs is up. The sum of nested frequency of perennial grasses increased by 47%, and production of perennial grasses increased to 6% of the total cover. There was a significant increase in the nested frequency of western wheatgrass and Kentucky bluegrass, and a significant decrease in the nested frequency of bottlebrush squirreltail. Sum of nested frequency of perennial forbs increased more than two-fold, and production of perennial forbs increased to 8% of the total cover.

winter range condition (DCI) - fair (52) Mid-level potential scale

browse - slightly down (-1)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 28 , Study no: 4

| Type                        | Species                 | Nested Frequency  |                   |                   |                  |                  | Average Cover % |      |      |      |
|-----------------------------|-------------------------|-------------------|-------------------|-------------------|------------------|------------------|-----------------|------|------|------|
|                             |                         | '87               | '92               | '98               | '03              | '08              | '92             | '98  | '03  | '08  |
| G                           | Agropyron cristatum     | -                 | -                 | 6                 | -                | 7                | -               | .06  | -    | .07  |
| G                           | Agropyron smithii       | <sub>bc</sub> 173 | <sub>bc</sub> 185 | <sub>ab</sub> 136 | <sub>a</sub> 103 | <sub>c</sub> 186 | 4.03            | 1.58 | .94  | 3.70 |
| G                           | Agropyron spicatum      | -                 | -                 | 2                 | 3                | -                | -               | .00  | .03  | -    |
| G                           | Bromus ciliatus         | -                 | 2                 | -                 | -                | -                | .01             | -    | -    | -    |
| G                           | Bromus tectorum (a)     | -                 | <sub>a</sub> 42   | <sub>b</sub> 167  | <sub>b</sub> 143 | <sub>b</sub> 171 | .11             | 2.90 | 1.62 | 2.71 |
| G                           | Poa fendleriana         | <sub>a</sub> 37   | <sub>b</sub> 47   | <sub>ab</sub> 33  | <sub>a</sub> 13  | <sub>a</sub> 18  | 1.52            | .95  | .40  | .32  |
| G                           | Poa pratensis           | <sub>a</sub> -    | <sub>a</sub> -    | <sub>c</sub> 44   | <sub>b</sub> 14  | <sub>c</sub> 55  | -               | 2.20 | .28  | 1.69 |
| G                           | Poa secunda             | -                 | 3                 | 2                 | -                | 6                | .01             | .01  | -    | .04  |
| G                           | Sitanion hystrix        | <sub>c</sub> 119  | <sub>c</sub> 115  | <sub>bc</sub> 89  | <sub>b</sub> 64  | <sub>a</sub> 23  | 2.17            | 1.43 | .78  | .36  |
| G                           | Stipa comata            | <sub>a</sub> 5    | <sub>b</sub> 31   | <sub>a</sub> 2    | <sub>a</sub> 3   | <sub>a</sub> 3   | .18             | .01  | .03  | .03  |
| G                           | Stipa lettermani        | <sub>a</sub> -    | <sub>b</sub> 28   | <sub>b</sub> 33   | <sub>a</sub> 6   | <sub>a</sub> 4   | .51             | .22  | .18  | .18  |
| Total for Annual Grasses    |                         | 0                 | 42                | 167               | 143              | 171              | 0.10            | 2.90 | 1.62 | 2.71 |
| Total for Perennial Grasses |                         | 334               | 411               | 347               | 206              | 302              | 8.46            | 6.47 | 2.66 | 6.40 |
| Total for Grasses           |                         | 334               | 453               | 514               | 349              | 473              | 8.57            | 9.37 | 4.29 | 9.11 |
| F                           | Agoseris glauca         | <sub>a</sub> -    | <sub>a</sub> -    | <sub>a</sub> 4    | <sub>a</sub> 6   | <sub>b</sub> 25  | -               | .04  | .07  | .53  |
| F                           | Allium sp.              | -                 | 3                 | 1                 | -                | 5                | .00             | .00  | -    | .01  |
| F                           | Arabis holboellii       | <sub>b</sub> 44   | <sub>b</sub> 27   | <sub>a</sub> 2    | <sub>a</sub> -   | <sub>a</sub> 6   | .06             | .01  | -    | .01  |
| F                           | Astragalus convallarius | 1                 | 8                 | 5                 | 10               | 8                | .67             | .06  | .12  | .07  |
| F                           | Astragalus panguicensis | <sub>a</sub> 6    | <sub>ab</sub> 9   | <sub>b</sub> 27   | <sub>a</sub> -   | <sub>a</sub> -   | .03             | .36  | -    | -    |
| F                           | Astragalus sp.          | <sub>ab</sub> 15  | <sub>b</sub> 16   | <sub>a</sub> 1    | <sub>a</sub> -   | <sub>b</sub> 22  | .07             | .09  | -    | .70  |
| F                           | Balsamorhiza sagittata  | -                 | -                 | 2                 | -                | 2                | -               | .00  | -    | .15  |
| F                           | Calochortus nuttallii   | 2                 | -                 | 5                 | 4                | 10               | -               | .01  | .01  | .07  |
| F                           | Chaenactis douglasii    | <sub>c</sub> 84   | <sub>b</sub> 32   | <sub>ab</sub> 12  | <sub>a</sub> -   | <sub>a</sub> -   | .17             | .02  | -    | -    |

| Type                      | Species                            | Nested Frequency |                  |                  |                  |                  | Average Cover % |      |       |       |
|---------------------------|------------------------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------|-------|-------|
|                           |                                    | '87              | '92              | '98              | '03              | '08              | '92             | '98  | '03   | '08   |
| F                         | <i>Cirsium wheeleri</i>            | c <sub>35</sub>  | bc <sub>24</sub> | ab <sub>16</sub> | a <sub>1</sub>   | a <sub>4</sub>   | .38             | .41  | .01   | .20   |
| F                         | <i>Cordylanthus kingii</i> (a)     | -                | -                | -                | 4                | -                | -               | -    | .03   | -     |
| F                         | <i>Comandra pallida</i>            | 5                | 7                | 6                | 12               | 8                | .03             | .03  | .07   | .10   |
| F                         | <i>Collinsia parviflora</i> (a)    | -                | a <sub>115</sub> | b <sub>262</sub> | c <sub>330</sub> | b <sub>302</sub> | .55             | 2.22 | 9.04  | 4.51  |
| F                         | <i>Crepis acuminata</i>            | -                | 9                | 6                | 5                | 11               | .04             | .05  | .07   | .25   |
| F                         | <i>Cryptantha</i> sp.              | -                | -                | -                | 1                | 1                | -               | -    | .00   | .00   |
| F                         | <i>Delphinium nuttallianum</i>     | -                | -                | -                | -                | 21               | -               | -    | -     | .08   |
| F                         | <i>Erigeron eatonii</i>            | 11               | -                | -                | 1                | -                | -               | -    | .00   | -     |
| F                         | <i>Erigeron</i> sp.                | -                | -                | 2                | -                | -                | -               | .00  | -     | -     |
| F                         | <i>Eriogonum racemosum</i>         | b <sub>41</sub>  | b <sub>32</sub>  | ab <sub>24</sub> | a <sub>8</sub>   | ab <sub>22</sub> | .28             | .14  | .05   | .15   |
| F                         | <i>Eriogonum umbellatum</i>        | 19               | 18               | 8                | 3                | 10               | .07             | .09  | .01   | .07   |
| F                         | <i>Gayophytum ramosissimum</i> (a) | -                | -                | -                | 7                | 12               | -               | -    | .01   | .02   |
| F                         | <i>Ipomopsis aggregata</i>         | 2                | -                | -                | -                | -                | -               | -    | -     | -     |
| F                         | <i>Lappula occidentalis</i> (a)    | -                | -                | -                | 2                | 12               | -               | -    | .00   | .02   |
| F                         | <i>Linum lewisii</i>               | -                | -                | 2                | -                | 2                | -               | .03  | -     | .03   |
| F                         | <i>Lithospermum</i> sp.            | -                | -                | 3                | -                | -                | -               | .03  | -     | -     |
| F                         | <i>Lomatium</i> sp.                | a <sub>-</sub>   | b <sub>9</sub>   | a <sub>-</sub>   | a <sub>-</sub>   | c <sub>58</sub>  | .03             | -    | .00   | .46   |
| F                         | <i>Lupinus argenteus</i>           | ab <sub>31</sub> | ab <sub>45</sub> | b <sub>55</sub>  | ab <sub>35</sub> | a <sub>23</sub>  | 1.42            | 3.22 | 1.65  | .88   |
| F                         | <i>Machaeranthera canescens</i>    | b <sub>36</sub>  | a <sub>4</sub>   | a <sub>2</sub>   | a <sub>-</sub>   | a <sub>-</sub>   | .04             | .00  | -     | -     |
| F                         | <i>Microsteris gracilis</i> (a)    | -                | b <sub>112</sub> | a <sub>61</sub>  | b <sub>138</sub> | a <sub>47</sub>  | .44             | .26  | 1.08  | .20   |
| F                         | <i>Navarretia intertexta</i> (a)   | -                | -                | -                | 2                | 1                | -               | -    | .03   | .00   |
| F                         | <i>Penstemon</i> sp.               | -                | -                | -                | 2                | 2                | -               | -    | .03   | .00   |
| F                         | <i>Phlox longifolia</i>            | b <sub>118</sub> | c <sub>177</sub> | b <sub>115</sub> | a <sub>53</sub>  | b <sub>100</sub> | 1.02            | .97  | .24   | .90   |
| F                         | <i>Polygonum douglasii</i> (a)     | -                | -                | 4                | -                | 5                | -               | .04  | -     | .01   |
| F                         | <i>Ranunculus testiculatus</i> (a) | -                | -                | -                | -                | 3                | -               | -    | -     | .00   |
| F                         | <i>Senecio douglasii</i>           | 4                | -                | -                | -                | -                | -               | -    | -     | -     |
| F                         | <i>Senecio multilobatus</i>        | b <sub>18</sub>  | a <sub>1</sub>   | a <sub>1</sub>   | a <sub>-</sub>   | a <sub>-</sub>   | .00             | .00  | -     | -     |
| F                         | <i>Sphaeralcea coccinea</i>        | 8                | 4                | 4                | 3                | -                | .01             | .01  | .00   | -     |
| F                         | <i>Taraxacum officinale</i>        | 6                | 1                | -                | -                | -                | .03             | -    | -     | -     |
| F                         | <i>Tragopogon dubius</i>           | 8                | 2                | 7                | -                | -                | .00             | .04  | -     | -     |
| F                         | <i>Trifolium</i> sp.               | a <sub>16</sub>  | b <sub>42</sub>  | b <sub>43</sub>  | ab <sub>30</sub> | b <sub>66</sub>  | .15             | .31  | .11   | .84   |
| F                         | <i>Zigadenus paniculatus</i>       | a <sub>7</sub>   | b <sub>38</sub>  | a <sub>5</sub>   | b <sub>37</sub>  | c <sub>77</sub>  | .82             | .04  | .37   | 2.59  |
| Total for Annual Forbs    |                                    | 0                | 227              | 327              | 483              | 382              | 0.99            | 2.53 | 10.21 | 4.78  |
| Total for Perennial Forbs |                                    | 517              | 508              | 358              | 211              | 483              | 5.38            | 6.02 | 2.86  | 8.15  |
| Total for Forbs           |                                    | 517              | 735              | 685              | 694              | 865              | 6.37            | 8.55 | 13.08 | 12.94 |

Values with different subscript letters are significantly different at alpha = 0.10



BROWSE TRENDS --

Management unit 28 , Study no: 4

| Type             | Species                                      | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |  | '92             | '98 | '03 | '08 | '92             | '98   | '03   | '08   |
| B                | Artemisia tridentata vaseyana                | 98              | 94  | 92  | 89  | 24.29           | 24.87 | 27.41 | 18.91 |
| B                | Chrysothamnus depressus                      | 1               | 0   | 0   | 0   | .00             | -     | -     | -     |
| B                | Chrysothamnus viscidiflorus<br>viscidiflorus | 2               | 0   | 0   | 0   | .00             | -     | -     | .00   |
| B                | Juniperus scopulorum                         | 1               | 1   | 1   | 0   | .00             | .03   | .53   | .63   |
| B                | Mahonia repens                               | 0               | 0   | 1   | 1   | -               | -     | .03   | .00   |
| B                | Opuntia sp.                                  | 44              | 28  | 24  | 36  | 1.29            | 1.03  | .57   | 1.89  |
| B                | Purshia tridentata                           | 79              | 65  | 61  | 55  | 5.57            | 8.25  | 6.44  | 4.64  |
| B                | Quercus gambelii                             | 2               | 3   | 6   | 2   | 1.62            | .56   | .41   | .03   |
| B                | Symphoricarpos oreophilus                    | 17              | 17  | 18  | 16  | .77             | 3.24  | 1.67  | 2.47  |
| Total for Browse |  | 244             | 208 | 203 | 199 | 33.56           | 38.00 | 37.07 | 28.59 |

CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 4

| Species                       | Percent Cover |       |
|-------------------------------|---------------|-------|
|                               | '03           | '08   |
| Artemisia tridentata vaseyana | 34.73         | 30.66 |
| Juniperus scopulorum          | .70           | .86   |
| Opuntia sp.                   | .33           | 1.39  |
| Purshia tridentata            | 6.55          | 8.25  |
| Quercus gambelii              | 1.00          | .78   |
| Symphoricarpos oreophilus     | 1.61          | 2.98  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 4

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.5                        | 1.4 |
| Purshia tridentata            | 2.0                        | 0.5 |

**BASIC COVER --**

Management unit 28 , Study no: 4

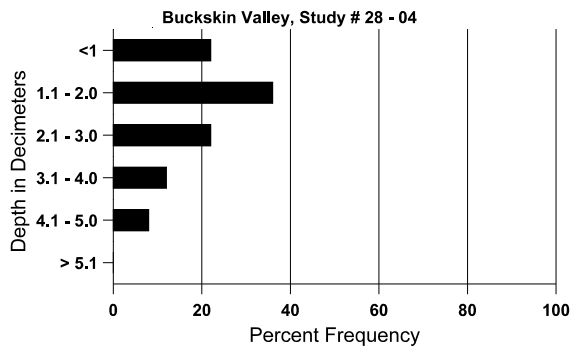
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 7.50            | 42.98 | 50.00 | 48.48 | 44.65 |
| Rock        | 5.50            | 5.53  | 4.95  | 3.54  | 4.16  |
| Pavement    | 1.00            | 1.26  | 1.68  | .55   | .91   |
| Litter      | 74.50           | 59.12 | 66.59 | 53.09 | 57.17 |
| Cryptogams  | 2.25            | 1.64  | .98   | .21   | .46   |
| Bare Ground | 9.25            | 14.50 | 16.27 | 18.33 | 19.09 |

**SOIL ANALYSIS DATA --**

Management unit 28, Study no: 4, Study Name: Buckskin Valley

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %0M | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 14.3                         | 50.4 (15.7)     | 5.9 | 44.2   | 30.0   | 25.8   | 3.8 | 22.7  | 236.8 | 0.4  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 28 , Study no: 4

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Sheep  | -                 | 1   | 6   | -   |
| Rabbit | 44                | 22  | 37  | 69  |
| Elk    | -                 | 1   | -   | -   |
| Deer   | 28                | 37  | 20  | 26  |
| Cattle | -                 | 2   | 1   | 4   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | 12 (30)  | -        |
| -                      | -        | -        |
| -                      | -        | 1 (3)    |
| 49 (121)               | 51 (126) | 43 (106) |
| 7 (17)                 | 1 (2)    | 6 (14)   |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 4

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>8732</b>                           | 66                                       | 933   | 4666   | 3133     | -    | 53          | 20      | 36         | 2       | 7            | 26/28                     |
| 92   | <b>8980</b>                           | 160                                      | 300   | 3660   | 5020     | -    | 49          | 32      | 56         | 9       | 16           | -/-                       |
| 98   | <b>5160</b>                           | 200                                      | 200   | 3640   | 1320     | 1160 | 40          | 5       | 26         | 6       | 8            | 29/37                     |
| 03   | <b>4620</b>                           | -  | 40    | 2560   | 2020     | 1360 | 10          | 3       | 44         | 11      | 13           | 35/37                     |
| 08   | <b>5620</b>                           | 460                                      | 140   | 2620   | 2860     | 2020 | 5           | 2       | 51         | 17      | 17           | 33/35                     |
| <i>Cercocarpus ledifolius</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>0</b>                              | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Chrysothamnus depressus</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/28                      |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | 60                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/10                      |
| <i>Juniperus scopulorum</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>20</b>                             | -  | 20    | -      | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Mahonia repens</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 3/4                       |
| 08                               | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | 3/6                       |
| <b>Opuntia sp.</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>1132</b>                           | 199                                      | 466   | 666    | -        | -    | 18          | 0       | 0          | -       | 53           | 3/4                       |
| 92                               | <b>2140</b>                           | 100                                      | 820   | 1120   | 200      | -    | 0           | 2       | 9          | 4       | 20           | -/-                       |
| 98                               | <b>740</b>                            | -  | 120   | 560    | 60       | -    | 0           | 3       | 8          | 5       | 5            | 6/13                      |
| 03                               | <b>840</b>                            | -  | 40    | 660    | 140      | -    | 0           | 2       | 17         | 2       | 5            | 7/14                      |
| 08                               | <b>980</b>                            | 60                                       | -     | 880    | 100      | -    | 0           | 2       | 10         | 6       | 14           | 6/17                      |
| <b>Purshia tridentata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>1732</b>                           | 866                                      | 866   | 866    | -        | -    | 19          | 73      | 0          | -       | 0            | 22/31                     |
| 92                               | <b>3080</b>                           | 140                                      | 1060  | 1700   | 320      | -    | 34          | 53      | 10         | -       | 3            | -/-                       |
| 98                               | <b>1900</b>                           | 180                                      | 280   | 1560   | 60       | 40   | 36          | 47      | 3          | 1       | 2            | 22/35                     |
| 03                               | <b>1860</b>                           | -  | 60    | 1360   | 440      | 60   | 13          | 72      | 24         | 3       | 3            | 22/35                     |
| 08                               | <b>1760</b>                           | 140                                      | -     | 1200   | 560      | 100  | 22          | 57      | 32         | 3       | 3            | 22/33                     |
| <b>Quercus gambelii</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>133</b>                            | 66                                       | 133   | -      | -        | -    | 50          | 0       | 0          | -       | 0            | -/-                       |
| 92                               | <b>460</b>                            | 120                                      | 100   | 320    | 40       | -    | 43          | 0       | 9          | 9       | 9            | -/-                       |
| 98                               | <b>400</b>                            | 20                                       | 40    | 360    | -        | -    | 0           | 0       | 0          | -       | 0            | 75/39                     |
| 03                               | <b>380</b>                            | -  | 180   | -      | 200      | 40   | 0           | 0       | 53         | -       | 0            | 58/32                     |
| 08                               | <b>200</b>                            | -  | 140   | 20     | 40       | 80   | 0           | 0       | 20         | 10      | 10           | 55/16                     |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                               | <b>599</b>                            | -  | 466   | 133    | -        | -    | 22          | 0       | 0          | -       | 0            | 20/19                     |
| 92                               | <b>700</b>                            | 100                                      | 200   | 480    | 20       | -    | 57          | 11      | 3          | -       | 9            | -/-                       |
| 98                               | <b>720</b>                            | -  | 120   | 600    | -        | -    | 33          | 0       | 0          | -       | 0            | 14/25                     |
| 03                               | <b>980</b>                            | -  | 20    | 960    | -        | -    | 6           | 29      | 0          | -       | 0            | 11/18                     |
| 08                               | <b>780</b>                            | 80                                       | 80    | 700    | -        | -    | 3           | 8       | 0          | -       | 0            | 13/20                     |

Trend Study 28-5-08

Study site name: Swayback Knoll.

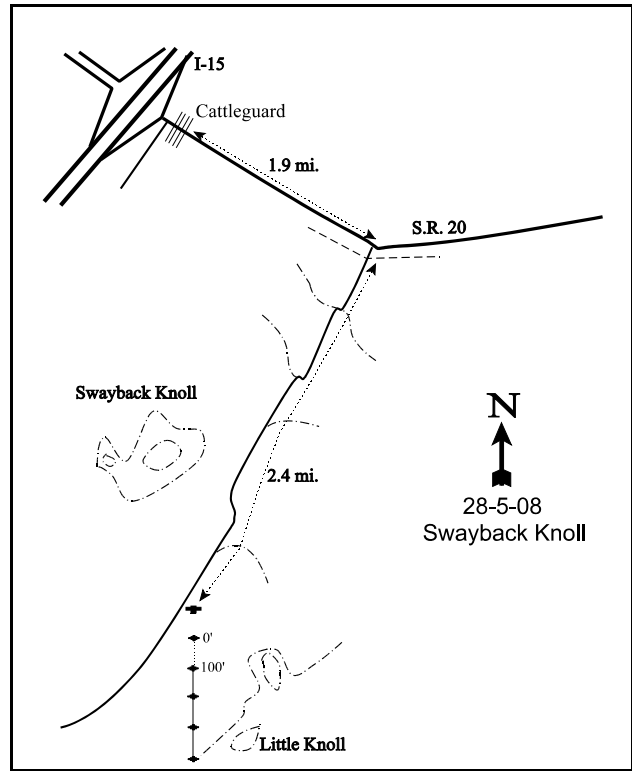
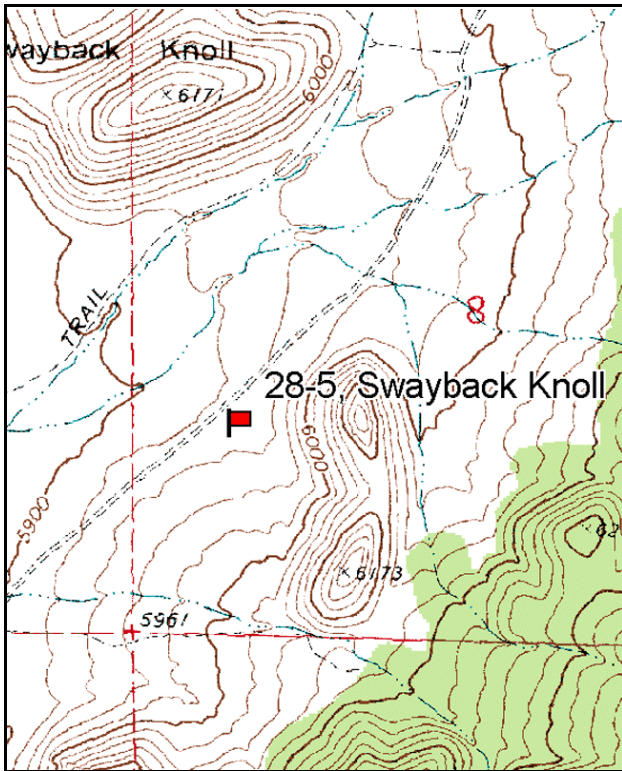
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 164 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From the cattleguard off SR 20 and I-15, travel 1.9 miles on SR 20 to a dirt road on the right. Travel south for 2.4 miles to a sage flat west of rocky knolls. There is a witness post on the left (east) side of the road. The 0-foot baseline stake is 200 feet away from the witness post at a bearing of 118 degrees magnetic. The 0-foot stake is marked by browse tag #477.



Map Name: Buckhorn Flat

Diagrammatic Sketch

Township 32S, Range 7W, Section 8

GPS: NAD 83, UTM 12S 352598 E, 4210820 N

## DISCUSSION

### Swayback Knoll - Trend Study No. 28-5

#### Study Information

This trend study samples critical deer winter range below the Hurricane Cliffs in the northwest corner of the Panguitch Lake management unit [elevation: 6,000 feet (1,829 m), slope: 6%, aspect: northwest]. The transect lies on BLM administered land on an alluvial fan at the base of the foothills east of I-15 and just south of Highway 20. This study samples one of the key wintering areas for mule deer on the east side of I-15, and has been used by as many as 400 deer during winter months. The range for many miles around is dominated by a depleted Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) type bordered by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) covered hills, which provide the nearest protective cover. Very little other forage is available. Winter range in this particular area is limited by the deer-proof fence along I-15 as well as the predominance of agricultural land which is also being fenced to prevent deer depredation. A pellet group transect read on the site estimated 82 deer days use/acre (203 ddu/ha) in both 1998 and 2003, and 93 days use/acre (230 ddu/ha) in 2008. A single elk pellet group was sampled in 2003. Several dead deer carcasses were found on the site in 1998 and 2003, and a 4-point antler shed was found in 1998.

#### Soils

Soil analysis indicates a loam texture with a neutral pH (6.7). The average effective rooting depth was almost 12 inches (30 cm) with rock and pavement scattered throughout the soil profile. Two small active gullies are located near the study site. Relative combined average vegetation and litter cover fluctuated from 39% in 1992, increasing to 60% in 1998, decreasing to 47% in 2003, and increasing to 54% in 2008. Relative combined average rock and pavement cover has been moderately high at 25%-34% since 1992. Relative average bare ground cover decreased from 32% in 1992, to 14%-19% since 1998. The erosion condition class assessment rated soils as stable in 2003 and 2008.

#### Browse

The only browse species encountered on the site consists of a dense stand of Wyoming big sagebrush with a low density of cholla cactus (*Opuntia whipplei*). Wyoming big sagebrush density has been fairly similar in all sample years, ranging from a high of 5,900 plants/acre in 1992, to a low of 4,240 plants/acre in 1998. The stand of sagebrush is mostly mature plants and had moderate decadence (22%-33%) from 1987 to 2003, but decadent plants increased to over half (51%) the population in 2008. Young plants comprised a good proportion of the population from 1987 to 1998, but declined in 2003 and 2008. Vigor in the sagebrush population has been good, but plants displaying poor vigor increased steadily from 1998 to 20% in 2008. Line-intercept canopy cover of sagebrush decreased from 16% in 2003 to 11% in 2008. Utilization of sagebrush has been mostly moderate to heavy in all sample years, with the heaviest use in 1987 and the lightest use in 1998.

#### Herbaceous Understory

Desirable herbaceous vegetation is very limited and diversity is low, even for a Wyoming big sagebrush type. Only three perennial grasses were encountered in 1987 while no perennial forbs were found. By the 2008 reading, seven perennial grasses were sampled, with bottlebrush squirreltail (*Sitanion hystrix*), galleta (*Hilaria jamesii*), and purple three-awn (*Aristida purpurea*) being the most numerous. Bottlebrush squirreltail has been the most abundant desirable perennial grass on the site in all readings. Two annual grasses, cheatgrass (*Bromus tectorum*) and six weeks fescue (*Vulpia octoflora*), contributed 15% of the herbaceous understory cover in 1992. In 1998, cheatgrass dominated the understory as it provided 85% of the grass cover and 53% of the total vegetation cover. With drought conditions following the 1998 reading, cheatgrass declined significantly in 2003 in both nested frequency and average cover. In 2003, cheatgrass was visibly more abundant on the hillsides that surround the transect, and with normal precipitation patterns, cheatgrass could

again dominate the site. In 2008, cheatgrass had a significant increase in nested frequency and comprised 31% of the grass cover. Perennial forbs have been almost non-existent on the site since it was established. Only 3 perennial forbs were sampled in 2008. Annual forbs steadily decreased on the site since from 1992 to 2003, but increased markedly in 2008 with a burr buttercup (*Ranunculus testiculatus*) being the most abundant.

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Density differences may be related to the larger sample area used in 1992, therefore, the trend for browse was determined using other parameters. Decadence of sagebrush remained moderate at 29%, though vigor declined slightly from 1987 with 9% of the shrubs sampled displaying poor vigor. Recruitment of young sagebrush plants was similar to 1987 with 16% of the population comprised of young plants. The trend for grasses is up. Sum of nested frequency of perennial grasses increased by 35%, and two perennial species, galleta and needle-and-thread (*Stipa comata*), were sampled for the first time. Trend for forbs is stable. The sum of nested frequency of perennial forbs increased slightly, but forbs are very rare on the site.

winter range condition (DCI) - fair (39) Low potential scale  
browse - stable (0)                      grass - up (+2)                      forb - stable (0)

#### 1998 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush decreased in density by 28% from 1992 to 4,240 plants/acre, though decadence of sagebrush improved slightly to 22%. Recruitment of young sagebrush plants declined slightly to 12% of the population. The trend for grasses is down. The sum of nested frequency of perennial grasses declined by 25%, and production of perennial grasses declined from 6% in 1992 to 3%. There was a significant increase in the nested frequency of cheatgrass and cheatgrass now dominates the site. Cheatgrass comprised 85% of the grass cover and 53% of the vegetative cover. As cheatgrass density and cover increases, there may be a decrease in the number of seedling and young plants of sagebrush encountered due to early spring competition with cheatgrass. Also, as cheatgrass density and cover increases in the future, there is a risk of losing the Wyoming big sagebrush population due to a catastrophic fire. Trend for forbs is stable. Forbs are currently almost non-existent and provide little cover or forage to this site.

winter range condition (DCI) - poor (22) Low potential scale  
browse - slightly down (-1)                      grass - down (-2)                      forb - stable (0)

#### 2003 TREND ASSESSMENT

Trend for browse is stable. The density estimate for Wyoming big sagebrush is 19% higher since 1998 at 5,220 plants/acre, but decadence has increased to 33%. The proportion of the sagebrush population displaying poor vigor increased to 12%. Recruitment of young sagebrush plants declined to the low since sampling began with comprising only 4% of the population. Trend for grasses is slightly up. Sum of nested frequency of perennial grasses changed little since 1998, but there was a significant decrease in the nested frequency of cheatgrass. Cheatgrass remains fairly abundant on the site comprising 18% of the grass cover, and may dominate the site again with a return to normal precipitation patterns. Trend for forbs is stable. Forbs are rare and perennial forbs are virtually non-existent.

winter range condition (DCI) - fair (35) Low level potential scale  
browse - stable (0)                      grass - slightly up (+1)                      forb - stable (0)

#### 2008 TREND ASSESSMENT

The trend for browse is slightly down. Density of Wyoming big sagebrush declined 13% from 2003 to 4,520 plants/acre, and decadence has increased from to 51%. Plants displaying poor vigor also increased from 2003 to 20%. Recruitment of young plants improved slightly, but remains low at 7%. The trend for grasses is stable. Sum of nested frequency of perennial grasses increased slightly, but there was also a significant

increase in the nested frequency of cheatgrass. Cheatgrass comprised 31% of the grass cover. Trend for forbs is slightly down. Perennial forbs are almost non-existent on the site while a significant increase in the nested frequency of burr buttercup shows a decrease in the forb community.

winter range condition (DCI) - poor-fair (27) Low level potential scale

browse - slightly down (-1)

grass - stable (0)

forb - slightly down (-1)

HERBACEOUS TRENDS --

Management unit 28 , Study no: 5

| Type                        | Species                            | Nested Frequency |                  |                  |                  |                  | Average Cover % |       |      |      |
|-----------------------------|------------------------------------|------------------|------------------|------------------|------------------|------------------|-----------------|-------|------|------|
|                             |                                    | '87              | '92              | '98              | '03              | '08              | '92             | '98   | '03  | '08  |
| G                           | <i>Aristida purpurea</i>           | <sub>a</sub> 13  | <sub>b</sub> 41  | <sub>ab</sub> 28 | <sub>ab</sub> 27 | <sub>ab</sub> 27 | 1.31            | .94   | .55  | .45  |
| G                           | <i>Bouteloua gracilis</i>          | -                | -                | 3                | 1                | -                | -               | .15   | .00  | -    |
| G                           | <i>Bromus tectorum</i> (a)         | -                | <sub>b</sub> 168 | <sub>d</sub> 357 | <sub>a</sub> 101 | <sub>c</sub> 264 | .68             | 19.37 | .98  | 2.20 |
| G                           | <i>Hilaria jamesii</i>             | <sub>a</sub> -   | <sub>c</sub> 48  | <sub>bc</sub> 32 | <sub>b</sub> 25  | <sub>bc</sub> 31 | .90             | .39   | .83  | 1.27 |
| G                           | <i>Oryzopsis hymenoides</i>        | 2                | 5                | 6                | 9                | 2                | .09             | .23   | .18  | .02  |
| G                           | <i>Poa secunda</i>                 | -                | -                | -                | -                | 3                | -               | -     | -    | .01  |
| G                           | <i>Sitanion hystrix</i>            | <sub>b</sub> 127 | <sub>a</sub> 86  | <sub>a</sub> 60  | <sub>a</sub> 59  | <sub>a</sub> 78  | 3.43            | 1.41  | 1.25 | 2.89 |
| G                           | <i>Stipa comata</i>                | <sub>a</sub> -   | <sub>b</sub> 11  | <sub>b</sub> 15  | <sub>b</sub> 11  | <sub>b</sub> 10  | .15             | .25   | .36  | .13  |
| G                           | <i>Vulpia octoflora</i> (a)        | -                | <sub>b</sub> 135 | <sub>a</sub> 59  | <sub>b</sub> 162 | <sub>a</sub> 43  | .51             | .16   | 1.24 | .10  |
| Total for Annual Grasses    |                                    | 0                | 303              | 416              | 263              | 307              | 1.19            | 19.53 | 2.22 | 2.30 |
| Total for Perennial Grasses |                                    | 142              | 191              | 144              | 132              | 151              | 5.90            | 3.39  | 3.19 | 4.78 |
| Total for Grasses           |                                    | 142              | 494              | 560              | 395              | 458              | 7.09            | 22.92 | 5.42 | 7.09 |
| F                           | <i>Allium</i> sp.                  | -                | 1                | -                | -                | -                | .00             | -     | -    | -    |
| F                           | <i>Calochortus nuttallii</i>       | <sub>a</sub> -   | <sub>ab</sub> 8  | <sub>a</sub> 2   | <sub>a</sub> 3   | <sub>b</sub> 20  | .02             | .01   | .00  | .06  |
| F                           | <i>Descurainia pinnata</i> (a)     | -                | <sub>b</sub> 16  | <sub>a</sub> 2   | <sub>ab</sub> 9  | <sub>ab</sub> 7  | .04             | .03   | .05  | .02  |
| F                           | <i>Draba</i> sp. (a)               | -                | -                | 3                | 4                | -                | -               | .00   | .01  | -    |
| F                           | <i>Eriogonum cernuum</i> (a)       | -                | <sub>b</sub> 24  | <sub>a</sub> -   | <sub>a</sub> 3   | <sub>ab</sub> 13 | .06             | -     | .00  | .06  |
| F                           | <i>Gayophytum ramosissimum</i> (a) | -                | -                | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 25  | -               | -     | -    | .09  |
| F                           | <i>Gilia</i> sp. (a)               | -                | <sub>d</sub> 160 | <sub>a</sub> -   | <sub>c</sub> 61  | <sub>b</sub> 11  | .38             | -     | .57  | .03  |
| F                           | <i>Hackelia patens</i>             | -                | 4                | -                | -                | -                | .01             | -     | -    | -    |
| F                           | <i>Lappula occidentalis</i> (a)    | -                | -                | <sub>a</sub> 1   | <sub>a</sub> 3   | <sub>b</sub> 34  | -               | .00   | .01  | .08  |
| F                           | <i>Mentzelia</i> sp.               | -                | -                | -                | -                | -                | -               | -     | -    | .00  |
| F                           | <i>Microsteris gracilis</i> (a)    | -                | 12               | -                | -                | -                | .02             | -     | -    | -    |
| F                           | <i>Navarretia intertexta</i> (a)   | -                | -                | <sub>a</sub> -   | <sub>a</sub> 3   | <sub>b</sub> 11  | -               | -     | .00  | .02  |
| F                           | <i>Orobanche fasciculata</i>       | -                | -                | 1                | -                | -                | -               | .00   | -    | -    |
| F                           | <i>Phlox longifolia</i>            | -                | 5                | 5                | -                | 5                | .01             | .01   | -    | .04  |
| F                           | <i>Plantago patagonica</i> (a)     | -                | <sub>a</sub> 13  | <sub>b</sub> 52  | <sub>a</sub> 5   | <sub>a</sub> 5   | .04             | .38   | .01  | .01  |
| F                           | <i>Ranunculus testiculatus</i> (a) | -                | <sub>b</sub> 12  | <sub>c</sub> 45  | <sub>a</sub> -   | <sub>d</sub> 276 | .04             | .35   | -    | 1.84 |
| F                           | <i>Sisymbrium altissimum</i> (a)   | -                | -                | -                | -                | 8                | -               | -     | -    | .07  |



| Type                      | Species                     | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|---------------------------|-----------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|                           |                             | '87              | '92 | '98 | '03 | '08 | '92             | '98  | '03  | '08  |
| F                         | <i>Sphaeralcea coccinea</i> | -                | 6   | 3   | 1   | 4   | .01             | .06  | .00  | .03  |
| Total for Annual Forbs    |                             | 0                | 237 | 103 | 88  | 390 | 0.59            | 0.77 | 0.66 | 2.23 |
| Total for Perennial Forbs |                             | 0                | 24  | 11  | 4   | 29  | 0.06            | 0.09 | 0.00 | 0.14 |
| Total for Forbs           |                             | 0                | 261 | 114 | 92  | 419 | 0.66            | 0.87 | 0.67 | 2.37 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 5

| Type             | Species                                  | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|--|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |  | '92             | '98 | '03 | '08 | '92             | '98   | '03   | '08   |
| B                | <i>Artemisia tridentata wyomingensis</i> | 92              | 92  | 90  | 92  | 11.11           | 12.46 | 18.76 | 12.12 |
| B                | <i>Opuntia sp.</i>                       | 0               | 0   | 2   | 2   | -               | -     | .00   | .15   |
| B                | <i>Opuntia whipplei</i>                  | 16              | 14  | 12  | 12  | 1.25            | .59   | 1.14  | 1.77  |
| Total for Browse |  | 108             | 106 | 104 | 106 | 12.36           | 13.06 | 19.89 | 14.04 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 5

| Species                                  | Percent Cover |       |
|--|---------------|-------|
|  | '03           | '08   |
| <i>Artemisia tridentata wyomingensis</i> | 16.26         | 11.06 |
| <i>Opuntia whipplei</i>                  | 1.14          | 1.10  |

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 5

| Species                                  | Average leader growth (in) |     |
|--|----------------------------|-----|
|  | '03                        | '08 |
| <i>Artemisia tridentata wyomingensis</i> | 0.7                        | 0.8 |

**BASIC COVER --**

Management unit 28 , Study no: 5

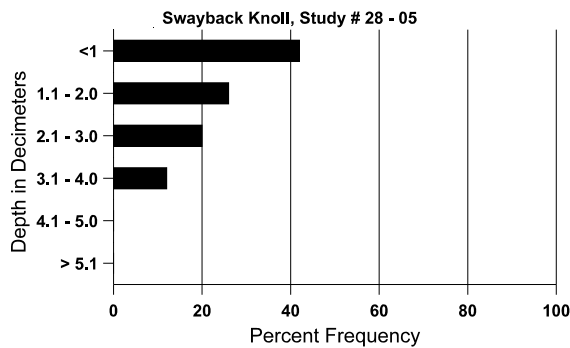
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 5.00            | 15.86 | 34.86 | 28.36 | 23.85 |
| Rock        | 9.50            | 17.97 | 8.12  | 13.06 | 12.06 |
| Pavement    | 39.75           | 9.97  | 21.18 | 25.84 | 18.45 |
| Litter      | 27.75           | 22.08 | 34.52 | 25.44 | 35.67 |
| Cryptogams  | .25             | .22   | .51   | .06   | 1.02  |
| Bare Ground | 17.75           | 31.76 | 16.11 | 21.64 | 19.29 |

**SOIL ANALYSIS DATA --**

Management unit 28, Study no: 5, Study Name: Swayback Knoll

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam  |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 11.9                         | 70.2 (10.9)     | 6.7 | 49.8  | 30.4  | 19.8  | 1.1 | 9.7   | 67.2  | 0.4  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 28 , Study no: 5

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Rabbit | 68                | 18  | 30  | 89  |
| Elk    | -                 | 1   | 1   | -   |
| Deer   | 59                | 32  | 38  | 54  |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| -                      | 1 (2)    | -        |
| 82 (202)               | 83 (205) | 93 (230) |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 5

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata wyomingensis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>4864</b>                           | 466                                      | 866   | 2599   | 1399     | -    | 23          | 75      | 29         | 1       | 4            | 21/20                     |
| 92                                       | <b>5900</b>                           | 480                                      | 940   | 3240   | 1720     | -    | 52          | 22      | 29         | 5       | 9            | -/-                       |
| 98                                       | <b>4240</b>                           | 540                                      | 500   | 2800   | 940      | 780  | 42          | 8       | 22         | 3       | 3            | 21/27                     |
| 03                                       | <b>5220</b>                           | -  | 220   | 3300   | 1700     | 560  | 48          | 37      | 33         | 12      | 12           | 20/25                     |
| 08                                       | <b>4520</b>                           | 1240                                     | 300   | 1900   | 2320     | 480  | 42          | 44      | 51         | 19      | 20           | 19/26                     |
| <i>Opuntia sp.</i>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>532</b>                            | -  | 266   | 133    | 133      | -    | 0           | 0       | 25         | 4       | 13           | 6/13                      |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                                       | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 4/6                       |
| 08                                       | <b>40</b>                             | -  | -     | -      | 40       | -    | 0           | 0       | 100        | -       | 100          | 6/15                      |
| <i>Opuntia whipplei</i>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                       | <b>660</b>                            | 100                                      | 20    | 580    | 60       | -    | 0           | 0       | 9          | -       | 0            | -/-                       |
| 98                                       | <b>360</b>                            | -  | 20    | 320    | 20       | 60   | 6           | 0       | 6          | 6       | 6            | 13/34                     |
| 03                                       | <b>320</b>                            | -  | -     | 240    | 80       | 40   | 0           | 0       | 25         | 6       | 13           | 12/27                     |
| 08                                       | <b>260</b>                            | -  | -     | 120    | 140      | 20   | 0           | 0       | 54         | 15      | 23           | 13/32                     |

Trend Study 28-6-08

Study site name: Cottonwood .

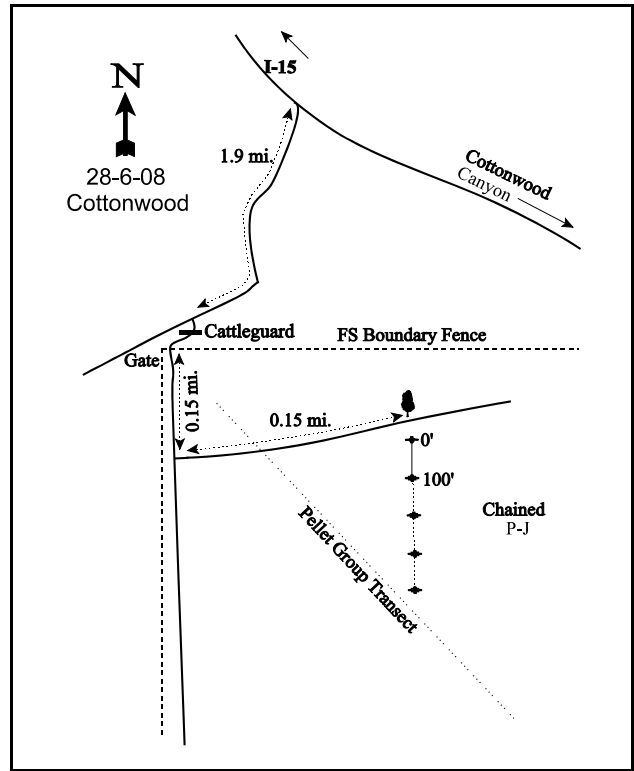
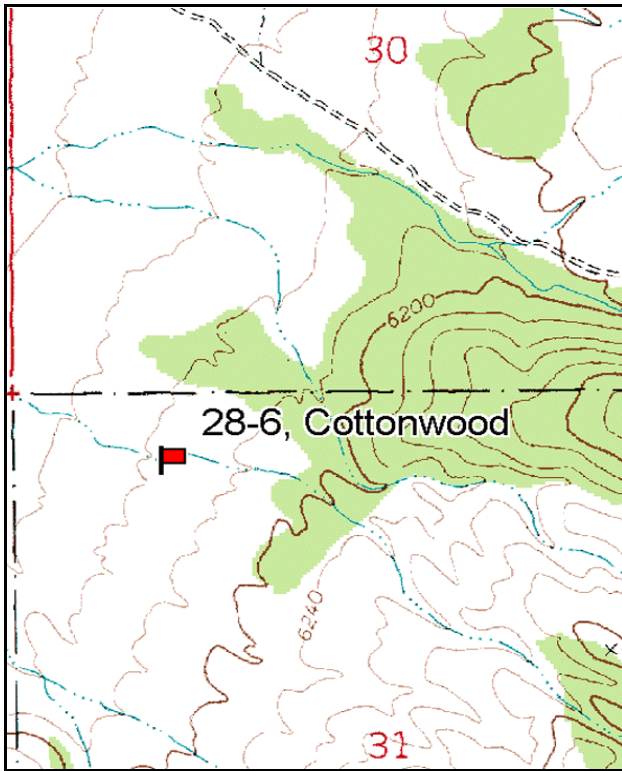
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). Rebar: belt 1 on 2ft, belt 3 on 2ft.

LOCATION DESCRIPTION

From the intersection of SR 20 and the frontage road along the east side of I-15, travel south down the frontage road 6.6 miles to a gate on the left. Go through the gate and travel east for 1.9 miles to a cattleguard on the right. From the cattleguard, go 0.15 miles south along the fence. Turn left on an old road going up into the chaining. Continue 0.15 miles to the study site on the south side of the road. Stop next to a large pinyon. From large pinyon, walk 75 feet at 130 degrees magnetic. The 0-foot baseline stake is 20 feet south of the road. This 2 foot tall fencepost is marked with a browse tag #9006.



Map Name: Cottonwood Mountain

Diagrammatic Sketch

Township 32S, Range 7W, Section 31

GPS: NAD 83, UTM 12S 351003 E, 4205316 N

## DISCUSSION

### Cottonwood - Trend Study No. 28-6

#### Study Information

This trend study is located on critical deer winter range west of the Hurricane Cliffs and samples a sagebrush area at the mouth of Cottonwood Canyon [elevation: 6,100 feet (1,859 m), slope: 2%-3%, aspect: west]. The site is just above the Forest Service boundary fence. The area is part of a large chaining project completed in 1970. The site is now dominated by a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and grass type with few pinyon pine (*Pinus edulis*) or Utah juniper (*Juniperus osteosperma*) trees being present. In 1992, deer sign was abundant including antler drops, pellet groups, and a carcass. A pellet group transect read on site in 1998 estimated 41 deer, 7 elk, and 2 cow days use/acre (101 ddu/ha, 17 edu/ha, and 5 cdu/ha). Pellet group transect data collected in 2003 estimated 60 deer, 3 elk, and 5 cow days use/acre (149 ddu/ha, 7 edu/ha, and 13 cdu/ha) on the site. Pellet group data for 2008 estimated 121 deer, 1 elk, and 4 cow days use/acre (299 ddu/ha, 2 edu/ha, and 11 cdu/ha).

#### Soils

The soil is a sandy loam with a slightly alkaline pH (7.5). Several gullies are found crossing the site, but do not appear to be very active. Relative combined average vegetation and litter cover has been 45%-64%, and relative combined average pavement and rock cover has been 18%-32% since 1992. Relative average bare ground cover has been moderate at 15%-23% since 1992. An erosion condition class assessment rated erosion as slight in 2003 due to surface litter movement, pedestaling, flow patterns, and rill formation. The erosion condition class assessment was rated as stable in 2008.

#### Browse

Wyoming big sagebrush is the only preferred browse species found in any frequency on the site. The sagebrush density has been similar since 1992 averaging about 1,600 plants/acre. Decadence in the sagebrush population increased steadily from 1987 to a high of 49% in 2003 before lowering slightly in 2008. Sagebrush plants displaying poor vigor have steadily increased from 1987, as well, with a high of 20% in 2008. Recruitment of young sagebrush plants showed a decline from 1987 with young plants comprising only 1% and 5% of the population in 2003 and 2008, respectively. Utilization of sagebrush has been moderate to heavy with very high use in 1987 when 89% of the sagebrush sampled displayed heavy hedging (>60% of twigs browsed). The only other browse encountered on the site include a few prickly phlox (*Leptodactylon pungens*) and prickly pear cactus (*Opuntia* sp.). Mature stands of pinyon and juniper to the north provide thermal cover. On the site itself, there are only scattered mature pinyon and juniper trees and a few young ones.

#### Herbaceous Understory

For a chained and seeded site, perennial herbaceous vegetation is limited. Common perennial grasses include crested wheatgrass (*Agropyron cristatum*), purple three-awn (*Aristida purpurea*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*). The average total cover of perennial grasses has been low at around 5% since 1992. Although annual species were not sampled in 1987, photographs from that year show that cheatgrass (*Bromus tectorum*) was moderately abundant. Cheatgrass has been the dominant grass on the site comprising 72% and 71% of the grass cover in 1998 and 2008, respectively. With drought conditions in 2003, cheatgrass had a drastic decline in frequency and cover, but quickly recovered in 2008. The forb component has poor composition and diversity. The only common perennial forb is scarlet globemallow (*Sphaeralcea coccinea*) which is a desirable species that has maintained a good population.

#### 1992 TREND ASSESSMENT

Trend for browse is slightly down. Differences in density of browse species may be related to the larger sample area used in 1992, therefore, trends for browse were determined using other parameters. Decadence of Wyoming big sagebrush increased from 1987 to 16%, and plants displaying poor vigor increased to 14%.

Recruitment of young plants declined with only 6% of the population comprised of young plants. Trend for grasses is up. Sum of nested frequencies for perennial grasses increased by 80% from 1987, with a significant increase in the nested frequency of bottlebrush squirreltail. Trend for forbs is slightly down. The sum of nested frequency of perennial forbs declined by 29% from 1987, with a significant decrease in the nested frequency of fendler spurge (*Euphorbia fendleri*). Annual grasses and forbs dominate the herbaceous understory. Cheatgrass accounts for 45% of the herbaceous understory cover.

winter range condition (DCI) - fair (35) Low potential scale  
browse - slightly down (-1)      grass - up (+2)      forb - slightly down (-1)

#### 1998 TREND ASSESSMENT

The browse trend is slightly down. Density of Wyoming big sagebrush has decreased by 19% since 1992 to 1,560 plants/acre and decadence has increased to 29% of the population. Sagebrush plants displaying poor vigor has remained fairly low at 13%. Recruitment of young plants is still low with only 6% of the population being categorized as young. The trend for grasses is slightly down. The sum of nested frequency of perennial grasses increased, but the nested frequency of cheatgrass increased significantly as well. The wet spring of 1998 produced high cheatgrass cover and cheatgrass was the dominant species comprising 72% of the grass cover, 66% of the herbaceous cover, and 52% of the vegetation cover. Trend for forbs is stable. The sum of nested frequency of perennial forbs and cover of perennial forbs had little change from 1992.

winter range condition (DCI) - poor-fair (24) Low potential scale  
browse - slightly down (-1)      grass - slightly down (-1)      forb - stable (0)

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Density of Wyoming big sagebrush remained similar to 1998 at 1,620 plants/acre. The sagebrush population increased in decadence to 49%, and the proportion of plants displaying poor vigor increased to 17%. Recruitment of young sagebrush declined to just 1% of the population. Trend for grasses is stable. Although the sum of nested frequency of perennial grasses has declined since 1998, cheatgrass significantly declined in cover and frequency which is a positive sign. Cool season grasses show declines in frequency while purple three-awn, a warm season species, remained stable. Trend for forbs is stable. Perennial forbs are stable in frequency, and cover of perennial forbs doubled since 1998 to 4%.

winter range condition (DCI) - fair (32) Low potential scale  
browse - slightly down (-1)      grass - stable (0)      forb - stable (0)

#### 2008 TREND ASSESSMENT

The browse trend is stable. Density of Wyoming big sagebrush remained similar to 2003. Decadence of sagebrush declined slightly, but was still fairly high at 39%. The proportion of sagebrush plants displaying poor vigor increased slightly to 20%. Recruitment of young sagebrush plants increased slightly, but is still low with young plants comprising only 5% of the population. Trend for grasses is down. The sum of nested frequency of perennial grasses declined by 20% since 2003, and the nested frequency of cheatgrass increased significantly. Cheatgrass dominated the grasses and comprised 71% of the grass cover. Trend for forbs is up. The sum of nested frequency of perennial forbs increased by 74% due to a significant increase in the nested frequency of scarlet globemallow. Globemallow is the only common perennial forb and provided 84% of the forb cover.

winter range condition (DCI) - poor-fair (28) Low potential scale  
browse - stable (0)      grass - down (-2)      forb - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 6

| T<br>y<br>p<br>e            | Species                            | Nested Frequency |                  |                  |                 |                  | Average Cover % |       |      |       |
|-----------------------------|------------------------------------|------------------|------------------|------------------|-----------------|------------------|-----------------|-------|------|-------|
|                             |                                    | '87              | '92              | '98              | '03             | '08              | '92             | '98   | '03  | '08   |
| G                           | <i>Agropyron cristatum</i>         | c <sub>35</sub>  | ab <sub>22</sub> | ab <sub>25</sub> | a <sub>18</sub> | a <sub>14</sub>  | .88             | .97   | .61  | .45   |
| G                           | <i>Aristida purpurea</i>           | a <sub>8</sub>   | bc <sub>53</sub> | cd <sub>75</sub> | d <sub>74</sub> | ab <sub>27</sub> | 3.02            | 4.52  | 2.42 | 2.17  |
| G                           | <i>Bouteloua gracilis</i>          | 3                | -                | -                | -               | -                | -               | -     | -    | -     |
| G                           | <i>Bromus tectorum</i> (a)         | -                | d <sub>302</sub> | b <sub>367</sub> | a <sub>44</sub> | c <sub>342</sub> | 8.19            | 17.91 | .33  | 12.06 |
| G                           | <i>Oryzopsis hymenoides</i>        | 8                | 6                | 8                | 2               | 7                | .07             | .10   | .03  | .40   |
| G                           | <i>Poa secunda</i>                 | -                | -                | 1                | 1               | 3                | -               | .03   | .00  | .01   |
| G                           | <i>Sitanion hystrix</i>            | a <sub>11</sub>  | b <sub>46</sub>  | b <sub>44</sub>  | a <sub>16</sub> | ab <sub>28</sub> | .93             | .86   | .19  | .68   |
| G                           | <i>Sporobolus cryptandrus</i>      | 3                | -                | 3                | -               | -                | -               | .00   | .00  | -     |
| G                           | <i>Stipa comata</i>                | 6                | 6                | 19               | 12              | 20               | .21             | .43   | .19  | 1.13  |
| Total for Annual Grasses    |                                    | 0                | 302              | 367              | 44              | 342              | 8.19            | 17.91 | 0.33 | 12.06 |
| Total for Perennial Grasses |                                    | 74               | 133              | 175              | 123             | 99               | 5.12            | 6.92  | 3.46 | 4.86  |
| Total for Grasses           |                                    | 74               | 435              | 542              | 167             | 441              | 13.32           | 24.84 | 3.80 | 16.93 |
| F                           | <i>Ambrosia</i> sp.                | -                | 5                | -                | -               | -                | .01             | -     | -    | -     |
| F                           | <i>Astragalus panguicensis</i>     | 2                | -                | -                | -               | -                | -               | -     | -    | -     |
| F                           | <i>Calochortus flexuosus</i>       | -                | -                | a <sup>-</sup>   | a <sup>-</sup>  | b <sub>11</sub>  | -               | -     | -    | .02   |
| F                           | <i>Chaenactis douglasii</i>        | -                | -                | 1                | -               | 3                | -               | .00   | -    | .01   |
| F                           | <i>Chenopodium fremontii</i> (a)   | -                | 3                | -                | 1               | -                | .00             | -     | .00  | -     |
| F                           | <i>Crepis acuminata</i>            | -                | -                | -                | -               | 8                | -               | -     | -    | .02   |
| F                           | <i>Cryptantha</i> sp.(a)           | -                | -                | a <sup>-</sup>   | a <sup>-</sup>  | b <sub>19</sub>  | -               | -     | -    | .05   |
| F                           | <i>Descurainia pinnata</i> (a)     | -                | b <sub>42</sub>  | a <sup>-</sup>   | a <sub>1</sub>  | a <sub>1</sub>   | 1.47            | -     | .00  | .00   |
| F                           | <i>Eriogonum cernuum</i> (a)       | -                | 6                | -                | -               | 7                | .04             | -     | -    | .01   |
| F                           | <i>Erigeron</i> sp.                | -                | -                | 2                | -               | -                | -               | .01   | -    | .00   |
| F                           | <i>Euphorbia fendleri</i>          | b <sub>90</sub>  | a <sup>-</sup>   | a <sup>-</sup>   | a <sup>-</sup>  | a <sup>-</sup>   | -               | -     | -    | -     |
| F                           | <i>Gayophytum ramosissimum</i> (a) | -                | -                | a <sup>-</sup>   | a <sup>-</sup>  | b <sub>36</sub>  | -               | -     | -    | .11   |
| F                           | <i>Gilia</i> sp. (a)               | -                | c <sub>112</sub> | a <sup>-</sup>   | b <sub>27</sub> | b <sub>40</sub>  | .66             | -     | .47  | .23   |
| F                           | <i>Ipomopsis aggregata</i>         | -                | 3                | -                | -               | -                | .00             | -     | -    | -     |
| F                           | <i>Lappula occidentalis</i> (a)    | -                | -                | -                | -               | 7                | -               | -     | -    | .16   |
| F                           | <i>Lygodesmia</i> sp.              | -                | -                | -                | -               | 1                | -               | -     | -    | .00   |
| F                           | <i>Mentzelia albicaulis</i> (a)    | -                | -                | a <sup>-</sup>   | a <sup>-</sup>  | b <sub>47</sub>  | -               | -     | -    | .62   |
| F                           | <i>Phlox longifolia</i>            | a <sup>-</sup>   | a <sup>-</sup>   | a <sup>-</sup>   | a <sub>6</sub>  | b <sub>19</sub>  | -               | -     | .15  | .13   |
| F                           | <i>Polygonum</i> sp.               | -                | 3                | -                | -               | 5                | .01             | -     | -    | .01   |
| F                           | <i>Ranunculus testiculatus</i> (a) | -                | -                | a <sup>-</sup>   | a <sup>-</sup>  | b <sub>31</sub>  | -               | -     | -    | .08   |
| F                           | <i>Senecio multilobatus</i>        | -                | 2                | -                | -               | -                | .00             | -     | -    | -     |
| F                           | <i>Sisymbrium altissimum</i> (a)   | -                | -                | -                | -               | -                | -               | -     | -    | .00   |

| Type                      | Species                      | Nested Frequency |                   |                  |                  |                  | Average Cover % |      |      |      |
|---------------------------|------------------------------|------------------|-------------------|------------------|------------------|------------------|-----------------|------|------|------|
|                           |                              | '87              | '92               | '98              | '03              | '08              | '92             | '98  | '03  | '08  |
| F                         | <i>Sphaeralcea coccinea</i>  | <sub>a</sub> 71  | <sub>ab</sub> 103 | <sub>b</sub> 125 | <sub>b</sub> 130 | <sub>c</sub> 188 | 2.59            | 2.29 | 4.25 | 7.80 |
| F                         | <i>Streptanthus cordatus</i> | -                | -                 | -                | -                | 1                | -               | -    | -    | .00  |
| Total for Annual Forbs    |                              | 0                | 163               | 0                | 29               | 188              | 2.18            | 0    | 0.48 | 1.29 |
| Total for Perennial Forbs |                              | 163              | 116               | 128              | 136              | 236              | 2.62            | 2.31 | 4.40 | 8.02 |
| Total for Forbs           |                              | 163              | 279               | 128              | 165              | 424              | 4.81            | 2.31 | 4.89 | 9.32 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 6

| Type             | Species                                  | Strip Frequency |     |     |     | Average Cover % |      |       |      |
|------------------|--|-----------------|-----|-----|-----|-----------------|------|-------|------|
|                  |  | '92             | '98 | '03 | '08 | '92             | '98  | '03   | '08  |
| B                | <i>Artemisia tridentata wyomingensis</i> | 50              | 46  | 44  | 47  | 9.88            | 7.56 | 12.17 | 8.91 |
| B                | <i>Leptodactylon pungens</i>             | 3               | 1   | 1   | 1   | .15             | .03  | .00   | .00  |
| B                | <i>Opuntia sp.</i>                       | 2               | 1   | 1   | 1   | .00             | .00  | .00   | .00  |
| Total for Browse |  | 55              | 48  | 46  | 49  | 10.03           | 7.59 | 12.17 | 8.91 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 6

| Species                                  | Percent Cover |      |
|--|---------------|------|
|  | '03           | '08  |
| <i>Artemisia tridentata wyomingensis</i> | 8.21          | 8.64 |

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 6

| Species                                  | Average leader growth (in) |     |
|--|----------------------------|-----|
|  | '03                        | '08 |
| <i>Artemisia tridentata wyomingensis</i> | 1.6                        | 1.5 |



**BASIC COVER --**

Management unit 28 , Study no: 6

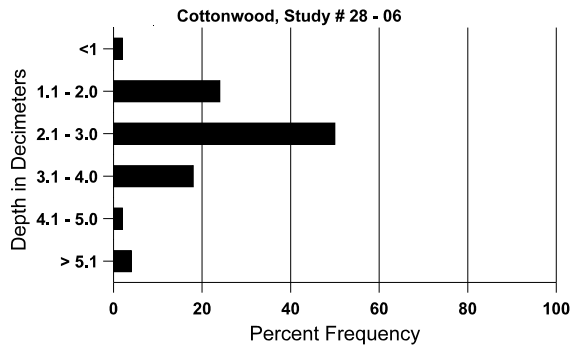
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 3.25            | 24.97 | 34.35 | 22.39 | 33.70 |
| Rock        | 12.75           | 5.65  | 4.45  | 5.30  | 3.54  |
| Pavement    | 10.50           | 24.90 | 16.75 | 30.56 | 20.37 |
| Litter      | 64.25           | 25.82 | 38.24 | 28.77 | 40.47 |
| Cryptogams  | 0               | .01   | .24   | .10   | .10   |
| Bare Ground | 9.25            | 21.09 | 23.68 | 26.27 | 17.06 |

**SOIL ANALYSIS DATA --**

Management unit 28, Study no: 6, Study Name: Cottonwood

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %0M | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 14.8                         | 68.8 (15.0)     | 7.5 | 61.4       | 20.4  | 18.2  | 1.3 | 7.8   | 147.2 | 0.5  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 28 , Study no: 6

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Rabbit | 61                | 38  | 35  | 88  |
| Elk    | -                 | 1   | -   | 1   |
| Deer   | 57                | 47  | 28  | 65  |
| Cattle | 2                 | -   | 2   | 2   |

| Days use per acre (ha) |          |           |
|------------------------|----------|-----------|
| '98                    | '03      | '08       |
| -                      | -        | -         |
| 7 (17)                 | 3 (7)    | 1 (2)     |
| 41 (101)               | 60 (149) | 121 (299) |
| 2 (5)                  | 5 (13)   | 4 (11)    |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 6

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata wyomingensis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>2464</b>                           | -  | 466   | 1799   | 199      | -    | 11          | 89      | 8          | .81     | 3            | 23/29                     |
| 92                                       | <b>1920</b>                           | -  | 120   | 1500   | 300      | -    | 57          | 14      | 16         | 6       | 14           | -/-                       |
| 98                                       | <b>1560</b>                           | 140                                      | 100   | 1000   | 460      | 340  | 64          | 6       | 29         | 6       | 13           | 26/37                     |
| 03                                       | <b>1620</b>                           | -  | 20    | 800    | 800      | 280  | 37          | 42      | 49         | 14      | 17           | 27/35                     |
| 08                                       | <b>1580</b>                           | 120                                      | 80    | 880    | 620      | 560  | 10          | 42      | 39         | 20      | 20           | 22/33                     |
| <i>Cowania mexicana stansburiana</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 26/50                     |
| <i>Juniperus osteosperma</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Leptodactylon pungens</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/10                      |
| 03                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/5                       |
| 08                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 4/8                       |
| <i>Opuntia sp.</i>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>40</b>                             | 20                                       | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 5/9                       |
| 03                                       | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/14                      |

Trend Study 28-7-08

Study site name: Paragonah .

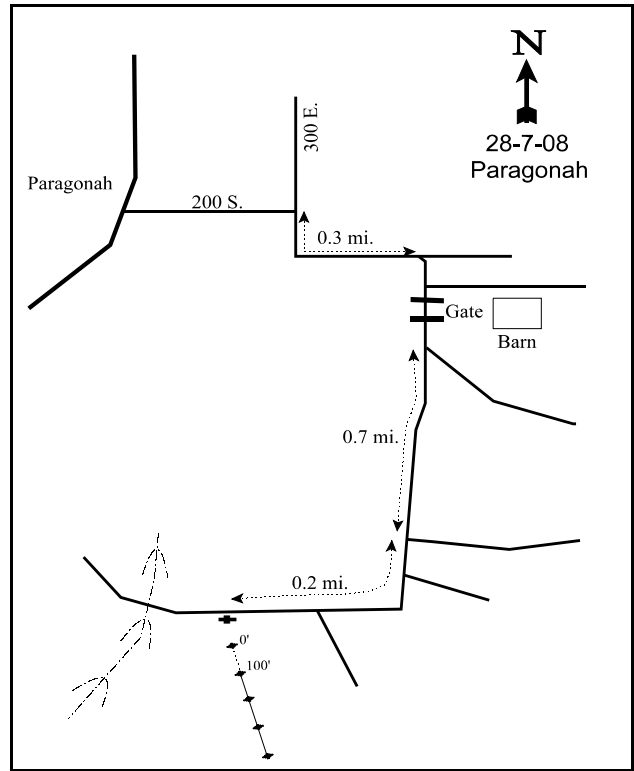
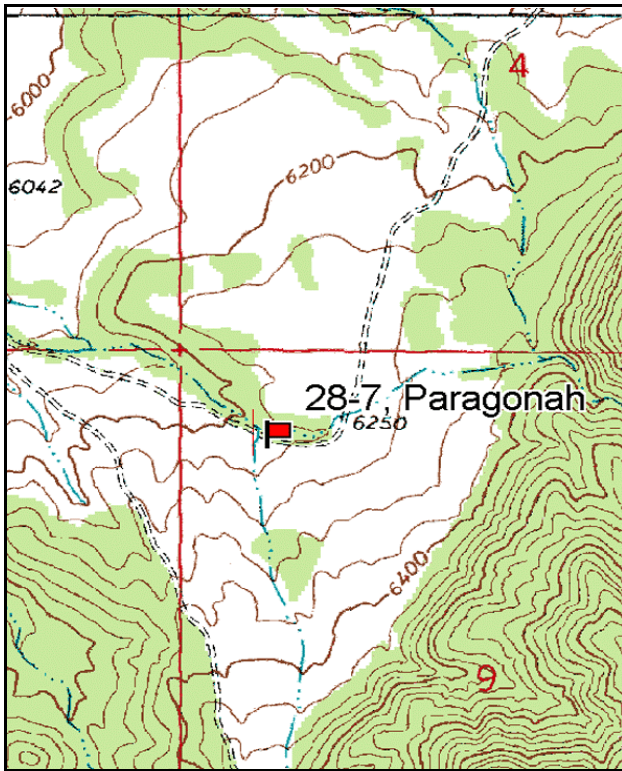
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 132 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From 200 South and 300 East in Paragonah, continue south on 300 East for 0.3 miles to where the road turns south. Drive 0.1 miles to a gate and a barn. Go through a series of two gates and to a fork. Stay right on the road that goes south and drive for 0.7 miles to another fork. Continue south for 0.2 miles (the road will bend and go west) to the witness post on the south (left) side of the road (just beyond the witness post is a large gully). The baseline starts 92 feet at 188 degrees magnetic from the witness post. The study is marked by short fenceposts.



Map Name: Parowan

Diagrammatic Sketch

Township 34S, Range 8W, Section 9

GPS: NAD 83, UTM 12S 344091 E, 4192360 N

## DISCUSSION

### Paragonah - Trend Study No. 28-7

#### Study Information

This study is located in an old chained and seeded pinyon-juniper area on critical winter range for deer [elevation: 6,200 feet (1,890 m), slope: 10%, aspect: northwest]. The site slopes away from the cliffs and towards the fields at the base of the bench. There was considerable regrowth of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) on this site until a lop and scatter treatment was done prior to the 2003 survey. Pellet group transect data estimated about 23 deer days use/acre (58 ddu/ha) in 1998 and 2003, and 30 deer days use/acre (73 ddu/ha) in 2008.

#### Soils

Soil textural and chemical analysis indicates a sandy loam with a slightly acidic pH (6.3). Phosphorus and potassium levels are low at 6.0 ppm and 3.2 ppm, respectively, and only have low availability to for plant growth and development (Tiedemann and Lopez 2004). Relative combined average vegetation and litter cover has been moderately high at 52%-67%, and relative combined average rock and pavement cover has been 15%-26% since 1992. Relative average bare ground cover has been 13%-21% since 1992. An erosion condition class assessment rated soils as stable in 2003, but increased to slight in 2008 due to flow patterns, rills, and gully formation.

#### Browse

Ten species of shrubs or trees have been sampled on the site in at least one sample year, but only black sagebrush (*Artemisia nova*), broom snakeweed (*Gutierrezia sarothrae*), and Gambel oak (*Quercus gambelii*) are abundant. Black sagebrush is the key browse species comprising 72% of the browse cover in 2008. Density of black sagebrush has ranged from a high of 4,480 plants/acre in 2008 and a low of 2,540 plants/acre in 1998. The black sagebrush population steadily became more mature and decadent with every reading from 1987 to 2003, then decadence declined again markedly in 2008. The increase in decadence in 2003 is not surprising with the drought experienced prior to and including the 2003 sampling year. Vigor of black sagebrush was good in all sample years, but the proportion of plants displaying poor vigor increased slightly in 2003 before decreasing again in 2008. Recruitment of young sagebrush plants has been good except in 2003 when young plants comprised only 5% of the population. Utilization on black sagebrush was heavy in 1987 when 76% of the shrubs displayed heavy use. Use declined to a more moderate level in 1992, and was mostly light in 1998, 2003, and 2008. Small numbers of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) also occur on the site, and some of the black sagebrush are hybrids with mountain big sagebrush.

Broom snakeweed was the most abundant shrub during the initial reading in 1987, and its density has fluctuated greatly over the sample years from an estimated high of 7,932 plants/acre in 1987 to a low of 1,320 plants/acre in 1998. A significant portion of the snakeweed population has been made up of young plants since 1992. Gambel oak on the site occurs in large scattered clones. Oak has shown mostly light use in all surveys and is used primarily for cover by wintering animals. Line-intercept canopy cover of oak was estimated at about 6% in both 1998 and 2003, but decreased to only 1% in 2008.

Pinyon and juniper, although not numerous, figured prominently in the structure of this site prior to the lop and scatter treatment. Point-center quarter data in 1998 estimated 49 Utah juniper trees/acre and 71 pinyon pine trees/acre for a total of 120 trees/acre. Tree density in 2008 was estimated at 21 juniper trees/acre and 48 pinyon trees/acre. Combined pinyon-juniper line-intercept canopy cover was estimated at 23% in 1998. Following the lop and scatter treatment, pinyon-juniper line-intercept canopy cover was reduced to less than 1% in 2003 increasing to 3% in 2008.

### Herbaceous Understory

The herbaceous understory is dominated by a patchy stand of crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*). Cheatgrass (*Bromus tectorum*) significantly increased in 1998, but also declined in 2003 with drought conditions. Crested wheatgrass and cheatgrass increased significantly in 2008 while intermediate wheatgrass remained stable. Perennial forbs are diverse but are rarely encountered. The only common perennial forb encountered during every sample year was the prostrate fendler spurge (*Euphorbia fendleri*). Annual forbs increased in 2003 due primarily to bur buttercup (*Ranunculus testiculatus*), but have decreased again in 2008.

### 1992 TREND ASSESSMENT

Trend for browse is stable. Density differences for browse species may be related to the larger sample area used in 1992, therefore, trend for browse was determined using other parameters. The key browse on the site consist of black sagebrush, mountain big sagebrush, and Gambel oak. Vigor was good in all three species, but decadence increased slightly in black sagebrush and oak. Recruitment of young plants was good in all three species. There was an increase in pinyon and juniper trees which appear to be regaining dominance of the site. Trend for grasses is down. The sum of nested frequency of perennial grasses declined by 37%. There was a significant decrease in the nested frequency of crested wheatgrass, intermediate wheatgrass, and bottlebrush squirreltail. The trend for forbs is stable. The sum of nested frequency of perennial forbs changed little from 1987, and forbs are rare on the site.

winter range condition (DCI) - good (48) Low potential scale  
browse - stable (0)                      grass - down (-2)                      forb - stable (0)

### 1998 TREND ASSESSMENT

The browse trend is stable. Density of the primary browse species, black sagebrush, has decreased by 41% since 1992 to 2,540 plants/acre. Black sagebrush appears to be thinning itself as the stand matures as cover on the site increased slightly since 1992. Decadence of black sagebrush has decreased slightly, but is still moderate at 20%. Recruitment of young black sagebrush plants has declined to 19% of the population. Gambel oak density has decreased by 61% since 1992 to 1,020 stems/acre. Mountain big sagebrush measurements have remained similar to 1992 levels. Trend for grasses is slightly up. The sum of nested frequency of perennial grasses increased by 43% from 1992, and production of perennial grasses increased from 4% of the total cover to 7% cover. There was a significant increase in the nested frequency of intermediate wheatgrass. However, cheatgrass also had a significant increase in nested frequency, and production increased from less than 1% of the total cover to over 3% cover. Cheatgrass currently accounts for 27% of the total herbaceous understory cover. Crested wheatgrass and intermediate wheatgrass are the dominate perennial species and together contribute 55% of the herbaceous understory cover. Trend for forbs is stable. There was a slight decline in the sum of nested frequency of perennial forbs, and forbs are rare on the site.

winter range condition (DCI) - good (54) Low potential scale  
browse - stable (0)                      grass - slightly up (+1)                      forb - stable (0)

### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Density of the primary browse species, black sagebrush, increased, but so did decadence and plants displaying poor vigor. Recruitment of young black sagebrush plants has declined to just 5% of the population. Density of mountain big sagebrush declined by 75% since 1998 to just 60 plants/acre. Mountain big sagebrush decadence increased to 67%, no young were sampled, and 33% of the population displayed poor vigor. There was a pinyon-juniper thinning treatment prior to the 2003 reading that should help both sagebrush species as well as the herbaceous understory. Trend for the grasses is down. Sum of nested frequency of perennial grasses has decreased by 51% since 1998, and production of perennial grasses declined to just 1% of the total cover. There was a significant decrease in the nested frequency of both of the

seeded grasses, crested wheatgrass and intermediate wheatgrass. Cheatgrass also had a significant decrease in its nested frequency, and it decreased to less than 1% of the total cover. Trend for forbs is slightly down. There has been a continued decrease in the sum of nested frequency of perennial forbs since 1992, and production of perennial forbs has decreased to less than 1% of the total cover. The annual species, burr buttercup, had a significant increase in nested frequency.

winter range condition (DCI) - fair (29) Low potential scale

browse - slightly down (-1)

grass - down (-2)

forb - slightly down (-1)

### 2008 TREND ASSESSMENT

Trend for browse is up. The density of the primary browse species, black sagebrush, increased 34% to 4,480 plants/acre. Decadence of black sagebrush has decreased to 13%, and vigor has improved. Recruitment of young black sagebrush plants is the highest since sampling began with young plants comprising 33% of the population. Density of mountain big sagebrush more than doubled to 180 plants/acre, and decadence and vigor improved markedly. The trend for grasses and forbs is up. The sum of nested frequency of perennial grasses and perennial forbs had around a two-fold increase. Production of perennial grasses and perennial forbs increased to 9% of the total cover and over 2% of the total cover, respectively. There was a significant increase in the nested frequency of crested wheatgrass, bottlebrush squirreltail, and cheatgrass. There was a significant decrease in the nested frequency of burr buttercup. Forbs are still a minor component on this site.

winter range condition (DCI) - good (63) Low potential scale

browse - slightly up (+1)

grass - up (+2)

forb - up (+2)

### HERBACEOUS TRENDS --

Management unit 28 , Study no: 7

| T<br>y<br>p<br>e            | Species                | Nested Frequency |      |       |      |      | Average Cover % |       |      |       |
|-----------------------------|------------------------|------------------|------|-------|------|------|-----------------|-------|------|-------|
|                             |                        | '87              | '92  | '98   | '03  | '08  | '92             | '98   | '03  | '08   |
| G                           | Agropyron cristatum    | c211             | b146 | bc154 | a90  | b140 | 3.39            | 4.71  | .71  | 6.98  |
| G                           | Agropyron intermedium  | bc58             | a27  | c59   | a13  | ab29 | .49             | 2.13  | .05  | .64   |
| G                           | Agropyron smithii      | -                | -    | 11    | -    | -    | -               | .02   | -    | -     |
| G                           | Agropyron spicatum     | -                | -    | -     | -    | 1    | -               | -     | -    | .03   |
| G                           | Aristida purpurea      | -                | -    | -     | -    | 8    | -               | -     | -    | .19   |
| G                           | Bromus tectorum (a)    | -                | a45  | d219  | b91  | c145 | .33             | 3.40  | .33  | 1.00  |
| G                           | Oryzopsis hymenoides   | 10               | 8    | 5     | 1    | 5    | .07             | .18   | .15  | .19   |
| G                           | Poa secunda            | a2               | ab3  | c24   | bc21 | c25  | .00             | .19   | .12  | .30   |
| G                           | Sitanion hystrix       | b13              | a-   | ab7   | a4   | c37  | .00             | .19   | .01  | .94   |
| G                           | Sporobolus cryptandrus | -                | -    | -     | -    | 1    | -               | -     | -    | .06   |
| G                           | Stipa comata           | -                | -    | 3     | -    | -    | -               | .00   | -    | -     |
| G                           | Vulpia octoflora (a)   | -                | -    | a-    | b12  | a-   | -               | -     | .03  | -     |
| Total for Annual Grasses    |                        | 0                | 45   | 219   | 103  | 145  | 0.32            | 3.40  | 0.36 | 1.00  |
| Total for Perennial Grasses |                        | 294              | 184  | 263   | 129  | 246  | 3.97            | 7.46  | 1.04 | 9.34  |
| Total for Grasses           |                        | 294              | 229  | 482   | 232  | 391  | 4.30            | 10.87 | 1.40 | 10.35 |
| F                           | Alyssum alyssoides (a) | -                | a3   | a7    | a10  | b33  | .00             | .02   | .02  | .12   |

| Type                      | Species                     | Nested Frequency |                  |                  |                 |                  | Average Cover % |      |      |      |
|---------------------------|-----------------------------|------------------|------------------|------------------|-----------------|------------------|-----------------|------|------|------|
|                           |                             | '87              | '92              | '98              | '03             | '08              | '92             | '98  | '03  | '08  |
| F                         | Arabis sp.                  | -                | 3                | -                | -               | -                | .00             | -    | -    | -    |
| F                         | Artemisia dracunculus       | -                | -                | 4                | -               | -                | -               | .03  | -    | -    |
| F                         | Astragalus lentiginosus     | -                | 2                | -                | -               | 5                | .01             | -    | -    | .06  |
| F                         | Astragalus newberryi        | 1                | 4                | 3                | -               | 8                | .01             | .01  | -    | .04  |
| F                         | Castilleja linariaefolia    | -                | -                | -                | -               | 2                | -               | -    | -    | .01  |
| F                         | Calochortus nuttallii       | -                | -                | -                | -               | 20               | -               | -    | -    | .27  |
| F                         | Collinsia parviflora (a)    | -                | -                | -                | 5               | -                | -               | -    | .01  | -    |
| F                         | Delphinium nuttallianum     | a-               | a-               | a-               | a <sup>2</sup>  | b <sup>13</sup>  | -               | -    | .00  | .22  |
| F                         | Draba sp. (a)               | -                | -                | -                | 7               | 2                | -               | -    | .02  | .00  |
| F                         | Eriogonum cernuum (a)       | -                | 2                | -                | -               | -                | .00             | -    | -    | -    |
| F                         | Erigeron sp.                | -                | -                | -                | -               | 1                | -               | -    | -    | .03  |
| F                         | Erigeron pumilus            | b <sup>10</sup>  | ab <sup>10</sup> | a <sup>4</sup>   | a-              | a <sup>3</sup>   | .04             | .01  | -    | .01  |
| F                         | Eriogonum racemosum         | -                | 1                | -                | 3               | 4                | .00             | -    | .00  | .06  |
| F                         | Eriogonum umbellatum        | 5                | 1                | 3                | 3               | 6                | .03             | .01  | .00  | .01  |
| F                         | Euphorbia fendleri          | b <sup>80</sup>  | ab <sup>75</sup> | ab <sup>55</sup> | a <sup>40</sup> | ab <sup>50</sup> | 1.12            | .88  | .40  | .21  |
| F                         | Lactuca serriola            | -                | 1                | 6                | -               | -                | .00             | .02  | -    | -    |
| F                         | Leucelene ericoides         | a-               | b <sup>12</sup>  | a <sup>8</sup>   | b <sup>15</sup> | b <sup>22</sup>  | .22             | .30  | .36  | 1.13 |
| F                         | Lithospermum ruderale       | a-               | b <sup>13</sup>  | a <sup>2</sup>   | a <sup>3</sup>  | a <sup>1</sup>   | .06             | .15  | .01  | .01  |
| F                         | Lygodesmia sp.              | -                | -                | -                | -               | 1                | -               | -    | -    | .03  |
| F                         | Machaeranthera canescens    | 3                | 3                | -                | -               | 3                | .03             | -    | -    | .15  |
| F                         | Microsteris gracilis (a)    | -                | -                | -                | 4               | 4                | -               | -    | .01  | .01  |
| F                         | Penstemon eatoni            | -                | -                | -                | -               | -                | -               | .00  | -    | -    |
| F                         | Petradoria pumila           | 1                | -                | -                | -               | -                | -               | -    | -    | -    |
| F                         | Phlox longifolia            | -                | -                | 7                | 6               | 5                | -               | .01  | .01  | .01  |
| F                         | Ranunculus testiculatus (a) | -                | ab <sup>18</sup> | a <sup>7</sup>   | c <sup>98</sup> | b <sup>41</sup>  | .09             | .02  | .74  | .08  |
| F                         | Senecio douglasii           | 2                | -                | -                | -               | -                | -               | -    | -    | -    |
| F                         | Sphaeralcea coccinea        | -                | 10               | 2                | 1               | 11               | .19             | .03  | .03  | .05  |
| F                         | Streptanthus cordatus       | 3                | 9                | 10               | 9               | 12               | .31             | .09  | .02  | .05  |
| F                         | Taraxacum officinale        | -                | -                | -                | -               | 4                | -               | -    | -    | .01  |
| F                         | Tragopogon dubius           | 1                | -                | -                | -               | -                | -               | -    | -    | .03  |
| F                         | Unknown forb-perennial      | b <sup>24</sup>  | a-               | a-               | a-              | a-               | -               | -    | -    | -    |
| Total for Annual Forbs    |                             | 0                | 23               | 14               | 124             | 80               | 0.09            | 0.04 | 0.80 | 0.22 |
| Total for Perennial Forbs |                             | 130              | 144              | 104              | 82              | 171              | 2.05            | 1.57 | 0.85 | 2.44 |
| Total for Forbs           |                             | 130              | 167              | 118              | 206             | 251              | 2.15            | 1.61 | 1.66 | 2.67 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 28 , Study no: 7

| Type             | Species                       | Strip Frequency |     |     |     | Average Cover % |       |      |       |
|------------------|-------------------------------|-----------------|-----|-----|-----|-----------------|-------|------|-------|
|                  |                               | '92             | '98 | '03 | '08 | '92             | '98   | '03  | '08   |
| B                | Artemisia nova                | 59              | 50  | 47  | 56  | 4.31            | 5.88  | 3.88 | 9.34  |
| B                | Artemisia tridentata vaseyana | 7               | 8   | 3   | 6   | .03             | .15   | .00  | .06   |
| B                | Brickellia sp.                | 1               | 0   | 0   | 0   | .00             | -     | -    | -     |
| B                | Chrysothamnus nauseosus       | 1               | 2   | 0   | 4   | .00             | .00   | -    | .15   |
| B                | Eriogonum microthecum         | 12              | 4   | 2   | 3   | 1.05            | .07   | .03  | .03   |
| B                | Gutierrezia sarothrae         | 49              | 30  | 43  | 48  | 1.46            | .79   | 1.07 | 1.18  |
| B                | Juniperus osteosperma         | 4               | 2   | 0   | 0   | 1.92            | 1.25  | -    | -     |
| B                | Leptodactylon pungens         | 11              | 7   | 5   | 13  | .27             | .39   | .15  | .42   |
| B                | Opuntia sp.                   | 2               | 2   | 1   | 5   | .03             | .04   | .15  | .15   |
| B                | Pediocactus simpsonii         | 0               | 0   | 0   | 2   | -               | -     | -    | .00   |
| B                | Pinus edulis                  | 13              | 14  | 0   | 2   | 8.71            | 9.66  | .39  | .16   |
| B                | Quercus gambelii              | 8               | 7   | 9   | 8   | 4.50            | 4.65  | 3.42 | 1.50  |
| Total for Browse |                               | 167             | 126 | 110 | 147 | 22.31           | 22.91 | 9.11 | 13.02 |

CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 7

| Species                       | Percent Cover |      |      |
|-------------------------------|---------------|------|------|
|                               | '98           | '03  | '08  |
| Artemisia nova                | -             | 3.26 | 4.41 |
| Artemisia tridentata vaseyana | -             | -    | .08  |
| Chrysothamnus nauseosus       | -             | -    | .13  |
| Gutierrezia sarothrae         | -             | .61  | .30  |
| Juniperus osteosperma         | 4.19          | .40  | -    |
| Leptodactylon pungens         | -             | .03  | .21  |
| Opuntia sp.                   | -             | -    | .01  |
| Pinus edulis                  | 18.60         | .50  | 2.91 |
| Quercus gambelii              | 6.00          | 5.31 | 1.41 |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 7

| Species        | Average leader growth (in) |     |
|----------------|----------------------------|-----|
|                | '03                        | '08 |
| Artemisia nova | 1.6                        | 0.5 |



POINT-QUARTER TREE DATA --  
Management unit 28 , Study no: 7

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 49             | -   | 21  |
| Pinus edulis          | 71             | 18  | 48  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 4.7                   | -   | 1.2 |
| 5.1                   | 1.0 | 3.9 |

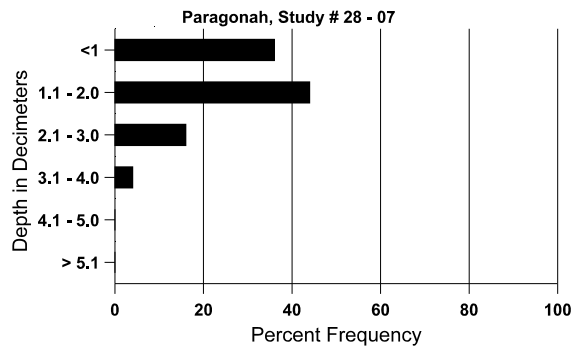
BASIC COVER --  
Management unit 28 , Study no: 7

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 2.75            | 25.71 | 35.17 | 11.72 | 22.99 |
| Rock        | 12.25           | 29.99 | 9.75  | 7.34  | 6.84  |
| Pavement    | 27.00           | 0     | 18.49 | 9.14  | 12.12 |
| Litter      | 43.50           | 34.60 | 47.87 | 57.23 | 52.14 |
| Cryptogams  | 0               | 2.03  | 2.18  | 1.27  | .38   |
| Bare Ground | 14.50           | 24.43 | 17.53 | 20.29 | 18.04 |

SOIL ANALYSIS DATA --  
Management unit 28, Study no: 7, Study Name: Paragonah

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 10.9                         | 68.4 (12.1)     | 6.3 | 65.4       | 20.4   | 14.2   | 2.2 | 6.0   | 3.2   | 0.4  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28 , Study no: 7

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Sheep  | 2                 | -   | -   | -   |
| Rabbit | 84                | 56  | 24  | 50  |
| Elk    | -                 | 1   | -   | -   |
| Deer   | 26                | 28  | 4   | 26  |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| -                      | -       | -       |
| -                      | -       | -       |
| 23 (57)                | 23 (58) | 29 (73) |

BROWSE CHARACTERISTICS --

Management unit 28 , Study no: 7

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>3665</b>                           | 333                                      | 466   | 2933   | 266      | -    | 11          | 76      | 7          | .54     | 2            | 10/18                     |
| 92                                   | <b>4300</b>                           | 440                                      | 840   | 2200   | 1260     | -    | 53          | 22      | 29         | -       | 1            | -/-                       |
| 98                                   | <b>2540</b>                           | 100                                      | 480   | 1560   | 500      | 260  | 13          | 0       | 20         | 3       | 3            | 11/21                     |
| 03                                   | <b>2960</b>                           | -  | 140   | 1560   | 1260     | 160  | 9           | 4       | 43         | 11      | 11           | 9/15                      |
| 08                                   | <b>4480</b>                           | 3040                                     | 1460  | 2440   | 580      | 100  | 28          | 4       | 13         | 3       | 3            | 10/22                     |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>199</b>                            | 66                                       | 133   | -      | 66       | -    | 0           | 100     | 33         | -       | 0            | -/-                       |
| 92                                   | <b>280</b>                            | 40                                       | 120   | 100    | 60       | -    | 21          | 14      | 21         | -       | 0            | -/-                       |
| 98                                   | <b>240</b>                            | 20                                       | 60    | 120    | 60       | 40   | 25          | 0       | 25         | -       | 0            | 14/26                     |
| 03                                   | <b>60</b>                             | -  | -     | 20     | 40       | -    | 0           | 33      | 67         | 33      | 33           | 22/33                     |
| 08                                   | <b>180</b>                            | -  | 100   | 60     | 20       | -    | 11          | 0       | 11         | 11      | 11           | 24/38                     |
| <i>Brickellia sp.</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Cercocarpus montanus</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/9                       |

|                                |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                           | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus nauseosus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                             | 20                                    | 20                                       | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                             | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 8/12                      |
| 03                             | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                             | 80                                    | -  | -     | 40     | 40       | 20   | 0           | 0       | 50         | 25      | 25           | 10/8                      |
| <b>Eriogonum microthecum</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                             | 520                                   | 20                                       | 120   | 400    | -        | -    | 4           | 8       | 0          | -       | 0            | -/-                       |
| 98                             | 140                                   | -  | 80    | 40     | 20       | -    | 0           | 29      | 14         | -       | 29           | 7/11                      |
| 03                             | 80                                    | -  | -     | 80     | -        | -    | 0           | 25      | 0          | -       | 0            | 5/6                       |
| 08                             | 80                                    | 20                                       | 20    | 40     | 20       | -    | 0           | 25      | 25         | 25      | 25           | 3/6                       |
| <b>Gutierrezia sarothrae</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 7931                                  | 466                                      | 399   | 7266   | 266      | -    | 0           | 0       | 3          | .75     | 3            | 8/5                       |
| 92                             | 4320                                  | 120                                      | 1640  | 2660   | 20       | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                             | 1320                                  | 20                                       | 400   | 900    | 20       | 40   | 0           | 0       | 2          | -       | 2            | 9/9                       |
| 03                             | 2560                                  | 60                                       | 420   | 2120   | 20       | 80   | 0           | 0       | 1          | .78     | .78          | 6/6                       |
| 08                             | 3040                                  | 1000                                     | 800   | 1800   | 440      | 1080 | 0           | 0       | 14         | 11      | 11           | 5/6                       |
| <b>Juniperus osteosperma</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 0                                     | 66                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                             | 80                                    | 20                                       | -     | 80     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                             | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                             | 0                                     | -  | -     | -      | -        | 80   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                             | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Leptodactylon pungens</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 932                                   | -  | 66    | 866    | -        | -    | 0           | 0       | 0          | -       | 93           | 3/5                       |
| 92                             | 600                                   | -  | 80    | 520    | -        | -    | 3           | 0       | 0          | -       | 0            | -/-                       |
| 98                             | 360                                   | -  | 40    | 300    | 20       | -    | 0           | 0       | 6          | -       | 0            | 7/12                      |
| 03                             | 320                                   | -  | 60    | 240    | 20       | -    | 0           | 0       | 6          | 6       | 6            | 4/7                       |
| 08                             | 820                                   | 40                                       | 260   | 400    | 160      | -    | 0           | 0       | 20         | -       | 0            | 6/8                       |
| <b>Opuntia sp.</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                             | 66                                    | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 100          | 2/8                       |
| 92                             | 100                                   | 20                                       | 20    | 60     | 20       | -    | 0           | 0       | 20         | -       | 20           | -/-                       |
| 98                             | 60                                    | 20                                       | 20    | 20     | 20       | -    | 0           | 0       | 33         | 33      | 67           | 5/9                       |
| 03                             | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/11                      |
| 08                             | 160                                   | -  | 40    | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | 4/6                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b>Pediocactus simpsonii</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 08                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 1/2                       |  |
| <b>Pinus edulis</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 87                           | <b>199</b>                            | -  | -     | 199    | -        | -    | 0           | 0       | -          | -       | 0            | 85/47                     |  |
| 92                           | <b>400</b>                            | -  | 240   | 160    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                           | <b>300</b>                            | 60                                       | 80    | 220    | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                           | <b>0</b>                              | 80                                       | -     | -      | -        | 180  | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 08                           | <b>80</b>                             | 80                                       | 80    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| <b>Quercus gambelii</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 87                           | <b>199</b>                            | -  | 199   | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |  |
| 92                           | <b>2620</b>                           | 400                                      | 1860  | 520    | 240      | -    | 9           | 18      | 9          | -       | 6            | -/-                       |  |
| 98                           | <b>1020</b>                           | -  | 640   | 380    | -        | 80   | 0           | 0       | 0          | -       | 0            | 87/29                     |  |
| 03                           | <b>2160</b>                           | -  | 740   | 1340   | 80       | 160  | 0           | 0       | 4          | 2       | 2            | 59/31                     |  |
| 08                           | <b>3280</b>                           | -  | 1420  | 1860   | -        | -    | 0           | 0       | 0          | -       | 0            | 76/40                     |  |

Trend Study 28-8-08

Study site name: Grass Valley .

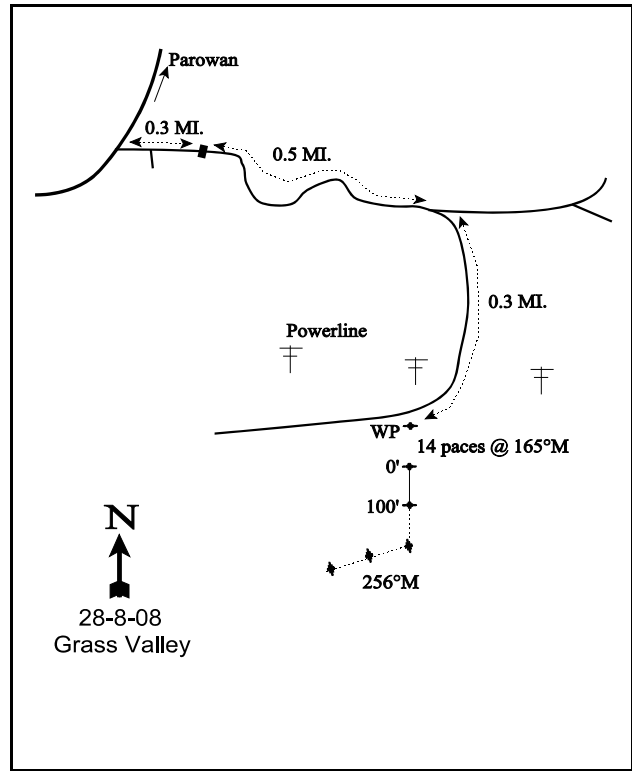
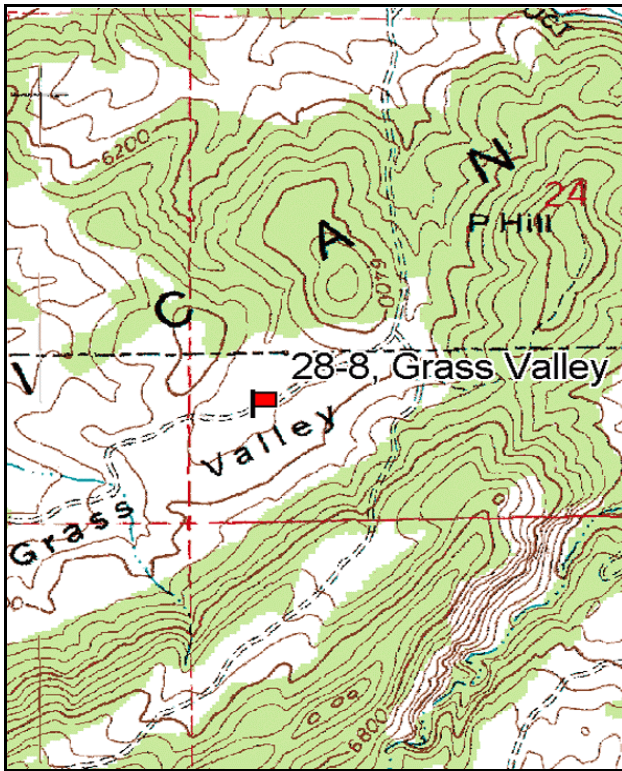
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic. (Lines 3-4, 256° M degrees).

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From I-15 take the north Parowan exit and go south into town. Continue down Main Street to a big gradual curve on the south end of town. Just passed the Parowan Heritage Park, turn east off the highway across from a log house onto a road, go past other houses staying on the main road 0.3 miles to cattleguard. From the cattleguard, continue 0.5 miles to a fork. Bear right. Proceed 0.3 miles underneath the powerlines to a witness post on left side of the road. The baseline starts 68 feet away at a bearing of 165 degrees magnetic and is marked by 2 foot tall fenceposts with no browse tag.



Map Name: Parowan

Diagrammatic Sketch

Township 34S, Range 9W, Section 24

GPS: NAD 83, UTM 12S 339053 E, 4188116 N

## DISCUSSION

### Grass Valley - Trend Study No. 28-8

#### Study Information

This trend study is located in the foothills south of Parowan [elevation: 6,400 feet (1,951 m), slope: 5%, aspect: northwest]. The site is surrounded by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) covered hills. Most of the valley was chained and seeded in the mid-1960's by the BLM. The site itself is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and seeded grasses and is considered critical deer winter range. There is a 3-way exclosure which was built in the late 1970's approximately 0.3 miles west of the site. A pellet group transect read in conjunction with the range trend transect in 1998 estimated 61 deer, 1 elk, and 9 cow days use/acre (151 ddu/ha, 3 edu/ha, and 22 cdu/ha). Pellet group transect data collected in 2003 estimated 57 deer, 1 elk, and 11 cow days use/acre (141 ddu/ha, 3 edu/ha, and 27 cdu/ha) on the site. Pellet group data collected in 2008 estimated 96 deer days use/acre (236 ddu/ha) and 4 cow day use/acre (11 cdu/ha).

#### Soils

Soil textural and chemical analysis indicates a sandy loam with a slightly acidic pH (6.4). The soil surface in the shrub interspaces is characterized by bare patches with concentrations of small rocks and pavement that appear to be of volcanic origin. Relative combined average vegetation and litter cover was 60%-65% , and relative combined average rock and pavement cover was 13%-24% since 1992. Relative average bare ground cover has been moderate at 15%-25% since 1992. The erosion condition class assessment rated erosion as stable in 2003 and 2008.

#### Browse

Mountain big sagebrush is the dominant browse as it provides over 90% of the average browse cover in all readings. The population of sagebrush is moderately dense with an average density of about 3,600 plants/acre since 1992, but has also declined since 1992. This population has been characterized by moderate to high decadence (34%-60%), and the proportion of plants displaying poor vigor has been low to moderate (5%-33%). Recruitment of young sagebrush plants has been relatively low with young plants comprising only 2%-9% of the population in all readings. Utilization has been moderate to heavy in all surveys, with the highest use being documented in 1987, and lightest use in 1998. Some of the sagebrush plants have the growth form of the more erect but less preferred basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and are likely hybrids between the two subspecies. Additional palatable forage is provided by bitterbrush (*Purshia tridentata*) and squaw apple (*Peraphyllum ramosissimum*) which are heavily browsed, but occur in very low densities on the site.

Pinyon and juniper trees are more prominent as you move south toward the hills. Point-center quarter data estimated 76 pinyon and 17 juniper trees/acre in 2003, and 32 pinyon and 37 juniper trees/acre in 2008. Additional browse sampled on the site include mostly less preferred increasers such as low rabbitbrush (*Chrysothamnus viscidiflorus*), prickly phlox (*Leptodactylon pungens*), and prickly pear cactus (*Opuntia* sp.).

#### Herbaceous Understory

Perennial grasses are abundant and dominate the herbaceous understory. Two seeded species, crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*), are the most common species. Of the perennials, they have the highest nested frequency values in all years and together have provided an average of 69% of the grass cover since 1992. Native perennials include Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread grass (*Stipa comata*). The annual species cheatgrass (*Bromus tectorum*) has steadily increased on the site with significant increases in nested frequency each reading from 1992 to 2003, before decreasing significantly in 2008. Another negative factor is the continued increase of bulbous bluegrass (*Poa bulbosa*), a low value short-lived perennial. The

forb component is limited, and perennial forb species are insignificant on the site.

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Density differences for browse species may be related to the larger sample area used in 1992, therefore, trend for browse was determined using other parameters. Decadence of mountain big sagebrush has increased slightly and is very high (60%), and vigor has declined slightly. The proportion of young sagebrush plants in the population increased slightly to 7%. Trend for both the grasses and forbs is stable. There was little change in measurements for perennial grasses or forbs since 1987. The herbaceous understory consists almost entirely of grasses. Perennial forbs are nearly absent.

winter range condition (DCI) - poor-fair (50) Mid-level potential scale  
browse - stable (0)                      grass - stable (0)                      forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for browse is slightly down. Density of mountain big sagebrush has decreased by 23% from 1992 to 3,480 plants/acre. Decadence of sagebrush decreased to 34%, and plants displaying poor vigor decreased to 5%. Recruitment of young sagebrush plants has improved slightly, but is still low at 9%. It appears that the population may not be able to sustain itself at current levels. The trend for grasses is stable. The sum of nested frequency of perennial grasses increased slightly, but there was a significant increase in the nested frequency of cheatgrass and bulbous bluegrass. The trend for forbs is stable. Forbs are lacking on this site, and perennial forbs are nearly absent.

winter range condition (DCI) - fair (55) Mid-level potential scale  
browse - slightly down (-1)                      grass - stable (0)                      forb - stable (0)

#### 2003 TREND ASSESSMENT

Trend for browse is slightly down. Mountain big sagebrush continued to decline in density although at a slower rate than in previous surveys. The sagebrush population has increased decadence to 47%, and plants displaying poor vigor increased to 21%. The proportion of young in the population declined to just 2%. Trend for grasses is slightly down. The sum of nested frequency of perennial grasses declined slightly, and the nested frequency of cheatgrass and bulbous bluegrass increased significantly. Production of cheatgrass increased to 6% of the total cover and 29% of the grass cover. Trend for the forbs is stable. Forbs are lacking on the site, and perennial forbs are nearly absent.

winter range condition (DCI) - poor (42) Mid-level potential scale  
browse - slightly down (-1)                      grass - slightly down (-1)                      forb - stable (0)

#### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of mountain big sagebrush has not changed from 2003. Decadence of sagebrush is similar and the proportion of plants displaying poor vigor has increased slightly since 2003. Recruitment of young sagebrush is up slightly, but is similar to 2003. Density of pinyon/juniper has decreased from 93 trees/acre in 2003 to 69 trees/acre. Trend for the grasses is up. Sum of nested frequency of perennial grasses increased by 25%, and production of perennial grasses increased to 22% of the total cover. There was a significant decrease in the nested frequency of cheatgrass, and cover of cheatgrass declined to less than 0.1% of the total cover. Trend for the forbs is stable. Forbs are lacking on the site, and perennial forbs are nearly absent.

winter range condition (DCI) - poor (46) Mid-level potential scale  
browse - stable (0)                      grass - up (+2)                      forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 8

| Type                        | Species                     | Nested Frequency |                   |                   |                  |                  | Average Cover % |       |       |       |
|-----------------------------|-----------------------------|------------------|-------------------|-------------------|------------------|------------------|-----------------|-------|-------|-------|
|                             |                             | '87              | '92               | '98               | '03              | '08              | '92             | '98   | '03   | '08   |
| G                           | Agropyron cristatum         | b <sub>144</sub> | ab <sub>111</sub> | ab <sub>132</sub> | a <sub>97</sub>  | a <sub>102</sub> | 6.79            | 10.14 | 5.32  | 7.33  |
| G                           | Agropyron intermedium       | b <sub>133</sub> | a <sub>168</sub>  | a <sub>120</sub>  | b <sub>146</sub> | b <sub>179</sub> | 8.02            | 5.08  | 5.65  | 9.04  |
| G                           | Aristida purpurea           | a <sup>-</sup>   | a <sup>-</sup>    | a <sup>-</sup>    | a <sup>-</sup>   | b <sub>10</sub>  | -               | .15   | .00   | .22   |
| G                           | Bromus inermis              | b <sub>21</sub>  | ab <sub>16</sub>  | ab <sub>18</sub>  | a <sub>5</sub>   | a <sub>3</sub>   | .25             | .21   | .06   | .03   |
| G                           | Bromus tectorum (a)         | -                | b <sub>124</sub>  | c <sub>194</sub>  | d <sub>261</sub> | a <sub>40</sub>  | 2.26            | 2.14  | 5.69  | .09   |
| G                           | Oryzopsis hymenoides        | 6                | 9                 | 5                 | 2                | 8                | .21             | .04   | .03   | .42   |
| G                           | Poa bulbosa                 | a <sup>-</sup>   | b <sub>7</sub>    | c <sub>77</sub>   | d <sub>94</sub>  | d <sub>124</sub> | .10             | 1.10  | 1.67  | 2.96  |
| G                           | Poa secunda                 | a <sup>-</sup>   | ab <sub>4</sub>   | ab <sub>12</sub>  | b <sub>15</sub>  | b <sub>16</sub>  | .02             | .07   | .25   | .10   |
| G                           | Sitanion hystrix            | bc <sub>29</sub> | bc <sub>46</sub>  | c <sub>56</sub>   | ab <sub>26</sub> | a <sub>1</sub>   | 1.90            | 2.02  | .55   | .03   |
| G                           | Sporobolus cryptandrus      | a <sup>-</sup>   | a <sup>-</sup>    | a <sup>-</sup>    | a <sup>-</sup>   | b <sub>21</sub>  | -               | -     | -     | .21   |
| G                           | Stipa comata                | b <sub>53</sub>  | ab <sub>30</sub>  | a <sub>13</sub>   | a <sub>14</sub>  | ab <sub>34</sub> | .69             | .72   | .37   | 1.49  |
| Total for Annual Grasses    |                             | 0                | 124               | 194               | 261              | 40               | 2.26            | 2.14  | 5.69  | 0.08  |
| Total for Perennial Grasses |                             | 386              | 391               | 433               | 399              | 498              | 18.00           | 19.54 | 13.92 | 21.88 |
| Total for Grasses           |                             | 386              | 515               | 627               | 660              | 538              | 20.27           | 21.69 | 19.61 | 21.97 |
| F                           | Agoseris glauca             | a <sup>-</sup>   | a <sup>-</sup>    | a <sup>-</sup>    | a <sub>2</sub>   | b <sub>11</sub>  | -               | -     | .00   | .05   |
| F                           | Alyssum alyssoides (a)      | -                | -                 | a <sub>1</sub>    | a <sub>1</sub>   | b <sub>8</sub>   | -               | .00   | .00   | .01   |
| F                           | Arabis sp.                  | -                | -                 | -                 | -                | 1                | -               | -     | -     | .00   |
| F                           | Astragalus sp.              | -                | -                 | 4                 | -                | 3                | -               | .06   | -     | .00   |
| F                           | Calochortus nuttallii       | -                | -                 | -                 | -                | 3                | -               | -     | -     | .01   |
| F                           | Chaenactis douglasii        | 1                | -                 | 2                 | -                | -                | -               | .01   | -     | -     |
| F                           | Cruciferae                  | -                | 9                 | 4                 | -                | -                | .04             | .01   | -     | -     |
| F                           | Draba sp. (a)               | -                | -                 | 1                 | -                | -                | -               | .00   | -     | -     |
| F                           | Eriogonum cernuum (a)       | -                | 6                 | -                 | -                | -                | .39             | -     | -     | -     |
| F                           | Gayophytum ramosissimum(a)  | -                | a <sup>-</sup>    | a <sup>-</sup>    | a <sub>7</sub>   | b <sub>22</sub>  | -               | -     | .02   | .06   |
| F                           | Microsteris gracilis (a)    | -                | a <sup>-</sup>    | a <sub>8</sub>    | b <sub>35</sub>  | a <sub>16</sub>  | -               | .02   | .10   | .03   |
| F                           | Orobanche fasciculata       | -                | -                 | 2                 | -                | -                | -               | .00   | -     | -     |
| F                           | Phlox longifolia            | -                | -                 | -                 | 3                | 1                | -               | -     | .00   | .03   |
| F                           | Polygonum douglasii (a)     | -                | a <sub>1</sub>    | a <sub>4</sub>    | a <sup>-</sup>   | b <sub>12</sub>  | .00             | .01   | -     | .04   |
| F                           | Ranunculus testiculatus (a) | -                | a <sup>-</sup>    | b <sub>12</sub>   | c <sub>47</sub>  | c <sub>65</sub>  | -               | .03   | .21   | .26   |
| F                           | Streptanthus cordatus       | -                | -                 | -                 | 3                | -                | -               | -     | .00   | -     |
| F                           | Taraxacum officinale        | -                | 3                 | 1                 | 3                | -                | .00             | .00   | .01   | -     |
| F                           | Unknown forb-annual (a)     | -                | b <sub>40</sub>   | a <sup>-</sup>    | a <sup>-</sup>   | a <sup>-</sup>   | .11             | -     | -     | -     |
| F                           | Unknown forb-perennial      | 1                | -                 | -                 | -                | -                | -               | -     | -     | -     |
| F                           | Zigadenus paniculatus       | -                | -                 | -                 | -                | -                | -               | -     | -     | .00   |



| Type | Species                   | Nested Frequency |     |     |     |     | Average Cover % |      |      |      |
|------|---------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|------|
|      |                           | '87              | '92 | '98 | '03 | '08 | '92             | '98  | '03  | '08  |
|      | Total for Annual Forbs    | 0                | 47  | 26  | 90  | 123 | 0.50            | 0.07 | 0.34 | 0.41 |
|      | Total for Perennial Forbs | 2                | 12  | 13  | 11  | 19  | 0.04            | 0.08 | 0.02 | 0.11 |
|      | Total for Forbs           | 2                | 59  | 39  | 101 | 142 | 0.55            | 0.15 | 0.36 | 0.52 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 8

| Type | Species                              | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------|--------------------------------------|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|      |                                      | '92             | '98 | '03 | '08 | '92             | '98   | '03   | '08   |
| B    | <i>Artemisia tridentata vaseyana</i> | 90              | 85  | 79  | 73  | 16.55           | 13.69 | 16.11 | 10.42 |
| B    | <i>Chrysothamnus viscidiflorus</i>   | 1               | 0   | 0   | 0   | .00             | -     | -     | -     |
| B    | <i>Juniperus osteosperma</i>         | 0               | 2   | 1   | 1   | .03             | .93   | .15   | .03   |
| B    | <i>Leptodactylon pungens</i>         | 11              | 7   | 7   | 8   | .25             | .27   | .24   | .21   |
| B    | <i>Opuntia sp.</i>                   | 3               | 0   | 0   | 0   | .00             | -     | -     | -     |
| B    | <i>Peraphyllum ramosissimum</i>      | 0               | 1   | 1   | 0   | -               | .00   | .00   | -     |
| B    | <i>Pediocactus simpsonii</i>         | 0               | 0   | 0   | 1   | -               | -     | -     | .00   |
|      | Total for Browse                     | 105             | 95  | 88  | 83  | 16.84           | 14.90 | 16.51 | 10.66 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 8

| Species                              | Percent Cover |       |
|--------------------------------------|---------------|-------|
|                                      | '03           | '08   |
| <i>Artemisia tridentata vaseyana</i> | 12.75         | 12.48 |
| <i>Leptodactylon pungens</i>         | -             | .11   |

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 8

| Species                              | Average leader growth (in) |     |
|--------------------------------------|----------------------------|-----|
|                                      | '03                        | '08 |
| <i>Artemisia tridentata vaseyana</i> | 1.6                        | 1.0 |

POINT-QUARTER TREE DATA --  
Management unit 28 , Study no: 8

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 40             | 17  | 37  |
| Pinus edulis          | 20             | 7   | 32  |

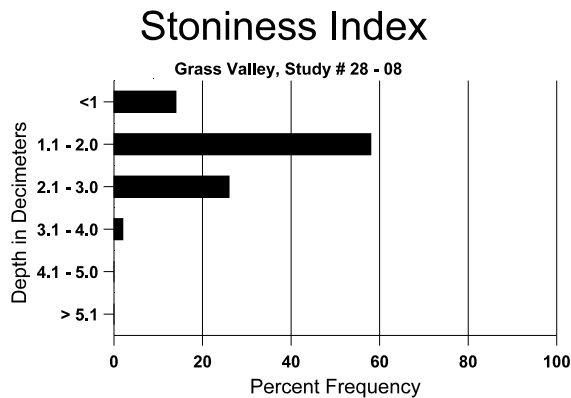
| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 3.4                   | 1.6 | 2.5 |
| 4.7                   | 1.3 | 1.2 |

BASIC COVER --  
Management unit 28 , Study no: 8

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 4.75            | 32.46 | 37.59 | 35.54 | 35.48 |
| Rock        | 3.00            | 1.86  | 3.20  | 3.13  | 2.15  |
| Pavement    | 21.25           | 23.52 | 20.40 | 11.61 | 20.28 |
| Litter      | 54.25           | 31.47 | 48.00 | 34.69 | 38.73 |
| Cryptogams  | 0               | .16   | .47   | .10   | .28   |
| Bare Ground | 16.75           | 16.85 | 21.84 | 28.43 | 17.62 |

SOIL ANALYSIS DATA --  
Management unit 28, Study no: 8, Study Name: Grass Valley

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 15.9                         | 69.6 (12.4)     | 6.4 | 60.7       | 20.7   | 18.6   | 1.7 | 9.4   | 192.0 | 0.4  |



PELLET GROUP DATA --

Management unit 28 , Study no: 8

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | 1                 | -   | -   |
| Rabbit | 48                | 30  | 71  |
| Elk    | -                 | 1   | -   |
| Deer   | 46                | 30  | 56  |
| Cattle | 3                 | 3   | 1   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| -                      | -        | -        |
| 1 (2)                  | 1 (3)    | -        |
| 61 (151)               | 57 (141) | 96 (236) |
| 9 (22)                 | 11 (27)  | 4 (11)   |

BROWSE CHARACTERISTICS --

Management unit 28 , Study no: 8

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>5531</b>                           | 66                                       | 199   | 2533   | 2799     | -    | 20          | 80      | 51         | 2       | 11           | 20/20                     |
| 92                                   | <b>4480</b>                           | 240                                      | 300   | 1480   | 2700     | -    | 41          | 40      | 60         | 11      | 16           | -/-                       |
| 98                                   | <b>3460</b>                           | 100                                      | 320   | 1960   | 1180     | 1080 | 47          | 3       | 34         | 5       | 5            | 25/35                     |
| 03                                   | <b>3280</b>                           | -  | 80    | 1660   | 1540     | 1060 | 35          | 24      | 47         | 21      | 21           | 22/29                     |
| 08                                   | <b>3280</b>                           | 120                                      | 120   | 1540   | 1620     | 1320 | 49          | 13      | 49         | 30      | 33           | 22/33                     |
| <i>Chrysothamnus viscidiflorus</i>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 15/17                     |
| <i>Juniperus osteosperma</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 57/39                     |
| 92                                   | <b>0</b>                              | 40                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>40</b>                             | 20                                       | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 35/11                     |
| 08                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Leptodactylon pungens</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                   | <b>920</b>                            | 20                                       | 160   | 760    | -        | -    | 11          | 9       | 0          | -       | 4            | -/-                       |
| 98                                   | <b>320</b>                            | -  | -     | 320    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/9                       |
| 03                                   | <b>300</b>                            | -  | -     | 260    | 40       | -    | 0           | 0       | 13         | 7       | 7            | 6/8                       |
| 08                                   | <b>340</b>                            | -  | 20    | 300    | 20       | -    | 0           | 0       | 6          | 6       | 6            | 5/8                       |

|                                 |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                            | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Opuntia sp.</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                              | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 3/7                       |
| 08                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/16                      |
| <b>Peraphyllum ramosissimum</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                              | 133                                   | -  | -     | -      | 133      | -    | 0           | 100     | 100        | -       | 0            | -/-                       |
| 92                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                              | 20                                    | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 25/22                     |
| 03                              | 20                                    | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 27/40                     |
| 08                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 36/67                     |
| <b>Pediocactus simpsonii</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                              | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus edulis</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                              | 0                                     | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 42/81                     |
| 08                              | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 32/35                     |

Trend Study 28-11-08

Study site name: Elliker Basin.

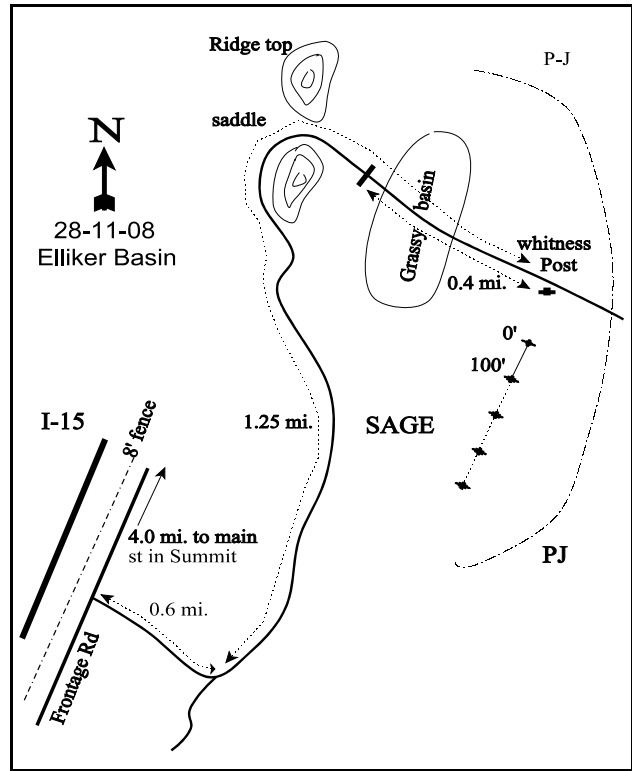
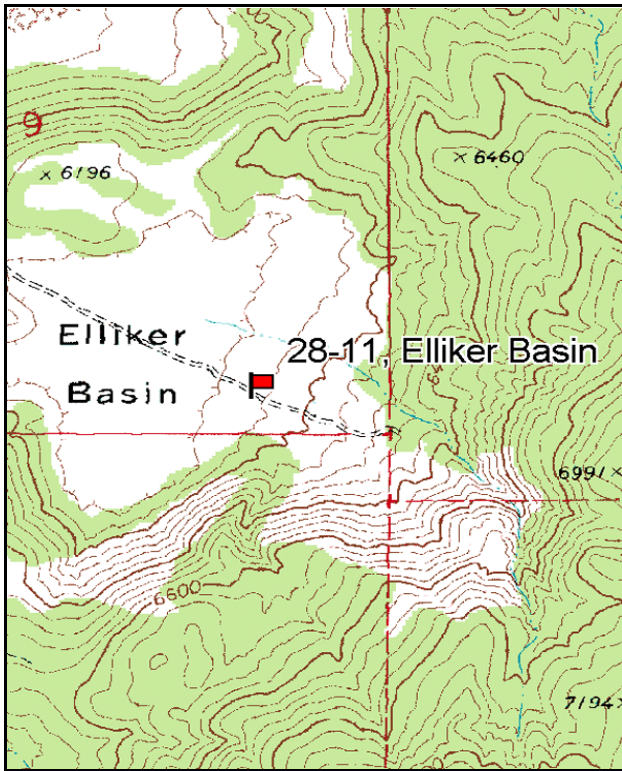
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 231 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft). Rebar: belts 1, 2, 4 on 3ft, belt 3&5 on 1ft.

LOCATION DESCRIPTION

At the I-15 interchange (exit 71) in Summit, go south on the frontage road (Summer Tree Dr.) on the east side of the freeway for 4.0 miles. Turn left onto a dirt road, proceed through a gate and go east for 0.6 miles. Bear left at the fork and continue 1.25 miles to Elliker Basin and up to a half-high witness post in the sagebrush on the right. The transect starts 12 paces away at a bearing of 221 degrees magnetic. The 0-foot stake is marked with browse tag #495.



Map Name: Summit

Diagrammatic Sketch

Township 35S, Range 10W, Section 9

GPS: NAD 83, UTM 12S 325608 E, 4181759 N

## DISCUSSION

### Elliker Basin - Trend Study No. 28-11

#### Study Information

This study is located in Elliker Basin, a small sagebrush valley at the base of the Hurricane Cliffs about eight miles northeast of Cedar City [elevation: 6,160 feet (1,878 m), slope: 10%-15%, aspect: west]. The transect itself is located on the southeastern slope of the basin just below the line of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) which continue up the cliffs. Pinyon and juniper dominate the slopes bordering the valley. The area is important deer winter range, which was acquired by the UDWR in a trade with the BLM. The area was apparently seeded years ago. Additionally, a hand chainsaw treatment was done during the spring of 1992 to eliminate encroaching juniper trees. A pellet group transect read on site in 1998 estimated 44 deer and 1 elk day use/acre (109 ddu/ha and 3 edu/ha). Use increased on the site in 2003 with 151 deer days use/acre (374 ddu/ha). Pellet groups were difficult to differentiate between in 2003 as they were very abundant and piled on top of one another. Pellet data in 2008 estimated 16 elk days use/acre (40 edu/ha) and 106 deer days use/acre (261 ddu/ha).

#### Soils

Soil textural and chemical analysis indicates a loam soil with a moderately acidic pH (5.8). Relative combined average vegetation and litter cover was 58%-70%, and relative combined average rock and pavement cover was 26%-39% since 1992. Relative average bare ground cover was low at 4%-8% since 1992. An erosion condition class assessment rated the as stable in 2003, but erosion on the site was rated as slight in 2008 with flow patterns and litter movement being the predominant factors.

#### Browse

The key browse species is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as it has provided 99% or more of the browse cover since 1992. Density of sagebrush has steadily declined from a high of 3,400 plants/acre in 1992 to a low of 2,220 plants/acre in 2008. The sagebrush population on the site has been moderately to highly decadent (25%-64%). The proportion of plants displaying poor vigor has been low to moderate (5%-39%). The highest decadence and poorest vigor occurred in 2008. Recruitment of young plants has been poor on this site with young plants comprising only 0%-6% of the population in any of the sample years. Utilization of sagebrush has been mostly moderate to heavy with the heaviest use recorded in 2003.

Pinyon and juniper dominate the surrounding slopes and have invaded into the upper part of the sagebrush valley. The juniper trees to the west and on the slope below the basin were severely high-lined in 1987. The chainsaw treatment cut down all the juniper on the study site, but of all the trees alive during the 1992 reading were dead by 1998. The only other browse with any density estimates on the site include small numbers of broom snakeweed (*Gutierrezia sarothrae*) and prickly pear cactus (*Opuntia* sp.).

#### Herbaceous Understory

The herbaceous understory was dominated by cheatgrass (*Bromus tectorum*) from 1992 to 2003, but frequency and cover of cheatgrass declined markedly in 2008. Another annual, sixweeks fescue (*Vulpia octoflora*), was also moderately abundant, but declined in 2008 as well. In 2008, the site was dominated by the perennial grasses intermediate wheatgrass (*Agropyron intermedium*) and galletta (*Hilaria jamesii*). Other common grasses are purple three-awn (*Aristida purpurea*), sand dropseed (*Sporobolus cryptandrus*). Bulbous bluegrass (*Poa bulbosa*) was sampled on the site in 2003, but not in any other sample year. Forbs are insignificant on this site, especially perennial species. All forbs combined have provided less than 1% average cover since 1992.

### 1992 TREND ASSESSMENT

Trend for browse is slightly down. Density differences in browse species may be related to the larger sample area used in 1992, therefore, trend for browse was determined using other parameters. Decadence of the primary browse species, mountain big sagebrush, increased to 51%, and the proportion of plants displaying poor vigor increased to 28%. Recruitment of young sagebrush plants has improved, but is still low with young plants comprising only 6% of the population. The trend for grasses is slightly down. The herbaceous understory is dominated by cheatgrass, sixweeks fescue, and a few annual forbs which make up 55% of the herbaceous understory cover. Perennial grasses consist primarily of three warm season species. The sum of nested frequencies for perennial grasses decreased by 12% since 1987. Trend for forbs is stable. Perennial forbs are rare.

winter range condition (DCI) - very poor (23) Mid-level potential  
browse - slightly down (-1)      grass - slightly down (-1)      forb - stable (0)

### 1998 TREND ASSESSMENT

The browse trend is slightly up. Density of mountain big sagebrush has declined slightly, though both sagebrush decadence and vigor improved from 1992. Recruitment of young sagebrush plants remained similar to 1992. Trend for the grasses is slightly up. Sum of nested frequency of perennial grasses increased by 13%, and production of perennial grasses increased to about 8% of the total cover. Cheatgrass still dominates the herbaceous understory, but has significantly declined in nested frequency since 1992. Trend for forbs is stable. There was a slight increase in the sum of nested frequency of perennial forbs, but forbs are rare.

winter range condition (DCI) - poor-fair (49) Mid-level potential  
browse - slightly up (+1)      grass - slightly up (+1)      forb - stable (0)

### 2003 TREND ASSESSMENT

Trend for browse is down. Density of mountain big sagebrush continues to decline, and decadence of sagebrush increased to 57%. Sagebrush plants displaying poor vigor increased slightly to 11%. Recruitment of young plants continued to decline and young plants comprised only 2% of the population. Trend for grasses is stable. Sum of nested frequency of perennial grasses increased somewhat, but cover of perennial grasses declined slightly. Cheatgrass remains the dominant species with and cover was very high at 25%. Trend for the forbs is stable. Forbs are rare and contribute little to this site.

winter range condition (DCI) - very poor (17) Mid-level potential  
browse - down (-2)      grass - stable (0)      forb - stable (0)

### 2008 TREND ASSESSMENT

Trend for browse is slightly down. Density of mountain big sagebrush continued to decrease 12% since 2003 to 2,220 plants/acre, the lowest estimated density since sampling began. Decadence of sagebrush declined to 64% of the population, and the proportion of plants displaying poor vigor increased to 39%. Both decadence and poor vigor are the highest measurement since sampling began. Recruitment of young plants is still poor at 3%. Trend for grasses is up. The sum of nested frequency of perennial grasses increased by 43%, and production increased to over 12% total cover. The annual species, cheatgrass and six weeks fescue, decreased significantly in nested frequency, and cover of annual species was less than 1%. This is a drastic improvement with perennial grasses now dominating the herbaceous understory. Trend for forbs is stable. Forbs continue to account for less than 1% of total cover.

winter range condition (DCI) - poor (40) Mid-level potential  
browse - slightly down (-1)      grass - up (+2)      forb - stable (0)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 11

| T<br>y<br>p<br>e            | Species                            | Nested Frequency |                  |                  |                   |                  | Average Cover % |       |       |       |
|-----------------------------|------------------------------------|------------------|------------------|------------------|-------------------|------------------|-----------------|-------|-------|-------|
|                             |                                    | '87              | '92              | '98              | '03               | '08              | '92             | '98   | '03   | '08   |
| G                           | <i>Agropyron cristatum</i>         | 7                | -                | -                | -                 | -                | -               | -     | -     | -     |
| G                           | <i>Agropyron intermedium</i>       | <sub>a</sub> 25  | <sub>a</sub> 17  | <sub>ab</sub> 38 | <sub>cd</sub> 65  | <sub>c</sub> 78  | .89             | 2.65  | 2.87  | 4.71  |
| G                           | <i>Agropyron smithii</i>           | 3                | -                | -                | -                 | -                | -               | -     | -     | -     |
| G                           | <i>Aristida purpurea</i>           | <sub>c</sub> 77  | <sub>b</sub> 34  | <sub>ab</sub> 9  | <sub>a</sub> 9    | <sub>b</sub> 35  | .42             | .19   | .07   | .52   |
| G                           | <i>Bromus tectorum</i> (a)         | -                | <sub>c</sub> 369 | <sub>b</sub> 330 | <sub>bc</sub> 347 | <sub>a</sub> 27  | 32.16           | 7.40  | 25.13 | .22   |
| G                           | <i>Hilaria jamesii</i>             | <sub>a</sub> -   | <sub>b</sub> 21  | <sub>bc</sub> 30 | <sub>bc</sub> 29  | <sub>c</sub> 43  | 1.70            | 1.88  | 2.24  | 5.35  |
| G                           | <i>Oryzopsis hymenoides</i>        | -                | 1                | -                | -                 | 1                | .03             | -     | -     | .00   |
| G                           | <i>Poa bulbosa</i>                 | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 20   | <sub>a</sub> -   | -               | -     | .23   | -     |
| G                           | <i>Poa secunda</i>                 | -                | -                | 6                | 4                 | 3                | -               | .18   | .06   | .01   |
| G                           | <i>Sitanion hystrix</i>            | <sub>ab</sub> 18 | <sub>ab</sub> 12 | <sub>a</sub> 8   | <sub>ab</sub> 15  | <sub>b</sub> 32  | .49             | .09   | .44   | .63   |
| G                           | <i>Sporobolus cryptandrus</i>      | <sub>a</sub> 6   | <sub>c</sub> 32  | <sub>c</sub> 43  | <sub>a</sub> 4    | <sub>bc</sub> 25 | 1.23            | 2.52  | .18   | 1.24  |
| G                           | <i>Stipa comata</i>                | -                | 3                | 1                | 6                 | -                | .15             | .15   | .18   | .00   |
| G                           | <i>Vulpia octoflora</i> (a)        | -                | <sub>b</sub> 145 | <sub>b</sub> 146 | <sub>b</sub> 170  | <sub>a</sub> -   | .77             | .58   | 2.33  | -     |
| Total for Annual Grasses    |                                    | 0                | 514              | 476              | 517               | 27               | 32.94           | 7.99  | 27.46 | 0.22  |
| Total for Perennial Grasses |                                    | 136              | 120              | 135              | 152               | 217              | 4.91            | 7.69  | 6.29  | 12.49 |
| Total for Grasses           |                                    | 136              | 634              | 611              | 669               | 244              | 37.85           | 15.68 | 33.76 | 12.72 |
| F                           | <i>Agoseris glauca</i>             | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 15  | <sub>a</sub> 5    | <sub>b</sub> 18  | -               | .14   | .01   | .14   |
| F                           | <i>Artemisia ludoviciana</i>       | -                | 1                | 6                | -                 | 2                | .01             | .18   | -     | .00   |
| F                           | <i>Astragalus</i> sp.              | -                | 2                | -                | -                 | -                | .03             | -     | -     | -     |
| F                           | <i>Calochortus nuttallii</i>       | -                | -                | 6                | -                 | 1                | -               | .04   | -     | .00   |
| F                           | <i>Chenopodium</i> sp. (a)         | -                | 1                | -                | -                 | -                | .00             | -     | -     | -     |
| F                           | <i>Crepis acuminata</i>            | -                | -                | -                | 1                 | -                | -               | -     | .00   | -     |
| F                           | <i>Draba</i> sp. (a)               | -                | <sub>a</sub> -   | <sub>b</sub> 50  | <sub>c</sub> 70   | <sub>a</sub> -   | -               | .09   | .23   | -     |
| F                           | <i>Lappula occidentalis</i> (a)    | -                | -                | -                | 7                 | -                | -               | -     | .02   | -     |
| F                           | <i>Microsteris gracilis</i> (a)    | -                | <sub>c</sub> 81  | <sub>b</sub> 37  | <sub>c</sub> 96   | <sub>a</sub> -   | .23             | .13   | .34   | -     |
| F                           | <i>Orobanche fasciculata</i>       | -                | 1                | 3                | -                 | 2                | .00             | .00   | -     | .03   |
| F                           | <i>Plantago patagonica</i> (a)     | -                | 8                | 4                | -                 | 3                | .01             | .01   | -     | .00   |
| F                           | <i>Ranunculus testiculatus</i> (a) | -                | <sub>a</sub> -   | <sub>b</sub> 22  | <sub>b</sub> 18   | <sub>c</sub> 63  | -               | .10   | .04   | .14   |
| F                           | <i>Tragopogon dubius</i>           | -                | -                | 4                | -                 | -                | -               | .01   | -     | -     |
| Total for Annual Forbs      |                                    | 0                | 90               | 113              | 191               | 66               | 0.25            | 0.34  | 0.64  | 0.14  |
| Total for Perennial Forbs   |                                    | 0                | 4                | 34               | 6                 | 23               | 0.04            | 0.37  | 0.01  | 0.18  |
| Total for Forbs             |                                    | 0                | 94               | 147              | 197               | 89               | 0.29            | 0.71  | 0.65  | 0.33  |

Values with different subscript letters are significantly different at alpha = 0.10



BROWSE TRENDS --

Management unit 28 , Study no: 11

| Type             | Species                                   | Strip Frequency |     |     |     | Average Cover % |       |       |       |
|------------------|---|-----------------|-----|-----|-----|-----------------|-------|-------|-------|
|                  |   | '92             | '98 | '03 | '08 | '92             | '98   | '03   | '08   |
| B                | Artemisia tridentata vaseyana             | 73              | 76  | 66  | 66  | 23.90           | 23.32 | 20.55 | 13.93 |
| B                | Chrysothamnus nauseosus hololeucus        | 0               | 1   | 0   | 0   | -               | .00   | -     | -     |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 0               | 1   | 0   | 0   | -               | .15   | -     | -     |
| B                | Gutierrezia sarothrae                     | 7               | 4   | 8   | 5   | .15             | .03   | .15   | .00   |
| B                | Juniperus osteosperma                     | 0               | 0   | 1   | 0   | -               | -     | .00   | -     |
| B                | Opuntia sp.                               | 2               | 2   | 2   | 3   | .15             | .15   | .00   | .03   |
| Total for Browse |   | 82              | 84  | 77  | 74  | 24.20           | 23.65 | 20.70 | 13.96 |

CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 11

| Species                       | Percent Cover |       |
|-------------------------------|---------------|-------|
|                               | '03           | '08   |
| Artemisia tridentata vaseyana | 15.14         | 11.94 |
| Gutierrezia sarothrae         | -             | .01   |
| Opuntia sp.                   | -             | .11   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 11

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.4                        | 2.1 |

BASIC COVER --

Management unit 28 , Study no: 11

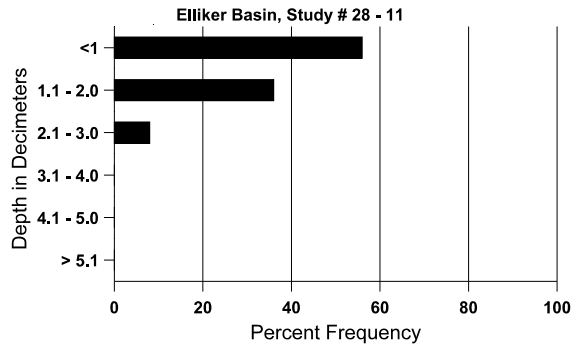
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '87             | '92   | '98   | '03   | '08   |
| Vegetation  | 3.75            | 47.87 | 38.06 | 52.34 | 26.62 |
| Rock        | 19.75           | 48.12 | 11.02 | 8.87  | 9.35  |
| Pavement    | 37.75           | 0     | 27.36 | 22.20 | 24.41 |
| Litter      | 37.25           | 23.97 | 41.11 | 31.03 | 51.99 |
| Cryptogams  | 0               | .04   | .12   | 0     | .24   |
| Bare Ground | 1.50            | 4.53  | 9.89  | 4.15  | 6.11  |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 11, Study Name: Elliker Basin

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 14.2                         | 75.8<br>(11.2)  | 5.8 | 50.7   | 31.4   | 17.8   | 2.8 | 10.6  | 99.2  | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28, Study no: 11

| Type   | Quadrat Frequency |     |     |     |
|--------|-------------------|-----|-----|-----|
|        | '92               | '98 | '03 | '08 |
| Rabbit | 26                | 19  | 13  | 54  |
| Elk    | -                 | 1   | 1   | -   |
| Deer   | 27                | 47  | 31  | 70  |

| Days use per acre (ha) |           |           |
|------------------------|-----------|-----------|
| '98                    | '03       | '08       |
| -                      | -         | -         |
| 1 (2)                  | -         | 16 (40)   |
| 44 (109)               | 151 (374) | 106 (261) |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 11

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 80/71                     |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 55/53                     |
| <b>Artemisia tridentata vaseyana</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 2465                                  | 66                                       | -     | 1799   | 666      | -    | 57          | 30      | 27         | .81     | 5            | 27/33                     |
| 92   | 3400                                  | 20                                       | 200   | 1480   | 1720     | -    | 44          | 16      | 51         | 24      | 28           | -/-                       |
| 98   | 3120                                  | 3480                                     | 120   | 2220   | 780      | 540  | 31          | 0       | 25         | 5       | 5            | 23/39                     |
| 03   | 2520                                  | -  | 40    | 1040   | 1440     | 560  | 37          | 46      | 57         | 11      | 11           | 24/38                     |
| 08   | 2220                                  | 3000                                     | 60    | 740    | 1420     | 800  | 38          | 30      | 64         | 38      | 39           | 21/34                     |
| <b>Chrysothamnus nauseosus hololeucus</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98   | 60                                    | -  | -     | -      | 60       | -    | 100         | 0       | 100        | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 6/5                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Cowania mexicana stansburiana</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 22/40                     |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Gutierrezia sarothrae</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>265</b>                            | -  | 66    | 133    | 66       | -    | 0           | 0       | 25         | -       | 0            | 10/4                      |
| 92                           | <b>180</b>                            | -  | -     | 160    | 20       | -    | 0           | 0       | 11         | -       | 0            | -/-                       |
| 98                           | <b>160</b>                            | -  | 60    | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 8/9                       |
| 03                           | <b>380</b>                            | -  | -     | 380    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/8                       |
| 08                           | <b>140</b>                            | -  | 20    | 100    | 20       | -    | 0           | 0       | 14         | 14      | 14           | 7/8                       |
| <i>Juniperus osteosperma</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                           | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 50           | 5/12                      |
| 03                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 5/10                      |
| 08                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/18                      |
| <i>Pediocactus simpsonii</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/4                       |
| <i>Purshia tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/27                      |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 22/37                     |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Yucca sp.</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 87                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 24/21                     |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 23/30                     |

Trend Study 28-14-08

Study site name: Sheep Hollow West .

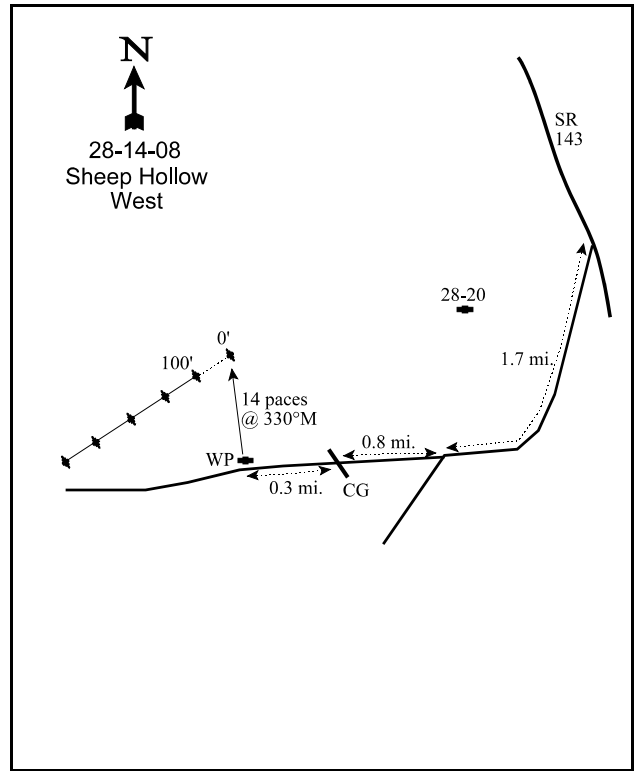
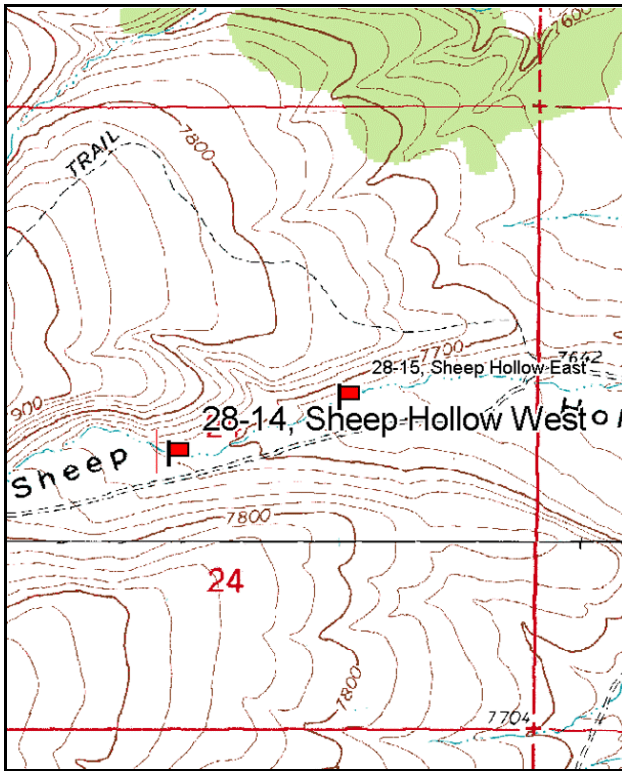
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 246 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 4 on 1ft.

LOCATION DESCRIPTION

From Panguitch, head south on SR 143 to mile marker 47. Go 0.1 mile west of mile marker 47 and turn south onto a dirt road heading towards Sheep Hollow. Drive 1.7 miles to a fork. Stay right and continue 0.8 miles to a fence and cattleguard. Cross the cattleguard and go 0.3 miles to a witness post on the right side of the road. The 0-foot baseline stake is 14 paces from the witness post at 330 degrees magnetic. The 0-foot stake has browse tag #500 attached.



Map Name: Panguitch

Diagrammatic Sketch

Township 35S, Range 6W, Section 24

GPS: NAD 83, UTM 12S 369494 E, 4179303 N

## DISCUSSION

### Sheep Hollow West - Study Site No. 28-14

#### Study Information

This site was established in 1998 to monitor important winter range on the east side of the unit [elevation: 7,800 feet (2,377 m), slope: 2%-5%, aspect: east]. Much of the winter range on this side of unit 28 is being effected by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) encroachment. The area is represented by black sagebrush (*Artemisia nova*) ridges with antelope bitterbrush (*Purshia tridentata*) and basin big sagebrush (*Artemisia tridentata* spp. *tridentata*) in the deeper soils of the drainage bottoms. This site samples a wide drainage bottom which supports a dense population of black sagebrush with a good bitterbrush component. The area is used by a variety of wildlife during most of the year, especially during the winter when deep snow pushes them to lower elevations, as well as livestock. This area was historically a sheep range but has been switched to cattle. The west side of the fence is permitted to be grazed by 296 AUM's from June to October (1998 grazing management information). The east side of the fence is grazed heavier and is monitored by trend study 28-15. Pellet data collected in 1998 estimated 15 deer, 7 elk and 12 cow days use/acre (37 ddu/ha, 17 edu/ha, and 30 cdu/ha). Pellet group data from 2003 estimated 32 deer, less than 1 elk, and 7 cow days use/acre (79 ddu/ha, 2 edu/ha, and 18 cdu/ha). Pellet group data from 2008 estimated 16 deer, 1 elk, and 4 cow days use/acre (40 ddu/ha, 2 edu/ha, and 11 dcu/ha). Deer and antelope pellets are difficult to differentiate and were all classified as deer pellets. Two dozen antelope and some deer were seen west of the site during study site establishment in 1998.

#### Soils

Soil texture is a clay loam with a slightly acidic pH (6.3). Parent material is basalt. The soil profile is moderately rocky. Relative combined average vegetation and litter cover was 60%-73%, and relative combined average rock and pavement cover was 8%-12% since 1998. Relative average bare ground cover was moderate in 1998 at 14%, increasing to 35% in 2003, and decreasing to 18% in 2008. An erosion condition class assessment rated erosion as slight in 2003 due primarily to a gully in the road that was active and had dumped a lot of new soil on the site. The erosion condition class was rated as stable in 2008.

#### Browse

The site supports a dense stand of black sagebrush, which is the primary browse species and has represented 64%-67% of the total browse cover since 1998. Black sagebrush has had an estimated average density around 8,700 plants/acre since 1998. Decadence of black sagebrush has been moderately high from 34%-41% since 1998. Recruitment of young black sagebrush plants has been poor with young plants comprising only 4%-7% of the population since 1998. Sagebrush vigor was good in all sample years. The black sagebrush shows mostly light to moderate use with some heavy use. The heaviest use was noted in 1998.

Antelope bitterbrush also provides important forage and has had an average estimated population density of about 500 plants/acre since 1998. Decadence was very low in 1998, but increased to moderate levels in 2003 and 2008. Bitterbrush vigor has been mostly good except for 2003, when plants displaying poor vigor increased to 21%. Recruitment by young bitterbrush plants has been low to moderate at 4%-15% since 1998. Utilization of bitterbrush has been moderate to heavy.

Other browse encountered on the site include several rabbitbrush species [dwarf rabbitbrush (*Chrysothamnus depressus*), stickyleaf low rabbitbrush (*C. viscidiflorus viscidiflorus*), and Parry rabbitbrush (*C. parryi*)], broom snakeweed (*Gutierrezia sarothrae*), and isolated patches of basin big sagebrush. Combined pinyon/juniper tree density was estimated at 10 to 15 trees/acre in 1998. These were hand cut prior to the 1998 reading as part of a tree thinning treatment. Only a few scattered young trees were left. By 2008 a few seedlings were seen across the site but nothing that was sampled.

### Herbaceous Understory

The herbaceous understory is diverse and abundant considering the high amount of shrub cover. Grasses dominate the herbaceous cover with 14 perennial species and one annual species being sampled between 1998 and 2008. The most common species are mutton bluegrass (*Poa fendleriana*) and Letterman needlegrass (*Stipa lettermani*), which together produced over half of the total grass cover in all surveys. Less abundant perennials include western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria cristata*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread grass (*Stipa comata*). Forbs are also diverse. The most common species include Indian paintbrush (*Castilleja linariaefolia*), Eaton fleabane (*Erigeron eatonii*), sulfur and redroot eriogonum (*Eriogonum umbellatum* and *Eriogonum racemosum*), Lewis flax (*Linum lewisii*), and longleaf phlox (*Phlox longifolia*). These species provide important succulent spring forage for big game animals.

### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (75) Mid-level potential scale

### 2003 TREND ASSESSMENT

Trend for browse is stable. Density of the primary browse species, black sagebrush, declined slightly from 1998 to 8,160 plants/acre. Decadence of black sagebrush improved slightly, but plants displaying poor vigor increased to 14%. Recruitment of young plants remains poor. Density of the preferred browse species, antelope bitterbrush, also declined slightly to 480 plants/acre. Decadence of bitterbrush increased markedly to 38%, and the proportion of plants displaying poor vigor increased to 21%. Recruitment of young bitterbrush plants declined to just 4% of the population. There was a large increase in the density of basin big sagebrush, but decadence and the proportion of plants displaying poor vigor increased markedly. Recruitment of young big sagebrush also declined with no young plants sampled. Trend for grasses is down. Sum of nested frequency of perennial grasses decreased by 21% from 1998, and production declined from 16% total cover in 1998 to 8%. There was a significant decrease in the nested frequency of sedge (*Carex sp.*) and Letterman needlegrass. Trend for forbs is down. Sum of nested frequency of perennial forbs declined by 59%, and production decreased to just over 1% of the total cover. Only eight of the eighteen species that were sampled in 1998 were sampled in 2003.

winter range condition (DCI) - fair (54) Mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of the primary browse species, black sagebrush, increased by 13% since 2003 to 9,360 plants/acre. Decadence of black sagebrush increased slightly, but is similar to 2003 levels. Vigor of black sagebrush and recruitment of young plants has changed little since 2003. There was little change in the population of the preferred browse species, antelope bitterbrush, except for an improvement in vigor. Density of basin big sagebrush has declined, but decadence and vigor of the population improved since 2003. Recruitment of young big sagebrush also increased from 2003. Trend for grasses is slightly up. Sum of nested frequency of perennial grasses increased from 2003, and production of perennial grasses increased to 15% of the total cover. There was a significant increase in the nested frequency of sedge and Letterman needlegrass, but a significant decrease in nested frequency of bottlebrush squirreltail. Trend for forbs is up. Sum of nested frequency of perennial forbs increased markedly, and total cover of perennial forbs increased to 3%. Fourteen of the original eighteen forbs sampled in 1998 were sampled, as well as five new species including segolilly (*Calochortus nuttallii*) and lobeleaf groundsel (*Senecio multilobatus*).

winter range condition (DCI) - fair-good (67) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 14

| T<br>y<br>p<br>e            | Species                     | Nested Frequency |                   |                  | Average Cover % |      |       |
|-----------------------------|-----------------------------|------------------|-------------------|------------------|-----------------|------|-------|
|                             |                             | '98              | '03               | '08              | '98             | '03  | '08   |
| G                           | Agropyron intermedium       | -                | 8                 | -                | -               | .08  | -     |
| G                           | Agropyron smithii           | 3                | 4                 | 2                | .00             | .03  | .03   |
| G                           | Agropyron spicatum          | 6                | -                 | -                | .03             | -    | -     |
| G                           | Agropyron trachycaulum      | 4                | 3                 | -                | .03             | .03  | -     |
| G                           | Bouteloua gracilis          | 4                | 7                 | 6                | .03             | .06  | .03   |
| G                           | Bromus inermis              | 5                | -                 | -                | .03             | -    | -     |
| G                           | Bromus tectorum (a)         | -                | 4                 | -                | -               | .01  | -     |
| G                           | Carex sp.                   | <sub>b</sub> 21  | <sub>a</sub> -    | <sub>c</sub> 53  | .63             | -    | 1.11  |
| G                           | Koeleria cristata           | <sub>a</sub> 27  | <sub>b</sub> 64   | <sub>ab</sub> 48 | .44             | 1.48 | .74   |
| G                           | Oryzopsis hymenoides        | 2                | 4                 | 5                | .03             | .15  | .03   |
| G                           | Poa fendleriana             | <sub>b</sub> 232 | <sub>ab</sub> 186 | <sub>a</sub> 163 | 8.61            | 4.21 | 6.92  |
| G                           | Sitanion hystrix            | <sub>b</sub> 74  | <sub>b</sub> 71   | <sub>a</sub> 24  | .97             | .90  | .18   |
| G                           | Stipa columbiana            | 8                | -                 | 6                | .19             | -    | .01   |
| G                           | Stipa comata                | 12               | 13                | 8                | .10             | .35  | .08   |
| G                           | Stipa lettermani            | <sub>b</sub> 183 | <sub>a</sub> 102  | <sub>b</sub> 186 | 4.86            | 1.08 | 5.90  |
| Total for Annual Grasses    |                             | 0                | 4                 | 0                | 0               | 0.00 | 0     |
| Total for Perennial Grasses |                             | 581              | 462               | 501              | 15.97           | 8.39 | 15.06 |
| Total for Grasses           |                             | 581              | 466               | 501              | 15.97           | 8.40 | 15.06 |
| F                           | Antennaria rosea            | <sub>b</sub> 16  | <sub>ab</sub> 9   | <sub>a</sub> 1   | .36             | .01  | .00   |
| F                           | Arabis sp.                  | 1                | -                 | 2                | .01             | -    | .03   |
| F                           | Astragalus convallarius     | 8                | -                 | 20               | .21             | -    | .51   |
| F                           | Astragalus sp.              | 3                | -                 | -                | .00             | -    | -     |
| F                           | Castilleja linariaefolia    | <sub>b</sub> 49  | <sub>a</sub> 2    | <sub>ab</sub> 37 | 1.24            | .03  | .61   |
| F                           | Calochortus nuttallii       | -                | -                 | 22               | -               | -    | .12   |
| F                           | Chenopodium leptophyllum(a) | <sub>a</sub> -   | <sub>b</sub> 15   | <sub>a</sub> 3   | -               | .09  | .00   |
| F                           | Cirsium sp.                 | -                | -                 | 1                | -               | -    | .00   |
| F                           | Erigeron eatonii            | <sub>c</sub> 63  | <sub>a</sub> 5    | <sub>b</sub> 28  | .59             | .03  | .08   |
| F                           | Erigeron flagellaris        | 9                | -                 | -                | .07             | -    | -     |
| F                           | Erigeron pumilus            | <sub>b</sub> 25  | <sub>a</sub> -    | <sub>a</sub> 3   | .04             | -    | .01   |
| F                           | Eriogonum racemosum         | 55               | 54                | 70               | .45             | .50  | .59   |
| F                           | Eriogonum umbellatum        | 46               | 33                | 30               | .79             | .61  | .44   |
| F                           | Gayophytum ramosissimum(a)  | -                | 87                | -                | -               | .43  | -     |
| F                           | Hymenoxys richardsonii      | 1                | -                 | 2                | .03             | -    | .03   |
| F                           | Lappula occidentalis (a)    | -                | -                 | 1                | -               | -    | .00   |



| T<br>y<br>p<br>e          | Species                  | Nested Frequency |                |                 | Average Cover % |                |      |
|---------------------------|--------------------------|------------------|----------------|-----------------|-----------------|----------------|------|
|                           |                          | '98              | '03            | '08             | '98             | '03            | '08  |
|                           |                          | F                | Linum lewisii  | <sub>b</sub> 46 | <sub>a</sub> 14 | <sub>a</sub> 9 | .25  |
| F                         | Lomatium sp.             | -                | -              | 5               | -               | -              | .02  |
| F                         | Lotus utahensis          | 35               | -              | 3               | .42             | -              | .04  |
| F                         | Lupinus kingii (a)       | 4                | -              | 11              | .03             | -              | .03  |
| F                         | Lychnis drummondii       | 7                | -              | -               | .01             | -              | -    |
| F                         | Machaeranthera canescens | 5                | -              | 4               | .06             | -              | .01  |
| F                         | Microsteris gracilis (a) | -                | -              | 3               | -               | -              | .00  |
| F                         | Penstemon caespitosus    | 3                | -              | -               | .03             | -              | -    |
| F                         | Penstemon sp.            | 3                | 4              | 1               | .00             | .01            | .03  |
| F                         | Phlox longifolia         | 58               | 56             | 74              | .17             | .19            | .24  |
| F                         | Polygonum douglasii (a)  | <sub>a</sub> 11  | <sub>a</sub> 5 | <sub>b</sub> 21 | .02             | .01            | .05  |
| F                         | Senecio multilobatus     | <sub>a</sub> -   | <sub>a</sub> - | <sub>b</sub> 16 | -               | -              | .11  |
| F                         | Trifolium sp.            | -                | -              | 5               | -               | -              | .01  |
| Total for Annual Forbs    |                          | 15               | 107            | 39              | 0.05            | 0.53           | 0.09 |
| Total for Perennial Forbs |                          | 433              | 177            | 333             | 4.79            | 1.45           | 3.00 |
| Total for Forbs           |                          | 448              | 284            | 372             | 4.84            | 1.99           | 3.10 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 14

| T<br>y<br>p<br>e | Species                                   | Strip Frequency |                |     | Average Cover % |       |       |
|------------------|---|-----------------|----------------|-----|-----------------|-------|-------|
|                  |   | '98             | '03            | '08 | '98             | '03   | '08   |
|                  |   | B               | Artemisia nova | 95  | 98              | 100   | 13.73 |
| B                | Artemisia tridentata tridentata           | 2               | 12             | 1   | .00             | .36   | .00   |
| B                | Chrysothamnus depressus                   | 10              | 12             | 15  | .40             | .12   | .22   |
| B                | Chrysothamnus parryi                      | 0               | 1              | 0   | -               | .00   | -     |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 54              | 66             | 69  | 2.79            | 4.17  | 3.65  |
| B                | Gutierrezia sarothrae                     | 3               | 8              | 3   | .21             | .31   | .01   |
| B                | Opuntia sp.                               | 1               | 2              | 2   | .00             | .00   | .00   |
| B                | Purshia tridentata                        | 23              | 21             | 22  | 4.41            | 3.42  | 3.51  |
| B                | Tetradymia canescens                      | 0               | 0              | 2   | -               | -     | .06   |
| Total for Browse |   | 188             | 220            | 214 | 21.54           | 25.46 | 22.78 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 28 , Study no: 14

| Species                                      | Average Line Intercept |       |
|--|------------------------|-------|
|  | '03                    | '08   |
| Artemisia nova                               | 16.66                  | 27.93 |
| Chrysothamnus depressus                      | .11                    | .31   |
| Chrysothamnus viscidiflorus<br>viscidiflorus | 1.86                   | 4.40  |
| Gutierrezia sarothrae                        | .05                    | -     |
| Purshia tridentata                           | 3.45                   | 5.36  |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 28 , Study no: 14

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia nova     | 0.9                        | 0.6 |
| Purshia tridentata | 1.6                        | 1.0 |

BASIC COVER --  
 Management unit 28 , Study no: 14

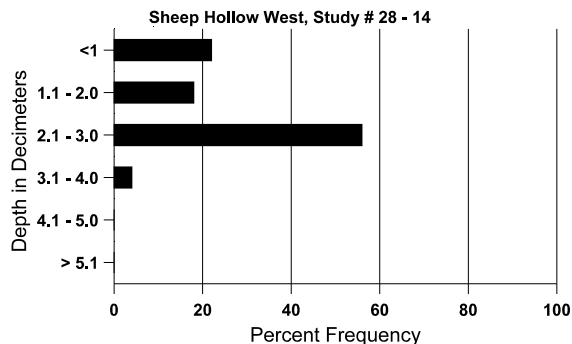
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 51.18           | 35.06 | 43.72 |
| Rock        | 5.71            | 5.79  | 5.90  |
| Pavement    | 6.77            | 3.70  | 7.75  |
| Litter      | 39.84           | 34.54 | 32.64 |
| Cryptogams  | 3.50            | 1.47  | .97   |
| Bare Ground | 18.07           | 35.31 | 20.43 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 14, Study Name: Sheep Hollow West

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand    | % silt | % clay |     |       |       |      |
| 15.0                         | 57.3 (14.3)     | 6.3 | 40.7      | 27.4   | 31.8   | 2.2 | 18.4  | 131.2 | 0.3  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28, Study no: 14

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 6                 | 2   | 70  |
| Elk    | 5                 | 2   | 1   |
| Deer   | 11                | 11  | 4   |
| Cattle | 1                 | 3   | 5   |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| 7 (17)                 | 1 (2)   | 1 (2)   |
| 15 (37)                | 32 (79) | 16 (40) |
| 12 (30)                | 7 (18)  | 4 (11)  |

BROWSE CHARACTERISTICS --

Management unit 28, Study no: 14

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/12                     |
| <b>Artemisia nova</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 8560                                  | 380                                      | 580   | 4680   | 3300     | 1560 | 43          | 13      | 39         | 3       | 3            | 16/22                     |
| 03                           | 8160                                  | -  | 400   | 4980   | 2780     | 2320 | 25          | 1       | 34         | 14      | 14           | 15/20                     |
| 08                           | 9360                                  | 540                                      | 420   | 5060   | 3880     | 1980 | 26          | 13      | 41         | 13      | 13           | 14/23                     |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata tridentata</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 60                                    | -  | 20    | 40     | -        | -    | 0           | 33      | 0          | -       | 0            | -/-                       |
| 03   | 560                                   | -  | -     | 320    | 240      | 40   | 18          | 0       | 43         | 21      | 21           | 20/26                     |
| 08   | 120                                   | -  | 40    | 80     | -        | -    | 100         | 0       | 0          | -       | 0            | -/-                       |
| <i>Chrysothamnus depressus</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 240                                   | 20                                       | 40    | 200    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/10                      |
| 03   | 340                                   | -  | 20    | 280    | 40       | -    | 71          | 12      | 12         | -       | 0            | 5/9                       |
| 08   | 380                                   | -  | 20    | 300    | 60       | -    | 21          | 47      | 16         | -       | 0            | 5/8                       |
| <i>Chrysothamnus parryi</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 7/9                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 2740                                  | -  | 320   | 2420   | -        | -    | 0           | 0       | 0          | -       | 0            | 8/12                      |
| 03   | 4120                                  | -  | 200   | 3820   | 100      | -    | 0           | 0       | 2          | .48     | .48          | 7/12                      |
| 08   | 3980                                  | 120                                      | 160   | 3080   | 740      | -    | 30          | 8       | 19         | .50     | .50          | 7/12                      |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 80                                    | -  | -     | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/8                       |
| 03   | 260                                   | -  | -     | 260    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/6                       |
| 08   | 100                                   | 60                                       | 20    | 60     | 20       | -    | 0           | 0       | 20         | -       | 0            | 5/4                       |
| <i>Opuntia sp.</i>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/12                      |
| 03   | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/12                      |
| 08   | 40                                    | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 0            | 6/11                      |
| <i>Purshia tridentata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 540                                   | -  | 80    | 440    | 20       | -    | 59          | 19      | 4          | -       | 0            | 23/36                     |
| 03   | 480                                   | -  | 20    | 280    | 180      | 40   | 71          | 29      | 38         | 21      | 21           | 30/45                     |
| 08   | 460                                   | 20                                       | 40    | 280    | 140      | 20   | 48          | 35      | 30         | 4       | 4            | 27/47                     |
| <i>Tetradymia canescens</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08   | 40                                    | -  | -     | 20     | 20       | -    | 100         | 0       | 50         | -       | 0            | -/-                       |

Trend Study 28-15-08

Study site name: Sheep Hollow East .

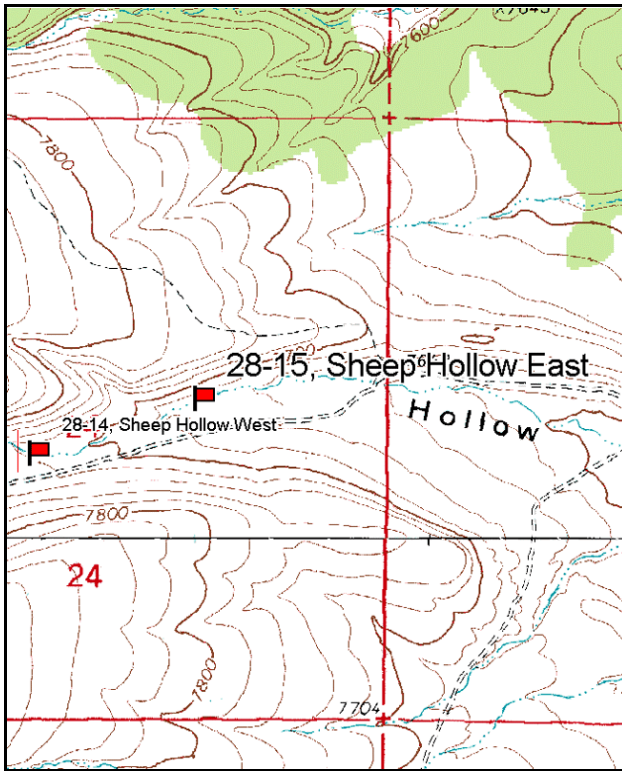
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 64 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 5 on 1ft.

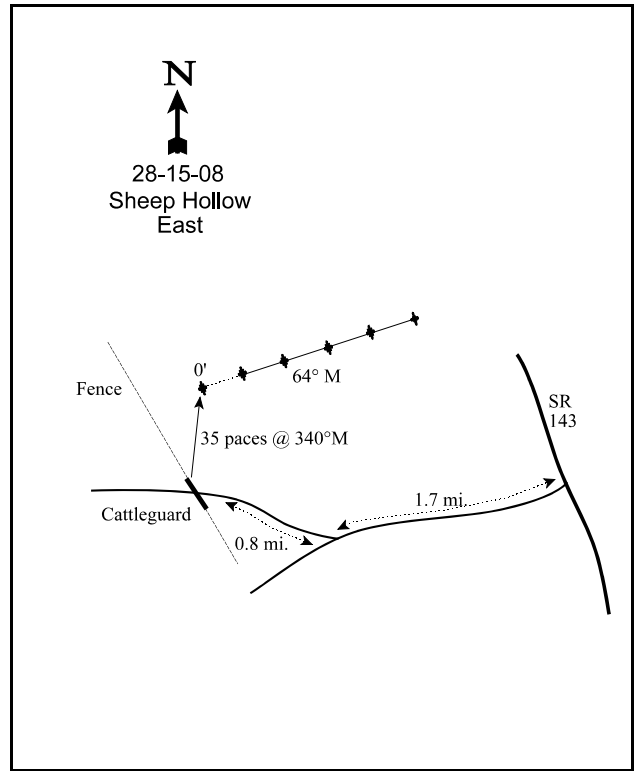
LOCATION DESCRIPTION

From Panguitch, head south on SR 143 to mile marker 47. Go 0.1 mile west of mile marker 47 and turn south onto a dirt road heading towards Sheep Hollow. Drive 1.7 miles to a fork. Stay right and continue 0.8 miles to a fence and cattleguard. The witness post is on the right side of the road just before the cattleguard. From the cattleguard, the 0-foot stake is 35 paces away at 340 degrees magnetic and is marked with browse tag #496.



Map Name: Panguitch

Township 35S, Range 6W, Section 24



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 369941 E, 4179446 N

## DISCUSSION

### Sheep Hollow East - Trend Study No. 28-15

#### Study Information

This study was established in 1998 in conjunction with study 28-14, which lies a half mile to the west of this site and across the fence in a different grazing regime [elevation: 7,700 feet (2,347 m), slope: 2%-5%, aspect: east]. This site receives heavier grazing pressure than the previous study and was historically grazed by sheep until 1991 when use was changed to cattle. This pasture is permitted for 800 AUM's from June to October (1998 grazing management data). The cows are moved around the pasture by utilizing various water sources at different times of the grazing season. Wildlife also appear to be using this site heavily. Pellet group data from 1998 estimated 27 deer, 15 elk, and 22 antelope days use/acre (67 ddu/ha, 37 edu/ha, and 54 adu/ha). A few antelope were seen near the site. Pellet group data from 2003 estimated 33 deer and 31 cow days use/acre (83 ddu/ha and 77 cdu/ha). Pellet group data in 2008 estimated 42 deer, 4 elk, and 32 cow days use/acre (103 ddu/ha, 10 edu/ha, and 79 cdu/ha). Because of difficulties distinguishing between the two, antelope and deer pellets were classified as deer in 2003 and 2008.

#### Soils

Ground cover characteristics are very similar to the Sheep Hollow West study (28-14). However, soil on this site is more shallow with more rock concentrated near the surface compared to the adjacent study. Soil texture is a sandy loam with a neutral pH (7.1). Parent material is basalt. Relative combined average vegetation and litter cover has been 63%-76% since 1998, with the lowest cover in 2003. Relative combined average rock and pavement cover has been 11%-12% since 1998. Relative average bare ground cover has been moderate at 13%-25%, with the highest cover in 2003. An erosion condition class assessment rated soils as stable in 2003 and 2008.

#### Browse

This site supports a mix of black sagebrush (*Artemisia nova*), basin big sagebrush (*Artemisia tridentata* spp. *tridentata*), and bitterbrush (*Purshia tridentata*) with a grass-forb understory. Black sagebrush is the most abundant shrub providing 63%-81% of the browse cover since 1998. The stand of black sagebrush is quite dense with an estimated density ranging from a low of 7,640 plant/acre in 2003 to a high of 9,740 plants/acre in 2008. This is a mostly mature population that showed moderate decadence in 1998 and 2003, but increased to higher rates of decadence in 2008. Recruitment of young black sagebrush has increased since 1998, with a large increase in young plants in 2008. Utilization has been light to moderate, although a few plants are heavily hedged. Vigor has been good on most plants.

The densities of basin big sagebrush and bitterbrush are higher on this site compared to study 28-14. Basin big sagebrush density has fluctuated greatly, but due to hybridization between black sagebrush and basin big sagebrush there may have been some discrepancy in identification between sample years. Decadence of big sagebrush has been moderate to high, but vigor has been good. Recruitment of young big sagebrush plants has been poor to absent. Utilization of big sagebrush has been mostly light. Bitterbrush density has been similar at around 600 plants/acre since 1998. Decadence of bitterbrush was low in the mostly mature population, but increased to over 50% in 2008. Vigor has been good, but recruitment of young bitterbrush plants has been low in all sample years. Utilization of bitterbrush has been moderate to very heavy.

The pinyon pine (*Pinus edulis*) and Utah juniper trees (*Juniperus osteosperma*) on this site were hand cut in the spring of 1998 with only a few scattered trees being left. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* spp. *viscidiflorus*), broom snakeweed (*Gutierrezia sarothrae*), Oregon grape (*Mahonia repens*), prickly pear (*Opuntia* sp.), and gray horsebrush (*Tetradymia canescens*) have also been sampled on the site in small numbers.

### Herbaceous Understory

The herbaceous understory is similar in diversity but not nearly as abundant compared to the Sheep Hollow West study site (28-14). Eleven species of perennial grasses, one annual grass, and one sedge have been sampled on the site. The dominant species is blue grama (*Bouteloua gracilis*), and other common perennial species include bottlebrush squirreltail (*Sitanion hystrix*), western wheatgrass (*Agropyron smithii*), needle-and-thread grass (*Stipa comata*), Letterman needlegrass (*Stipa lettermani*), and mutton bluegrass (*Poa fendleriana*). Most of the preferred grass species are found growing under the protection of shrubs, with blue grama found in the shrub interspaces. The forb component is very diverse, with fair abundance. Twenty-seven perennial and seven annual forbs have been identified on the site since 1998. As with grasses, fewer forb species were sampled in 2003 due to drought. The most abundant perennial forbs include sulfur and redroot eriogonum (*Eriogonum umbellatum* and *E. racemosum*), Indian paintbrush (*Castilleja linariaefolia*), low fleabane (*Erigeron pumilus*), skeletonweed (*Lygodesmia spinosa*), hoary aster (*Machaeranthera canescens*), and longleaf phlox (*Phlox longifolia*). Groundsmoke (*Gayophytum ramosissimum*) has been the most abundant annual forb on the site.

### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - fair (61) Mid-level potential scale

### 2003 TREND ASSESSMENT

Trend for browse is stable. Due to possible identification problems from hybridization, trend for black sagebrush and basin big sagebrush will be considered together. Combined sagebrush density increased slightly from 1998. Sagebrush decadence remained moderate and vigor was mostly good. Recruitment of young sagebrush plants was poor. The density of the preferred browse, antelope bitterbrush, remained the same as 1998, and the population has low decadence and good vigor. Trend for both grasses and forbs is down, most likely due to an ongoing drought. Sum of nested frequency of both perennial grasses and perennial forbs decreased markedly, as did their total cover. There was a significant decrease in the nested frequency of mountain brome (*Bromus carinatus*), bottlebrush squirreltail, and Letterman needlegrass.

winter range condition (DCI) - poor (47) Mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

Trend for browse is slightly up. Due to possible identification problems from hybridization, trend for black sagebrush and basin big sagebrush will be considered together. Combined sagebrush density increased, with a large increase in the recruitment of young black sagebrush plants. Decadence increased in sagebrush, but vigor remained good. Combined sagebrush line-intercept canopy cover was similar to 2003. Bitterbrush density is estimated at 620 plants/acre, similar to past years, although recruitment is low and decadence increased to 52%. Trend for both grasses and forbs is up. Sum of nested frequency of perennial grasses and perennial forbs, as well as their total cover, increased to 1998 levels. There was a significant increase in the nested frequency of western wheatgrass, sedge (*Carex sp.*), needle-and-thread grass, and Letterman needlegrass.

winter range condition (DCI) - fair (59) Mid-level potential scale

browse - slightly down (-1)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 15

| T<br>y<br>p<br>e            | Species                     | Nested Frequency |                 |                  | Average Cover % |      |      |
|-----------------------------|-----------------------------|------------------|-----------------|------------------|-----------------|------|------|
|                             |                             | '98              | '03             | '08              | '98             | '03  | '08  |
| G                           | Agropyron intermedium       | 3                | -               | -                | .01             | -    | -    |
| G                           | Agropyron smithii           | <sub>a</sub> 2   | <sub>a</sub> 8  | <sub>b</sub> 49  | .01             | .01  | .15  |
| G                           | Bouteloua gracilis          | 175              | 137             | 154              | 2.76            | 1.14 | 3.60 |
| G                           | Bromus carinatus            | 23               | -               | 9                | .12             | -    | .09  |
| G                           | Bromus tectorum (a)         | 7                | 9               | 19               | .02             | .01  | .04  |
| G                           | Carex sp.                   | <sub>a</sub> 3   | <sub>a</sub> -  | <sub>b</sub> 26  | .06             | .00  | .16  |
| G                           | Koeleria cristata           | 3                | 3               | 3                | .03             | .15  | .06  |
| G                           | Oryzopsis hymenoides        | 4                | -               | -                | .18             | -    | .00  |
| G                           | Poa fendleriana             | 40               | 40              | 13               | .76             | .23  | .14  |
| G                           | Sitanion hystrix            | <sub>b</sub> 116 | <sub>a</sub> 60 | <sub>ab</sub> 74 | 1.57            | .46  | 1.25 |
| G                           | Stipa columbiana            | 9                | 7               | -                | .21             | .04  | -    |
| G                           | Stipa comata                | <sub>ab</sub> 16 | <sub>a</sub> 8  | <sub>b</sub> 33  | .38             | .07  | .68  |
| G                           | Stipa lettermani            | <sub>b</sub> 62  | <sub>a</sub> 19 | <sub>b</sub> 64  | 1.63            | .18  | .96  |
| Total for Annual Grasses    |                             | 7                | 9               | 19               | 0.02            | 0.01 | 0.04 |
| Total for Perennial Grasses |                             | 456              | 282             | 425              | 7.76            | 2.30 | 7.12 |
| Total for Grasses           |                             | 463              | 291             | 444              | 7.78            | 2.32 | 7.17 |
| F                           | Alyssum alyssoides (a)      | 6                | -               | -                | .01             | -    | -    |
| F                           | Arabis sp.                  | <sub>b</sub> 11  | <sub>a</sub> -  | <sub>c</sub> 38  | .05             | -    | .33  |
| F                           | Astragalus convallarius     | 11               | 13              | 3                | .22             | .11  | .09  |
| F                           | Astragalus sp.              | 9                | 13              | 4                | .02             | .02  | .03  |
| F                           | Castilleja linariaefolia    | 17               | 10              | 12               | .16             | .04  | .39  |
| F                           | Calochortus nuttallii       | -                | 5               | 6                | -               | .01  | .04  |
| F                           | Chaenactis douglasii        | 7                | 1               | -                | .02             | .03  | -    |
| F                           | Chenopodium leptophyllum(a) | <sub>a</sub> -   | <sub>a</sub> 3  | <sub>b</sub> 10  | -               | .00  | .02  |
| F                           | Cirsium sp.                 | -                | -               | 1                | -               | -    | .00  |
| F                           | Cryptantha sp.              | 6                | -               | 8                | .04             | .00  | .04  |
| F                           | Descurainia pinnata (a)     | 2                | -               | -                | .01             | -    | -    |
| F                           | Erigeron divergens          | <sub>b</sub> 20  | <sub>a</sub> -  | <sub>a</sub> -   | .15             | -    | -    |
| F                           | Erigeron eatonii            | 7                | -               | 6                | .01             | -    | .07  |
| F                           | Erigeron flagellaris        | 8                | -               | -                | .38             | -    | -    |
| F                           | Erigeron pumilus            | <sub>b</sub> 25  | <sub>a</sub> 6  | <sub>ab</sub> 15 | .11             | .04  | .37  |
| F                           | Eriogonum racemosum         | 23               | 24              | 25               | .21             | .17  | .37  |
| F                           | Eriogonum umbellatum        | 31               | 28              | 43               | .49             | .30  | .41  |
| F                           | Euphorbia robusta           | 5                | 4               | 4                | .09             | .06  | .15  |



| T<br>y<br>p<br>e          | Species                  | Nested Frequency |                            |                 | Average Cover %  |                 |      |
|---------------------------|--------------------------|------------------|----------------------------|-----------------|------------------|-----------------|------|
|                           |                          | '98              | '03                        | '08             | '98              | '03             | '08  |
|                           |                          | F                | Gayophytum ramosissimum(a) | <sub>a</sub> -  | <sub>b</sub> 108 | <sub>b</sub> 86 | -    |
| F                         | Gilia sp. (a)            | 4                | -                          | -               | .01              | -               | -    |
| F                         | Leucelene ericoides      | -                | 2                          | 4               | -                | .03             | .01  |
| F                         | Linum lewisii            | 9                | 3                          | 2               | .05              | .01             | .00  |
| F                         | Lotus utahensis          | 4                | -                          | 3               | .06              | -               | .01  |
| F                         | Lupinus argenteus        | 12               | 2                          | 10              | .25              | .07             | .48  |
| F                         | Lupinus kingii (a)       | -                | -                          | 11              | -                | -               | .01  |
| F                         | Lychnis drummondii       | 1                | 4                          | -               | .00              | .01             | -    |
| F                         | Lygodesmia spinosa       | 23               | 29                         | 28              | .18              | .14             | .28  |
| F                         | Machaeranthera canescens | <sub>b</sub> 28  | <sub>a</sub> 5             | <sub>a</sub> 2  | .15              | .09             | .03  |
| F                         | Oenothera pallida        | <sub>b</sub> 17  | <sub>ab</sub> 3            | <sub>a</sub> 3  | .08              | .00             | .03  |
| F                         | Penstemon sp.            | -                | -                          | 6               | -                | -               | .01  |
| F                         | Phlox longifolia         | 23               | 13                         | 35              | .08              | .03             | .19  |
| F                         | Polygonum douglasii (a)  | <sub>a</sub> -   | <sub>a</sub> -             | <sub>b</sub> 21 | -                | -               | .04  |
| F                         | Senecio multilobatus     | 1                | -                          | 10              | .03              | -               | .05  |
| F                         | Trifolium sp.            | 2                | -                          | 3               | .00              | -               | .00  |
| Total for Annual Forbs    |                          | 12               | 111                        | 128             | 0.03             | 0.61            | 0.31 |
| Total for Perennial Forbs |                          | 300              | 165                        | 271             | 2.89             | 1.19            | 3.45 |
| Total for Forbs           |                          | 312              | 276                        | 399             | 2.92             | 1.80            | 3.77 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 28 , Study no: 15

| Type             | Species                                   | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|---|-----------------|-----|-----|-----------------|-------|-------|
|                  |   | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Artemisia nova                            | 96              | 87  | 100 | 20.73           | 21.42 | 21.17 |
| B                | Artemisia tridentata tridentata           | 9               | 26  | 2   | .77             | 6.57  | .53   |
| B                | Ceanothus fendleri                        | 1               | 0   | 0   | .00             | -     | -     |
| B                | Chrysothamnus parryi                      | 0               | 1   | 3   | -               | .00   | .00   |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 9               | 7   | 9   | .24             | .59   | .22   |
| B                | Gutierrezia sarothrae                     | 1               | 2   | 2   | .03             | .00   | .00   |
| B                | Juniperus osteosperma                     | 0               | 0   | 1   | -               | -     | .00   |
| B                | Mahonia repens                            | 9               | 9   | 10  | .01             | .06   | .04   |
| B                | Opuntia sp.                               | 3               | 2   | 2   | .00             | .00   | .00   |
| B                | Pediocactus simpsonii                     | 0               | 1   | 0   | -               | .00   | -     |
| B                | Pinus edulis                              | 1               | 2   | 1   | .03             | .30   | .15   |
| B                | Purshia tridentata                        | 23              | 21  | 22  | 4.14            | 5.08  | 3.92  |
| B                | Tetradymia canescens                      | 1               | 0   | 2   | .00             | -     | .00   |
| Total for Browse |   | 153             | 158 | 154 | 25.96           | 34.04 | 26.04 |

CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 15

| Species                                   |       |       |
|---|-------|-------|
|   | '03   | '08   |
| Artemisia nova                            | 21.60 | 30.10 |
| Artemisia tridentata tridentata           | 10.26 | .68   |
| Chrysothamnus viscidiflorus viscidiflorus | .21   | .76   |
| Gutierrezia sarothrae                     | .26   | -     |
| Mahonia repens                            | .05   | -     |
| Pinus edulis                              | .10   | .36   |
| Purshia tridentata                        | 7.68  | 6.84  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 15

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia nova     | 1.0                        | 0.7 |
| Purshia tridentata | 1.7                        | 1.3 |

**BASIC COVER --**

Management unit 28 , Study no: 15

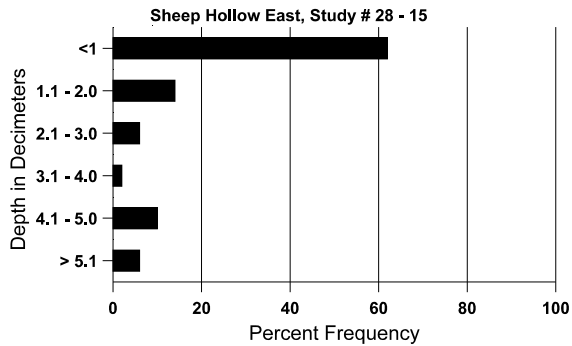
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 44.70           | 37.75 | 36.70 |
| Rock        | 5.99            | 8.08  | 7.09  |
| Pavement    | 6.91            | 5.80  | 5.66  |
| Litter      | 45.79           | 37.56 | 39.92 |
| Cryptogams  | .04             | .18   | .07   |
| Bare Ground | 16.03           | 30.54 | 23.18 |

**SOIL ANALYSIS DATA --**

Management unit 28, Study no: 15, Study Name: Sheep Hollow East

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %0M | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 11.5                         | 59.3 (12.7)     | 7.1 | 62.7       | 21.4  | 15.8  | 2.6 | 24.8  | 262.4 | 0.3  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 28 , Study no: 15

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 3                 | 12  | 58  |
| Elk    | 5                 | 1   | -   |
| Deer   | 27                | 27  | 23  |
| Cattle | 6                 | 3   | 6   |

| Days use per acre (ha) |         |          |
|------------------------|---------|----------|
| '98                    | '03     | '08      |
| -                      | -       | -        |
| 15 (37)                | -       | 4 (10)   |
| 49 (121)               | 33 (83) | 42 (103) |
| -                      | 31 (77) | 32 (79)  |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 15

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>7840</b>                           | 220                                      | 320   | 5320   | 2200     | 1180 | 35          | 7       | 28         | 5       | 5            | 18/28                     |
| 03   | <b>7640</b>                           | -  | 460   | 5300   | 1880     | 1060 | 17          | 1       | 25         | 11      | 11           | 13/19                     |
| 08   | <b>9740</b>                           | 2720                                     | 1340  | 4300   | 4100     | 1180 | 26          | 7       | 42         | 9       | 10           | 16/27                     |
| <i>Artemisia tridentata tridentata</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>260</b>                            | -  | 20    | 180    | 60       | 80   | 31          | 0       | 23         | -       | 0            | 40/48                     |
| 03   | <b>1400</b>                           | -  | -     | 1000   | 400      | 240  | 6           | 0       | 29         | 7       | 7            | 32/37                     |
| 08   | <b>60</b>                             | -  | -     | 20     | 40       | -    | 100         | 0       | 67         | -       | 0            | 41/50                     |
| <i>Ceanothus fendleri</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 28/29                     |
| <i>Chrysothamnus nauseosus</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 26/24                     |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 16/17                     |
| <i>Chrysothamnus parryi</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 8/10                      |
| 08   | <b>60</b>                             | -  | -     | 20     | 40       | -    | 0           | 0       | 67         | -       | 0            | 7/8                       |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>260</b>                            | -  | 20    | 220    | 20       | -    | 8           | 0       | 8          | -       | 0            | 8/15                      |
| 03   | <b>300</b>                            | -  | -     | 300    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/10                      |
| 08   | <b>260</b>                            | -  | -     | 240    | 20       | -    | 15          | 0       | 8          | -       | 0            | 9/15                      |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/18                      |
| 03   | <b>40</b>                             | -  | -     | 40     | -        | 40   | 0           | 0       | 0          | -       | 0            | 8/16                      |
| 08   | <b>60</b>                             | -  | -     | 20     | 40       | -    | 0           | 0       | 67         | 67      | 67           | 8/6                       |
| <i>Juniperus osteosperma</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Mahonia repens</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>880</b>                            | -  | 80    | 800    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>520</b>                            | -  | 40    | 480    | -        | -    | 0           | 0       | -          | -       | 0            | 2/3                       |
| 08                           | <b>780</b>                            | -  | 20    | 760    | -        | -    | 0           | 0       | -          | -       | 0            | 3/4                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 8/6                       |
| 03                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/9                       |
| 08                           | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 0            | 6/7                       |
| <b>Pediocactus simpsonii</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 2/3                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus edulis</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>20</b>                             | -  | 20    | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>600</b>                            | -  | 40    | 540    | 20       | 20   | 53          | 33      | 3          | -       | 0            | 31/50                     |
| 03                           | <b>600</b>                            | -  | 20    | 500    | 80       | -    | 3           | 97      | 13         | -       | 0            | 31/51                     |
| 08                           | <b>620</b>                            | 20                                       | -     | 300    | 320      | 20   | 48          | 45      | 52         | 3       | 3            | 26/50                     |
| <b>Rhus trilobata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 14/23                     |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Tetradymia canescens</b>  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 12/18                     |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 11/22                     |

Trend Study 28-16-08

Study site name: Asay Bench.

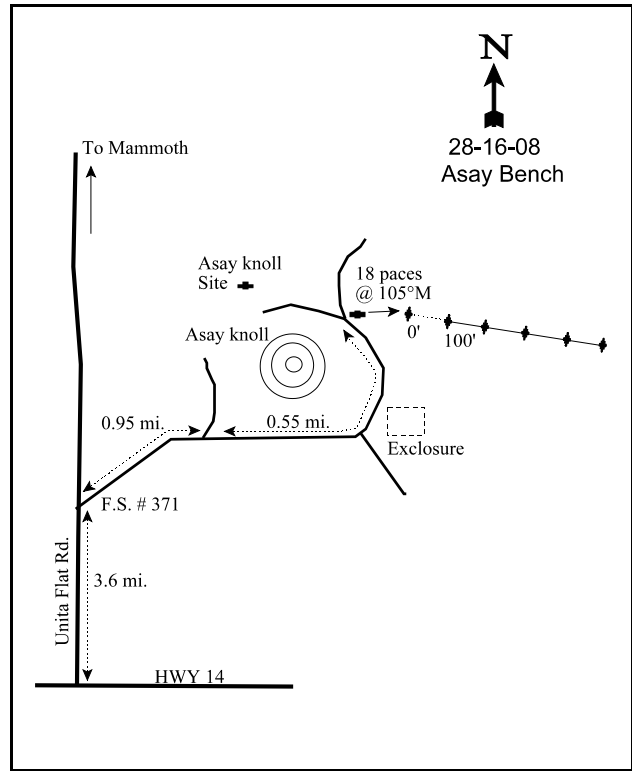
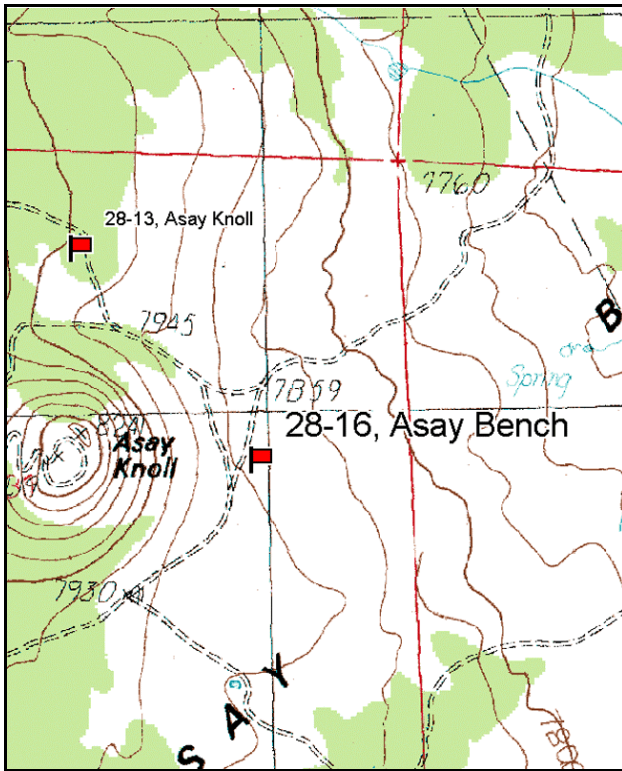
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 65 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 3 on 1ft, belt 5 on 1ft.

LOCATION DESCRIPTION

Start at the junction of Highway 14 and Uinta Flat Road, which is just east of mile post 33 on Hwy 14. Drive north on Uinta Flat Road for 3.6 miles to a fork going east (F.S. Rd. 371). Drive east for 1.0 miles crossing over a cattleguard and coming to a fork on the left (north). Continue straight (right) for 0.55 miles to a fork (an enclosure should be passed on the right before the fork). The witness post is on the east (right) side of the road just past the right fork. From the witness post the 0-foot stake is 18 paces at 105 degrees magnetic. The 0-foot stake is marked by browse tag #165.



Map Name: Asay Bench

Diagrammatic Sketch

Township 37S, Range 6W, Section 31

GPS: NAD 83, UTM 12S 361875 E, 4157011 N

## DISCUSSION

### Asay Bench - Trend Study No. 28-16

#### Study Information

This study was placed just under a half mile east of the Asay Knoll (28-9) trend study and samples a mountain brush community dominated by mountain big sagebrush and bitterbrush [elevation:7,900 feet (2,408 m), slope: 4%, aspect: northeast]. The study was established in 2003 to replace trend study 28-9 which sampled marginal big game transitional range. Pellet group transect data collected on site in 2003 estimated 20 elk, 19 deer, and 7 cow days use/acre (50 edu/ha, 48 ddu/ha, and 18 cdu/ha). Pellet group data in 2008 estimated 61 deer, 13 elk, and 12 cow days use/acre (150 ddu/ha, 33 edu/ha, and 29 cdu/ha).

#### Soils

Soils are derived from basalt parent material and have moderate depth with the effective rooting depth measured at over 11 inches. Soils are loam in texture and have a slightly acidic pH (6.2). Relative combined average vegetation and litter cover is high at 74%-82% since 2003. Relative average bare ground has been moderate at 20% in 2003, decreasing to 11% in 2008. Erosion is low for the most part although some of the shrub interspaces show shrink and swell cracking. An erosion condition class assessment rated soils as stable in 2003 and 2008.

#### Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bitterbrush (*Purshia tridentata*) combined to provide 81% of the total browse cover in 2003 and 86% in 2008. Mountain big sagebrush density averaged 6,600 plants/acre in the two sample years. Average height of sagebrush was 18 inches in both years. The sagebrush population is mostly mature and decadence was low in 2003, but increased markedly in 2008. Vigor has remained mostly good in the sagebrush population, though it did decline slightly in 2008. Recruitment of young plants has been moderate. Utilization of sagebrush has been mostly light to moderate, with some scattered heavy use. Bitterbrush density averaged 2,250 plants/acre over the two sample years. Decadence of bitterbrush was very high in 2003. It decreased in 2008, but was still high. The proportion of plants displaying poor vigor was moderate in 2003, but improved in 2008. Recruitment of young bitterbrush plants is fairly poor. Utilization of bitterbrush has been moderate to very heavy, with the heaviest use in 2003. Other browse sampled on the site include snowberry (*Symphoricarpos oreophilus*), a few very large serviceberry plants (*Amelanchier utahensis*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*), broom snakeweed (*Gutierrezia sarothrae*), Wood's rose (*Rosa woodsii*), and gray horsebrush (*Tetradymia canescens*).

#### Herbaceous Understory

The herbaceous understory is moderately diverse but most of the species are not very abundant. Mutton bluegrass (*Poa fendleriana*) was by far the most abundant species in the understory. A total of 12 perennial grasses have been sampled since 2003. The most common species include prairie Junegrass (*Koeleria cristata*), Letterman needlegrass (*Stipa lettermani*), and needle-and-thread grass (*Stipa comata*). Grasses showed no utilization. Several important perennial species that were sampled in low numbers include pale agoseris (*Agoseris glauca*), segolily (*Calochortus nuttallii*), low fleabane (*Erigeron pumilus*), and redroot eriogonum (*Eriogonum racemosum*).

#### 2003 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - fair (62) Mid-level potential scale

#### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of mountain big sagebrush declined slightly from 2003 to 6,440 plants/acre. Decadence in the population increased to 65%, and plants displaying poor vigor increased slightly

to 19%. Recruitment of sagebrush improved slightly with young plants comprising 11% of the population. Countering some of the negative trend in the sagebrush population, density of the preferred browse, bitterbrush, increased slightly. Decadence of bitterbrush improved markedly, but is still high at 45%. Vigor in the population also improved with the proportion of plants displaying poor vigor declining to 12%. Recruitment of young bitterbrush plants remained poor. Trend for grasses is up. Sum of nested frequency of perennial grasses was high and increased 26% from 2003. Production of perennial grasses also increased to 21% of the total cover. There was a significant increase in the nested frequency of intermediate wheatgrass (*Agropyron intermedium*), mutton bluegrass, and Letterman needlegrass. Trend for forbs is up, but forbs are still rare. Sum of nested frequency of perennial forbs increased by 63% since 2003, and production of perennial forbs doubled to just over 1%. There was a significant increase in the nested frequency of pale agoseris, cudweed sagewort (*Artemisia ludoviciana*), and segolily.

winter range condition (DCI) - fair-good (65) Mid-level potential scale  
browse - stable (0)                      grass - up (+2)                      forb - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 16

| Type                        | Species                       | Nested Frequency |                  | Average Cover % |       |
|-----------------------------|-------------------------------|------------------|------------------|-----------------|-------|
|                             |                               | '03              | '08              | '03             | '08   |
| G                           | <i>Agropyron dasystachyum</i> | 3                | 17               | .06             | .20   |
| G                           | <i>Agropyron intermedium</i>  | <sub>a</sub> 3   | <sub>b</sub> 10  | .03             | .33   |
| G                           | <i>Bouteloua gracilis</i>     | 1                | 6                | .00             | .16   |
| G                           | <i>Bromus inermis</i>         | -                | 6                | -               | .03   |
| G                           | <i>Carex</i> sp.              | 3                | 8                | .06             | .06   |
| G                           | <i>Koeleria cristata</i>      | 109              | 73               | 1.50            | .69   |
| G                           | <i>Poa fendleriana</i>        | <sub>b</sub> 249 | <sub>a</sub> 339 | 9.31            | 17.07 |
| G                           | <i>Poa pratensis</i>          | <sub>b</sub> 11  | <sub>a</sub> -   | .60             | -     |
| G                           | <i>Poa secunda</i>            | <sub>b</sub> 29  | <sub>a</sub> 3   | .60             | .00   |
| G                           | <i>Sitanion hystrix</i>       | 3                | -                | .01             | -     |
| G                           | <i>Stipa comata</i>           | 24               | 45               | .34             | .80   |
| G                           | <i>Stipa lettermani</i>       | <sub>a</sub> 41  | <sub>b</sub> 94  | .56             | 2.05  |
| Total for Annual Grasses    |                               | 0                | 0                | 0               | 0     |
| Total for Perennial Grasses |                               | 476              | 601              | 13.11           | 21.43 |
| Total for Grasses           |                               | 476              | 601              | 13.11           | 21.43 |
| F                           | <i>Agoseris glauca</i>        | <sub>a</sub> 25  | <sub>b</sub> 42  | .10             | .21   |
| F                           | <i>Antennaria rosea</i>       | 7                | 7                | .04             | .19   |
| F                           | <i>Arabis</i> sp.             | 13               | 4                | .02             | .01   |
| F                           | <i>Artemisia ludoviciana</i>  | <sub>a</sub> 15  | <sub>b</sub> 24  | .11             | .14   |
| F                           | <i>Astragalus</i> sp.         | -                | 11               | -               | .09   |
| F                           | <i>Calochortus nuttallii</i>  | <sub>a</sub> 18  | <sub>b</sub> 99  | .03             | .39   |
| F                           | <i>Comandra pallida</i>       | 3                | -                | .03             | -     |



| T<br>y<br>p<br>e          | Species                            | Nested<br>Frequency |                 | Average<br>Cover % |      |
|---------------------------|------------------------------------|---------------------|-----------------|--------------------|------|
|                           |                                    | '03                 | '08             | '03                | '08  |
| F                         | <i>Collinsia parviflora</i> (a)    | 167                 | 167             | .72                | .61  |
| F                         | <i>Crepis acuminata</i>            | 3                   | -               | .01                | -    |
| F                         | <i>Delphinium nuttallianum</i>     | 2                   | 4               | .00                | .01  |
| F                         | <i>Erigeron flagellaris</i>        | 1                   | -               | .00                | -    |
| F                         | <i>Erigeron pumilus</i>            | <sub>b</sub> 35     | <sub>a</sub> 16 | .10                | .08  |
| F                         | <i>Eriogonum racemosum</i>         | 6                   | 8               | .03                | .09  |
| F                         | <i>Eriogonum umbellatum</i>        | 2                   | -               | .00                | -    |
| F                         | <i>Gayophytum ramosissimum</i> (a) | <sub>b</sub> 85     | <sub>a</sub> 2  | .24                | .01  |
| F                         | <i>Lactuca serriola</i>            | 2                   | -               | .00                | -    |
| F                         | <i>Microsteris gracilis</i> (a)    | <sub>b</sub> 166    | <sub>a</sub> 60 | .84                | .15  |
| F                         | <i>Plantago patagonica</i> (a)     | <sub>a</sub> -      | <sub>b</sub> 32 | -                  | .11  |
| F                         | <i>Polygonum douglasii</i> (a)     | 5                   | 6               | .01                | .04  |
| Total for Annual Forbs    |                                    | 423                 | 267             | 1.82               | 0.93 |
| Total for Perennial Forbs |                                    | 132                 | 215             | 0.52               | 1.23 |
| Total for Forbs           |                                    | 555                 | 482             | 2.34               | 2.16 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 28 , Study no: 16

| T<br>y<br>p<br>e | Species  | Strip<br>Frequency |     | Average<br>Cover % |       |
|------------------|--|--------------------|-----|--------------------|-------|
|                  |  | '03                | '08 | '03                | '08   |
| B                | <i>Amelanchier utahensis</i>                     | 2                  | 1   | .00                | .00   |
| B                | <i>Artemisia tridentata vaseyana</i>             | 90                 | 94  | 13.83              | 11.36 |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 64                 | 80  | 3.49               | 3.72  |
| B                | <i>Gutierrezia sarothrae</i>                     | 19                 | 0   | 1.33               | -     |
| B                | <i>Opuntia</i> sp.                               | 0                  | 3   | -                  | .00   |
| B                | <i>Purshia tridentata</i>                        | 71                 | 77  | 14.19              | 15.21 |
| B                | <i>Rosa woodsii</i>                              | 2                  | 1   | .03                | .03   |
| B                | <i>Symphoricarpos oreophilus</i>                 | 7                  | 7   | 1.86               | .45   |
| B                | <i>Tetradymia canescens</i>                      | 1                  | 1   | .03                | .00   |
| Total for Browse |  | 256                | 264 | 34.78              | 30.79 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 28 , Study no: 16

| Species                                   | Percent Cover |       |
|---|---------------|-------|
|   | '03           | '08   |
| Amelanchier utahensis                     | .05           | .03   |
| Artemisia tridentata vaseyana             | 17.11         | 20.88 |
| Chrysothamnus viscidiflorus viscidiflorus | 1.93          | 4.68  |
| Gutierrezia sarothrae                     | .66           | -     |
| Purshia tridentata                        | 10.13         | 18.83 |
| Rosa woodsii                              | .03           | -     |
| Symphoricarpos oreophilus                 | 1.39          | .66   |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 28 , Study no: 16

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.7                        | 1.1 |
| Purshia tridentata            | 2.1                        | 1.1 |

BASIC COVER --  
 Management unit 28 , Study no: 16

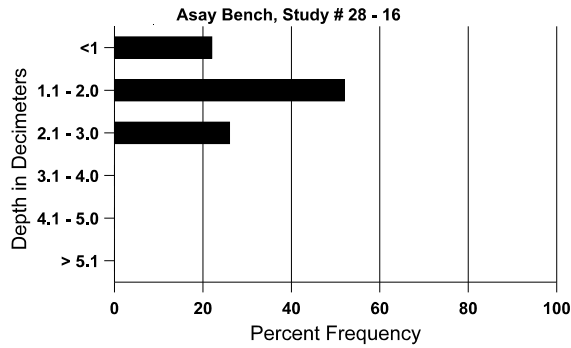
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 49.34           | 59.40 |
| Rock        | 5.65            | 2.99  |
| Pavement    | 1.37            | 4.62  |
| Litter      | 40.23           | 36.27 |
| Cryptogams  | .15             | .01   |
| Bare Ground | 23.70           | 13.17 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 16, Study Name: Asay Bench

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 11.4                         | 61.4<br>(16.4)  | 6.2 | 36.6   | 39.2   | 24.2   | 2.9 | 28.4  | 572.8 | 0.6  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28 , Study no: 16

| Type   | Quadrat Frequency |     | Days use per acre (ha) |          |
|--------|-------------------|-----|------------------------|----------|
|        | '03               | '08 | '03                    | '08      |
| Rabbit | 2                 | 8   | -                      | -        |
| Elk    | 12                | 18  | 20 (50)                | 13 (33)  |
| Deer   | 5                 | 16  | 19 (50)                | 61 (150) |
| Cattle | 5                 | 8   | 7 (18)                 | 12 (29)  |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 16

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>40</b>                             | -  | -     | -      | 40       | -    | 0           | 0       | 100        | 50      | 50           | -/-                       |
| 08   | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | 100     | 100          | 18/20                     |
| <b>Artemisia tridentata vaseyana</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>6760</b>                           | -  | 580   | 5200   | 980      | 460  | 33          | 2       | 14         | 3       | 3            | 18/19                     |
| 08   | <b>6440</b>                           | 100                                      | 680   | 1600   | 4160     | 720  | 27          | 4       | 65         | 12      | 19           | 18/24                     |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>5080</b>                           | -  | 120   | 4780   | 180      | -    | 1           | 0       | 4          | 2       | 2            | 7/9                       |
| 08   | <b>5320</b>                           | 40                                       | 360   | 3960   | 1000     | 40   | 23          | .75     | 19         | 1       | 2            | 6/12                      |
| <b>Gutierrezia sarothrae</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>2640</b>                           | -  | -     | 2640   | -        | -    | 0           | 0       | -          | -       | 0            | 6/7                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 3/9                       |
| 08   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 33           | 5/11                      |
| <b>Purshia tridentata</b>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>2120</b>                           | -  | 80    | 380    | 1660     | -    | 20          | 77      | 78         | 31      | 32           | 19/31                     |
| 08   | <b>2380</b>                           | 20                                       | 100   | 1220   | 1060     | 100  | 62          | 5       | 45         | 5       | 12           | 23/43                     |
| <b>Ribes cereum inebrians</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 41/54                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Rosa woodsii</b>                              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>80</b>                             | -  | 80    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 5/4                       |
| 08   | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Symphoricarpos oreophilus</b>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>200</b>                            | -  | 20    | 160    | 20       | -    | 0           | 0       | 10         | -       | 0            | 17/25                     |
| 08   | <b>180</b>                            | 20                                       | -     | 80     | 100      | -    | 11          | 11      | 56         | 11      | 11           | 18/27                     |
| <b>Tetradymia canescens</b>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 9/13                      |
| 08   | <b>20</b>                             | -  | -     | -      | 20       | -    | 100         | 0       | 100        | -       | 0            | -/-                       |

Trend Study 28-17-08

Study site name: Sidney Valley.

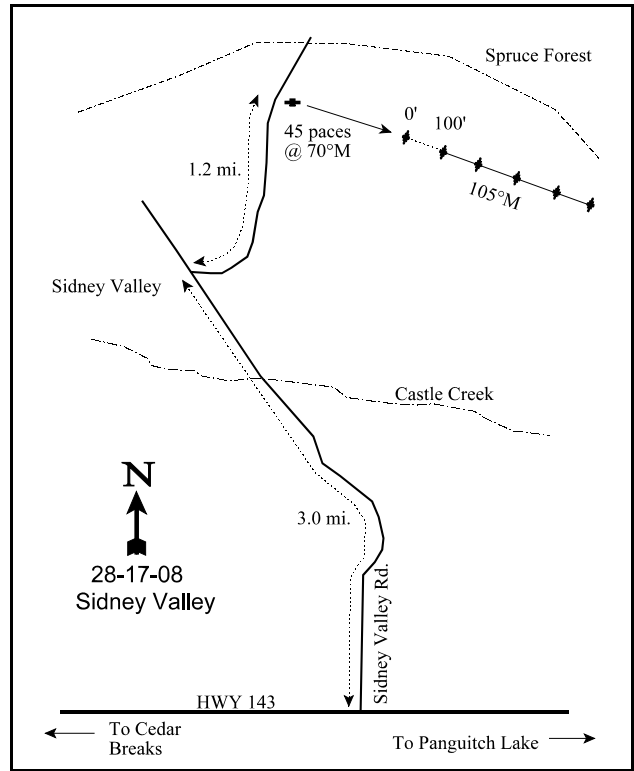
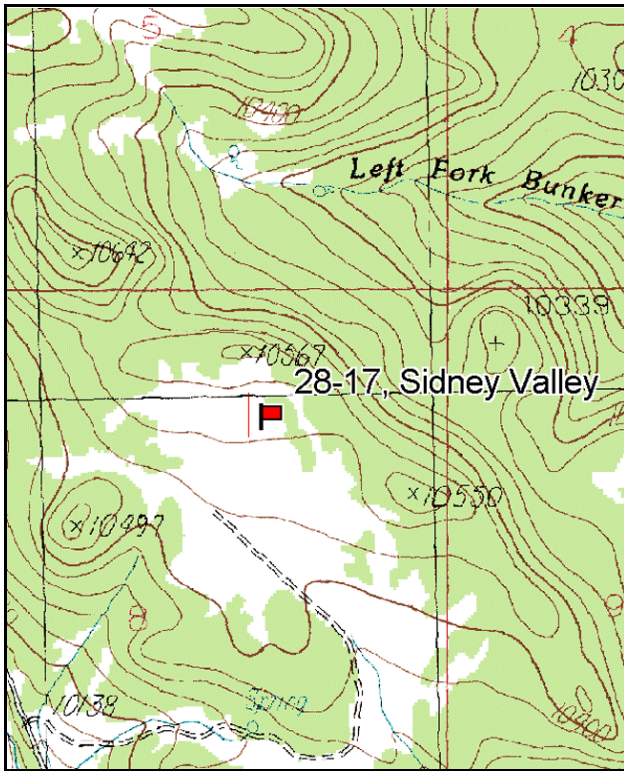
Vegetation type: Perennial Grass.

Compass bearing: frequency baseline 105 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Start at the junction of Highway 143 and the Sidney Valley Road. This junction is between Cedar Breaks and Panguitch Lake. Drive north on Sidney Valley Road for 3.0 miles to a fork on the right (east) side of the road (Castle Creek will be crossed). Take the right fork for 1.2 miles to the witness post on the right (east) side of the road. The 0-foot stake is 54 paces at 70 degrees magnetic from the witness post. The 0-foot stake is marked with browse tag #164.



Map Name: Brian Head

Diagrammatic Sketch

Township 36S, Range 8W, Section 8

GPS: NAD 83, UTM 12S 344406 E, 4174160 N

## DISCUSSION

### Sidney Valley - Trend Study No. 28-17

#### Study Information

This study was established in 2003 to monitor elk use in an dry alpine meadow, which had shown increases in use in years prior to the study establishment.[elevation: 10,500 feet (3,200 m), slope: 8%, aspect: south]. Pellet group transect data taken in 2003 estimated 97 elk and 27 deer days use/acre (240 edu/ha and 66 ddu/ha). Pellet group data from 2008 estimated 135 elk and 3 deer days use/acre (332 edu/ha and 7 ddu/ha). Elk were seen on site in 2008. This area is also apparently grazed by sheep in some years as a mineral lick was found near the site in 2003.

#### Soils

Soils on the site are loam in texture and moderately acidic in pH (5.6). These are deep mountain soils derived from igneous parent material. Effective rooting depth was measured at 18 inches. Relative combined average vegetation and litter cover was relatively high at 65%-78%, and relative combined average rock and pavement cover was 7%-18% since 2003. Relative average bare ground cover has been moderate at 15%-17% since 2003. An erosion condition class assessment rated soils as stable in both 2003 and 2008.

#### Browse

There were no browse species sampled on the site, but as this is high elevation summer range, browse is not of great importance.

#### Herbaceous Understory

The herbaceous understory is abundant, but dominated by only a few species. Subalpine needlegrass (*Stipa columbiana*), mountain muhly (*Muhlenbergia montana*), Letterman needlegrass (*Stipa lettermani*), and needle-and-thread grass (*Stipa comata*) are the predominant grass species. Dandelion (*Taraxacum officinale*) and yarrow (*Achillea millefolium*) dominate the forb component. These six species combined to provide an average of 94% of the total vegetation cover in both sample years.

#### 2008 TREND ASSESSMENT

No browse is present on the site. Trend for grasses is slightly up. Sum of nested frequency of perennial grasses increased by 20% since 2003, with a significant increase in the nested frequency of slender wheatgrass (*Agropyron trachycaulum*), needle-and-thread grass, and Letterman needlegrass. Trend for forbs is up. There was nearly a two-fold increase in the sum of nested frequency of perennial forbs, and production of perennial forbs increased from 10% total cover in 2003 to just over 27% cover. There was a significant increase in the nested frequency of six perennial forbs including the two dominant species, yarrow and dandelion.

browse - (no trend)

grasses - slightly up (+1)

forbs - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 17

| T<br>y<br>p<br>e            | Species                       | Nested<br>Frequency |                  | Average<br>Cover % |       |
|-----------------------------|-------------------------------|---------------------|------------------|--------------------|-------|
|                             |                               | '03                 | '08              | '03                | '08   |
| G                           | Agropyron trachycaulum        | <sub>a</sub> 54     | <sub>b</sub> 91  | .75                | 1.03  |
| G                           | Carex sp.                     | 13                  | 21               | .22                | .32   |
| G                           | Elymus cinereus               | -                   | -                | -                  | .03   |
| G                           | Festuca ovina                 | 11                  | 9                | .15                | .26   |
| G                           | Muhlenbergia montana          | 100                 | 107              | 6.28               | 4.30  |
| G                           | Poa glauca                    | <sub>b</sub> 10     | <sub>a</sub> -   | .36                | -     |
| G                           | Poa pratensis                 | -                   | 2                | -                  | .01   |
| G                           | Sitanion hystrix              | 5                   | 7                | .10                | .05   |
| G                           | Stipa columbiana              | 272                 | 224              | 15.90              | 9.80  |
| G                           | Stipa comata                  | <sub>a</sub> -      | <sub>b</sub> 76  | -                  | 2.30  |
| G                           | Stipa lettermani              | <sub>a</sub> 167    | <sub>b</sub> 224 | 4.22               | 4.48  |
| Total for Annual Grasses    |                               | 0                   | 0                | 0                  | 0     |
| Total for Perennial Grasses |                               | 632                 | 761              | 28.01              | 22.63 |
| Total for Grasses           |                               | 632                 | 761              | 28.01              | 22.63 |
| F                           | Achillea millefolium          | <sub>a</sub> 218    | <sub>b</sub> 317 | 3.67               | 9.07  |
| F                           | Agoseris aurantiaca           | <sub>a</sub> 6      | <sub>b</sub> 26  | .07                | .16   |
| F                           | Androsace septentrionalis (a) | <sub>a</sub> 1      | <sub>b</sub> 153 | .00                | .86   |
| F                           | Arabis sp.                    | <sub>a</sub> 6      | <sub>b</sub> 160 | .01                | 1.00  |
| F                           | Aster chilensis               | 16                  | 6                | .19                | .18   |
| F                           | Chenopodium fremontii (a)     | <sub>a</sub> -      | <sub>b</sub> 11  | -                  | .03   |
| F                           | Erigeron sp.                  | <sub>a</sub> 19     | <sub>b</sub> 96  | .21                | .85   |
| F                           | Fritillaria atropurpurea      | -                   | 4                | -                  | .06   |
| F                           | Geum triflorum                | -                   | 2                | -                  | .00   |
| F                           | Lepidium densiflorum (a)      | 28                  | 45               | .16                | .33   |
| F                           | Polygonum douglasii (a)       | <sub>a</sub> -      | <sub>b</sub> 221 | -                  | .71   |
| F                           | Potentilla sp.                | 2                   | 7                | .00                | .03   |
| F                           | Senecio integerrimus          | 19                  | 14               | .10                | .26   |
| F                           | Taraxacum officinale          | <sub>a</sub> 245    | <sub>b</sub> 329 | 5.73               | 15.53 |
| F                           | Tragopogon dubius             | 1                   | -                | .03                | -     |
| F                           | Trifolium sp.                 | 11                  | 21               | .07                | .17   |
| F                           | Unknown forb-perennial        | <sub>a</sub> -      | <sub>b</sub> 15  | -                  | .14   |
| Total for Annual Forbs      |                               | 29                  | 430              | 0.16               | 1.94  |
| Total for Perennial Forbs   |                               | 543                 | 997              | 10.10              | 27.48 |
| Total for Forbs             |                               | 572                 | 1427             | 10.27              | 29.43 |

BASIC COVER --

Management unit 28 , Study no: 17

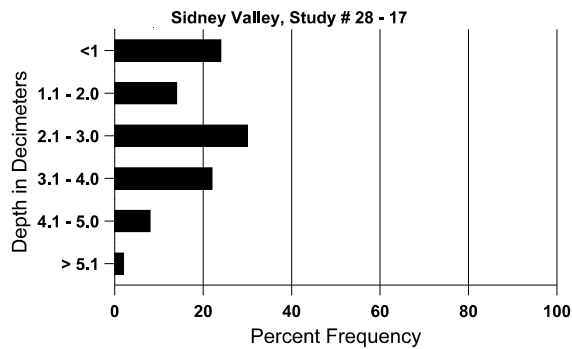
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 41.18           | 59.90 |
| Rock        | 6.98            | 2.32  |
| Pavement    | 13.15           | 5.21  |
| Litter      | 30.29           | 24.59 |
| Cryptogams  | 0               | .03   |
| Bare Ground | 18.93           | 15.89 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 17, Study Name: Sidney Valley

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 17.9                         | 54.8 (18.1)     | 5.6 | 44.6   | 37.2   | 18.2   | 3.3 | 25.4  | 752.0 | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28 , Study no: 17

| Type   | Quadrat Frequency |     | Days use per acre (ha) |           |
|--------|-------------------|-----|------------------------|-----------|
|        | '03               | '08 | '03                    | '08       |
| Rabbit | 5                 | -   | -                      | -         |
| Elk    | 28                | 47  | 97 (240)               | 135 (332) |
| Deer   | 10                | 8   | 27 (66)                | 3 (7)     |
| Cattle | 3                 | 3   | -                      | -         |



Trend Study 28-18-08

Study site name: Shakespeare Hollow .

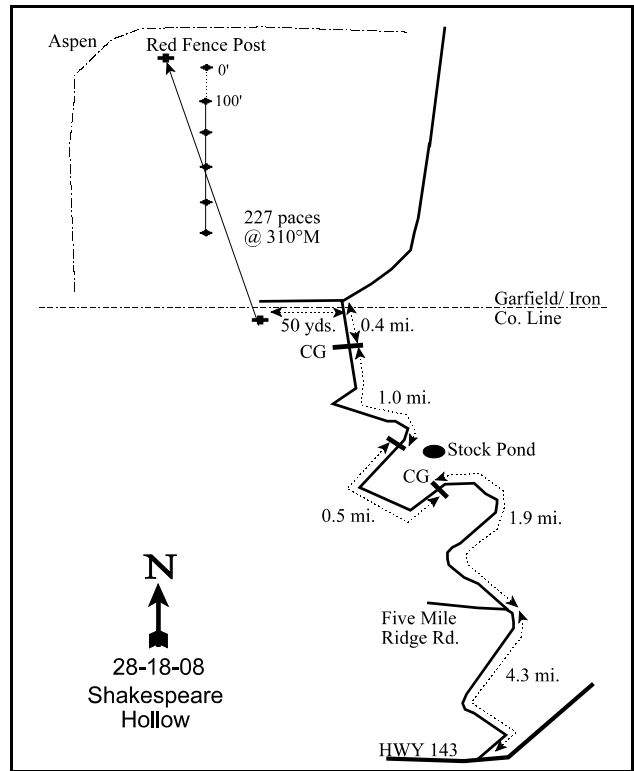
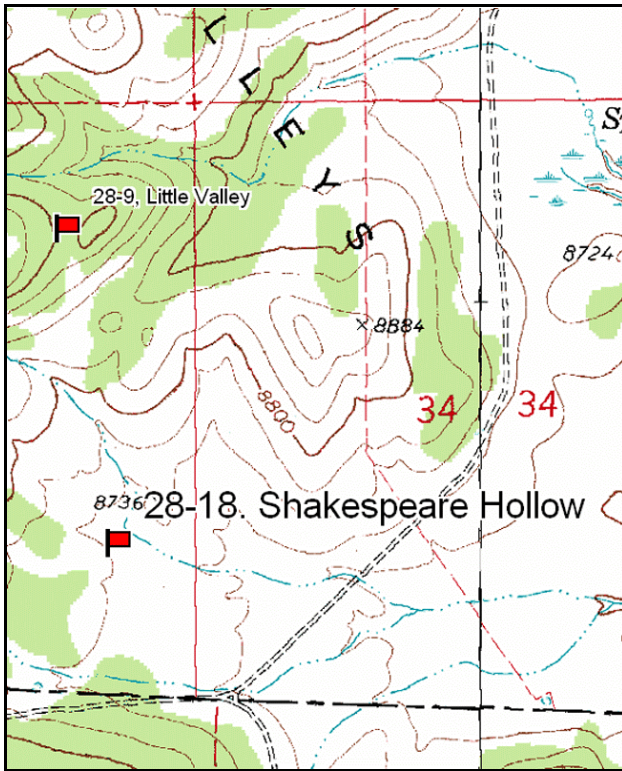
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 1 on 5ft, belt 4 on 5ft.

LOCATION DESCRIPTION

From Panguitch, go south towards Panguitch Lake. At mile marker 41, turn right onto a dirt road. Proceed up Pole Hollow 4.3 miles to the Five Mile Ridge Road. Continue straight 1.9 miles to a cattleguard. Continue 0.5 miles to a cattleguard and stockpond. Continue 1.0 miles to another cattleguard. Go 0.4 miles to a fork at the Iron County-Garfield County line. Bear right, go 50 yards, and park by a witness post and aspen on the left side of the road (south). From the witness post, walk 227 paces at 310 degrees magnetic to another witness post. The 0-foot stake is west-southwest of the witness post.



Map Name: Red Creek Reservoir

Diagrammatic Sketch

Township 35S, Range 7W, Section 3

GPS: NAD 83, UTM 12S 356016 E, 4185924 N

## DISCUSSION

### Shakespeare Hollow - Trend Study No. 28-18

#### Study Information

This study was established in 2003 about one-half mile south of the Little Valleys (28-9) study and samples a mountain brush community surrounded by pockets of aspen [elevation: 8,750 feet (2667 m), slope: 1-3%, aspect: east]. This study replaced the Little Valleys transect, which was no longer representative of important summer range. The Little Valleys transect was placed inside a thick aspen clone with a very dense snowberry understory that received very little use by big game or livestock. The new transect was left in the general area because of its importance to deer, elk, and sage grouse. Pellet group transect data collected on site in 2003 estimated 24 elk, 23 deer, and 16 cow days use/acre (60 edu/ha, 56 ddu/ha, and 39 cdu/ha). Pellet group data from 2008 estimated 4 elk, 23 deer, and 12 cow days use/acre (10 edu/ha, 58 ddu/ha, and 29 cdu/ha). Some of the deer pellets could be antelope because both deer and antelope were seen near the study site in 2008.

#### Soils

Soils are loam in texture and moderately acidic with a pH of 6.0. Relative combined average vegetation and litter cover was moderately high at 63%-70%, and relative combined average rock and pavement cover was fairly low at 9%-11% since 2003. Relative average bare ground cover has been moderately high at 26% in 2003, decreasing to 21% in 2008. An erosion condition class assessment rated soils as stable in 2003 and 2008.

#### Browse

Silver sagebrush (*Artemisia cana*) and bitterbrush (*Purshia tridentata*) are the dominant browse species on the site contributing a combined average of 84% of the total browse cover in both sample years. Bitterbrush is the only preferred species found in any notable density. Bitterbrush density was estimated to have an average of about 1,000 plants/acre with a mostly mature population. Average height of bitterbrush has been 21 inches. Decadence of bitterbrush was low in 2003, but increased substantially in 2008. The proportion of plants displaying poor vigor also increased in 2008, but vigor is still good. Recruitment of young bitterbrush plants was low in 2003, but also increased in 2008. Utilization of bitterbrush has been moderate to heavy, with the heaviest use measured in 2003. Other browse sampled on the site include Parry rabbitbrush (*Chrysothamnus parryi*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), and a few currant plants (*Ribes* sp.). Parry rabbitbrush population has displayed moderate use in the sample years.

#### Herbaceous Understory

The herbaceous understory is diverse and moderately abundant. Eight perennial grasses and 25 perennial forbs have been sampled on the site. Mutton bluegrass (*Poa secunda*), Kentucky blugrass (*Poa pratensis*), bottlebrush squirreltail (*Sitanion hystrix*), needle-and-thread grass (*Stipa comata*), and Letterman needlegrass (*Stipa lettermani*) were the most abundant grasses. Perennial forbs are diverse and fairly abundant on the site. Six species of annual forbs have also been sampled on the site.

#### 2008 TREND ASSESSMENT

Browse trend is stable. Density of the preferred browse species, bitterbrush, is similar to 2003, but decadence has increased to 32%. Plants displaying poor vigor have increased to 11% of the population, but recruitment of young bitterbrush plants has improved with young plants comprising 13% of the population. The trend for both grasses and forbs is up. The sum of nested frequency of both perennial grasses and perennial forbs increased substantially, as did their total cover. There was a significant increase in the nested frequency of Kentucky bluegrass, bottlebrush squirreltail, and Letterman needlegrass. There was also a significant increase in seven perennial forb species.

browse - stable (0)

grasses - up (+2)

forbs - up (+2)

HERBACEOUS TRENDS --  
Management unit 28 , Study no: 18

| T<br>y<br>p<br>e            | Species                              | Nested<br>Frequency |                  | Average<br>Cover % |       |
|-----------------------------|--------------------------------------|---------------------|------------------|--------------------|-------|
|                             |                                      | '03                 | '08              | '03                | '08   |
| G                           | <i>Bouteloua gracilis</i>            | 10                  | 10               | .38                | .53   |
| G                           | <i>Koeleria cristata</i>             | 38                  | 48               | .31                | .83   |
| G                           | <i>Poa fendleriana</i>               | 214                 | 174              | 5.05               | 6.35  |
| G                           | <i>Poa pratensis</i>                 | <sub>a</sub> 8      | <sub>b</sub> 198 | .16                | 6.26  |
| G                           | <i>Sitanion hystrix</i>              | <sub>a</sub> 36     | <sub>b</sub> 65  | .37                | 1.34  |
| G                           | <i>Stipa columbiana</i>              | 10                  | 4                | .21                | .18   |
| G                           | <i>Stipa comata</i>                  | 66                  | 90               | 1.37               | 3.05  |
| G                           | <i>Stipa lettermani</i>              | <sub>a</sub> 63     | <sub>b</sub> 119 | 1.00               | 4.12  |
| Total for Annual Grasses    |                                      | 0                   | 0                | 0                  | 0     |
| Total for Perennial Grasses |                                      | 445                 | 708              | 8.88               | 22.69 |
| Total for Grasses           |                                      | 445                 | 708              | 8.88               | 22.69 |
| F                           | <i>Achillea millefolium</i>          | 31                  | 42               | .13                | 1.02  |
| F                           | <i>Agoseris glauca</i>               | <sub>a</sub> 2      | <sub>b</sub> 38  | .00                | .13   |
| F                           | <i>Antennaria rosea</i>              | <sub>a</sub> 10     | <sub>b</sub> 30  | .09                | .48   |
| F                           | <i>Androsace septentrionalis</i> (a) | -                   | 6                | -                  | .02   |
| F                           | Apiaceae sp.                         | <sub>a</sub> -      | <sub>b</sub> 62  | -                  | .19   |
| F                           | <i>Arabis</i> sp.                    | <sub>a</sub> -      | <sub>b</sub> 9   | -                  | .05   |
| F                           | <i>Artemisia dracunculus</i>         | 5                   | 1                | .38                | .00   |
| F                           | <i>Artemisia ludoviciana</i>         | <sub>a</sub> 79     | <sub>b</sub> 138 | .81                | 2.08  |
| F                           | <i>Aster chilensis</i>               | 15                  | 15               | .10                | .23   |
| F                           | <i>Aster</i> sp.                     | <sub>a</sub> -      | <sub>b</sub> 39  | -                  | .45   |
| F                           | <i>Astragalus</i> sp.                | -                   | 4                | -                  | .15   |
| F                           | <i>Calochortus nuttallii</i>         | <sub>a</sub> 11     | <sub>b</sub> 23  | .03                | .08   |
| F                           | <i>Chenopodium album</i> (a)         | -                   | 2                | -                  | .00   |
| F                           | <i>Collinsia parviflora</i> (a)      | <sub>a</sub> 127    | <sub>b</sub> 228 | .63                | 1.21  |
| F                           | <i>Delphinium nuttallianum</i>       | <sub>a</sub> 4      | <sub>b</sub> 14  | .00                | .09   |
| F                           | <i>Erigeron flagellaris</i>          | 79                  | 51               | 1.05               | .53   |
| F                           | <i>Erigeron pumilus</i>              | <sub>b</sub> 133    | <sub>a</sub> 42  | 2.11               | .32   |
| F                           | <i>Eriogonum racemosum</i>           | <sub>a</sub> 65     | <sub>b</sub> 92  | 1.54               | 1.75  |
| F                           | <i>Eriogonum umbellatum</i>          | 34                  | 29               | .56                | .52   |
| F                           | <i>Fritillaria atropurpurea</i>      | -                   | 1                | -                  | .00   |
| F                           | <i>Lomatium</i> sp.                  | -                   | 3                | -                  | .01   |
| F                           | <i>Microsteris gracilis</i> (a)      | <sub>a</sub> 19     | <sub>b</sub> 53  | .06                | .12   |
| F                           | <i>Penstemon</i> sp.                 | 21                  | 22               | .16                | .18   |

| T<br>y<br>p<br>e          | Species                          | Nested<br>Frequency |                 | Average<br>Cover % |       |
|---------------------------|----------------------------------|---------------------|-----------------|--------------------|-------|
|                           |                                  | '03                 | '08             | '03                | '08   |
| F                         | <i>Polygonum douglasii</i> (a)   | <sub>a</sub> -      | <sub>b</sub> 73 | -                  | .21   |
| F                         | <i>Potentilla</i> sp.            | 8                   | 18              | .10                | .43   |
| F                         | <i>Senecio integerrimus</i>      | <sub>a</sub> 3      | <sub>b</sub> 52 | .04                | .68   |
| F                         | <i>Senecio multilobatus</i>      | 12                  | 7               | .05                | .05   |
| F                         | <i>Sisymbrium altissimum</i> (a) | 1                   | -               | .00                | -     |
| F                         | <i>Taraxacum officinale</i>      | -                   | 4               | -                  | .04   |
| F                         | <i>Tragopogon dubius</i>         | <sub>b</sub> 20     | <sub>a</sub> 5  | .06                | .03   |
| F                         | <i>Trifolium</i> sp.             | <sub>a</sub> 21     | <sub>b</sub> 58 | .42                | .90   |
| Total for Annual Forbs    |                                  | 147                 | 362             | 0.69               | 1.57  |
| Total for Perennial Forbs |                                  | 553                 | 799             | 7.69               | 10.47 |
| Total for Forbs           |                                  | 700                 | 1161            | 8.39               | 12.05 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 28 , Study no: 18

| T<br>y<br>p<br>e | Species  | Strip<br>Frequency |     | Average<br>Cover % |       |
|------------------|--|--------------------|-----|--------------------|-------|
|                  |  | '03                | '08 | '03                | '08   |
| B                | <i>Artemisia cana</i>                                      | 85                 | 93  | 11.55              | 14.15 |
| B                | <i>Chrysothamnus parryi</i>                                | 32                 | 8   | .74                | .18   |
| B                | <i>Chrysothamnus viscidiflorus</i><br><i>viscidiflorus</i> | 48                 | 49  | 3.59               | 3.07  |
| B                | <i>Gutierrezia sarothrae</i>                               | 2                  | 0   | .00                | -     |
| B                | <i>Purshia tridentata</i>                                  | 37                 | 35  | 9.35               | 6.19  |
| B                | <i>Ribes</i> sp.   | 1                  | 1   | .01                | .30   |
| Total for Browse |  | 205                | 186 | 25.26              | 23.92 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 28 , Study no: 18

| Species                                      | Percent Cover |       |
|--|---------------|-------|
|  | '03           | '08   |
| Artemisia cana                               | 11.18         | 13.06 |
| Chrysothamnus parryi                         | 1.39          | .10   |
| Chrysothamnus viscidiflorus<br>viscidiflorus | 3.75          | 5.86  |
| Purshia tridentata                           | 13.05         | 9.89  |
| Ribes sp.                                    | .11           | .25   |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 28 , Study no: 18

| Species            | Average leader growth (in) |     |
|--------------------|----------------------------|-----|
|                    | '03                        | '08 |
| Artemisia cana     | 1.4                        | 1.8 |
| Purshia tridentata | 1.8                        | 1.9 |

BASIC COVER --  
 Management unit 28 , Study no: 18

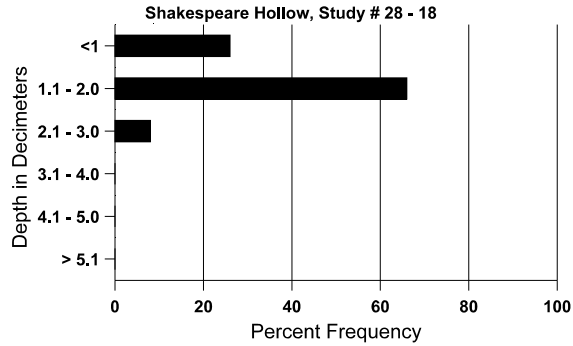
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 39.65           | 55.81 |
| Rock        | 9.71            | 6.40  |
| Pavement    | 3.34            | 3.54  |
| Litter      | 33.43           | 21.52 |
| Cryptogams  | .18             | .18   |
| Bare Ground | 30.55           | 23.07 |

SOIL ANALYSIS DATA --

Management unit 28, Study no: 18, Study Name: Shakespeare Hollow

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 8.9                          | 63.2 (13.0)     | 6.0 | 44.7   | 32.0   | 23.3   | 3.3 | 30.0  | 787.2 | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 28, Study no: 18

| Type   | Quadrat Frequency |     | Days use per acre (ha) |         |
|--------|-------------------|-----|------------------------|---------|
|        | '03               | '08 | '03                    | '08     |
| Rabbit | 2                 | 2   | -                      | -       |
| Elk    | 8                 | 4   | 24 (60)                | 4 (10)  |
| Deer   | 17                | 15  | 23 (56)                | 23 (58) |
| Cattle | 5                 | 9   | 16 (39)                | 12 (29) |

BROWSE CHARACTERISTICS --  
Management unit 28 , Study no: 18

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia cana</i>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>6400</b>                           | -  | 60    | 5100   | 1240     | 20   | 14          | 2       | 19         | 6       | 6            | 12/19                     |
| 08   | <b>8480</b>                           | 1260                                     | 1060  | 4180   | 3240     | 100  | 4           | 0       | 38         | 9       | 9            | 11/21                     |
| <i>Chrysothamnus parryi</i>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>1240</b>                           | -  | -     | 1160   | 80       | -    | 32          | 2       | 6          | -       | 0            | 8/10                      |
| 08   | <b>280</b>                            | -  | 40    | 160    | 80       | -    | 21          | 0       | 29         | 7       | 7            | 10/19                     |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>3020</b>                           | -  | -     | 2700   | 320      | -    | 0           | 0       | 11         | 3       | 3            | 13/15                     |
| 08   | <b>3040</b>                           | 140                                      | 240   | 2180   | 620      | -    | 0           | 0       | 20         | 5       | 5            | 11/17                     |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 6/6                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 9/12                      |
| <i>Purshia tridentata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>1000</b>                           | -  | 20    | 900    | 80       | -    | 20          | 80      | 8          | -       | 0            | 21/59                     |
| 08   | <b>1060</b>                           | 80                                       | 140   | 580    | 340      | -    | 40          | 55      | 32         | 11      | 11           | 21/48                     |
| <i>Ribes sp.</i>                                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 32/24                     |
| 08   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 37/58                     |
| <i>Symphoricarpos oreophilus</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 15/18                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 28-21-08

Study site name: South Summit WMA .

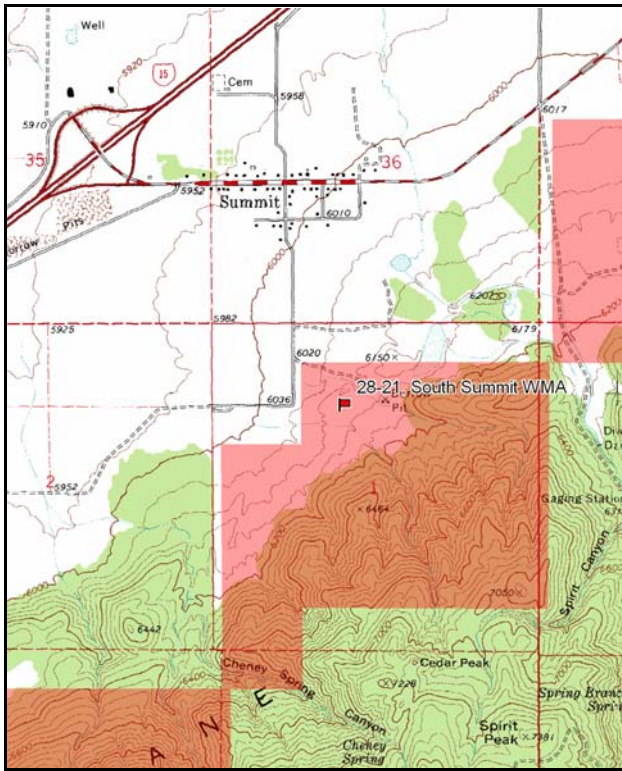
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 0 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). No rebar.

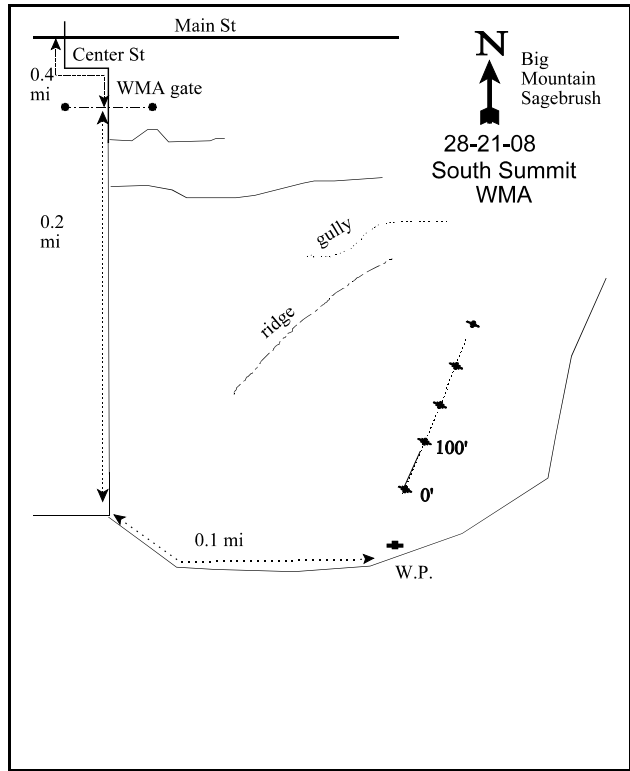
LOCATION DESCRIPTION

From the intersection of Center St and Main St in the city of Summit, travel south for 0.4 miles to a WMA gate. From the gate, continue for 0.2 miles to a T in the road. Take the fork on the left and travel for 0.1 miles to the witness post. From the witness post walk 12 paces at 25 degrees magnetic to the 0-ft stake. The 0-ft stake is marked with browse tag number 193.



Map Name: Panguitch

Township 35S , Range 10W , Section 1



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 329793 E, 4184348 N



## DISCUSSION

### South Summit WMA - Trend Study No. 28-21

#### Study Information

This study was established in 2008 on DWR land to monitor an old chaining that has also received herbicide and a lop-and-scatter treatments in the past [elevation: 6,026 feet (1,837 m), slope: 5%, aspect: southwest]. This transect lies 1 mile south of Summit on a wildlife management area. The range type is a mixture of mountain big sagebrush and basin big sagebrush (*Artemisia tridentata* ssp. *vaseyana* and *A. tridentata* ssp. *tridentata*). A pellet group transect in 2008 estimated 1 elk, 92 deer, and 12 cow days use/acre (2 edu/ha, 228 ddu/ha, and 29 cdu/ha).

#### Soils

Soils are sandy with a neutral in reactivity (pH 7.15). Relative combined average vegetation and litter cover was moderately high at 69%, and relative combined average rock and pavement cover was moderate at 17%. Relative average bare ground was moderate at 14%. An erosion condition class assessment rated soils as stable in 2008.

#### Browse

Browse is not particularly dense on this site with browse species providing only 28% of the vegetative cover. Mountain big sagebrush is the dominant browse cover providing 62% of the browse cover. Density of mountain big sagebrush is fairly low at 1,660 plants/acre. Over half of the population is decadent, and 40% of the population is displaying poor vigor. Recruitment of young mountain big sagebrush plants is poor. The other preferred browse species on the site is basin big sagebrush, which accounts for 20% of the browse cover. Its density is low at 340 plants/acre, with 65% of the population being decadent and 59% displaying poor vigor. The low value, increaser species broom snakeweed (*Gutierrezia sarothrae*) is common on the site.

#### Herbaceous Understory

Grasses are fairly diverse and abundant on the site proving 72% of the vegetation cover, but forbs are rare and lacking. Seven perennial grasses and one annual grass have been sampled on the site. Purple three-awn (*Aristida purpurea*) is the dominant grass along with crested wheatgrass (*Agropyron cristatum*). Sandberg bluegrass (*Poa secunda*) and sand dropseed (*Sporobolus cryptandrus*) are also common. The annual species cheatgrass (*Bromus tectorum*) has a high nested frequency, but provides less than 3% of the vegetation cover.

#### 2008 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - very poor-poor (37) Mid-level potential scale.

HERBACEOUS TRENDS --  
 Management unit 28 , Study no: 21

| T<br>y<br>p<br>e            | Species                     | Nested<br>Frequency | Average<br>Cover % |
|-----------------------------|-----------------------------|---------------------|--------------------|
|                             |                             | '08                 | '08                |
| G                           | Agropyron cristatum         | 135                 | 4.45               |
| G                           | Agropyron dasystachyum      | -                   | .00                |
| G                           | Agropyron intermedium       | 69                  | 1.67               |
| G                           | Aristida purpurea           | 243                 | 11.16              |
| G                           | Bromus tectorum (a)         | 121                 | .93                |
| G                           | Poa secunda                 | 144                 | 2.93               |
| G                           | Sitanion hystrix            | 3                   | .15                |
| G                           | Sporobolus cryptandrus      | 62                  | 1.24               |
| Total for Annual Grasses    |                             | 121                 | 0.93               |
| Total for Perennial Grasses |                             | 656                 | 21.62              |
| Total for Grasses           |                             | 777                 | 22.55              |
| F                           | Astragalus lentiginosus     | 2                   | .00                |
| F                           | Erodium cicutarium (a)      | 3                   | .00                |
| F                           | Ranunculus testiculatus (a) | 8                   | .01                |
| F                           | Sphaeralcea coccinea        | 3                   | .01                |
| Total for Annual Forbs      |                             | 11                  | 0.01               |
| Total for Perennial Forbs   |                             | 5                   | 0.01               |
| Total for Forbs             |                             | 16                  | 0.03               |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --  
 Management unit 28 , Study no: 21

| T<br>y<br>p<br>e | Species                               | Strip<br>Frequency | Average<br>Cover % |
|------------------|---------------------------------------|--------------------|--------------------|
|                  |                                       | '08                | '08                |
| B                | Artemisia nova                        | 1                  | .00                |
| B                | Artemisia tridentata tridentata       | 10                 | 1.72               |
| B                | Artemisia tridentata vaseyana         | 52                 | 5.44               |
| B                | Chrysothamnus nauseosus<br>albicaulis | 3                  | .00                |
| B                | Gutierrezia sarothrae                 | 30                 | 1.10               |
| B                | Opuntia sp.                           | 2                  | .15                |
| B                | Opuntia whipplei                      | 6                  | .33                |
| B                | Pediocactus simpsonii                 | 1                  | .00                |
| Total for Browse |                                       | 105                | 8.76               |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 28 , Study no: 21

| Species                         | Percent Cover<br>'08 |
|---------------------------------|----------------------|
| Artemisia tridentata tridentata | 1.93                 |
| Artemisia tridentata vaseyana   | 9.26                 |
| Gutierrezia sarothrae           | 1.20                 |
| Opuntia sp.                     | .48                  |
| Opuntia whipplei                | .20                  |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 28 , Study no: 21

| Species                       | Average leader growth (in)<br>'08 |
|-------------------------------|-----------------------------------|
| Artemisia tridentata vaseyana | 1.0                               |

BASIC COVER --  
 Management unit 28 , Study no: 21

| Cover Type  | Average Cover %<br>'08 |
|-------------|------------------------|
| Vegetation  | 33.77                  |
| Rock        | 1.79                   |
| Pavement    | 17.06                  |
| Litter      | 43.83                  |
| Cryptogams  | .31                    |
| Bare Ground | 15.44                  |

SOIL ANALYSIS DATA --  
 Management unit 28, Study no: 21, Study Name: South Summit WMA

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| -                            | -               | 7.2 | 64         | 20.4  | 15.6  | 1.5 | 25.9  | 172.8 | 1.14 |

PELLET GROUP DATA --  
 Management unit 28 , Study no: 21

| Type   | Quadrat Frequency | Days use per acre (ha) |
|--------|-------------------|------------------------|
|        | '08               | '08                    |
| Rabbit | 94                | -                      |
| Elk    | -                 | 1 (2)                  |
| Deer   | 32                | 92 (228)               |
| Cattle | 5                 | 12 (29)                |

BROWSE CHARACTERISTICS --  
 Management unit 28 , Study no: 21

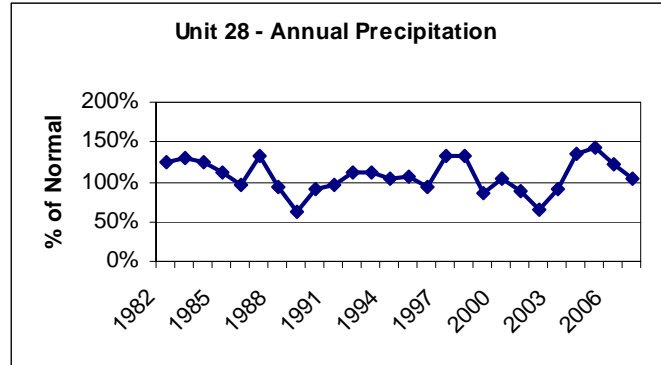
|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 27/27                     |
| <i>Artemisia tridentata tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>340</b>                            | -  | -     | 120    | 220      | 140  | 65          | 0       | 65         | 53      | 59           | 55/64                     |
| <i>Artemisia tridentata vaseyana</i>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>1660</b>                           | 20                                       | 60    | 640    | 960      | 420  | 23          | 4       | 58         | 35      | 40           | 29/39                     |
| <i>Chrysothamnus nauseosus albicaulis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>100</b>                            | -  | 20    | 40     | 40       | 20   | 0           | 80      | 40         | 20      | 40           | 9/11                      |
| <i>Gutierrezia sarothrae</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>2720</b>                           | -  | 560   | 1960   | 200      | 140  | 1           | 0       | 7          | 1       | 2            | 7/9                       |
| <i>Opuntia sp.</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | 50      | 50           | 11/33                     |
| <i>Opuntia whipplei</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>120</b>                            | -  | 20    | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 14/32                     |
| <i>Pediocactus simpsonii</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Purshia tridentata</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 19/71                     |

SUMMARY

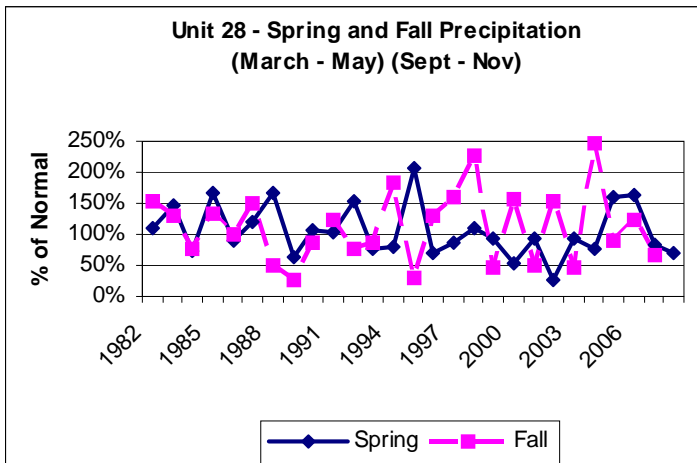
WILDLIFE MANAGEMENT UNIT 28 - PANGUITCH LAKE

Community Types

Fourteen trend studies were read in the Panguitch Lake unit in 2008. Three studies sampled higher elevation summer and summer/transitional range (28-16, 28-17, and 28-18). Six studies sampled winter range in mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) communities (28-1, 28-3, 28-4, 28-8, 28-11, and 28-21), and two studies sampled Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) communities (28-5 and 28-6). Two studies sampled black sagebrush (*Artemisia nova*) and antelope bitterbrush (*Purshia tridentata*) mixed communities (28-14 and 28-15), and one study sampled a chained and seeded pinyon pine (*Pinus*



**Figure 1.** Annual average precipitation for unit 28, Panguitch Lake. Precipitation data were collected at the Hatch, Panguitch, Cedar City FAA Airport, and Circleville weather stations (Utah Climate Summaries 2008).



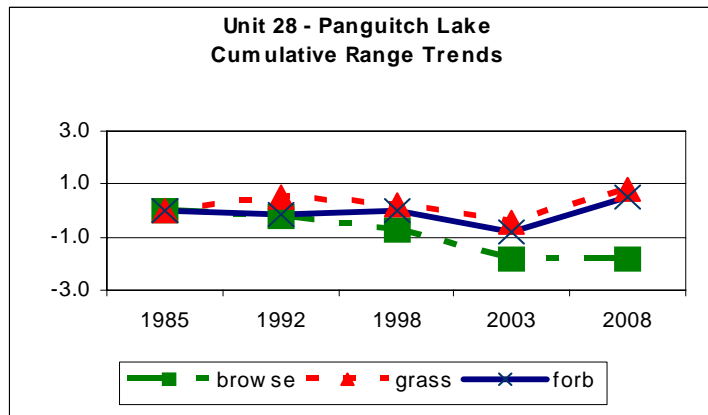
**Figure 2.** Annual average spring (March-May) and fall (Sept.-Nov.) precipitation for unit 28, Panguitch Lake. Precipitation data were collected at the Hatch, Panguitch, Cedar City FAA Airport, and Circleville weather stations (Utah Climate Summaries 2008).

was near or below 75% of normal in 1984, 1992, and 2007, near or below 50% in 1988, 1999, 2001, and 2003, and near or below 30% of normal in 1989 and 1995 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

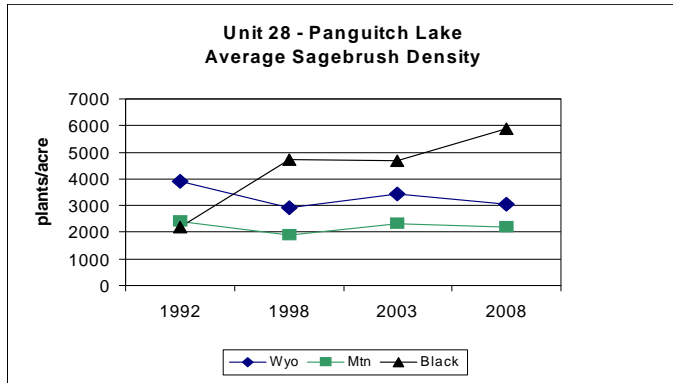
*edulis*) and Utah juniper (*Juniperus osteosperma*) community that is now a black sagebrush community (28-7).

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Hatch, Panguitch, Cedar City FAA Airport, and Circleville weather stations and averaged since sampling began in 1982 (Figures 1 and 2). The units annual precipitation was below 75% of normal (drought conditions) in 1989 and 2002 (Figure 1). Spring precipitation for the unit was at or below 75% of normal in 1984, 1989, 1996, 2004, and 2008, near 50% of normal in 2000, and near 25% of normal in 2002 (Figure 2). Fall precipitation



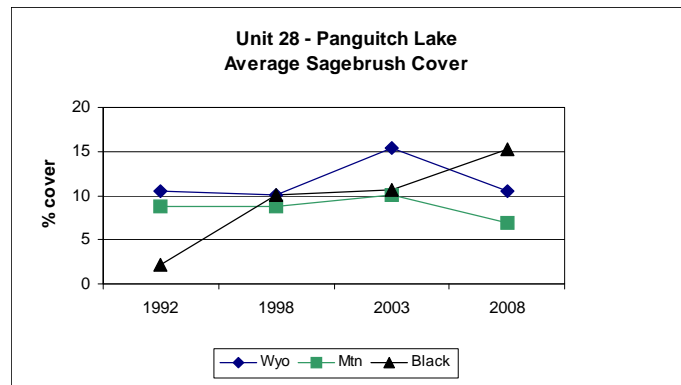
**Figure 3.** Cumulative range trends for unit 28, Panguitch Lake.



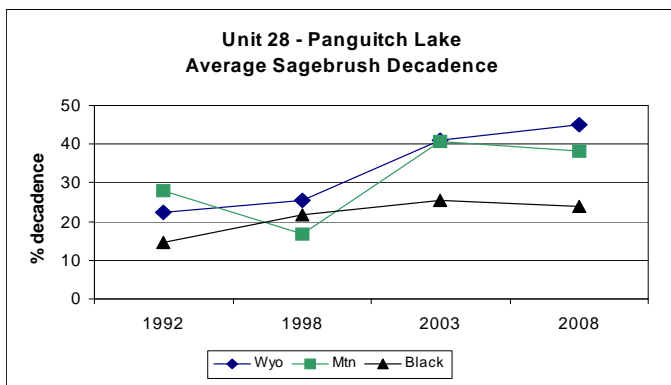
**Figure 4.** Average density of Wyoming big (Wyo), mountain big (Mtn), and black sagebrushes for unit 28, Panguitch Lake.

high of 2,418 plants/acre in 1992 and a low of 1,898 plants/acre in 1998 (Figure 4). Average cover of mountain big sagebrush increased slightly from 1992 to its high of 10% in 2003, but declined to just under 7% in 2008 (Figure 5). Average decadence of the population of mountain big sagebrush has fluctuated greatly declining from 1992 to 1998, before increasing to around 40% in 2003 and 2008 (Figure 6).

Black sagebrush was the next most common sagebrush species sampled on the management unit, sampled on Three Creeks, Paragonah, Sheep Hollow West, and Sheep Hollow East studies. Average density of black sagebrush increased markedly from 1992 to 1998, remained similar in 2003, then increased again to a high of 5,895 plants/acre in 2008 (Figure 4). Average cover of black sagebrush showed similar trends (Figure 5). Average decadence of black sagebrush increased slightly, but steadily, from 1992 before leveling off at a moderate level in 2003 and 2008 (Figure 6).



**Figure 5.** Average cover of Wyoming big (Wyo), mountain big (Mtn), and black sagebrushes for unit 28, Panguitch Lake.



**Figure 6.** Average decadence of Wyoming big (Wyo), mountain big (Mtn), and black sagebrushes for unit 28, Panguitch Lake.

Wyoming big sagebrush was only sampled on two study sites, Swayback Knoll (28-5) and Cottonwood (28-6), but a summary average was still done for the species. Wyoming big sagebrush average density had its greatest decline from 1992 to 1998. Average density of Wyoming big sagebrush ranged from a high of 3,910 plants/acre in 1992 to a low of 2,900 plants/acre in 1998 (Figure 4). The average cover of Wyoming big sagebrush was around 10%-11% in all measured sample years except 2003 when it increased to around 16% (Figure 5). The average decadence of Wyoming big sagebrush has increased from a low of 23% in 1992 to a high of 45% in 2008, with the greatest increase between the 1998 and 2003 (Figure 6) sample years. Basin big sagebrush was sampled on four study sites, Three Creeks, Sheep Hollow West, Sheep Hollow East, and South Summit WMA, but was found at such low densities that a summary was not done on the species.

## Browse

The cumulative trend for browse on the Panguitch Lake management unit declined steadily from 1985 to 2003, then stayed down but relatively similar in 2008 (Figure 3). Mountain big sagebrush was the most common sagebrush sampled in the unit and was sampled on the Three Creeks (28-1), Bear Valley (28-3), Buckskin Valley (28-4), Paragonah (28-7), Grass Valley (28-8), Elliker Basin (28-11), Sheep Hollow West (28-14), Sheep Hollow East (28-15), Asay Bench (28-16), and South Summit WMA (28-21) studies. Average density of mountain big sagebrush has only had minor fluctuations over the measured sample years with a

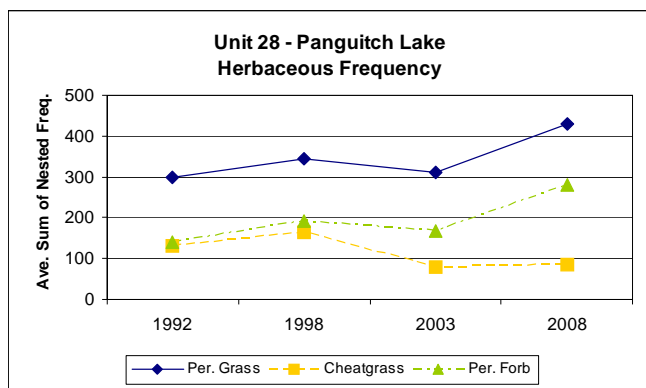


Figure 7. Average herbaceous sum of nested frequency for unit 28, Panguitch Lake.

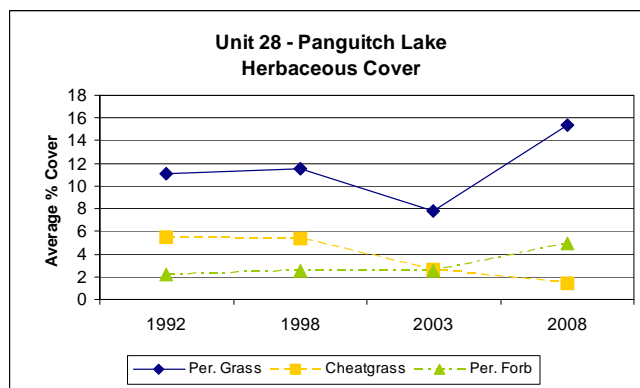


Figure 8. Average herbaceous cover for unit 28, Panguitch Lake.

### Grass

The overall trends of grasses showed upward signs in 2008. The cumulative trend for grasses remained fairly constant from 1985 to 1998, declined slightly in 2003 likely due to drought conditions, then increased in 2008 (Figure 3). The average sum of nested frequency of perennial grasses was similar from 1992 to 2003, before increasing markedly in 2008. The average sum of nested frequency of cheatgrass increased to a high in 1998, but decreased in 2003, and stayed similar in 2008 (Figure 7). The trend of average cover for perennial grasses declined from 1998 to 2003, but showed a marked increase in 2008. Average cover of cheatgrass steadily declined from 1998 to 2008 (Figure 8). Bulbous bluegrass (*Poa bulbosa*), a short-lived perennial grass with a life cycle similar to that of cheatgrass, was sampled at a moderate frequency and cover on the Grass Valley study site, and limited frequency and cover on the Elliker Basin study site. For further details on this species refer to the discussion section.

### Forb

The cumulative trend of forbs was similar to the grasses with the increases in the average sum of nested frequency and cover of perennial forbs in 2008 (Figure 3, Figure 7, and Figure 8).

### Desirable Components Index

Four studies in this unit were considered to be in the low potential scale for the Desirable Components Index (DCI); Swayback Knoll, Cottonwood, Paragonah, and South Summit WMA. The average DCI of the low potential scale sites has remained fair over the sampled years (Figure 9). Eight study sites were considered to be in the mid-level potential scale for the DCI; Three Creeks, Bear Valley, Buckskin Valley, Grass Valley, Elliker Basin, Sheep Hollow West, Sheep Hollow East, and Asay Bench. The average DCI of the mid-level potential scale sites showed up and down fluctuations, likely due to precipitation patterns (Figure 9).

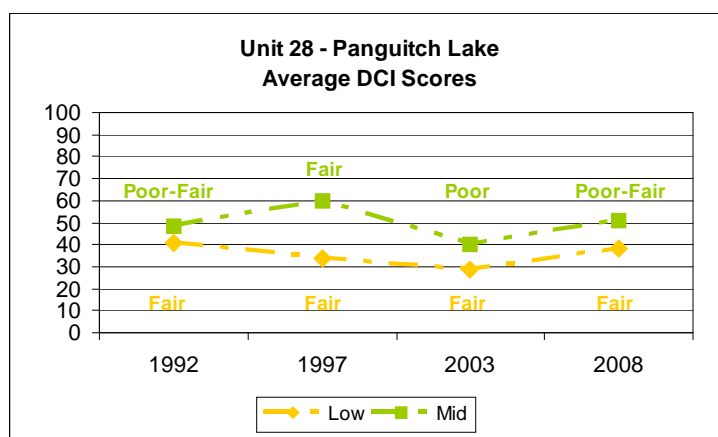
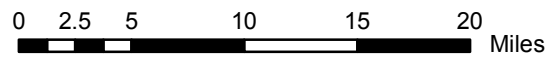
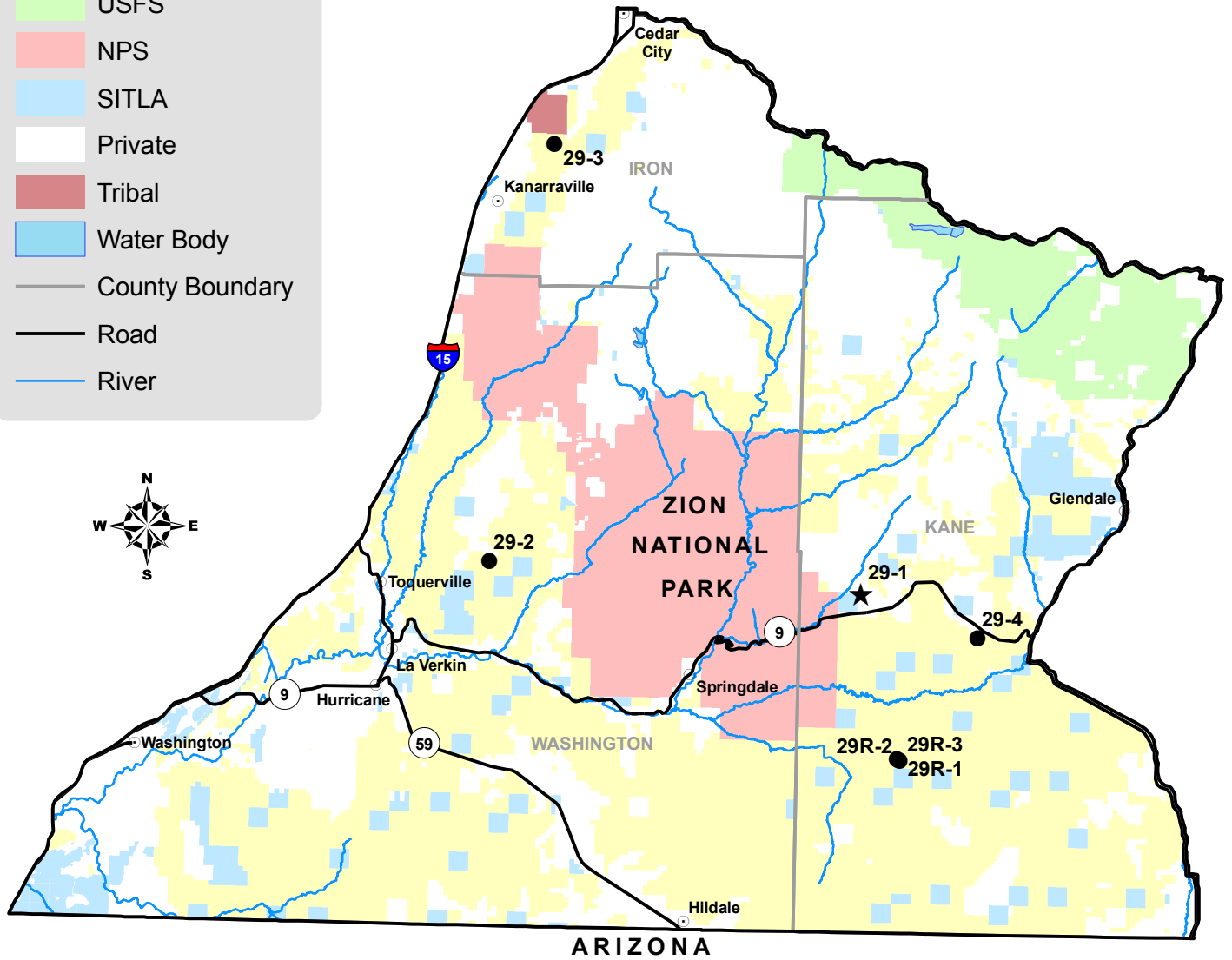
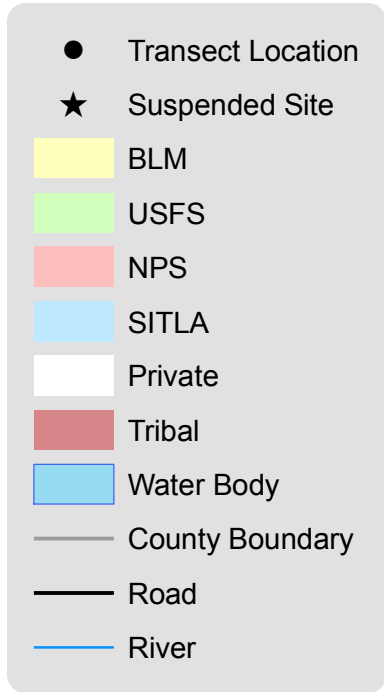
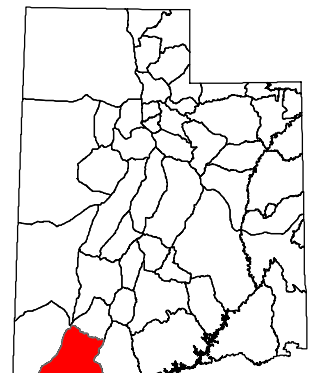


Figure 9. Unit 28, Panguitch Lake, desirable components index (DCI) scores by year. DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high. No high potential sites are sampled on this unit.

# Management Unit 29



Unit Location





## WILDLIFE MANAGEMENT UNIT 29 - ZION

### Boundary Description

**Iron, Kane and Washington counties** - Boundary begins at Interstate 15 and the Utah-Arizona state line; then north on I-15 to Highway SR-14; then east on SR-14 to Highway US-89; then south on US-89 to Highway US-89A; then south on US-89A to the Utah-Arizona state line; then west on this state line to I-15 and beginning point.

### Management Unit Description

The Zion unit is relatively large, yet there are few trend studies located within the unit. There is an estimated 301,431 acres of deer summer range and 333,914 acres of winter range within the unit (DWR 1998). Most of the summer range is found in the northern part of the unit, which includes the southern end of the Markagunt Plateau. Unlike the majority of the wildlife management units in the state, most of the summer range (59%) in the Zion unit occurs on private land with increased summer home development becoming more of a management problem. Of the remaining summer range, 21% is administered by the Forest Service and another 12% occurs within Zion National Park. Winter range occurs predominately on BLM land (54%), with an additional 20% in Zion National Park and 18% private (DeBloois 2001).

### Study Site Description

Only one key area was selected for study in this unit in 1987. It was located at Wilson Ranch (now the Clear Creek Ranch). This study samples a Wyoming big sagebrush flat on private land located just east of the Zion National Park boundary, and north of Highway 9. This site was reread in 1992 and 1998. In 1998, two additional permanent trend study sites were established, one at Smith's Mesa and the other at North Hills. Both occur on the west side of the unit. In 1998, three special studies were established at the Elephant Gap enclosure to monitor the effects of differing grazing regimes. These studies were read as normal range trend studies in 2003 and 2008. In 2003, the Wilson Ranch study was suspended and a new study was established in the Barracks chaining located about three miles west of Carmel Junction and one-half mile south of Highway 9.

Trend Study 29-2-08

Study site name: Smith's Mesa .

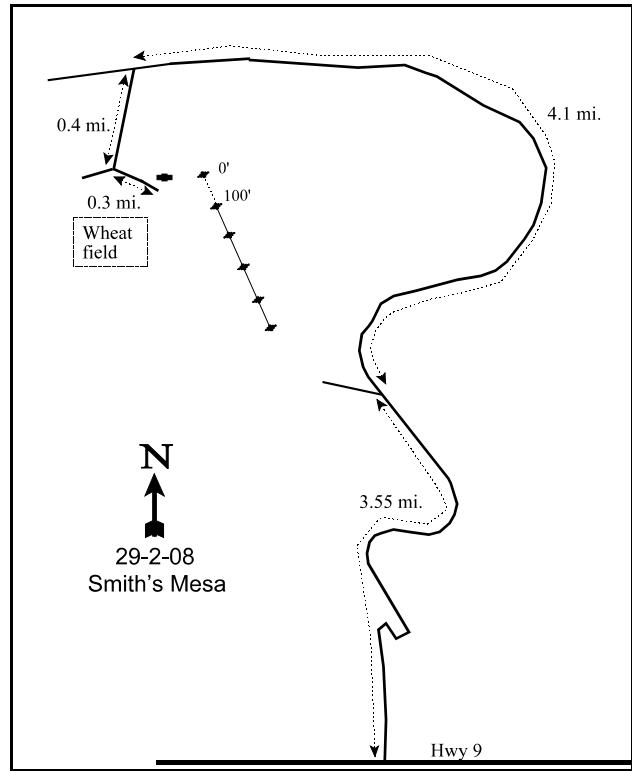
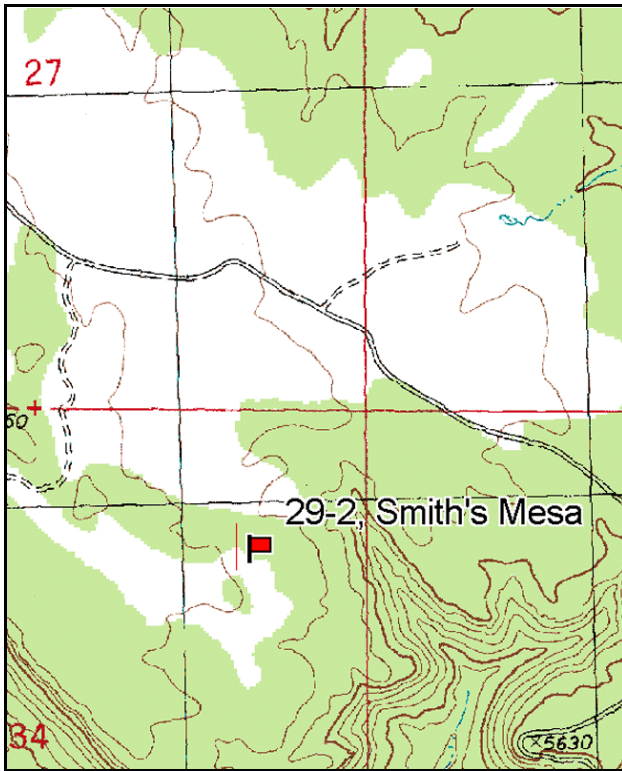
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 145 degrees magnetic.

Frequency belt placement: line 1 (11 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

At mile marker 17 on Hwy 9, turn north onto Mesa Road. Drive up the old paved road up to the mesa top for 3.35 miles to a fork. Turn right and continue 4.1 miles to a small dirt road next to a wheat field on the left side of the main road. Turn left and follow this road 0.4 miles to a fork next to another wheat field. Turn left and follow the edge of the field 0.3 miles and stop. Walk east over a small P-J covered hill to a sage opening. The 0-foot stake is on the north end of the opening near some *Quercus turbinella*. The baseline runs at 145 degrees magnetic and is marked by half-high green fenceposts.



Map Name: Smith Mesa

Diagrammatic Sketch

Township 40S , Range 12W , Section 34

GPS: NAD 83, UTM 12S 306102 E, 4127054 N

## DISCUSSION

### Smith's Mesa - Trend Study No. 29-2

#### Study Information

This trend study was established in a mixed big sagebrush (*Artemisia tridentata*) stand in 1998 on a clearing on Smith's Mesa on BLM land [elevation: 5,700 feet (1,737 m), slope: 2-3%, aspect: southwest]. The study site is surrounded on three sides by singleleaf pinyon (*Pinus monophyllus*) and Utah juniper (*Juniperus osteosperma*) trees, and dryland wheat fields on the west. The large mesa is three miles north of the town of Virgin. It rises approximately 2,000 feet above the town and supports many sagebrush openings surrounded by pinyon and juniper woodland. Some dryland wheat fields are also found on the south end of the mesa on private land. A cattle pond is located about one-third of a mile east of the site but it appears to contain water only in the early spring. Smith's Mesa provides important winter range for deer which summer in Zion National Park. Pellet group data from the site estimated 38 deer days use/acre in 1998 (94 ddu/ha). Some cattle sign was also encountered with an estimated 7 cow days use/acre (17 cdu/ha). Pellet group data from 2003 indicated much lighter use at 16 deer days use/acre (40 ddu/ha). No cattle sign was noted in 2003. Pellet group data from 2008 estimated 32 deer days use/acre (78 ddu/ha) and 3 cow days use/acre (7 cdu/ha).

#### Soils

Soils on the site are very sandy and deep with the effective rooting depth estimated at 23 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.2). Phosphorus is marginally available for plant growth and development at 8.1 ppm (Tiedemann and Lopez 2004). Rock is absent on the surface and in the profile. Herbaceous plants, mostly in the form of winter annuals, are common and provide adequate soil protection. In addition, cryptogamic crusts are abundant. There appears to be some pedestalling of soil around shrubs, possibly caused as much by wind as by water. Erosion is not a problem due to the gentle terrain and the erosion condition class was rated as stable in 2003 and 2008.

#### Browse

The site supports a fair stand of big sagebrush with a few antelope bitterbrush (*Purshia tridentata*). Some sagebrush plants exhibit characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*). There also appears to be some hybridization with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since a few sagebrush sampled fluoresced under a black light. Since most of the sagebrush appeared to be more like basin big sagebrush, all sagebrush were classified as basin big sagebrush. Sagebrush density was estimated at 2,200 plants/acre in 1998, declining to 1,500 plants/acre by 2003, then rebounding slightly to 1,640 plants/acre in 2008. The stand is mostly mature, light to moderately utilized, in good vigor, and shows low to moderate decadence. Young recruitment was good in 1998 with 10% of the population consisting of young plants. No seedlings or young were encountered in 2003. Recruitment improved in 2008 with 4,680 young/acre. Only a few bitterbrush plants occur on the site. Broom snakeweed (*Gutierrezia sarothrae*), was the most abundant shrub on the site with a population estimated at 5,380 plants/acre in 1998. Drought conditions in 2003 caused a 61% decline in density to an average of 2,080 plants/acre in 2003 and 2008. Pinyon and juniper trees appeared to be slowly encroaching into the clearing, but density was still low. Point-quarter data from 1998 estimated 6 juniper and 6 pinyon trees/acre that increased in 2008 to 20 juniper and 27 pinyon trees/acre, average basal diameter was 4.8 inches for pinyon and 13.8 inches for juniper.

#### Herbaceous Understory

Grasses provided 30% and 19% of vegetation cover in 1998 and 2003, respectively, then dropped to 2% in 2008. The herbaceous understory was very poor with two annual grasses, cheatgrass (*Bromus tectorum*) and six weeks fescue (*Vulpia octoflora*), providing 100% of the grass cover in 1998 and 88% in 2003. By 2008, only three grass species were found on the site, cheatgrass, sixweeks grass, and rattail fescue (*Festuca myuros*), all annuals. Few perennial species occur on this site and none were sampled in 2008. The forb component was composed mostly of annuals. Forb cover decreased from 4% in 2003 to less than 1% in 2008,

while sum of nested frequency decreased 40%.

1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - very poor (11) Mid-level potential

2003 TREND ASSESSMENT

Trend for sagebrush is slightly down. Density of sagebrush declined 32% from 2,200 plants/acre in 1998 to 1,500 plants/acre. Vigor was poor on 15% of the sagebrush plants sampled and decadence increased from 13% in 1998 to 33%. No seedlings or young plants were encountered. Drought conditions likely caused the 61% decline in the density of broom snakeweed. Trend for the herbaceous understory is difficult to determine due to the lack of perennial species. Sum of nested frequency of the few perennial grasses found on the site declined slightly while sum of nested frequency of perennial forbs increased slightly. Annual grasses and forbs dominate the understory. Sum of nested frequency of annual grasses and forbs increased slightly but cover dropped from 33% in 1998 to 23% in 2003. Trend is considered stable and in very poor condition.

Winter range condition (DCI) - very poor (3) Mid-level potential scale

browse - slightly down (-1)      grasses - stable (0)      forbs - stable (0)

2008 TREND ASSESSMENT

Browse trend is stable. Basin big sagebrush has increased in density from 1,500 to 1,640 plants/acre. Decadence has increased from 33% to 41%. Young plants account for only 1% of the population. The grass and forb trends are stable as perennial species are almost nonexistent on the site. Annual grasses have decreased from 19% to 2% of cover while the sum of nested frequency has declined 28%. Perennial forbs have decreased slightly in cover since 2003, and sum of nested frequency of perennial forbs has decreased slightly. Perennial forbs have likewise been rare on this site. The desirable components index improved due to an increase in basin big sagebrush density and recruitment while cheatgrass cover declined.

Winter range condition - poor (18) Mid-level potential scale

browse - stable (0)      grasses - stable (0)      forbs - stable (0)

HERBACEOUS TRENDS --

Management unit 29 , Study no: 2

| Type                        | Species                  | Nested Frequency |                  |                  | Average Cover % |       |      |
|-----------------------------|--------------------------|------------------|------------------|------------------|-----------------|-------|------|
|                             |                          | '98              | '03              | '08              | '98             | '03   | '08  |
| G                           | Bromus tectorum (a)      | c <sub>436</sub> | b <sub>333</sub> | a <sub>196</sub> | 22.90           | 8.58  | .60  |
| G                           | Festuca myuros (a)       | a <sup>-</sup>   | b <sub>105</sub> | b <sub>140</sub> | -               | 2.18  | .50  |
| G                           | Poa secunda              | 15               | 4                | -                | .05             | .03   | -    |
| G                           | Sitanion hystrix         | -                | -                | -                | .00             | -     | -    |
| G                           | Sporobolus cryptandrus   | 2                | -                | -                | .03             | -     | -    |
| G                           | Vulpia octoflora (a)     | b <sub>304</sub> | b <sub>348</sub> | a <sub>226</sub> | 7.54            | 8.48  | .89  |
| Total for Annual Grasses    |                          | 740              | 786              | 562              | 30.45           | 19.25 | 1.99 |
| Total for Perennial Grasses |                          | 17               | 4                | 0                | 0.08            | 0.03  | 0    |
| Total for Grasses           |                          | 757              | 790              | 562              | 30.53           | 19.29 | 1.99 |
| F                           | Castilleja linariaefolia | -                | -                | 5                | -               | -     | .06  |
| F                           | Draba sp. (a)            | b <sub>25</sub>  | a <sup>-</sup>   | a <sub>4</sub>   | .05             | -     | .01  |

| T<br>y<br>p<br>e          | Species                          | Nested Frequency |                               |                 | Average Cover % |                |      |
|---------------------------|----------------------------------|------------------|-------------------------------|-----------------|-----------------|----------------|------|
|                           |                                  | '98              | '03                           | '08             | '98             | '03            | '08  |
|                           |                                  | F                | <i>Erodium cicutarium</i> (a) | c <sup>78</sup> | b <sup>55</sup> | a <sup>7</sup> | 1.95 |
| F                         | <i>Eriogonum racemosum</i>       | -                | 3                             | 2               | -               | .00            | .00  |
| F                         | <i>Eriogonum umbellatum</i>      | 4                | 3                             | 4               | .03             | .06            | .16  |
| F                         | <i>Gilia</i> sp. (a)             | a <sup>-</sup>   | b <sup>20</sup>               | a <sup>-</sup>  | -               | .17            | -    |
| F                         | <i>Lappula occidentalis</i> (a)  | b <sup>32</sup>  | a <sup>15</sup>               | a <sup>41</sup> | .11             | .11            | .22  |
| F                         | <i>Lygodesmia grandiflora</i>    | -                | 3                             | -               | -               | .03            | -    |
| F                         | <i>Microsteris gracilis</i> (a)  | b <sup>17</sup>  | a <sup>-</sup>                | a <sup>2</sup>  | .06             | -              | .00  |
| F                         | <i>Navarretia intertexta</i> (a) | a <sup>5</sup>   | b <sup>39</sup>               | b <sup>48</sup> | .03             | .30            | .09  |
| F                         | <i>Oenothera pallida</i>         | 4                | 8                             | -               | .01             | .04            | -    |
| F                         | <i>Orobancha fasciculata</i>     | 1                | -                             | -               | .00             | -              | -    |
| F                         | <i>Plantago patagonica</i> (a)   | a <sup>11</sup>  | b <sup>26</sup>               | a <sup>5</sup>  | .39             | .08            | .01  |
| F                         | <i>Polygonum douglasii</i> (a)   | 3                | -                             | 3               | .00             | -              | .01  |
| F                         | <i>Senecio multilobatus</i>      | b <sup>17</sup>  | c <sup>39</sup>               | a <sup>-</sup>  | .05             | .32            | -    |
| F                         | <i>Sisymbrium altissimum</i> (a) | -                | -                             | 5               | -               | -              | .01  |
| F                         | Unknown forb-perennial           | 2                | -                             | -               | .00             | -              | -    |
| Total for Annual Forbs    |                                  | 171              | 155                           | 115             | 2.60            | 3.41           | 0.40 |
| Total for Perennial Forbs |                                  | 28               | 56                            | 11              | 0.11            | 0.47           | 0.22 |
| Total for Forbs           |                                  | 199              | 211                           | 126             | 2.71            | 3.88           | 0.62 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 29 , Study no: 2

| T<br>y<br>p<br>e | Species  | Strip Frequency |  |     | Average Cover % |       |       |
|------------------|--|-----------------|--|-----|-----------------|-------|-------|
|                  |  | '98             | '03                                    | '08 | '98             | '03   | '08   |
|                  |  | B               | <i>Artemisia tridentata tridentata</i> | 54  | 44              | 47    | 11.80 |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 0               | 1                                      | 0   | -               | .00   | -     |
| B                | <i>Gutierrezia sarothrae</i>                     | 51              | 28                                     | 38  | 3.29            | 1.75  | 2.95  |
| B                | <i>Juniperus osteosperma</i>                     | 0               | 1                                      | 0   | .78             | 1.48  | 3.05  |
| B                | <i>Opuntia</i> sp.                               | 3               | 2                                      | 2   | .18             | .18   | .38   |
| B                | <i>Pinus monophylla</i>                          | 1               | 2                                      | 4   | 1.70            | 1.29  | .68   |
| B                | <i>Purshia tridentata</i>                        | 1               | 0                                      | 1   | .00             | -     | .53   |
| B                | <i>Salvia dorrii</i>                             | 1               | 2                                      | 4   | .00             | .15   | .38   |
| Total for Browse |  | 111             | 80                                     | 96  | 17.76           | 14.23 | 19.46 |

CANOPY COVER, LINE INTERCEPT --

Management unit 29 , Study no: 2

| Species                         | Percent Cover |       |       |
|---------------------------------|---------------|-------|-------|
|                                 | '98           | '03   | '08   |
| Artemisia tridentata tridentata | -             | 10.66 | 14.63 |
| Gutierrezia sarothrae           | -             | .96   | 3.03  |
| Juniperus osteosperma           | -             | 3.20  | 3.50  |
| Opuntia sp.                     | -             | .03   | .03   |
| Pinus monophylla                | 1.39          | 2.03  | 1.75  |
| Purshia tridentata              | -             | -     | .15   |
| Salvia dorrii                   | -             | .53   | 1.08  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 29 , Study no: 2

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 1.5                        | 1.4 |
| Purshia tridentata              | 3.1                        | 0.6 |

POINT-QUARTER TREE DATA --

Management unit 29 , Study no: 2

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 6              | <18 | 20  |
| Pinus monophylla      | 6              | <18 | 27  |

| Average diameter (in) |     |      |
|-----------------------|-----|------|
| '98                   | '03 | '08  |
| 5.7                   | -   | 13.8 |
| 10.4                  | -   | 4.8  |

BASIC COVER --

Management unit 29 , Study no: 2

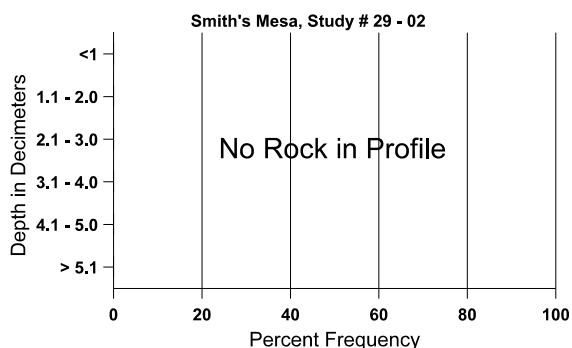
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 46.12           | 38.27 | 22.45 |
| Rock        | .03             | .00   | .02   |
| Pavement    | .04             | .05   | .29   |
| Litter      | 39.47           | 24.39 | 50.94 |
| Cryptogams  | 12.36           | 10.87 | 1.53  |
| Bare Ground | 33.09           | 41.97 | 40.14 |

SOIL ANALYSIS DATA --

Management unit 29, Study no: 2, Study Name: Smith's Mesa

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 23.2                         | 71.3 (11.7)     | 6.2 | 72.7       | 17.4   | 9.8    | 0.7 | 8.1   | 3.2   | 0.2  |

Stoniness Index



PELLET GROUP DATA --

Management unit 29, Study no: 2

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 23                | 25  | 64  |
| Elk    | -                 | -   | -   |
| Deer   | 44                | 2   | 17  |
| Cattle | 1                 | -   | -   |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| -                      | 1 (2)   | -       |
| 38 (94)                | 16 (40) | 32 (78) |
| 7 (17)                 | -       | 3 (7)   |

BROWSE CHARACTERISTICS --

Management unit 29, Study no: 2

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia tridentata tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>2200</b>                           | 20                                       | 220   | 1700   | 280      | 340  | 28          | 4       | 13         | 5       | 5            | 28/39                     |
| 03                                     | <b>1500</b>                           | -  | -     | 1000   | 500      | 520  | 5           | 0       | 33         | 15      | 15           | 30/40                     |
| 08                                     | <b>1640</b>                           | 38500                                    | 20    | 940    | 680      | 640  | 3           | 0       | 41         | 16      | 34           | 34/50                     |
| <b>Ceanothus greggii</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 76/121                    |
| 08                                     | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 73/143                    |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 7/13                      |
| 03   | 180                                   | -  | -     | 180    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 5380                                  | 20                                       | 440   | 4840   | 100      | 220  | 0           | 0       | 2          | .37     | .37          | 9/11                      |
| 03   | 2100                                  | 200                                      | 120   | 1800   | 180      | 300  | 0           | 0       | 9          | 4       | 7            | 9/13                      |
| 08   | 2060                                  | 580                                      | 20    | 1200   | 840      | 180  | 0           | 0       | 41         | 14      | 22           | 10/18                     |
| <i>Juniperus osteosperma</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/16                      |
| 03   | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/15                      |
| 08   | 60                                    | -  | -     | 20     | 40       | 20   | 0           | 0       | 67         | -       | 67           | 6/14                      |
| <i>Pinus monophylla</i>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 40                                    | 20                                       | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 80                                    | 40                                       | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Purshia tridentata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 23/99                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 17/46                     |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 20/47                     |
| <i>Quercus turbinella</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 129/216                   |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 113/227                   |
| <i>Salvia dorrii</i>                             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 13/46                     |
| 03   | 40                                    | -  | 20    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 15/36                     |
| 08   | 80                                    | -  | -     | 60     | 20       | -    | 25          | 0       | 25         | 25      | 50           | 15/33                     |



Trend Study 29-3-08

Study site name: North Hills .

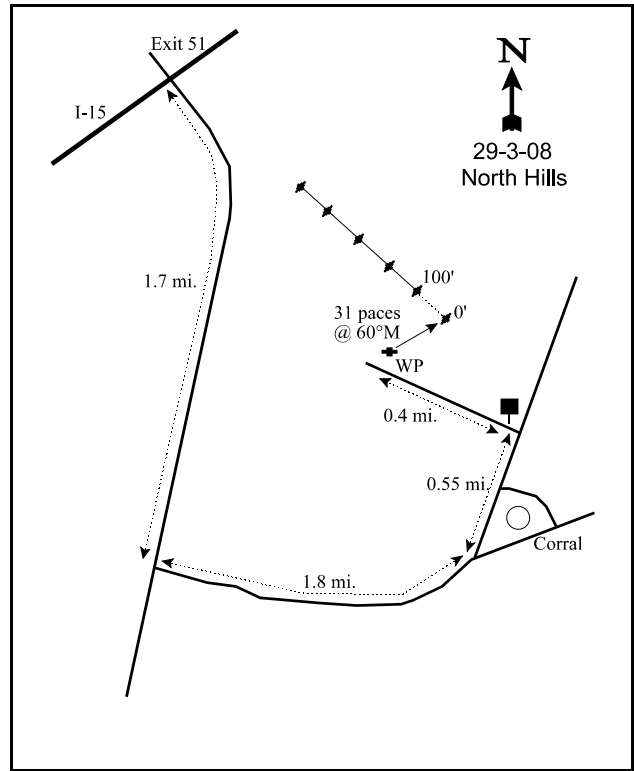
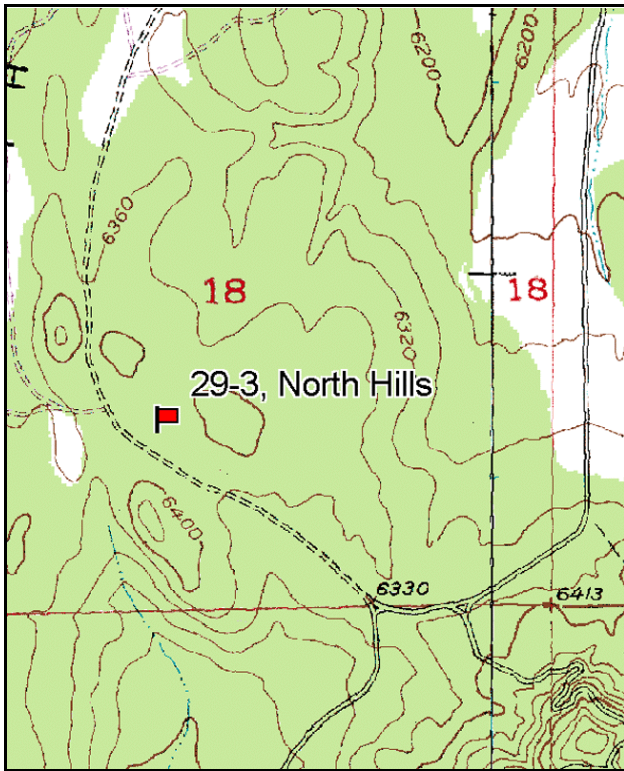
Vegetation type: Chained,Seeded P-J .

Compass bearing: frequency baseline 323 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 4 on 1ft.

LOCATION DESCRIPTION

From Exit 51 (Hamilton Fort ), cross under the highway and proceed south on the east side of the freeway for 1.7 miles. Turn left and go 1.8 miles to a corral. Stay left for 0.55 miles to a turnoff into the chaining with a sign that says “North Hills Reseeding.” Continue 0.4 miles to a witness post on the right. Walk 31 paces at 60 degrees magnetic to the 0-foot stake.



Map Name: Kanarraville

Diagrammatic Sketch

Township 37S, Range 11W, Section 18

GPS: NAD 83, UTM 12S 311446 E, 4161327 N

## DISCUSSION

### North Hills - Trend Study No. 29-3

#### Study Information

This trend study was established in 1998 on a chained and seeded pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) site in the North Hills located north of Kanarraville. The area lies between Interstate 15 and the Hurricane Cliffs to the east on BLM land [elevation: 6,400 feet (1,950 m), slope: 5%, aspect: south]. The site was chained in 1967 and seeded to crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*). The area contains rolling terrain with the study established on a wide ridge top. Pinyon pine and Utah juniper trees are found on the site in low densities. Deer use on the site is heavy, and there is also some sign of elk and cattle use. Pellet group data from 1998 estimated 103 deer days use/acre (254 ddu/ha). Deer were seen near the site during study site establishment on 16 July 1998. Estimated elk and cattle use was low at 6 elk and 4 cow days use/acre (15 edu/ha and 10 cdu/ha) in 1998. Pellet group data from 2003 estimated 118 deer days use/acre (291 ddu/ha), while 2008 pellet data estimated 60 deer days use/acre (147 ddu/ha), 3 elk days use/acre (7 edu/ha), and 10 cow days use/acre (25 cdu/ha).

#### Soil

Soil is somewhat shallow with a moderate amount of rock and pavement on the surface and within the profile. Effective rooting depth is estimated at only 10 inches. Soil texture is a sandy loam which is neutral in reaction (pH 6.8). Relative combined vegetation and litter cover has decreased from 69% in 1998 to 50% in 2008. Relative bare ground cover has ranged from 16%-29% since 1998. Erosion is not a problem on the site due to the abundance of herbaceous vegetation and the gentle terrain. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

The site supports a variety of browse species including Utah serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), and Gambel oak (*Quercus gambelii*). Mountain big sagebrush was the most numerous species with an average density of 1,840 plants/acre in 1998 and 2003, and 2,240 plants/acre in 2008. Sagebrush has averaged 12% since 1998. Utilization was moderate to heavy during both readings. The number of decadent plants was moderately high in 1998 at 31% of the population, increasing to 48% in 2003, then dropping to 24% in 2008. Young recruitment was 14% in 2008, an improvement from about 5% in previous readings. There was a small number of moderately utilized black sagebrush which appear to be black/mountain big sagebrush hybrids.

Utah serviceberry provided 25% of browse cover in 2008 (up from an average of 14% in 1998 and 2003) with an increase in density from 560 plants/acre in 2003 to 740 plants/acre in 2008. They displayed light to moderate use, good vigor, and low decadence. There were also some isolated thick oak clones on the site. Mature plants averaged over 4 feet in height, making much of the oak partly unavailable to browsing. Available plants appeared unutilized. A few scattered heavily hedged bitterbrush (*Purshia tridentata*) provided some additional browse forage. Point-quarter data estimated only 18 pinyon and 29 juniper trees/acre in 1998. Average basal diameter was 2 inches for pinyon and 1.3 inches for juniper. There was some evidence of hand cutting of young trees in the past. By 2008, pinyon/juniper density was estimated at 25 and 38 trees/acre, respectively. Pinyon diameter was 2.2 inches and juniper diameter was 2.6 inches, in 2008.

#### Herbaceous Understory

The herbaceous understory has dominated the site with seeded perennial grasses, crested and intermediate wheatgrass, providing most of the herbaceous cover. Combined, these species significantly declined in nested frequency in 2003 and 2008, and also showed declines in cover. A few other perennial grasses occur occasionally. Cheatgrass (*Bromus tectorum*) although a small part of the herbaceous understory is increasing. Forbs are severely limited and produce less than 1% cover.

## 1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - good (67) Mid-level potential scale

### 2003 TREND ASSESSMENT

The key browse species, mountain big sagebrush, is showing the effects of several years of drought. Annual precipitation was only 49% of normal in 2002 at Cedar City. Spring precipitation (April to June) has been poor for the past three years (2001 - 2003), averaging only 59% of normal (Utah Climate Summary 2008). The density of mountain big sagebrush has remained similar to 1998 levels, but the number of decadent plants has increased to 48% of the population. No seedlings were encountered and young plants accounted for only 4% of the population. Serviceberry is also important although it provides only 15% of the browse cover. It has remained stable in average cover and strip frequency. Serviceberry vigor remains good and no plants were classified as decadent. Trend for browse is considered slightly down due to increasing decadence and poor young recruitment of sagebrush. The herbaceous understory is also showing the effects of drought. Sum of nested frequency of perennial grasses has declined 26%, and cover has dropped from 24% in 1998 to 9%, a decrease of more than 60%. Seeded crested and intermediate wheatgrass provide nearly all of the grass cover. Both species declined significantly in nested frequency. Forbs are still rare. Trend for grasses is down and trend for forbs is stable.

Winter range condition (DCI) - poor-fair (52) Mid-level potential scale

browse - slightly down (-1)      grasses - down (-2)      forbs - stable (0)

### 2008 TREND ASSESSMENT

Browse trend is up. Mountain big sagebrush density has increased from 1,860 plants/acre in 2003 to 2,240, and decadence has declined from 48% to 24%. Recruitment appears good with 320 young/acre (14% of plants). Utah serviceberry has a density of 740 plants/acre with 65% classified as young and no decadent plants. Grass trend is slightly down. Perennial grass nested frequency has declined 14% and cover has declined 41%. Annual grass nested frequency has increased 600% (from 17 in 2003 to 120) due to an increase in cheatgrass. Forb trend is stable. Forbs still account for very little cover on the site.

Winter range condition (DCI) - fair (58) Mid-level potential scale

browse - up (+2)      grasses - slightly down (-1)      forbs - stable (0)

HERBACEOUS TRENDS --  
Management unit 29 , Study no: 3

| Type                        | Species                             | Nested Frequency |                  |                  | Average Cover % |      |      |
|-----------------------------|-------------------------------------|------------------|------------------|------------------|-----------------|------|------|
|                             |                                     | '98              | '03              | '08              | '98             | '03  | '08  |
| G                           | <i>Agropyron cristatum</i>          | <sub>b</sub> 271 | <sub>a</sub> 233 | <sub>a</sub> 231 | 19.65           | 7.71 | 4.41 |
| G                           | <i>Agropyron intermedium</i>        | <sub>c</sub> 142 | <sub>b</sub> 86  | <sub>a</sub> 43  | 3.04            | 1.12 | .89  |
| G                           | <i>Aristida purpurea</i>            | -                | 4                | -                | -               | .15  | .00  |
| G                           | <i>Bromus tectorum</i> (a)          | <sub>a</sub> 24  | <sub>a</sub> 17  | <sub>b</sub> 120 | .23             | .05  | .62  |
| G                           | <i>Hilaria jamesii</i>              | 6                | 6                | 3                | .41             | .18  | .03  |
| G                           | <i>Oryzopsis hymenoides</i>         | 3                | -                | -                | .00             | -    | -    |
| G                           | <i>Poa secunda</i>                  | <sub>b</sub> 10  | <sub>a</sub> -   | <sub>a</sub> 2   | .33             | -    | .03  |
| G                           | <i>Sitanion hystrix</i>             | <sub>b</sub> 21  | <sub>a</sub> 6   | <sub>a</sub> 3   | .46             | .06  | .03  |
| G                           | <i>Stipa comata</i>                 | -                | -                | 5                | -               | -    | .01  |
| G                           | <i>Vulpia octoflora</i> (a)         | 3                | -                | -                | .00             | -    | -    |
| Total for Annual Grasses    |                                     | 27               | 17               | 120              | 0.23            | 0.05 | 0.62 |
| Total for Perennial Grasses |                                     | 453              | 335              | 287              | 23.91           | 9.22 | 5.42 |
| Total for Grasses           |                                     | 480              | 352              | 407              | 24.15           | 9.27 | 6.04 |
| F                           | <i>Arabis</i> sp.                   | 1                | -                | -                | .00             | -    | -    |
| F                           | <i>Astragalus</i> sp.               | 12               | 9                | 12               | .30             | .36  | .06  |
| F                           | <i>Chaenactis douglasii</i>         | -                | 1                | -                | -               | .03  | -    |
| F                           | <i>Draba</i> sp. (a)                | -                | 2                | -                | -               | .03  | -    |
| F                           | <i>Gilia</i> sp. (a)                | -                | 3                | -                | -               | .00  | -    |
| F                           | <i>Lithospermum</i> sp.             | 10               | 9                | 4                | .03             | .07  | .03  |
| F                           | <i>Microsteris gracilis</i> (a)     | -                | 4                | -                | -               | .01  | -    |
| F                           | <i>Navarretia intertexta</i> (a)    | 1                | -                | -                | .00             | -    | -    |
| F                           | <i>Oenothera albicaulis</i> (a)     | -                | -                | 8                | -               | -    | .01  |
| F                           | <i>Oenothera</i> sp.                | -                | 3                | -                | -               | .03  | -    |
| F                           | <i>Phlox longifolia</i>             | -                | -                | 4                | -               | -    | .01  |
| F                           | <i>Ranunculus testiculatus</i> (a)  | <sub>a</sub> -   | <sub>a</sub> 4   | <sub>b</sub> 18  | -               | .01  | .03  |
| F                           | <i>Sphaeralcea grossulariifolia</i> | -                | 2                | 2                | -               | .00  | .00  |
| Total for Annual Forbs      |                                     | 1                | 13               | 26               | 0.00            | 0.06 | 0.05 |
| Total for Perennial Forbs   |                                     | 23               | 24               | 22               | 0.34            | 0.50 | 0.10 |
| Total for Forbs             |                                     | 24               | 37               | 48               | 0.34            | 0.56 | 0.15 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 29 , Study no: 3

| Type             | Species                       | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|-------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                               | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Amelanchier utahensis         | 15              | 16  | 17  | 2.34            | 2.57  | 4.55  |
| B                | Artemisia nova                | 5               | 1   | 5   | .30             | .00   | .18   |
| B                | Artemisia tridentata vaseyana | 59              | 55  | 60  | 13.00           | 11.44 | 11.49 |
| B                | Chrysothamnus viscidiflorus   | 0               | 1   | 1   | -               | .00   | .15   |
| B                | Gutierrezia sarothrae         | 0               | 1   | 2   | -               | .00   | .00   |
| B                | Juniperus osteosperma         | 0               | 1   | 1   | -               | .00   | .00   |
| B                | Opuntia sp.                   | 2               | 0   | 0   | .00             | -     | -     |
| B                | Purshia tridentata            | 1               | 1   | 1   | .00             | .00   | .03   |
| B                | Quercus gambelii              | 6               | 10  | 8   | 2.19            | 2.79  | 1.69  |
| Total for Browse |                               | 88              | 86  | 95  | 17.84           | 16.81 | 18.09 |

CANOPY COVER, LINE INTERCEPT --

Management unit 29 , Study no: 3

| Species                       |      |       |
|-------------------------------|------|-------|
|                               | '03  | '08   |
| Amelanchier utahensis         | 3.95 | 4.65  |
| Artemisia nova                | .15  | .71   |
| Artemisia tridentata vaseyana | 8.23 | 12.14 |
| Purshia tridentata            | -    | .01   |
| Quercus gambelii              | 4.36 | 7.36  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 29 , Study no: 3

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 2.9                        | 1.4 |
| Purshia tridentata            | 4.0                        | 0.6 |

POINT-QUARTER TREE DATA --

Management unit 29 , Study no: 3

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 29             | 38  | 38  |
| Pinus edulis          | 18             | <18 | 25  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 1.3                   | 1.2 | 2.6 |
| 2.0                   | -   | 2.2 |

**BASIC COVER --**

Management unit 29 , Study no: 3

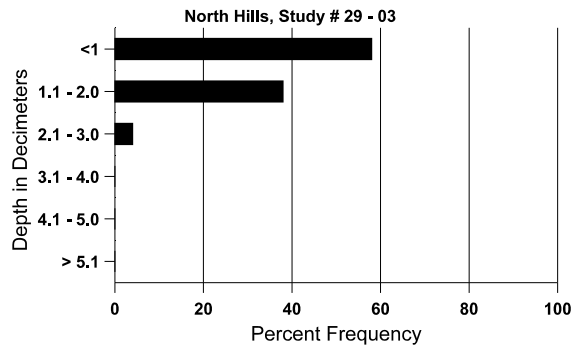
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 39.57           | 24.71 | 22.64 |
| Rock        | 6.71            | 5.57  | 6.50  |
| Pavement    | 12.20           | 17.24 | 25.10 |
| Litter      | 51.77           | 36.99 | 34.38 |
| Cryptogams  | .41             | .03   | .01   |
| Bare Ground | 21.43           | 34.08 | 25.32 |

**SOIL ANALYSIS DATA --**

Management unit 29, Study no: 3, Study Name: North Hills

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 9.9                          | 78.7 (8.5)      | 6.8 | 70.0       | 14.2   | 15.8   | 3.1 | 9.4   | 16.0  | 0.5  |

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 29 , Study no: 3

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 28                | 32  | 78  |
| Elk    | 5                 | -   | 2   |
| Deer   | 58                | 34  | 28  |
| Cattle | 1                 | 2   | 5   |

| Days use per acre (ha) |           |          |
|------------------------|-----------|----------|
| '98                    | '03       | '08      |
| -                      | -         | -        |
| 6 (15)                 | 1 (2)     | 3 (7)    |
| 103 (254)              | 118 (291) | 60 (147) |
| 4 (10)                 | 5 (13)    | 10 (25)  |

BROWSE CHARACTERISTICS --  
Management unit 29 , Study no: 3

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>1040</b>                           | -  | 380   | 620    | 40       | -    | 21          | 2       | 4          | -       | 0            | 38/56                     |
| 03  | <b>560</b>                            | -  | 280   | 280    | -        | 20   | 29          | 14      | 0          | -       | 0            | 42/51                     |
| 08  | <b>740</b>                            | 20                                       | 480   | 260    | -        | -    | 22          | 22      | 0          | -       | 3            | 46/53                     |
| <b>Artemisia nova</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>120</b>                            | -  | -     | 100    | 20       | 20   | 83          | 0       | 17         | -       | 0            | 13/24                     |
| 03  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 13/28                     |
| 08  | <b>120</b>                            | -  | 40    | 80     | -        | 20   | 17          | 33      | 0          | -       | 0            | 15/33                     |
| <b>Artemisia tridentata vaseyana</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>1860</b>                           | 120                                      | 100   | 1180   | 580      | 500  | 56          | 14      | 31         | 5       | 13           | 26/37                     |
| 03  | <b>1820</b>                           | -  | 80    | 860    | 880      | 400  | 48          | 37      | 48         | 9       | 9            | 25/33                     |
| 08  | <b>2240</b>                           | 580                                      | 320   | 1380   | 540      | 360  | 39          | 21      | 24         | 4       | 5            | 27/42                     |
| <b>Chrysothamnus nauseosus hololeucus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 42/26                     |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Chrysothamnus viscidiflorus</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/7                       |
| <b>Gutierrezia sarothrae</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 12/9                      |
| 03  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 8/11                      |
| 08  | <b>100</b>                            | -  | 20    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | 5/5                       |
| <b>Juniperus osteosperma</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | 50      | 50           | 5/6                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 5/13                      |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 4/11                      |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Purshia tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                        | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 39/72                     |
| 03                        | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | 37/52                     |
| 08                        | <b>20</b>                             | 80                                       | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 32/56                     |
| <b>Quercus gambelii</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                        | <b>940</b>                            | 60                                       | 340   | 600    | -        | -    | 0           | 0       | -          | -       | 0            | 50/28                     |
| 03                        | <b>1420</b>                           | -  | 220   | 1200   | -        | 140  | 0           | 0       | -          | -       | 0            | 49/32                     |
| 08                        | <b>1900</b>                           | 140                                      | 500   | 1400   | -        | 100  | 5           | 0       | -          | -       | 0            | 39/23                     |



Trend Study 29-4-08

Study site name: Barracks Chaining.

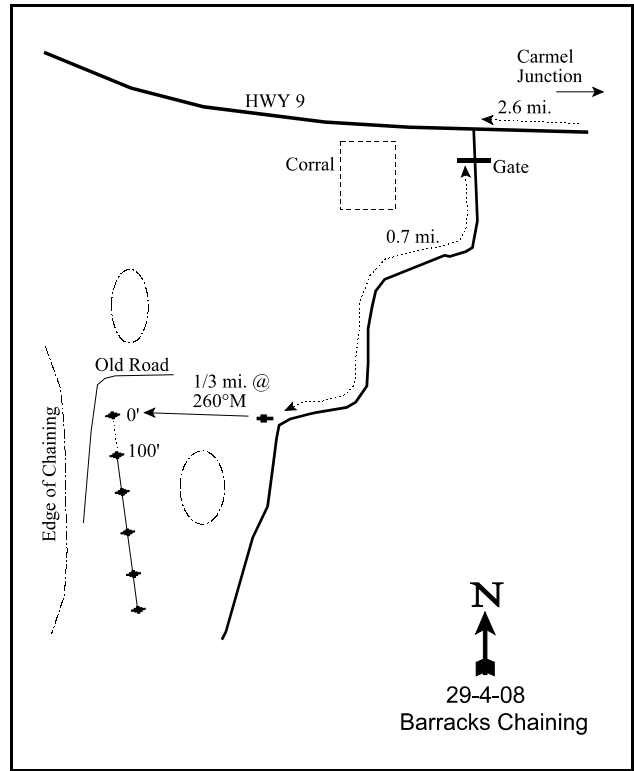
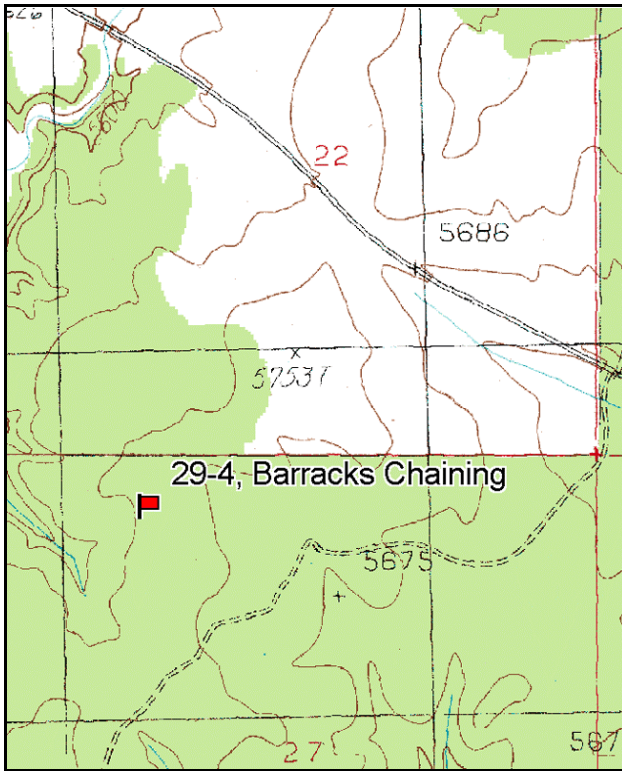
Vegetation type: Chaining.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the junction of Hwy 89 and Hwy 9 (Carmel Junction), proceed west on Hwy 9 for 2.6 miles to a road on the left (south) side of the Hwy. Turn left on this road, go through a gate, proceed 0.7 miles passing a corral on the right side of the road to a witness post on the right side of the road. From the witness post, walk ~1/3-1/2 mile at 260 degrees magnetic to the 0-foot stake.



Map Name: Mount Carmel

Diagrammatic Sketch

Township 41S, Range 8W, Section 27

GPS: NAD 83, UTM 12S 346134 E, 4120740 N

## DISCUSSION

### Barracks Chaining - Trend Study No. 29-4

#### Study Information

This trend study was established in 2003 on an old chaining located about three miles west of Carmel Junction and approximately one-half mile south of Highway 9 on BLM land [elevation: 5,730 (1,747 m), slope: 7%, aspect: west]. The site samples a chained area surrounded on three sides by unchained pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland. This is an important area for wintering deer. Pellet group data taken on the site estimated 45 deer days use/acre in 2003. Cattle also use the site with 14 days use/acre being estimated (34 cdu/ha). Pellet data from 2008 estimated 56 deer days use/acre (139 ddu/ha) and 25 cow days use/acre (61 cdu/ha).

#### Soils

Soil at the site is a deep sandy clay loam. Effective rooting depth is estimated at 16 inches. There is very little rock or pavement on the surface or within the soil profile. Phosphorus has a low availability for plant growth and development at only 4 ppm (Tiedemann and Lopez 2004). Organic matter is also low at about 1%. There is still a lot of old chaining litter scattered over the site, but relative bare ground cover was common in 2003 at 42%, dropping to 15% in 2008. There are signs of erosion in the form of pedestalling, flow patterns, and soil movement. Most of this is localized, but due to these factors the erosion condition class was rated as slight in both 2003 and 2008.

#### Browse

There are several species of preferred browse on the site including serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), squaw-apple (*Peraphyllum ramosissimum*), and bitterbrush (*Purshia tridentata*). Serviceberry numbered only 100 plants/acre in 2003, decreasing to 20 plants/acre in 2008. Mountain big sagebrush had a density estimated at 60 plants/acre in 2003, but that has increased to 740 plants/acre in 2008. Decadence has decreased from 33% in 2003 to 5% in 2008. No mountain big sagebrush seedlings or young were encountered in 2003 but 620 were seen in 2008. Bitterbrush density averaged 170 plants/acre from 2003 to 2008.

Pinyon and juniper trees are still found in the chaining. Point-quarter data estimated a density of 47 pinyon and 56 juniper trees/acre in 2003 and 36 juniper and 39 pinyon trees/acre in 2008. Average 2008 diameter was estimated at 4.7 inches for pinyon and 6.7 inches for juniper. Approximately 15-18% of the juniper trees sampled in 2003 and 2008 were mature trees that were chained over but still living.

#### Herbaceous understory

The herbaceous understory is diverse but only moderately abundant. Five perennial and two annual grasses were encountered in 2008 with 14% cover. Seeded species, crested and intermediate wheatgrass (*Agropyron cristatum* and *A. intermedium*), are the most abundant accounting for 26% and 62% of the total grass cover respectively. Forbs are abundant and include Searls prairie clover (*Dalea searlsiae*), coyote tobacco (*Nicotiana attenuata*), lemon scurf-pea (*Psoralea lanceolata*), cutleaf nightshade (*Solanum triflorum*), and gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*).

#### 2003 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - poor (43) Mid-level potential scale

#### 2008 TREND ASSESSMENT

Browse trend is slightly up. The three preferred browse species, serviceberry, mountain big sagebrush, and bitterbrush, provided only 5% cover. Mountain big sagebrush increased in density from 60 plants/acre in 2003 to 740 plants/acre, of which 620 plants/acre were young plants. This type of recruitment bodes well for this

population. Serviceberry decreased in density from 100 plants/acre to only 20 plants/acre with no young. Grass trend is up. Perennial grasses increased in sum of nested frequency by 81%, and cover of perennial grasses increased from 6% in 2003 to 14%. Annual grasses increased more than two-fold in sum of nested frequency, and cover of annual grasses increased from 0.5% in 2003 to 1.4%. Crested wheatgrass and intermediate wheatgrass accounted for 88% of the total grass cover. Cheatgrass (*Bromus tectorum*) was the most common annual and accounted for 1% of the total cover. Forb trend is up. Sum of nested frequency of perennial forbs increased 40% since 2003, with a significant increase in the nested frequency of gooseberryleaf globemallow.

Winter range condition (DCI) - fair (61) Mid-level potential scale  
browse - slightly up (+1)      grasses - up (+2)      forbs - up (+2)

HERBACEOUS TRENDS --  
 Management unit 29 , Study no: 4

| T<br>y<br>p<br>e            | Species                    | Nested<br>Frequency |                  | Average<br>Cover % |       |
|-----------------------------|----------------------------|---------------------|------------------|--------------------|-------|
|                             |                            | '03                 | '08              | '03                | '08   |
| G                           | Agropyron cristatum        | <sub>a</sub> 46     | <sub>b</sub> 108 | 1.20               | 3.94  |
| G                           | Agropyron intermedium      | <sub>a</sub> 117    | <sub>b</sub> 213 | 3.42               | 9.59  |
| G                           | Bouteloua gracilis         | <sub>a</sub> 1      | <sub>b</sub> 60  | .15                | .44   |
| G                           | Bromus tectorum (a)        | <sub>a</sub> 9      | <sub>b</sub> 146 | .57                | 1.36  |
| G                           | Oryzopsis hymenoides       | 5                   | -                | .03                | -     |
| G                           | Poa fendleriana            | -                   | 1                | -                  | .00   |
| G                           | Sitanion hystrix           | 2                   | 7                | .00                | .02   |
| G                           | Sporobolus cryptandrus     | <sub>b</sub> 48     | <sub>a</sub> 8   | .71                | .01   |
| G                           | Vulpia octoflora (a)       | 2                   | 9                | .01                | .03   |
| Total for Annual Grasses    |                            | 11                  | 155              | 0.57               | 1.39  |
| Total for Perennial Grasses |                            | 219                 | 397              | 5.53               | 14.01 |
| Total for Grasses           |                            | 230                 | 552              | 6.11               | 15.41 |
| F                           | Amaranthus graecizans      | 4                   | -                | .01                | -     |
| F                           | Chaenactis douglasii       | -                   | 5                | -                  | .01   |
| F                           | Chenopodium fremontii (a)  | -                   | 1                | .15                | .00   |
| F                           | Collinsia parviflora (a)   | <sub>a</sub> -      | <sub>b</sub> 11  | -                  | .05   |
| F                           | Dalea searlsiae            | 33                  | 31               | 2.53               | 1.99  |
| F                           | Descurainia pinnata (a)    | -                   | 4                | -                  | .04   |
| F                           | Erigeron divergens         | 1                   | 6                | .03                | .04   |
| F                           | Euphorbia sp.              | 27                  | 50               | .55                | .75   |
| F                           | Gayophytum ramosissimum(a) | -                   | 6                | -                  | .02   |
| F                           | Gilia sp. (a)              | -                   | 7                | -                  | .01   |
| F                           | Hymenopappus filifolius    | 5                   | -                | .06                | -     |
| F                           | Lappula occidentalis (a)   | <sub>a</sub> -      | <sub>b</sub> 99  | -                  | 3.10  |
| F                           | Lotus utahensis            | 2                   | -                | .15                | -     |

| T<br>y<br>p<br>e          | Species                      | Nested<br>Frequency |                  | Average<br>Cover % |       |
|---------------------------|------------------------------|---------------------|------------------|--------------------|-------|
|                           |                              | '03                 | '08              | '03                | '08   |
| F                         | Lupinus sp.                  | -                   | 1                | -                  | .01   |
| F                         | Nicotiana attenuata (a)      | 6                   | -                | 1.04               | -     |
| F                         | Penstemon humilis            | 1                   | 1                | .00                | .03   |
| F                         | Penstemon leonardi           | 1                   | 8                | .03                | .04   |
| F                         | Phlox longifolia             | 9                   | 3                | .02                | .00   |
| F                         | Psoralea lanceolata          | 15                  | 11               | 1.61               | .24   |
| F                         | Solanum triflorum (a)        | <sub>b</sub> 23     | <sub>a</sub> -   | 1.40               | -     |
| F                         | Sphaeralcea grossulariifolia | <sub>a</sub> 66     | <sub>b</sub> 113 | 2.55               | 3.73  |
| F                         | Tragopogon dubius            | -                   | -                | .03                | -     |
| Total for Annual Forbs    |                              | 29                  | 128              | 2.59               | 3.24  |
| Total for Perennial Forbs |                              | 164                 | 229              | 7.60               | 6.87  |
| Total for Forbs           |                              | 193                 | 357              | 10.20              | 10.12 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 29 , Study no: 4

| T<br>y<br>p<br>e | Species                       | Strip<br>Frequency |     | Average<br>Cover % |      |
|------------------|-------------------------------|--------------------|-----|--------------------|------|
|                  |                               | '03                | '08 | '03                | '08  |
| B                | Amelanchier utahensis         | 3                  | 1   | 1.70               | 1.50 |
| B                | Artemisia tridentata vaseyana | 3                  | 12  | .38                | .82  |
| B                | Juniperus osteosperma         | 3                  | 3   | 1.62               | 2.11 |
| B                | Opuntia sp.                   | 0                  | 1   | -                  | .03  |
| B                | Peraphyllum ramosissimum      | 0                  | 1   | -                  | .00  |
| B                | Pinus edulis                  | 3                  | 3   | 1.00               | 2.11 |
| B                | Purshia tridentata            | 7                  | 7   | 3.03               | 2.82 |
| Total for Browse |                               | 19                 | 28  | 7.75               | 9.40 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 29 , Study no: 4

| Species                       | Percent Cover |      |
|-------------------------------|---------------|------|
|                               | '03           | '08  |
| Amelanchier utahensis         | 1.60          | 3.29 |
| Artemisia tridentata vaseyana | .73           | 1.00 |
| Juniperus osteosperma         | 1.83          | 2.48 |
| Pinus edulis                  | 1.23          | 1.70 |
| Purshia tridentata            | 3.71          | 3.54 |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 29 , Study no: 4

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 5.0                        | 1.6 |
| Artemisia tridentata vaseyana | 4.8                        | 1.5 |
| Purshia tridentata            | 6.4                        | 1.8 |

POINT-QUARTER TREE DATA --  
 Management unit 29 , Study no: 4

| Species               | Trees per Acre |     |
|-----------------------|----------------|-----|
|                       | '03            | '08 |
| Juniperus osteosperma | 47             | 36  |
| Pinus edulis          | 56             | 39  |

| Average diameter (in) |     |
|-----------------------|-----|
| '03                   | '08 |
| 3.1                   | 6.7 |
| 2.6                   | 4.7 |

BASIC COVER --  
 Management unit 29 , Study no: 4

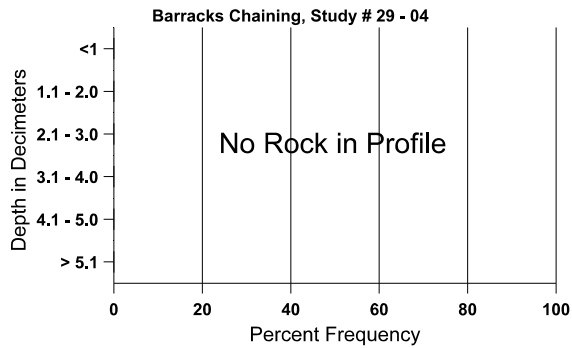
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 22.40           | 35.04 |
| Rock        | .03             | 0     |
| Pavement    | .04             | .04   |
| Litter      | 42.29           | 46.73 |
| Cryptogams  | .21             | .12   |
| Bare Ground | 47.20           | 36.32 |

SOIL ANALYSIS DATA --

Management unit 29, Study no: 4, Study Name: Barracks Chaining

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand          | % silt | % clay |     |       |       |      |
| 16.1                         | 70.8 (18.1)     | 6.5 | 62.6            | 14.7   | 22.7   | 1.0 | 4.0   | 448.0 | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 29, Study no: 4

| Type   | Quadrat Frequency |     |
|--------|-------------------|-----|
|        | '03               | '08 |
| Rabbit | 35                | 89  |
| Horse  | 1                 | -   |
| Elk    | 1                 | -   |
| Deer   | 31                | 24  |
| Cattle | 9                 | 6   |

| Days use per acre (ha) |          |
|------------------------|----------|
| '03                    | '08      |
| -                      | -        |
| -                      | -        |
| -                      | -        |
| 45 (111)               | 56 (139) |
| 14 (34)                | 25 (61)  |

BROWSE CHARACTERISTICS --  
Management unit 29 , Study no: 4

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>100</b>                            | -  | 40    | 60     | -        | -    | 40          | 0       | -          | -       | 0            | 81/92                     |
| 08                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 108/120                   |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>60</b>                             | -  | -     | 40     | 20       | -    | 33          | 33      | 33         | -       | 0            | 16/27                     |
| 08                                   | <b>740</b>                            | 5300                                     | 620   | 80     | 40       | -    | 5           | 0       | 5          | -       | 0            | 16/17                     |
| <b>Chrysothamnus viscidiflorus</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 17/10                     |
| <b>Juniperus osteosperma</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>120</b>                            | -  | 120   | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>60</b>                             | -  | 20    | 40     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 5/9                       |
| <b>Peraphyllum ramosissimum</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 87/103                    |
| 08                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 76/115                    |
| <b>Pinus edulis</b>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>60</b>                             | -  | 20    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>180</b>                            | -  | -     | 120    | 60       | -    | 56          | 44      | 33         | 11      | 11           | 54/86                     |
| 08                                   | <b>160</b>                            | -  | 20    | 60     | 80       | -    | 38          | 0       | 50         | 25      | 25           | 59/87                     |
| <b>Quercus gambelii</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 26/25                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 44/31                     |

Trend Study 29R-1-08

Study site name: Elephant Gap Total Enclosure.

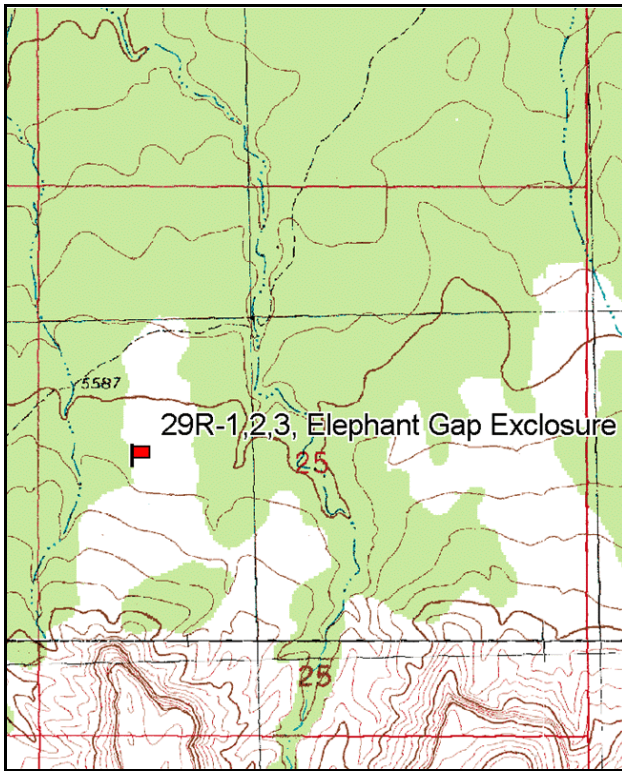
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 50 degrees magnetic.

Frequency belt placement: line 1 (11ft, 59 ft, and 95 ft), line 2 (34ft and 71 ft).

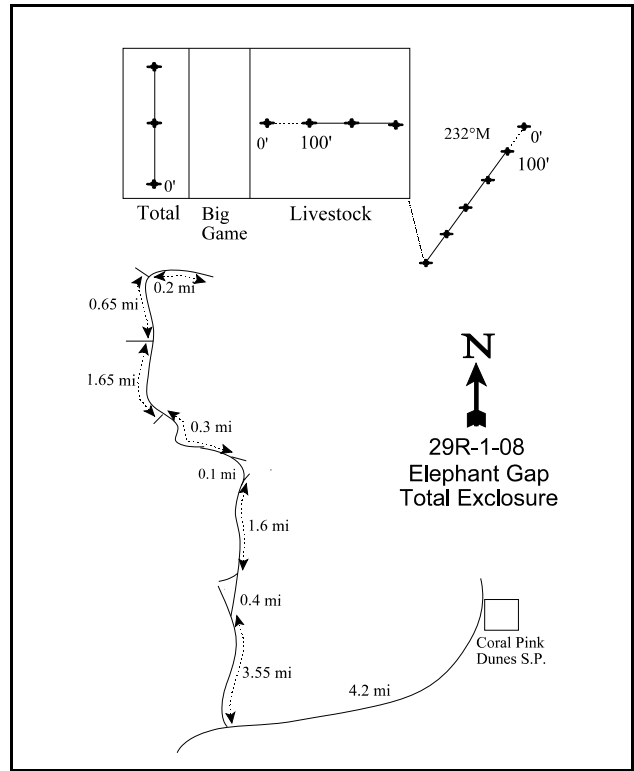
LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park off of Hwy 89. From the entry of the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 2.7 miles to a cattleguard. Continue on main road for another 0.65 miles to another cattleguard. Drive another 1.85 miles to a faint road to the right (south). Drive on this road for 0.2 miles to the enclosure. The total enclosure is nearest to the road and the baseline (200 feet long) runs through the middle at 50 degrees magnetic. The 0 foot stake is marked by browse tag #116.



Map Name: The Barracks

Township 42S, Range 9W, Section 25



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 339577 E, 4110770 N



## DISCUSSION

### Elephant Gap Total Exclosure - Trend Study No. 29R-1

#### Study information

This study was established in 1998 inside the total exclosure at Elephant Gap [elevation: 5,600 feet (1,707 m), slope: 6%, aspect: north to northwest]. The Elephant Gap exclosure complex is located about 16 miles west-northwest of Kanab and about 9 miles northwest of the Coral Pink Sand Dunes State Park. The exclosure was built in the 1960's just north of Harris Point, and the total exclosure is approximately 100 feet by 200 feet in size. The area supports a moderately dense stand of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees with a mixture of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), bitterbrush (*Purshia tridentata*), and serviceberry (*Amelanchier utahensis*) in the understory. The exclosure is in need of repair. In 2008, a deer carcass and deer pellets were found inside the exclosure. Pellet group data from 2008 estimated 3 deer days use/acre (8 ddu/ha).

#### Soils

Soil at the site is very deep with an effective rooting depth estimated at over 31 inches. Texture is sandy and reactivity is slightly acidic (6.2 pH). Phosphorus and potassium have low availability for plant growth and development at just 5.6 ppm and 12.8 ppm, respectively (Tiedemann and Lopez 2004). There is virtually no rock or pavement on the surface or within the profile. A considerable amount of bare ground was estimated in both surveys, but there is little erosion occurring due to the gentle slope and the rapid infiltration capacity of the soil. The soil erosion condition was classified as stable in 2008.

#### Browse

Basin big sagebrush and bitterbrush are the key browse species. They combined to provide 48% and 41% of the shrub cover in 1998 and 2003, respectively, but only 33% of shrub cover in 2008. Density of basin big sagebrush was estimated at 1,280 plants/acre in 1998, decreasing to 760 plants/acre in 2003, then rising to 880 plants/acre in 2008. Decadence was moderately low in 1998 at 19%, but increased to 53% in 2003, and 55% in 2008. In 2008, there were only about 200 bitterbrush plants/acre inside the total exclosure with half being mature and half decadent. No young bitterbrush were sampled in any of the surveys. Small numbers of sand sagebrush (*Artemisia filifolia*), rubber rabbitbrush (*Chrysothamnus nauseosus hololeucus*), green ephedra (*Ephedra viridis*), coin buckwheat (*Eriogonum nummularre*), and yucca (*Yucca sp.*) were found inside of the exclosure. There were a few small pinyon pine and large Utah juniper trees inside of the total exclosure. Average basal diameter was approximately 14 inches for juniper and 4 inches for pinyon, juniper canopy cover was estimated at 12% in 1998 and 19% in 2003 and 2008.

#### Herbaceous understory

The herbaceous understory is very poor on the site. Total herbaceous cover was estimated at only 6% in 1998, 3% in 2003, and 4% in 2008. The most common perennial grasses were blue grama (*Bouteloa gracilis*) and sand dropseed (*Sporobolus cryptandrus*), both warm season species. They accounted for 93% of the grass cover in 1998 and 66% in 2008. With the exception of milkvetch (*Astragalus sp.*), most of the herbaceous species on the site declined in 2003 with drought. There was an improvement in herbaceous cover, although it is still low overall. There are few annual species on the site.

#### 1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - poor (40) Mid-level potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is down. Basin big sagebrush and bitterbrush had reduced population densities and increased decadence. The sagebrush population displayed poor vigor. Trends for grasses and forbs were down. Perennial grasses and forbs have lower sum of nested frequency values in 2003. The most abundant

grasses, blue grama and sand dropseed, both significantly declined in nested frequency in 2003. Nested frequency of milkvetch remained similar to 2003, while pale evening primrose (*Oenothera pallida*) significantly declined.

Winter range condition - very poor (24) Mid-level potential scale  
browse - down (-2)                      grasses - down (-2)                      forbs - down (-2)

**2008 TREND ASSESSMENT**

Browse trend is stable. Basin big sagebrush density increased 16% to 880 plants/acre. No seedlings were found but young plants were estimated at 140 plants/acre (16% of population). Bitterbrush density was the same as 2003 with an estimated 200 plants/acre with 50% decadence and no young or seedlings sampled. Grass trend is slightly up and forbs are stable. Herbaceous understory has increased in cover and sum of nested frequency since 2003. Perennial grass sum of nested frequency was up 51% and cover was up nearly three-fold. Forbs remained stable overall but perennial species provided more cover while annual species declined.

Winter range condition (DCI) - very poor (20) Mid-level potential scale  
browse - stable (0)                      grasses - slightly up (+1)                      forbs - stable (0)

**HERBACEOUS TRENDS --**  
 Management unit 29R, Study no: 1

| T<br>y<br>p<br>e                   | Species                        | Nested Frequency |                 |                | Average Cover % |             |             |
|------------------------------------|--------------------------------|------------------|-----------------|----------------|-----------------|-------------|-------------|
|                                    |                                | '98              | '03             | '08            | '98             | '03         | '08         |
| G                                  | <i>Bouteloua gracilis</i>      | 51               | 38              | 56             | 1.21            | .22         | 1.16        |
| G                                  | <i>Bromus tectorum</i> (a)     | 4                | -               | 2              | .01             | -           | .01         |
| G                                  | <i>Muhlenbergia pungens</i>    | 2                | 2               | 4              | .03             | .00         | .03         |
| G                                  | <i>Oryzopsis hymenoides</i>    | 2                | 3               | 5              | .03             | .16         | .00         |
| G                                  | <i>Sitanion hystrix</i>        | -                | 3               | 4              | -               | .00         | .01         |
| G                                  | <i>Sporobolus cryptandrus</i>  | <sub>b</sub> 39  | <sub>a</sub> 5  | <sub>a</sub> 8 | .77             | .07         | .01         |
| G                                  | <i>Stipa comata</i>            | 5                | 4               | 6              | .00             | .15         | .53         |
| G                                  | <i>Vulpia octoflora</i> (a)    | <sub>b</sub> 20  | <sub>a</sub> -  | <sub>a</sub> 8 | .09             | -           | .02         |
| <b>Total for Annual Grasses</b>    |                                | <b>24</b>        | <b>0</b>        | <b>10</b>      | <b>0.10</b>     | <b>0</b>    | <b>0.02</b> |
| <b>Total for Perennial Grasses</b> |                                | <b>99</b>        | <b>55</b>       | <b>83</b>      | <b>2.04</b>     | <b>0.62</b> | <b>1.75</b> |
| <b>Total for Grasses</b>           |                                | <b>123</b>       | <b>55</b>       | <b>93</b>      | <b>2.15</b>     | <b>0.62</b> | <b>1.77</b> |
| F                                  | <i>Amaranthus graecizans</i>   | -                | -               | 3              | -               | -           | .15         |
| F                                  | <i>Artemisia dracunculus</i>   | 5                | -               | -              | .01             | .03         | -           |
| F                                  | <i>Arenaria</i> sp.            | -                | 1               | -              | -               | .03         | -           |
| F                                  | <i>Astragalus</i> sp.          | 60               | 52              | 69             | 1.92            | 1.57        | 2.08        |
| F                                  | <i>Descurainia pinnata</i> (a) | 7                | 4               | 12             | .16             | .00         | .03         |
| F                                  | <i>Dithyrea wislizenii</i> (a) | 10               | -               | -              | .27             | -           | -           |
| F                                  | <i>Eriogonum cernuum</i> (a)   | 9                | -               | -              | .02             | -           | -           |
| F                                  | <i>Gilia</i> sp. (a)           | <sub>a</sub> 6   | <sub>b</sub> 19 | <sub>a</sub> 2 | .03             | .32         | .00         |

| Type                      | Species                  | Nested Frequency |                 |                 | Average Cover % |      |      |
|---------------------------|--------------------------|------------------|-----------------|-----------------|-----------------|------|------|
|                           |                          | '98              | '03             | '08             | '98             | '03  | '08  |
| F                         | Lappula occidentalis (a) | <sub>a</sub> 3   | <sub>a</sub> -  | <sub>b</sub> 14 | .03             | -    | .03  |
| F                         | Oenothera albicaulis (a) | -                | 1               | -               | -               | .00  | -    |
| F                         | Oenothera pallida        | <sub>c</sub> 43  | <sub>b</sub> 16 | <sub>a</sub> -  | 1.06            | .05  | -    |
| F                         | Unknown forb-perennial   | -                | -               | 2               | -               | -    | .03  |
| Total for Annual Forbs    |                          | 35               | 24              | 28              | 0.52            | 0.32 | 0.06 |
| Total for Perennial Forbs |                          | 108              | 69              | 74              | 3.00            | 1.69 | 2.26 |
| Total for Forbs           |                          | 143              | 93              | 102             | 3.52            | 2.02 | 2.33 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 29R, Study no: 1

| Type             | Species                            | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                    | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Artemisia filifolia                | 15              | 12  | 12  | .62             | .73   | .87   |
| B                | Artemisia tridentata tridentata    | 37              | 33  | 34  | 6.46            | 5.61  | 2.71  |
| B                | Chrysothamnus nauseosus hololeucus | 9               | 6   | 10  | 1.19            | 1.93  | 1.41  |
| B                | Ephedra viridis                    | 6               | 5   | 7   | .56             | .57   | .66   |
| B                | Eriogonum nummularre               | 5               | 5   | 6   | .33             | .15   | .00   |
| B                | Juniperus osteosperma              | 1               | 2   | 2   | 7.94            | 9.25  | 9.05  |
| B                | Opuntia sp.                        | 1               | 5   | 4   | .03             | .00   | .00   |
| B                | Purshia tridentata                 | 9               | 9   | 8   | 3.56            | 4.09  | 3.59  |
| B                | Rhus trilobata                     | 1               | 0   | 0   | .00             | -     | -     |
| B                | Tetradymia canescens               | 0               | 1   | 0   | -               | .00   | -     |
| B                | Yucca sp.                          | 3               | 5   | 6   | .16             | 1.34  | .71   |
| Total for Browse |                                    | 87              | 83  | 89  | 20.88           | 23.71 | 19.01 |

CANOPY COVER, LINE INTERCEPT --  
 Management unit 29R, Study no: 1

| Species                            |       |       |
|------------------------------------|-------|-------|
|                                    | '03   | '08   |
| Artemisia filifolia                | 1.13  | 2.88  |
| Artemisia tridentata tridentata    | 3.71  | 4.93  |
| Chrysothamnus nauseosus hololeucus | 1.75  | 1.91  |
| Ephedra viridis                    | 1.13  | 2.86  |
| Eriogonum nummulare                | .38   | 1.14  |
| Juniperus osteosperma              | 18.54 | 19.61 |
| Opuntia sp.                        | .01   | -     |
| Purshia tridentata                 | 4.34  | 4.43  |
| Yucca sp.                          | 1.06  | 2.11  |

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 29R, Study no: 1

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 1.9                        | 1.5 |
| Purshia tridentata              | 3.5                        | 0.7 |

BASIC COVER --  
 Management unit 29R, Study no: 1

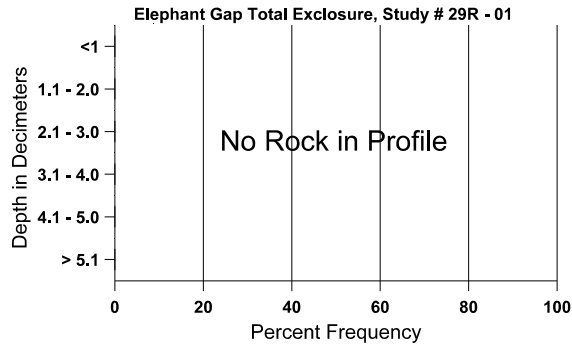
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 28.10           | 25.73 | 24.84 |
| Rock        | 0               | .00   | 0     |
| Pavement    | 0               | .01   | .02   |
| Litter      | 44.43           | 51.48 | 54.87 |
| Cryptogams  | 5.10            | 2.59  | 1.03  |
| Bare Ground | 38.44           | 41.14 | 38.72 |

SOIL ANALYSIS DATA --

Management unit 29R, Study no: 1, Study Name: Elephant Gap Total Exclosure

| Effective rooting depth (in) | Temp °F (depth) | pH  | sand  |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 31.4                         | 68.0<br>(18.0)  | 6.2 | 90.7  | 4.7   | 4.6   | 0.6 | 5.6   | 12.8  | 0.3  |

Stoniness Index



PELLET GROUP DATA --

Management unit 29R, Study no: 1

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 2                 | 22  | 81  |
| Deer   | 1                 | 9   | 13  |

| Days use per acre (ha) |     |       |
|------------------------|-----|-------|
| '98                    | '03 | '08   |
| -                      | -   | -     |
| -                      | -   | 3 (8) |

BROWSE CHARACTERISTICS --

Management unit 29R, Study no: 1

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia filifolia</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>380</b>                            | -  | 120   | 260    | -        | 20   | 0           | 0       | 0          | -       | 0            | 24/63                     |
| 03                                     | <b>280</b>                            | -  | 20    | 120    | 140      | 40   | 0           | 0       | 50         | 7       | 7            | 23/25                     |
| 08                                     | <b>240</b>                            | -  | 20    | 160    | 60       | 40   | 0           | 0       | 25         | -       | 0            | 30/31                     |
| <b>Artemisia tridentata tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                     | <b>1280</b>                           | 120                                      | 220   | 820    | 240      | 560  | 0           | 0       | 19         | 13      | 13           | 35/45                     |
| 03                                     | <b>760</b>                            | -  | 80    | 280    | 400      | 960  | 0           | 0       | 53         | 50      | 50           | 31/33                     |
| 08                                     | <b>880</b>                            | -  | 140   | 260    | 480      | 820  | 7           | 5       | 55         | 36      | 39           | 39/40                     |

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Chrysothamnus nauseosus hololeucus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 2400                                  | -  | -     | 2400   | -        | 40   | 0           | 0       | 0          | -       | 0            | 41/81                     |
| 03  | 120                                   | -  | -     | 40     | 80       | 60   | 0           | 0       | 67         | 33      | 33           | 36/55                     |
| 08  | 320                                   | -  | 140   | 20     | 160      | 20   | 0           | 0       | 50         | 25      | 25           | 33/44                     |
| <i>Ephedra viridis</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 160                                   | -  | 40    | 60     | 60       | -    | 0           | 0       | 38         | -       | 0            | 28/26                     |
| 03  | 100                                   | -  | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 29/32                     |
| 08  | 160                                   | -  | -     | 80     | 80       | 120  | 0           | 13      | 50         | -       | 0            | 31/33                     |
| <i>Eriogonum nummulare</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 120                                   | -  | 40    | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 22/23                     |
| 03  | 140                                   | -  | -     | 100    | 40       | 40   | 0           | 0       | 29         | 14      | 14           | 17/19                     |
| 08  | 160                                   | -  | -     | 20     | 140      | -    | 50          | 0       | 88         | -       | 0            | 23/20                     |
| <i>Juniperus osteosperma</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 20                                    | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | 4/14                      |
| 03  | 100                                   | -  | -     | 80     | 20       | -    | 0           | 0       | 20         | 20      | 20           | 5/16                      |
| 08  | 80                                    | -  | -     | 40     | 40       | -    | 25          | 0       | 50         | -       | 50           | 3/9                       |
| <i>Purshia tridentata</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 240                                   | -  | -     | 220    | 20       | 40   | 0           | 0       | 8          | 8       | 8            | 48/64                     |
| 03  | 200                                   | -  | -     | 140    | 60       | 100  | 20          | 10      | 30         | 10      | 10           | 48/92                     |
| 08  | 200                                   | -  | -     | 100    | 100      | 100  | 0           | 10      | 50         | 20      | 20           | 45/77                     |
| <i>Quercus gambelii</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 39/31                     |
| <i>Rhus trilobata</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ribes sp.</i>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 111/104                   |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                             |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|-----------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                        | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <i>Tetradymia canescens</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 98                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                          | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 34/42                     |  |
| 08                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 36/47                     |  |
| <i>Yucca sp.</i>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 98                          | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 33/42                     |  |
| 03                          | <b>180</b>                            | -  | 20    | 160    | -        | -    | 0           | 0       | 0          | -       | 0            | 27/33                     |  |
| 08                          | <b>280</b>                            | -  | 60    | 120    | 100      | 20   | 7           | 0       | 36         | 21      | 29           | 25/35                     |  |

Trend Study 29R-2-08

Study site name: Elephant Gap Livestock Exclosure .

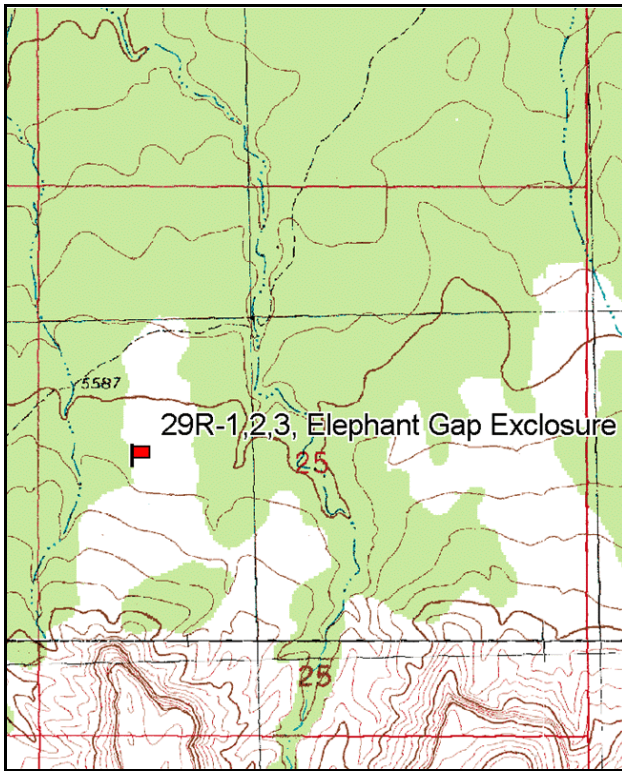
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 90 degrees magnetic.

Frequency belt placement: line 1 (11ft and 95 ft), line 2 (59ft), line 3 (34 ft and 71 ft).

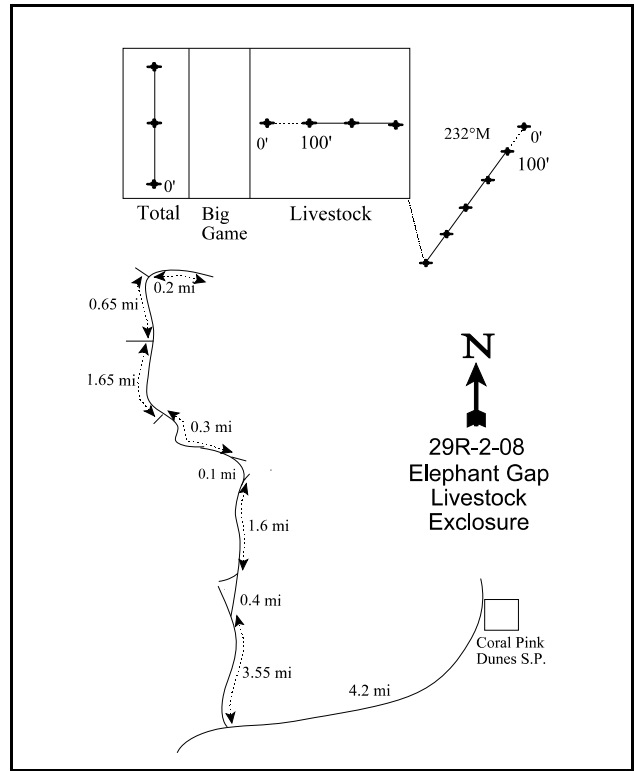
LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park off of Hwy 89. From the entry of the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 2.7 miles to a cattleguard. Continue on main road for another 0.65 miles to another cattleguard. Drive another 1.85 miles to a faint road to the right (south). Drive on this road for 0.2 miles to the exclosure. The livestock exclosure is located on the east side of the exclosure complex. The baseline starts inside the livestock exclosure near the taller fence denoting the big game exclosure and runs through the middle of the exclosure (see map below).



Map Name: The Barracks

Township 42S , Range 9W , Section 25



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 339634 E, 4110719 N



## DISCUSSION

### Elephant Gap Livestock Exclosure - Trend Study No. 29R-2

#### Study information

This study was established in 1998 inside the livestock exclosure at Elephant Gap [elevation: 5,600 feet (1,707 m), slope: 7%, aspect: northwest]. The Elephant Gap exclosure complex is located about 16 miles west-northwest of Kanab and about 9 miles northwest of the Coral Pink San Dunes State Park. The exclosure was built in the 1960's just north of Harris Point. The area is composed of an open pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland with a mixed shrub understory. Deer use this area as winter range and pellet data estimated a high level of use within the livestock exclosure at 96 deer days use/acre (237 ddu/ha) in 1998 and 102 days use/acre (251 ddu/ha) in 2003, and 43 deer days use/acre (106 ddu/ha) in 2008.

#### Soils

Soil in the livestock exclosure is very similar to the total exclosure and outside. It is deep, sandy in texture, but strongly acidic (pH of 5.5). Phosphorus and potassium are limited at just 3.8 ppm and 3.2 ppm respectively, which may be limiting to plant growth and development (Tiedemann and Lopez 2004). There is very little rock or pavement on the surface or within the profile. Relative bare ground cover is similar to the total exclosure at 27%-35% since 1998. Relative cryptogamic cover is about twice as high inside the livestock exclosure as inside the total exclosure, but is similar to cover outside the exclosures. There is some soil pedestalling around shrubs, but erosion does not appear to be a problem due to the gentle terrain and high infiltration capacity. Soil erosion condition was classified as stable in 2008.

#### Browse

Total shrub cover is similar to the total exclosure yet composition differs considerably. The key browse species consist of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and green ephedra (*Ephedra viridis*). Basin big sagebrush density decreased from 1,180 plants/acre in 1998 to an average of 780 plants/acre in 2003 and 2008, and decadence has decreased from 95% in 2003 to 56% in 2008. Recruitment of young sagebrush plants was at 10% (80 plants/acre) of the population in 2008. Green ephedra density has averaged 1,040 plants/acre from 1998 to 2008, this population has maintained good vigor, low to moderate decadence, and light use. Young plants increased from 100 plants/acre to 240 plants/acre (11% to 21%) from 2003 to 2008. A few bitterbrush (*Purshia tridentata*) plants occur in the livestock exclosure but only numbered 20 plants/acre in 2003 and 2008. Other shrubs found on the site include sand sagebrush (*Artemisia filifolia*), coin buckwheat (*Eriogonum nummularre*), prickly pear cactus (*Opuntia* sp.), and yucca (*Yucca* sp.). Juniper trees are scattered in the livestock exclosure at a density of 29 trees/acre in 2003, no density was estimated in 2008.

#### Herbaceous understory

Grass composition in the livestock exclosure closely resembles that of the total exclosure, but forbs are more diverse and were much more abundant in 1998. Sand dropseed (*Sporobolus cryptandrus*) was the most abundant grass in 1998, with pale evening primrose (*Oenothera pallida*), toadflax (*Comandra pallida*), and milkvetch (*Astragalus* sp.) being the most common forbs. With drought in 2003, grasses and forbs declined in abundance, especially perennial forbs. Total forb cover was estimated at only 3% in 2003 and 2008 compared to 11% in 1998. Sum of nested frequency of perennial grasses has remained constant since 1998 while cover has decreased from 1.5% in 1998 to 0.4% in 2008. Perennial forbs showed a 56% decline from 1998 to 2003 and 10% decline in 2008 in sum nested frequency.

#### 1998 DESIRABLE COMPONENTS INDEX

Winter range condition - fair (55) Mid-level potential scale

### 2003 TREND ASSESSMENT

Browse trend is down. The key browse species, basin big sagebrush and green ephedra, have lower densities, higher decadence, and lower recruitment. The decadence rate for sagebrush is extreme at 95%. Ephedra is in better condition than sagebrush. Grass trend is stable. Grasses provide little cover to the site and perennial grasses remained similar in sum of nested frequency. Forb trend is down. Perennial forbs showed a large decline in sum of nested frequency with drought in 2003. The largest loss came from pale evening primrose, but toadflax (*Comandra pallida*) and milkvetch also showed decreases in their respective frequencies.

Winter range condition (DCI) - very poor-poor (34) Mid-level potential scale  
browse - down (-2)                      grasses - stable (0)                      forbs - down (-2)

### 2008 TREND ASSESSMENT

Browse trend is slightly up. Basin big sagebrush has increased in density from 740 plants/acre in 2003 to 820 plants/acre. Decadence has decreased from 95% to 56% in the same period, while recruitment is improving from no young in 2003 to 80 young/acre. Ephedra densities have increased from 900 plants/acre in 2003 to 1,160/acre, decadence has increased from 22% in 2003 to 36%, and young have increased from 100 plants/acre to 240 plants/acre in the same period. Trend for the grasses is stable. Perennial grasses are rare and sum of nested frequency of perennial grasses has changed little, though cover of perennial grasses is now less than 0.5%. The nested frequency of cheatgrass has increased significantly, but is still rare and provides little cover. Trend for forbs is stable. Perennial forbs sum of nested frequency has remained similar to 2003. Perennial forbs are represented by a milkvetch and bastard toadflax.

Winter range condition - very poor (32) Mid-level potential scale  
browse - slightly up (+1)                      grasses - stable (0)                      forbs - stable (0)

HERBACEOUS TRENDS --  
Management unit 29R, Study no: 2

| Type                        | Species                         | Nested Frequency |                  |                 | Average Cover % |      |      |
|-----------------------------|---------------------------------|------------------|------------------|-----------------|-----------------|------|------|
|                             |                                 | '98              | '03              | '08             | '98             | '03  | '08  |
| G                           | <i>Bouteloua gracilis</i>       | <sub>a</sub> 7   | <sub>a</sub> 11  | <sub>b</sub> 39 | .30             | .34  | .35  |
| G                           | <i>Bromus tectorum</i> (a)      | <sub>b</sub> 11  | <sub>a</sub> -   | <sub>c</sub> 68 | .08             | -    | .54  |
| G                           | <i>Muhlenbergia pungens</i>     | 4                | 3                | 2               | .01             | .03  | .01  |
| G                           | <i>Oryzopsis hymenoides</i>     | <sub>ab</sub> 3  | <sub>b</sub> 6   | <sub>a</sub> -  | .06             | .09  | .00  |
| G                           | <i>Sitanion hystrix</i>         | 1                | -                | -               | .00             | -    | -    |
| G                           | <i>Sporobolus cryptandrus</i>   | <sub>b</sub> 34  | <sub>a</sub> 21  | <sub>a</sub> 5  | 1.11            | .58  | .01  |
| G                           | <i>Vulpia octoflora</i> (a)     | <sub>b</sub> 51  | <sub>a</sub> -   | <sub>b</sub> 27 | .44             | -    | .05  |
| Total for Annual Grasses    |                                 | 62               | 0                | 95              | 0.52            | 0    | 0.59 |
| Total for Perennial Grasses |                                 | 49               | 41               | 46              | 1.49            | 1.04 | 0.37 |
| Total for Grasses           |                                 | 111              | 41               | 141             | 2.01            | 1.04 | 0.97 |
| F                           | <i>Artemisia dracunculus</i>    | 2                | -                | -               | .06             | -    | -    |
| F                           | <i>Astragalus</i> sp.           | 56               | 38               | 38              | 1.74            | 1.62 | 1.33 |
| F                           | <i>Castilleja linariaefolia</i> | -                | -                | 4               | .03             | -    | .03  |
| F                           | <i>Carduus nutans</i> (a)       | -                | 2                | -               | -               | .03  | -    |
| F                           | <i>Chaenactis douglasii</i>     | 5                | -                | -               | .03             | -    | -    |
| F                           | <i>Comandra pallida</i>         | <sub>b</sub> 88  | <sub>ab</sub> 64 | <sub>a</sub> 52 | 1.35            | .52  | 1.15 |
| F                           | <i>Cordylanthus parviflorus</i> | 5                | -                | -               | .09             | -    | -    |
| F                           | <i>Cordylanthus</i> sp. (a)     | -                | 7                | -               | -               | .29  | -    |
| F                           | <i>Descurainia pinnata</i> (a)  | <sub>b</sub> 16  | <sub>a</sub> -   | <sub>b</sub> 19 | .11             | -    | .04  |
| F                           | <i>Dithyrea wislizenii</i> (a)  | <sub>a</sub> 4   | <sub>a</sub> -   | <sub>b</sub> 35 | .09             | -    | .14  |
| F                           | <i>Draba</i> sp. (a)            | 13               | -                | 9               | .07             | -    | .02  |
| F                           | <i>Eriogonum cernuum</i> (a)    | <sub>b</sub> 11  | <sub>a</sub> -   | <sub>a</sub> -  | .12             | -    | -    |
| F                           | <i>Euphorbia</i> sp.            | <sub>b</sub> 14  | <sub>a</sub> -   | <sub>a</sub> -  | .02             | -    | -    |
| F                           | <i>Gilia</i> sp. (a)            | 1                | 6                | -               | .03             | .02  | -    |
| F                           | <i>Lappula occidentalis</i> (a) | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 55 | .00             | -    | .16  |
| F                           | <i>Machaeranthera canescens</i> | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 28 | -               | -    | .11  |
| F                           | <i>Oenothera albicaulis</i> (a) | <sub>b</sub> 18  | <sub>a</sub> -   | <sub>a</sub> -  | .60             | -    | -    |
| F                           | <i>Oenothera pallida</i>        | <sub>c</sub> 155 | <sub>b</sub> 42  | <sub>a</sub> -  | 6.51            | .45  | -    |
| F                           | <i>Penstemon</i> sp.            | -                | 4                | -               | -               | .03  | -    |
| F                           | <i>Phlox longifolia</i>         | 2                | -                | -               | .00             | -    | -    |
| F                           | <i>Sphaeralcea parvifolia</i>   | <sub>b</sub> 11  | <sub>a</sub> -   | <sub>b</sub> 10 | .21             | -    | .03  |
| Total for Annual Forbs      |                                 | 63               | 15               | 118             | 1.03            | 0.34 | 0.36 |
| Total for Perennial Forbs   |                                 | 338              | 148              | 132             | 10.07           | 2.64 | 2.66 |
| Total for Forbs             |                                 | 401              | 163              | 250             | 11.11           | 2.99 | 3.02 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 29R, Study no: 2

| Type             | Species                            | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                    | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Artemisia filifolia                | 3               | 2   | 1   | .93             | .78   | .63   |
| B                | Artemisia tridentata tridentata    | 47              | 26  | 36  | 4.79            | 2.14  | 1.91  |
| B                | Chrysothamnus nauseosus hololeucus | 0               | 1   | 1   | -               | .00   | .00   |
| B                | Ephedra viridis                    | 23              | 24  | 19  | 8.32            | 11.07 | 9.48  |
| B                | Eriogonum nummulare                | 1               | 2   | 2   | .03             | .15   | .06   |
| B                | Juniperus osteosperma              | 1               | 1   | 1   | 5.21            | 6.52  | 2.42  |
| B                | Opuntia sp.                        | 2               | 2   | 2   | .00             | .06   | .00   |
| B                | Pediocactus simpsonii              | 0               | 0   | 0   | -               | .15   | -     |
| B                | Purshia tridentata                 | 2               | 1   | 1   | .66             | .53   | .76   |
| B                | Yucca sp.                          | 2               | 3   | 2   | .15             | .41   | .00   |
| Total for Browse |                                    | 81              | 62  | 65  | 20.11           | 21.83 | 15.27 |

CANOPY COVER, LINE INTERCEPT --

Management unit 29R, Study no: 2

| Species                         | Percent Cover |       |       |
|---------------------------------|---------------|-------|-------|
|                                 | '98           | '03   | '08   |
| Artemisia filifolia             | -             | .61   | 1.04  |
| Artemisia tridentata tridentata | -             | .95   | 5.03  |
| Ephedra viridis                 | -             | 16.64 | 15.86 |
| Eriogonum nummulare             | -             | -     | .11   |
| Juniperus osteosperma           | 4.80          | 14.00 | 9.83  |
| Purshia tridentata              | -             | 1.18  | .76   |
| Yucca sp.                       | -             | .45   | .63   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 29R, Study no: 2

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 2.2                        | 2.1 |
| Purshia tridentata              | 5.1                        | 3.5 |

BASIC COVER --

Management unit 29R, Study no: 2

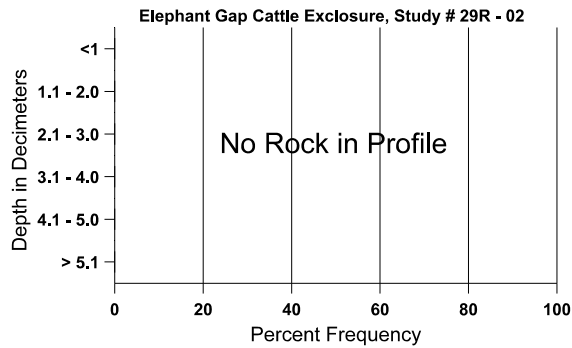
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 37.53           | 25.90 | 19.55 |
| Rock        | .00             | .00   | .01   |
| Pavement    | .08             | 0     | .02   |
| Litter      | 42.49           | 42.98 | 58.50 |
| Cryptogams  | 13.53           | 7.22  | 3.94  |
| Bare Ground | 34.80           | 40.44 | 34.67 |

SOIL ANALYSIS DATA --

Management unit 29R, Study no: 2, Study Name: Elephant Gap Livestock Enclosure

| Effective rooting depth (in) | Temp °F (depth) | pH  | sand  |       |       | %0M | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 25.7                         | 70.8 (17.7)     | 5.5 | 90.7  | 2.7   | 6.6   | 0.6 | 3.8   | 3.2   | 0.8  |

Stoniness Index



PELLET GROUP DATA --

Management unit 29R, Study no: 2

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | -                 | 7   | 74  |
| Deer   | 47                | 29  | 61  |

| Days use per acre (ha) |           |          |
|------------------------|-----------|----------|
| '98                    | '03       | '08      |
| -                      | -         | -        |
| 96 (237)               | 102 (251) | 43 (106) |

BROWSE CHARACTERISTICS --  
Management unit 29R, Study no: 2

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia filifolia</b>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>60</b>                             | -  | -     | 20     | 40       | -    | 0           | 0       | 67         | 33      | 33           | 47/51                     |
| 03  | <b>40</b>                             | -  | -     | 20     | 20       | -    | 50          | 0       | 50         | -       | 0            | 43/47                     |
| 08  | <b>60</b>                             | -  | 40    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 59/69                     |
| <b>Artemisia tridentata tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>1180</b>                           | 60                                       | 80    | 560    | 540      | 1060 | 15          | 0       | 46         | 22      | 24           | 37/38                     |
| 03  | <b>740</b>                            | -  | -     | 40     | 700      | 1480 | 35          | 46      | 95         | 57      | 57           | 26/24                     |
| 08  | <b>820</b>                            | -  | 80    | 280    | 460      | 1640 | 5           | 0       | 56         | 41      | 46           | 27/25                     |
| <b>Chrysothamnus nauseosus hololeucus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 37/50                     |
| 08  | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 33/57                     |
| <b>Echinocereus sp.</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 31/23                     |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Ephedra viridis</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>1060</b>                           | 280                                      | 560   | 480    | 20       | 40   | 0           | 0       | 2          | -       | 0            | 52/81                     |
| 03  | <b>900</b>                            | -  | 100   | 600    | 200      | 20   | 4           | 0       | 22         | 7       | 7            | 43/63                     |
| 08  | <b>1160</b>                           | -  | 240   | 500    | 420      | 40   | 26          | 0       | 36         | -       | 0            | 47/69                     |
| <b>Eriogonum nummularre</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 26/35                     |
| 03  | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 14/19                     |
| 08  | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 0            | 27/44                     |
| <b>Juniperus osteosperma</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08  | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 4/9                       |
| 03  | <b>40</b>                             | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 50           | 4/11                      |
| 08  | <b>60</b>                             | -  | 20    | 20     | 20       | -    | 0           | 0       | 33         | -       | 0            | 4/12                      |

|                             |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                        | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Purshia tridentata</i>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | <b>60</b>                             | -  | 40    | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 36/44                     |
| 03                          | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 48/61                     |
| 08                          | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 100     | 100        | -       | 0            | 33/67                     |
| <i>Tetradymia canescens</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 35/35                     |
| 08                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 39/62                     |
| <i>Yucca sp.</i>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | <b>100</b>                            | -  | 20    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | 24/17                     |
| 03                          | <b>100</b>                            | -  | -     | 100    | -        | 40   | 0           | 0       | -          | -       | 0            | 28/28                     |
| 08                          | <b>60</b>                             | -  | 20    | 40     | -        | 80   | 0           | 0       | -          | -       | 0            | 10/9                      |

Trend Study 29R-3-08

Study site name: Elephant Gap Enclosure-Outside.

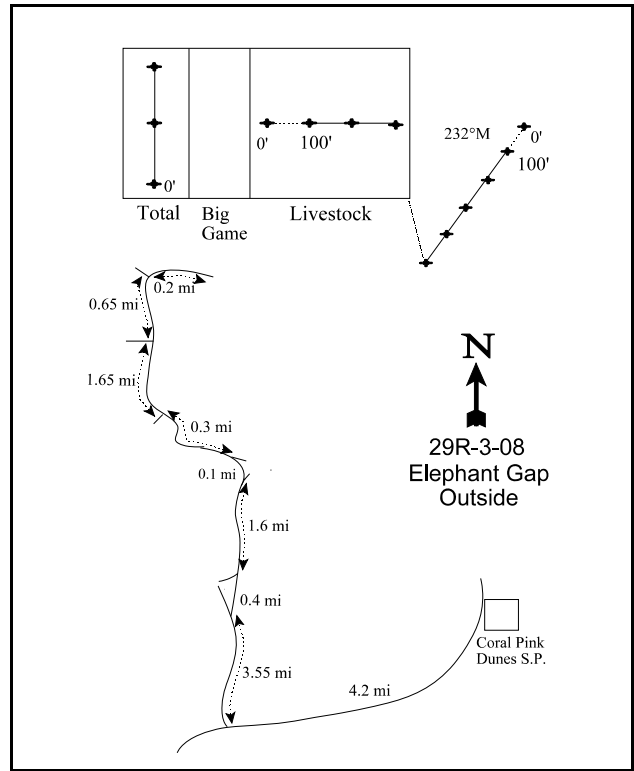
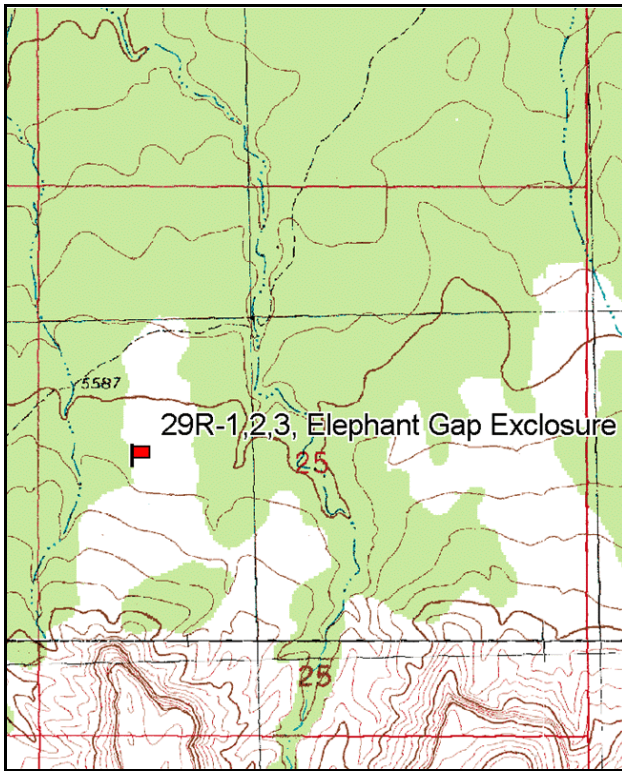
Vegetation type: Pinyon-Juniper.

Compass bearing: frequency baseline 232 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park off of Hwy 89. From the entry of the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 2.7 miles to a cattleguard. Continue on main road for another 0.65 miles to another cattleguard. Drive another 1.75 miles to a faint road to the right (south). Drive on this road for 0.2 miles to the enclosure. From the southeast corner of the livestock enclosure, the 500 foot stake of the baseline is located 25 paces away at an azimuth of 186°M. The 0 foot stake is located 500 feet to the northeast at a bearing of 128°M. Browse tag #117 is attached to the 0 foot stake.



Map Name: The Barracks

Diagrammatic Sketch

Township 42S, Range 9W, Section 25

GPS: NAD 83, UTM 12S 339768 E, 4110650 N



## DISCUSSION

### Elephant Gap Exclosure Outside - Trend Study No. 29R-3

#### Study information

This study was established in 1998 outside of the exclosure complex at Elephant Gap [elevation: 5,600 feet (1,707 m), slope: 7%, aspect: northwest aspect]. The Elephant Gap exclosure complex is located about 16 miles west-northwest of Kanab and about 9 miles northwest of the Coral Pink San Dunes State Park. This exclosure was built in the 1960's just north of Harris Point. The area is composed of an open pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland with a mixed shrub understory. Deer use this area as winter range. Pellet group data estimated deer use at 95 days use/acre (235 ddu/ha) in 1998, 46 days use/acre (114 ddu/ha) in 2003, and 54 deer days use/acre (134 ddu/ha) in 2008. Cattle use was estimated at only 2 days use/acre (5 cdu/ha) in 2003 and 2008.

#### Soils

Soils are very deep, sand in texture, and strongly acidic (pH of 5.4). Effective rooting depth was estimated at 26 inches. Phosphorus and potassium have a low availability for plant growth and development at 3.5 ppm and 51.2 ppm, respectively (Tiedemann and Lopez 2004). There is very little rock or pavement on the surface or within the profile. Relative bare ground cover was higher outside than in either the total or livestock exclosures at 36%-43% since 1998. Relative cryptogamic cover was similar to the livestock exclosure at 8% in 1998 and declining to 3% in 2008. There is some soil pedestalling around shrubs, but erosion does not appear to be a significant problem due to the gentle terrain and high infiltration capacity of the soil. The soil erosion condition was classified as stable in 2008.

#### Browse

The key browse species are basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), green ephedra (*Ephedra viridis*), and antelope bitterbrush (*Purshia tridentata*). Total sagebrush cover was 5% in 1998 declining to 1% in 2008. Sagebrush density numbered 1,520 plants/acre in 1998 and decreased over the next 10 years to 360 plants/acre in 2008. The number of dead and decadent plants has been high in all years the site was read, while recruitment has declined each year. Ephedra density was estimated at 320 plants/acre in 1998, then increased to an average of 490 plants/acre in 2003 and 2008. Bitterbrush is the most preferred species on the site, but it occurs in very low densities. Bitterbrush density was only 20 plants/acre, and displayed heavy use and poor vigor in 2003. No bitterbrush were sampled in 2008. Other shrubs occurring in limited numbers include sand sagebrush (*Artemisia filifolia*), rubber rabbitbrush (*Chrysothamnus nauseosus*), coin buckwheat (*Eriogonum nummularre*), prickly pear (*Opuntia* sp.), yucca (*Yucca* sp.), and gray horsebrush (*Tetrademia canescens*).

Juniper and pinyon trees are found scattered throughout the area. Point-quarter data estimated 29 Utah juniper and 24 pinyon pine trees/acre in 1998. Average basal diameter was 9.8 inches for juniper and 5.5 inches for pinyon. Combined overhead canopy cover for juniper and pinyon was 10% in 2003. Point-quarter data estimated 32 juniper and 22 pinyon trees/acre in 2008.

#### Herbaceous understory

The herbaceous understory is more abundant and diverse than the total exclosure and similar in composition and cover to the livestock exclosure. Grasses provided only 2% cover in 1998, and less than 1% in 2003 and 2008. Sixweeks fescue (*Vulpia octoflora*) was the most abundant grass in 1998 and 2003, although it had declined significantly in nested frequency in 2003. Sand dropseed (*Sporobolus cryptandrus*) was the most abundant perennial species in 1998, but it also significantly decreased in 2003. In 1998, the forb component was dominated by pale evening primrose (*Oenothera pallida*), prairie evening primrose (*Oenothera albicaulis*), and milkvetch (*Astragalus* sp.), as these species combined for 74% of the forb cover and 64% of the total herbaceous cover. Both of the primrose species significantly declined in 2003 in nested frequency with drought conditions, but milkvetch significantly increased in frequency and cover and now dominates the

understory. By 2008, only milkvetch remained of the dominant forb species and accounted for 87% of forb cover and 40% of total vegetative cover.

#### 1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - very poor-poor (34) Mid-level potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is down. Basin big sagebrush is in very poor condition with a 64% decrease in population density, 74% of the remaining population being classified as decadent, and declining vigor and recruitment. Ephedra increased in density due to the high proportion of young in the population in 1998. This species also showed increases in decadence in poor vigor in 2003, but neither is considered high. Bitterbrush remains very limited with only one plant being sampled on the transect. This plant was heavily utilized and was classified as having poor vigor. The grass and forb trends are both down. Grasses were in low abundance in 1998, further decreasing in frequency and cover in 2003. Forbs had good production in 1998 and fair diversity. The nested frequency of evening primrose significantly decreased in 2003 while milkvetch significantly increased. With the drought in 2003, sum of nested frequency of perennial grasses and forbs declined by 35%. Nearly all of the herbaceous perennials showed significant declines in individual nested frequency values in 2003, and diversity was much lower as well.

Winter range condition (DCI) - very poor (22) Mid-level potential scale

browse - down (-2)

grasses - down (-2)

forbs - down (-2)

#### 2008 TREND ASSESSMENT

Browse trend is down. Basin big sagebrush density is down 33% (360 plants/acre) and still has high decadence (67%). Recruitment is down as well with only 20 young/acre (6%). No bitterbrush plants were found this sample. Ephedra has maintained its density (480 plants/acre) while decadence has decreased. No young or seedlings were seen. Grass and forb trends are both stable. Herbaceous understory is dominated by forbs as grasses account for less than half a percent of cover. The sum of nested frequency of both perennial and annual grasses increased. There was a significant increase in the nested frequency of blue grama and cheatgrass. Overall, annual grass cover decreased and perennial grass cover increased since 2003. There was little change in the sum of nested frequency of perennial forbs. Milkvetch is the dominant forb accounting for 87% of forbs and 40% of vegetation cover.

Winter range condition (DCI) - very poor (23) Mid-level potential scale

browse - down (-2)

grasses - stable (0)

forbs - stable (0)

HERBACEOUS TRENDS --  
Management unit 29R, Study no: 3

| Type                        | Species                         | Nested Frequency |                  |                  | Average Cover % |      |      |
|-----------------------------|---------------------------------|------------------|------------------|------------------|-----------------|------|------|
|                             |                                 | '98              | '03              | '08              | '98             | '03  | '08  |
| G                           | <i>Bouteloua gracilis</i>       | <sub>a</sub> 10  | <sub>a</sub> 7   | <sub>b</sub> 41  | .53             | .02  | .16  |
| G                           | <i>Bromus tectorum</i> (a)      | <sub>b</sub> 20  | <sub>a</sub> -   | <sub>c</sub> 49  | .10             | .00  | .15  |
| G                           | <i>Oryzopsis hymenoides</i>     | 1                | 3                | 1                | .03             | .00  | .01  |
| G                           | <i>Sitanion hystrix</i>         | 1                | -                | -                | .03             | -    | -    |
| G                           | <i>Sporobolus cryptandrus</i>   | <sub>b</sub> 40  | <sub>a</sub> 7   | <sub>a</sub> 7   | .68             | .01  | .02  |
| G                           | <i>Vulpia octoflora</i> (a)     | <sub>b</sub> 106 | <sub>a</sub> 43  | <sub>a</sub> 28  | .68             | .72  | .09  |
| Total for Annual Grasses    |                                 | 126              | 43               | 77               | 0.79            | 0.72 | 0.24 |
| Total for Perennial Grasses |                                 | 52               | 17               | 49               | 1.27            | 0.04 | 0.19 |
| Total for Grasses           |                                 | 178              | 60               | 126              | 2.06            | 0.76 | 0.43 |
| F                           | <i>Ambrosia</i> sp.             | -                | -                | -                | .03             | -    | -    |
| F                           | <i>Artemisia dracunculus</i>    | <sub>b</sub> 14  | <sub>a</sub> -   | <sub>a</sub> -   | .53             | -    | -    |
| F                           | <i>Astragalus</i> sp.           | <sub>a</sub> 40  | <sub>b</sub> 118 | <sub>b</sub> 135 | 1.77            | 6.56 | 6.22 |
| F                           | <i>Castilleja linariaefolia</i> | -                | -                | 1                | .01             | -    | .00  |
| F                           | <i>Chaenactis douglasii</i>     | -                | -                | 3                | -               | -    | .00  |
| F                           | <i>Comandra pallida</i>         | <sub>b</sub> 40  | <sub>a</sub> 20  | <sub>a</sub> 20  | .42             | .14  | .40  |
| F                           | <i>Cryptantha</i> sp.           | <sub>b</sub> 28  | <sub>a</sub> -   | <sub>a</sub> 2   | .25             | -    | .00  |
| F                           | <i>Descurainia pinnata</i> (a)  | <sub>b</sub> 26  | <sub>a</sub> -   | <sub>b</sub> 31  | .09             | -    | .11  |
| F                           | <i>Dithyrea wislizenii</i> (a)  | <sub>b</sub> 28  | <sub>a</sub> -   | <sub>a</sub> 2   | .89             | -    | .01  |
| F                           | <i>Draba</i> sp. (a)            | 3                | -                | 14               | .01             | -    | .02  |
| F                           | <i>Eriogonum cernuum</i> (a)    | <sub>c</sub> 92  | <sub>a</sub> -   | <sub>b</sub> 8   | .63             | -    | .02  |
| F                           | <i>Euphorbia</i> sp.            | <sub>b</sub> 26  | <sub>a</sub> -   | <sub>a</sub> -   | .05             | -    | -    |
| F                           | <i>Gilia</i> sp. (a)            | 15               | 17               | 4                | .13             | .31  | .01  |
| F                           | <i>Lappula occidentalis</i> (a) | <sub>a</sub> 5   | <sub>a</sub> -   | <sub>b</sub> 57  | .01             | -    | .16  |
| F                           | <i>Linum kingii</i>             | -                | -                | 1                | -               | -    | .00  |
| F                           | <i>Machaeranthera canescens</i> | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 21  | -               | -    | .13  |
| F                           | <i>Oenothera albicaulis</i> (a) | <sub>b</sub> 40  | <sub>a</sub> -   | <sub>a</sub> -   | 1.77            | -    | -    |
| F                           | <i>Oenothera pallida</i>        | 144              | 73               | -                | 5.56            | 1.60 | -    |
| F                           | <i>Sphaeralcea coccinea</i>     | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 11  | -               | -    | .02  |
| F                           | <i>Sphaeralcea parvifolia</i>   | 7                | -                | -                | .01             | -    | -    |
| F                           | <i>Stephanomeria exigua</i> (a) | -                | 5                | -                | -               | .16  | -    |
| Total for Annual Forbs      |                                 | 209              | 22               | 116              | 3.55            | 0.47 | 0.33 |
| Total for Perennial Forbs   |                                 | 299              | 211              | 194              | 8.66            | 8.30 | 6.80 |
| Total for Forbs             |                                 | 508              | 233              | 310              | 12.22           | 8.78 | 7.13 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 29R, Study no: 3

| Type             | Species                            | Strip Frequency |     |     | Average Cover % |      |      |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|------|------|
|                  |                                    | '98             | '03 | '08 | '98             | '03  | '08  |
| B                | Artemisia filifolia                | 0               | 0   | 1   | .15             | -    | .15  |
| B                | Artemisia frigida                  | 0               | 0   | 0   | -               | -    | .07  |
| B                | Artemisia tridentata tridentata    | 60              | 22  | 16  | 4.83            | 2.29 | 1.25 |
| B                | Chrysothamnus nauseosus hololeucus | 1               | 3   | 4   | .15             | .03  | .56  |
| B                | Ephedra viridis                    | 9               | 11  | 12  | 1.50            | 2.75 | 2.40 |
| B                | Eriogonum nummularae               | 0               | 2   | 0   | .00             | .03  | -    |
| B                | Juniperus osteosperma              | 1               | 2   | 1   | 4.40            | 1.79 | 3.50 |
| B                | Opuntia sp.                        | 7               | 6   | 5   | .03             | .36  | .00  |
| B                | Pinus edulis                       | 0               | 0   | 0   | .66             | .63  | .15  |
| B                | Purshia tridentata                 | 1               | 1   | 0   | .15             | .15  | .03  |
| B                | Tetradymia canescens               | 2               | 1   | 0   | 1.62            | .66  | -    |
| Total for Browse |                                    | 81              | 48  | 39  | 13.52           | 8.70 | 8.13 |

CANOPY COVER, LINE INTERCEPT --

Management unit 29R, Study no: 3

| Species                            | Percent Cover |      |      |
|------------------------------------|---------------|------|------|
|                                    | '98           | '03  | '08  |
| Artemisia tridentata tridentata    | -             | 1.43 | .63  |
| Chrysothamnus nauseosus hololeucus | -             | -    | .13  |
| Ephedra viridis                    | -             | 2.84 | 3.91 |
| Juniperus osteosperma              | 4.00          | 9.00 | 7.98 |
| Opuntia sp.                        | -             | -    | .13  |
| Pinus edulis                       | 1.00          | 1.20 | 1.01 |
| Tetradymia canescens               | -             | .41  | -    |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 29R, Study no: 3

| Species                         | Average leader growth (in) |     |
|---------------------------------|----------------------------|-----|
|                                 | '03                        | '08 |
| Artemisia tridentata tridentata | 2.5                        | 2.2 |
| Purshia tridentata              | 5.7                        | 2.7 |

POINT-QUARTER TREE DATA --  
Management unit 29R, Study no: 3

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 29             | 32  | 32  |
| Pinus edulis          | 24             | 24  | 22  |

| Average diameter (in) |     |      |
|-----------------------|-----|------|
| '98                   | '03 | '08  |
| 9.8                   | 9.8 | 10.8 |
| 5.5                   | 7.2 | 6.8  |

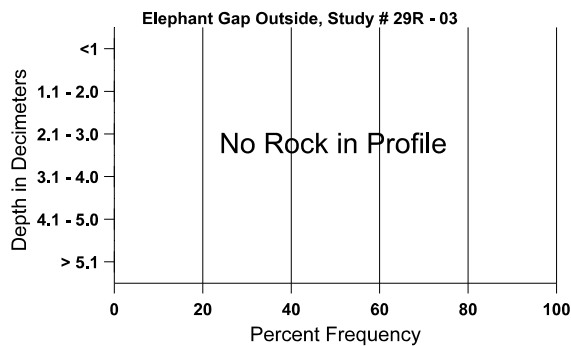
BASIC COVER --  
Management unit 29R, Study no: 3

| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 28.61           | 17.58 | 15.27 |
| Rock        | .01             | .17   | .23   |
| Pavement    | .08             | .02   | .16   |
| Litter      | 38.06           | 33.89 | 39.16 |
| Cryptogams  | 10.76           | 6.68  | 3.96  |
| Bare Ground | 46.34           | 54.31 | 52.88 |

SOIL ANALYSIS DATA --  
Management unit 29R, Study no: 3, Study Name: Elephant Gap Outside

| Effective rooting depth (in) | Temp °F (depth) | pH  | sand  |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 25.9                         | 69.0 (17.7)     | 5.4 | 90.7  | 2.7   | 6.6   | 1.3 | 3.5   | 51.2  | 0.1  |

### Stoniness Index



PELLET GROUP DATA --  
Management unit 29R, Study no: 3

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 7                 | 22  | 89  |
| Deer   | 45                | 37  | 58  |
| Cattle | 1                 | 1   | -   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| 95 (235)               | 46 (114) | 54 (134) |
| -                      | 2 (5)    | 2 (5)    |

BROWSE CHARACTERISTICS --  
Management unit 29R, Study no: 3

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia filifolia</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 32/32                     |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 48/47                     |
| 08  | 20                                    | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | 38/37                     |
| <i>Artemisia tridentata tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 1520                                  | 80                                       | 220   | 620    | 680      | 980  | 28          | 3       | 45         | 28      | 28           | 42/44                     |
| 03  | 540                                   | -  | 60    | 80     | 400      | 1720 | 19          | 30      | 74         | 41      | 44           | 32/30                     |
| 08  | 360                                   | -  | 20    | 100    | 240      | 1500 | 6           | 0       | 67         | 44      | 72           | 34/35                     |
| <i>Cercocarpus montanus</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 24/25                     |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Chrysothamnus nauseosus hololeucus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 20                                    | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | 45/61                     |
| 03  | 60                                    | -  | -     | 40     | 20       | -    | 33          | 0       | 33         | -       | 0            | 41/56                     |
| 08  | 80                                    | 20                                       | 20    | 20     | 40       | -    | 0           | 0       | 50         | 25      | 25           | 35/50                     |
| <i>Ephedra viridis</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 320                                   | -  | 140   | 120    | 60       | 80   | 25          | 0       | 19         | 6       | 6            | 41/83                     |
| 03  | 500                                   | -  | 80    | 260    | 160      | -    | 28          | 0       | 32         | 12      | 12           | 38/53                     |
| 08  | 480                                   | -  | 40    | 360    | 80       | -    | 8           | 0       | 17         | -       | 0            | 35/49                     |
| <i>Eriogonum nummulare</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 36/49                     |
| 03  | 40                                    | -  | -     | 40     | -        | 80   | 50          | 0       | -          | -       | 0            | 21/29                     |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 26/38                     |
| <i>Juniperus osteosperma</i>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 180                                   | -  | 20    | 140    | 20       | -    | 0           | 0       | 11         | 11      | 11           | 4/12                      |
| 03  | 180                                   | -  | -     | 160    | 20       | 20   | 0           | 0       | 11         | -       | 0            | 4/11                      |
| 08  | 180                                   | -  | 40    | 120    | 20       | 20   | 0           | 0       | 11         | -       | 44           | 4/14                      |

|                             |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                        | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Purshia tridentata</i>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | 20                                    | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 11/26                     |
| 03                          | 20                                    | -  | -     | -      | 20       | -    | 0           | 100     | 100        | 100     | 100          | -/-                       |
| 08                          | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 9/11                      |
| <i>Tetradymia canescens</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | 40                                    | -  | -     | 20     | 20       | -    | 0           | 0       | 50         | -       | 0            | 58/65                     |
| 03                          | 20                                    | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | 53/84                     |
| 08                          | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 42/56                     |
| <i>Yucca sp.</i>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                          | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 29/28                     |
| 03                          | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 27/31                     |
| 08                          | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 35/37                     |

## ELEPHANT GAP EXCLOSURE COMPARISON SUMMARY

### Ground Cover

Relative bare ground cover was moderate to high in all of the studies, and relative combined vegetation was moderate in all three studies as well. Not surprisingly, relative bare ground cover was highest outside of the enclosure (29R-3) than both the total enclosure (29R-1) and livestock enclosure (29R-2), which had similar rates (Figure 1a). Contrastingly, relative combined vegetation and litter cover was lowest outside the enclosure than both the total enclosure and livestock enclosure, which again had similar rates (Figure 1b). Surprisingly, relative cryptogam cover was lowest in the total enclosure and had similar rates in the livestock enclosure and outside the enclosure. Cryptogams appear to be declining overall on the site (Figure 1c).

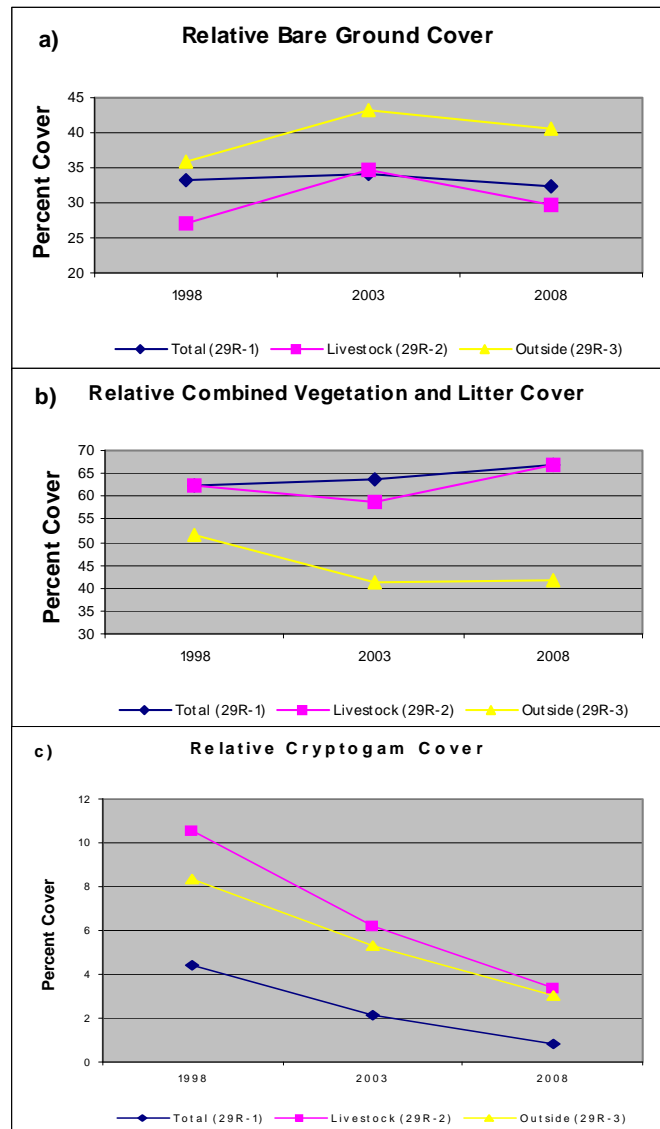
### Browse

The site is characterized by heavy browse cover with a sparse understory of grasses and forbs. The primary browse species is Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) on all three studies. There is a difference in composition of the preferred browse species between the studies. Inside the total enclosure, the preferred browse is a mixture of Basin big sagebrush, antelope bitterbrush (*Purshia tridentata*), and green ephedra (*Ephedra viridis*). In the livestock enclosure and outside of the enclosure, the preferred browse species are Basin big sagebrush and green ephedra, with sparse amounts of antelope bitterbrush (Table 1).

### Herbaceous Understory

The herbaceous understory is limited, particularly the grasses, in all three of the enclosure studies. The dominant perennial grass in all three studies was blue grama (*Bouteloua gracilis*). Other perennial grass species include Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), and sand dropseed (*Sporobolus cryptandrus*) occurring in very low nested frequencies and cover. Sand dropseed was a co-dominant perennial grass species at the outset of the studies in 1998, but nested frequency of sand dropseed decreased significantly in all three studies in 2003. Perennial grass species diversity, nested frequency, and cover were highest in the total enclosure and lowest outside of the enclosure (Table 2). Two annual grass species, cheatgrass (*Bromus tectorum*) and sixweeks fescue (*Vulpia octoflora*), are also present on the site at low frequencies and cover in all three studies.

Perennial forbs are more abundant on the site than grasses, but are still limited in composition and nested frequency. The dominant perennial forbs in all three studies were a milkvetch (*Astragalus* sp.) and pale



**Figure 1.** a) Relative bare ground cover of the three enclosure studies, total enclosure (29R-1), livestock enclosure (29R-2), and outside the enclosure (29R-3), at the Elephant Gap enclosure complex. b) Relative combined vegetation and litter cover of the three enclosure studies at the Elephant Gap enclosure complex. c) Relative cryptogam cover of the three enclosure studies at the Elephant Gap enclosure complex.



evening primrose (*Oenothera pallida*). Bastard toadflax (*Comandra pallida*) was also common in the livestock enclosure and outside the enclosure. Perennial forb species diversity, nested frequency, and cover were higher in the livestock enclosure and outside of the enclosure than in the total enclosure (Table 3). The presence of toadflax inside the livestock enclosure and outside the enclosure represented much of the higher nested frequency and cover of perennial forb species observed in those studies.

| Study Name           | Year | Basin Big Sagebrush      |                  | Green Ephedra            |                  | Antelope Bitterbrush     |                  |
|----------------------|------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|
|                      |      | Density<br>(plants/acre) | Percent<br>Cover | Density<br>(plants/acre) | Percent<br>Cover | Density<br>(plants/acre) | Percent<br>Cover |
| Total Enclosure      | 1998 | 1280                     | 6.46             | 120                      | 0.56             | 240                      | 3.56             |
| (29R-1)              | 2003 | 760                      | 5.61             | 140                      | 0.57             | 200                      | 4.09             |
|                      | 2008 | 880                      | 2.71             | 160                      | 0.66             | 200                      | 3.59             |
| Livestock Enclosure  | 1998 | 1180                     | 4.79             | 1060                     | 8.32             | 60                       | 0.66             |
| (29R-2)              | 2003 | 740                      | 2.14             | 900                      | 11.07            | 20                       | 0.53             |
|                      | 2008 | 820                      | 1.91             | 1160                     | 9.48             | 20                       | 0.76             |
| Outside of Enclosure | 1998 | 1520                     | 4.83             | 320                      | 1.50             | 20                       | 0.15             |
| (29R-3)              | 2003 | 540                      | 2.29             | 500                      | 2.75             | 20                       | 0.15             |
|                      | 2008 | 360                      | 1.25             | 480                      | 2.40             | 0                        | 0.03             |

**Table 1.** Estimated density and quadrat cover of the preferred browse species in the three enclosure studies at the Elephant Gap enclosure complex.

| Study Name          | Year | Perennial Grass Species |                            |               | Annual Grass Species |                            |               |
|---------------------|------|-------------------------|----------------------------|---------------|----------------------|----------------------------|---------------|
|                     |      | <i>n</i>                | Sum of Nested<br>Frequency | Percent Cover | <i>n</i>             | Sum of Nested<br>Frequency | Percent Cover |
| Total Enclosure     | 1998 | 5                       | 99                         | 2.04          | 2                    | 24                         | 0.52          |
| (29R-1)             | 2003 | 6                       | 55                         | 0.62          | 0                    | 0                          | 0.32          |
|                     | 2008 | 6                       | 83                         | 1.75          | 2                    | 10                         | 0.06          |
| Livestock Enclosure | 1998 | 5                       | 49                         | 1.49          | 2                    | 62                         | 0.52          |
| (29R-2)             | 2003 | 4                       | 41                         | 1.04          | 0                    | 0                          | 0             |
|                     | 2008 | 3                       | 46                         | 0.37          | 2                    | 95                         | 0.59          |
| Outside Enclosure   | 1998 | 4                       | 52                         | 1.27          | 2                    | 126                        | 0.79          |
| (29R-3)             | 2003 | 3                       | 17                         | 0.04          | 1                    | 43                         | 0.72          |
|                     | 2008 | 3                       | 49                         | 0.19          | 2                    | 77                         | 0.24          |

**Table 2.** Number of species sampled, sum of nested frequency, and cover of perennial grasses and annual grasses in the three studies at the Elephant Gap enclosure complex.

| Study Name          | Year | Perennial Forb Species |                                |                      | Annual Forb Species |                                |                      |
|---------------------|------|------------------------|--------------------------------|----------------------|---------------------|--------------------------------|----------------------|
|                     |      | <i>n</i>               | <i>Sum of Nested Frequency</i> | <i>Percent Cover</i> | <i>n</i>            | <i>Sum of Nested Frequency</i> | <i>Percent Cover</i> |
| Total Exclosure     | 1998 | 3                      | 108                            | 3.00                 | 5                   | 35                             | 0.52                 |
| (29R-1)             | 2003 | 3                      | 69                             | 1.69                 | 3                   | 24                             | 0.32                 |
|                     | 2008 | 3                      | 74                             | 2.26                 | 3                   | 28                             | 0.06                 |
| Livestock Exclosure | 1998 | 8                      | 338                            | 10.07                | 6                   | 63                             | 1.03                 |
| (29R-2)             | 2003 | 4                      | 148                            | 2.64                 | 3                   | 15                             | 0.34                 |
|                     | 2008 | 4                      | 132                            | 2.66                 | 4                   | 118                            | 0.36                 |
| Outside Exclosure   | 1998 | 7                      | 299                            | 8.66                 | 7                   | 209                            | 3.55                 |
| (29R-3)             | 2003 | 3                      | 211                            | 8.30                 | 2                   | 22                             | 0.47                 |
|                     | 2008 | 8                      | 194                            | 6.80                 | 6                   | 116                            | 0.33                 |

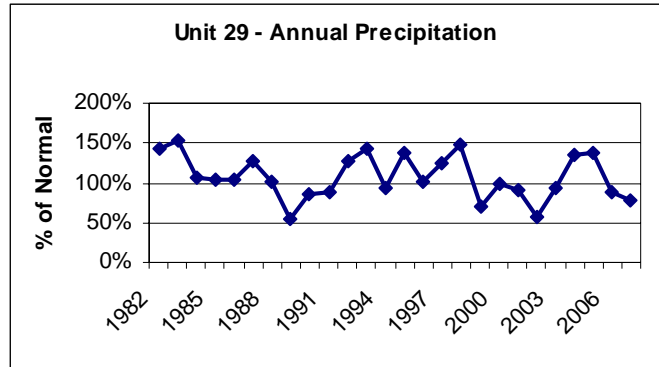
**Table 3.** Number of species sampled, sum of nested frequency, and cover of perennial forbs and annual forbs in the three studies at the Elephant Gap exclosure complex.

## SUMMARY

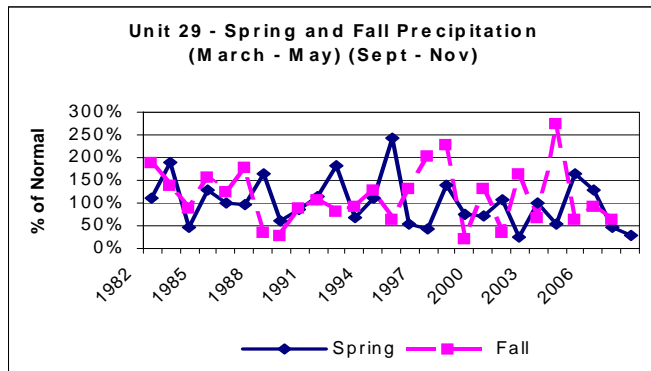
### WILDLIFE MANAGEMENT UNIT 29 - ZION

#### Community Types

Six trend studies were sampled in the Zion unit in 2008. All of the studies sample were winter range. Three of the studies were initially special project studies established at the Elephant Gap enclosure complex to evaluate different grazing effects that have since become regular range trend studies (29R-1, 29R-2, and 29R-3). These studies are in a pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) community. One study is located in a Basin big sagebrush community (29-2). One study is located in a chained and seeded pinyon pine, Utah juniper, and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community (29-3). One study is located in a mountain brush community (29-4).



**Figure 1.** Average annual precipitation data for unit 29, Zion. Precipitation data were collected from the Cedar City FAA Airport, Orderville, Kanab, LaVerkin, and Zion National Park weather stations (Utah Climate Summaries 2008).

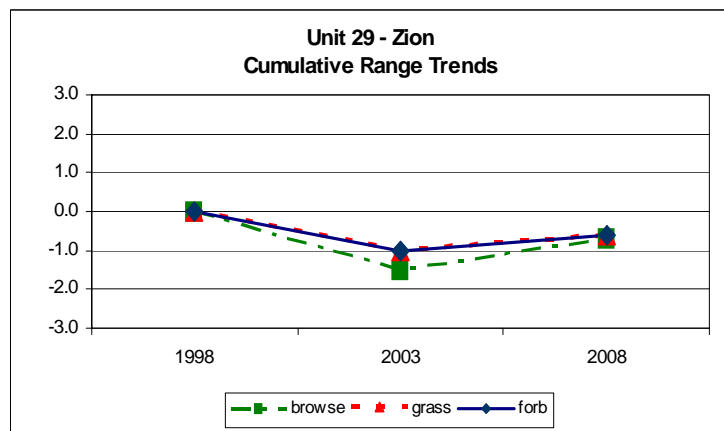


**Figure 2.** Average annual spring (March-May) and fall (Sept.-Nov.) precipitation data for unit 29, Zion. Precipitation data were collected from the Cedar City FAA Airport, Orderville, Kanab, LaVerkin, and Zion National Park weather stations (Utah Climate Summaries 2008).

Fall precipitation (Sept.-Nov.) was near or below 75% of normal in 1995, 2003, 2005, and 2007, and near or below 35% of normal in 1988, 1989, 1999, and 2001 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation, however, benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

#### Precipitation

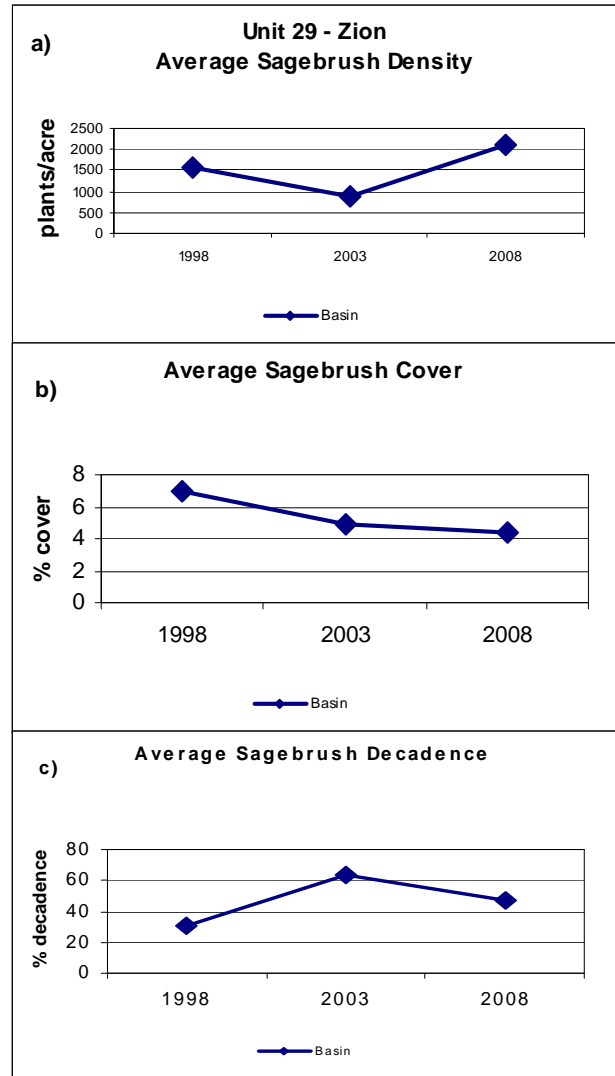
Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Cedar City FAA Airport, Orderville, Kanab, LaVerkin, and Zion National Park weather stations (Figures 1 and 2). Precipitation data are averaged from the inception of the program in 1982 to present (Utah Climate Summaries 2008). The unit annual precipitation average was below or near 75% of normal (drought conditions) in 1999 and 2007, and near 55% in 1989 and 2002 (Figure 1). Spring precipitation (March-May) was below 75% of normal in 1989, 1993, 1999, and 2000, below 55% of normal in 1984, 1996, 1997, 2004, and 2007, and below 30% of normal in 2002 and 2008 (Figure 2).



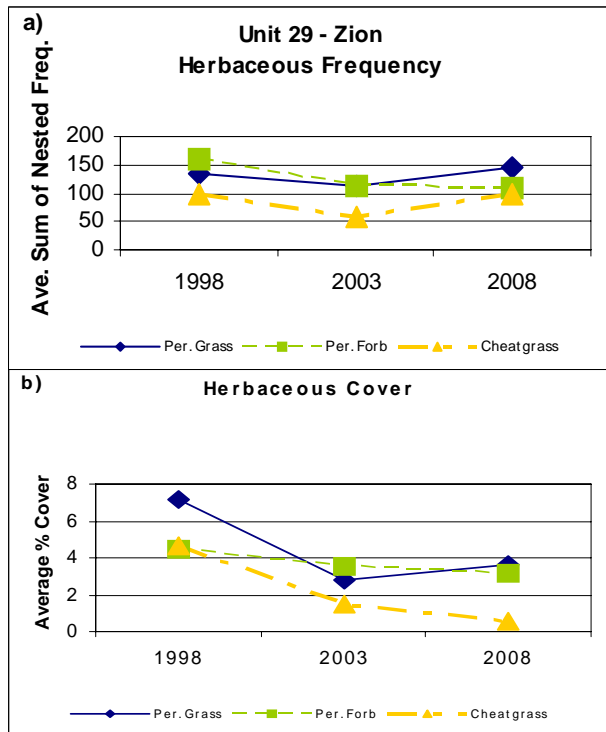
**Figure 3.** Cumulative range trends for unit 29, Zion.

Browse

The cumulative browse trend decreased from in 2003, likely due to drought conditions, then increased again in 2008 (Figure 3). Basin big sagebrush was sampled in four of the studies, Smith’s Mesa (29-2), Elephant Gap Total Exclosure (29R-1), Elephant Gap Livestock Exclosure (29R-2), and Elephant Gap Exclosure Outside (29R-3). Density and cover of basin big sagebrush declined and decadence increased in 2003, likely due to drought conditions. There was a large increase in density of Basin big sagebrush and a decrease in decadence in 2008, but cover continued to decrease. This increase in density is primarily due to the large density of young Basin big sagebrush plants sampled at the Smith’s Mesa study. Black sagebrush (*Artemisia nova*) was only sampled on one site, North Hills (29-3). Mountain big sagebrush was sampled on two sites, North Hills and Barracks Chaining (29-4), but was only sampled on the Barracks Chaining study in 2003 and 2008. Because of the limited data, a summary was not done for these species. For more information on these species refer to the discussion section.



**Figure 4.** a) Average density of Basin big sagebrush unit 29, Zion. b) Average cover of Basin big sagebrush for unit 29. c) Average decadence of Basin big sagebrush for unit 29.



**Figure 5.** a) Average sum of nested frequency of perennial grasses, perennial forbs, and cheatgrass for unit 29, Zion. b) Average cover of perennial grasses, perennial forbs, and cheatgrass for unit 29.

Grass

The cumulative grass trend was similar to the cumulative browse trend decreasing in 2003, likely due to drought condition, and increasing to some extent in 2008 (Figure 3). Average perennial grass nested frequency decreased by 16% from 1998 to 2003, and increased by 29% in 2008 (Figure 7). Average perennial grass cover decreased markedly from 1998 to 2003, and increased slightly in 2008 (Figure 8). Cheatgrass was sampled on all of the studies in this herd unit. Cheatgrass average nested frequency decreased 40% from 1998 to 2003, but increased to near 1998 levels again in 2008 (Figure 7). Average cheatgrass

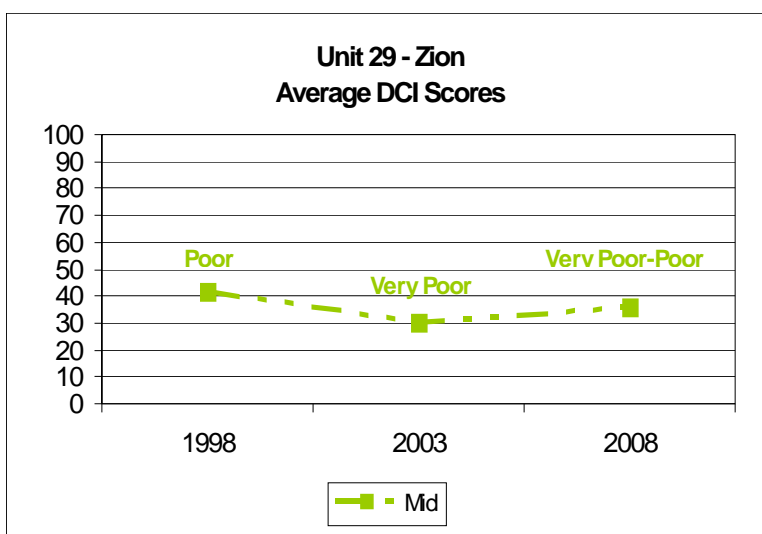
cover steadily decreased from near 5% in 1998 to less than 1% in 2008 (Figure 8).

### Forbs

The cumulative forb trend was almost identical to the cumulative grass trend (Figure 3). Average perennial forb nested frequency decreased 30% from 1998 to 2003, but remained similar between 2003 and 2008 (Figure 7). The decrease in forb frequency in 2003 may be attributed to low annual and spring precipitation from 2002 (Figures 1 and 2). Average perennial forb cover decreased slightly, but steadily, from over 4% in 1998 to 3% in 2008 (Figure 8).

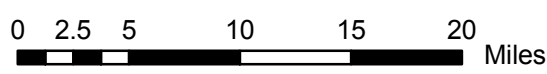
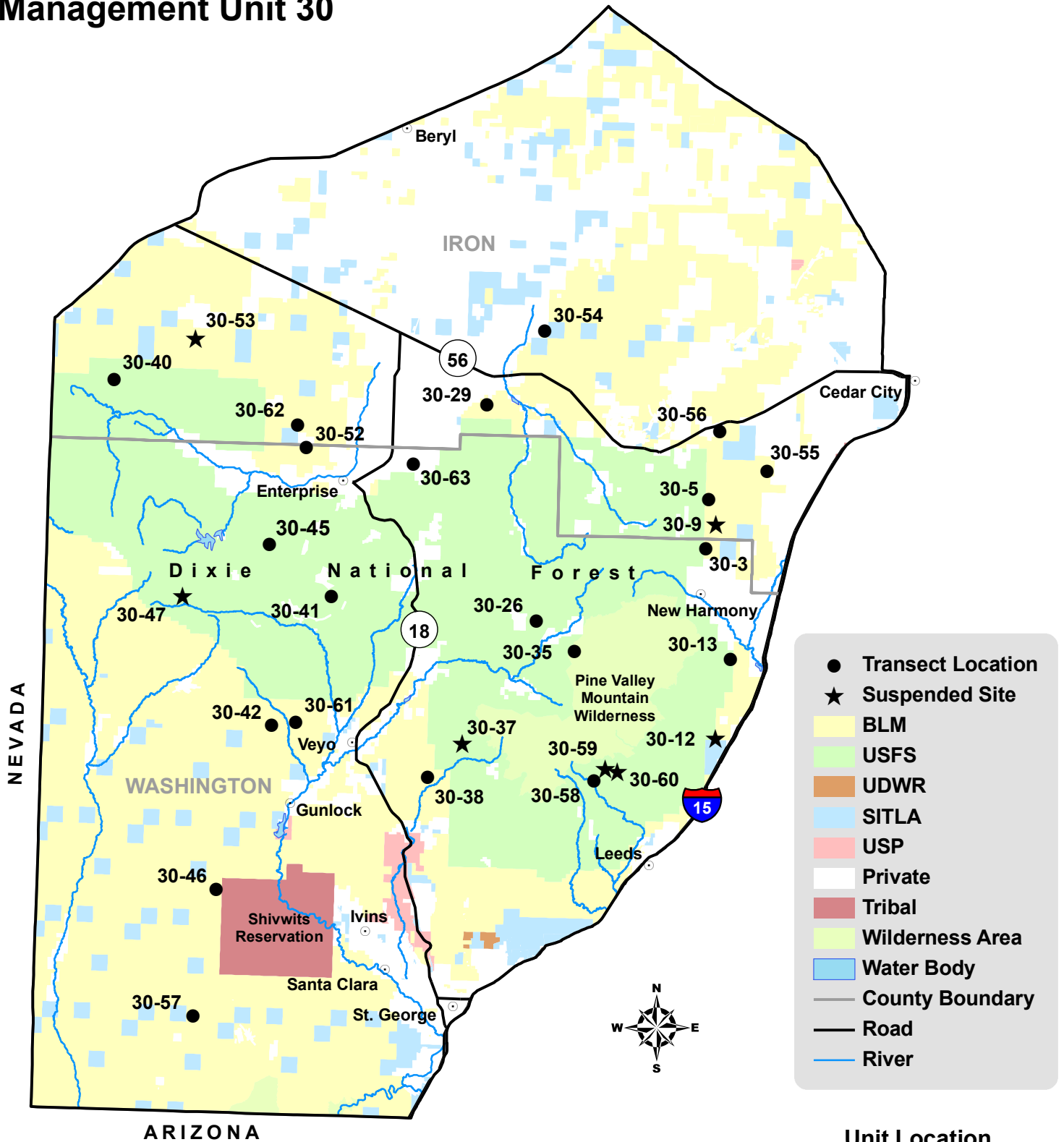
### Desirable Components Index

All six studies in unit 29 were considered to be in the mid-level potential scale for the Desirable Components Index (DCI). The average DCI rating declined for the unit in 2003, but increased again in 2008 (Figure 9). The likely reason for the decline in habitat quality in 2003 was drought. There were general decreases in density of browse and cover of all species for that year.

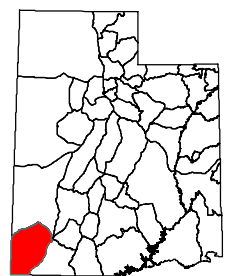


**Figure 6.** Unit 29 Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include, low, mid-level, and high. Only mid-level sites are sampled on this unit.

# Management Unit 30



Unit Location



## WILDLIFE MANAGEMENT UNIT 30 - PINE VALLEY

### Boundary Description

**Iron and Washington counties** - Boundary begins at I-15 and the Utah-Arizona state line; north on I-15 to SR-56; west on SR-56 to the Lund Highway; northwest along the Lund Highway to the Union Pacific railroad tracks at Lund; southwest on the Union Pacific railroad tracks to the Utah-Nevada state line; south on this state line to the Utah-Arizona state line; west on this state line to I-15 and beginning point.

### Management Unit Description

This unit was divided into 3 subunits; 30A West Pine Valley, 30B Comanche, and 30C Pine Valley/Browse prior to 1992. All subunits (A, B, and C) were combined for deer in 2001. The Pine Valley wildlife management unit encompasses the Antelope Range, Harmony Mountains, Pine Valley Mountains, Bull Valley Mountains, and the Beaver Dam Mountains. Unit 30 contains approximately 300,053 acres of summer range, 78% of which is managed by the U.S. Forest Service as part of the Dixie National Forest. Winter range encompasses 466,484 acres, 41% of which occurs on Forest Service lands and 41% occurs on lands administered by the Bureau of Land Management. The I-15 corridor runs on the eastern side of the unit, effectively eliminating deer movement east due to a deer proof fence.

In the past, the assumption has been that summer range is a limiting habitat factor on this unit. However, in reality, the situation is not that simple. There is also a resident deer population in the New Harmony area which further complicates management.

Summer range is confined to elevations above 6,000 to 6,500 feet on the New Harmony and Pine Valley Mountains. The vegetational character is principally oakbrush and mountain brush on the Harmony Mountains and on the lower slopes of the Pine Valleys. Aspen and coniferous types are common on the higher portions of the Pine Valley Mountains, but much less prevalent on the Harmony Mountains. Sagebrush-grass parks and meadowlands can be found at the summit of the Harmony Mountains. These are important areas to deer for short periods during the summer which have been heavily impacted by cattle. Many similar, but more interspersed parklands occur on the northern end of the Pine Valley Mountains. Summer deer concentrations are primarily on the Harmony Mountain and the north end of the Pine Valleys. Relatively few deer summer south of Timber Mountain within unit 30C.

Herd unit 30 winter range varies greatly, depending upon elevation. North of the Great Basin-Colorado River divide, pinyon-juniper and sagebrush-grass predominate. South of the divide, pinyon-juniper is still important, but there are increasing amounts of a desert shrub type dominated by shrub live oak (*Quercus turbinella*) and several other browse species not often found to the north. Both areas possess important acreages of seeded range, most notably east of Pinto at Page Ranch, Woolsey Ranch, New Harmony and Pintura Bench. Deer tend to concentrate on these sites, especially the latter three. The winter range south of Pintura currently supports few deer. A comprehensive study conducted by the Southern Region of the Division of Wildlife Resources on deer population dynamics and habitat use, has contributed greatly to understanding of this herd unit. This study was especially helpful in locating trend studies on critical sites. For example, it is now evident that fawning and fawn rearing habitat are very critical for this unit. Accordingly, studies have been located at known fawning areas. In addition, the winter range is now better defined and critical areas have been identified. These sites were also sampled.

The herd unit varies with elevations of 10,000 feet on the Pine Valley Mountains to lower and drier areas such as Motoqua at an elevation of 4,000 feet. Vegetationally, the summer range consists of dense conifers with a few aspen clones and dry meadows at higher elevations, and mixed oakbrush, mountain brush, southern desert shrub, and sagebrush-grass on lower areas. Most of the summer range is within the officially designated

"wilderness area" which is open to livestock use.

Winter range is extensive, but not uniformly utilized. Pinyon-juniper is the dominant vegetative type, but there are also large areas of sagebrush-grass, southern desert shrub, oakbrush, and mountain brush. Important critical winter concentration areas include the area east of Central, the lower Pinto Creek drainage, the Antelope Range, Iron Mountain, the Shoal Creek drainage, Moody Creek, Tobin Bench, and the middle portion of the East Fork of Beaver Dam Wash. Only during the most severe winters do deer utilize the lower portions of the winter range, especially the Mojave desert areas. During the spring, summer, and fall, critical concentration areas include the higher elevations of the Bull Valley Mountains, Lost Peak, Maple Ridge, the slopes surrounding Pine Valley Reservoir, the meadows of the Whipple Valley area, and Flattop Mountains.

#### Trend Study Site Description

Trend study sites were originally established on the unit in 1982. Most of these sites were reread in 1992, and 1998. In 1986, 4 study sites were established on a burned area on the east side of the Pine Valley mountains. These sites were reread in 1987, 1992, and 1998. In 1998, several of the sites established in 1982 were discontinued and 3 sites were reread that were not read in 1992. In addition, 4 new study sites were established to cover important areas which were not previously being monitored. In 2003 most of the studies read in 1998 were revisited and 3 new trend studies were added.



Trend Study 30-3-08

Study site name: Upper Broad Hollow .

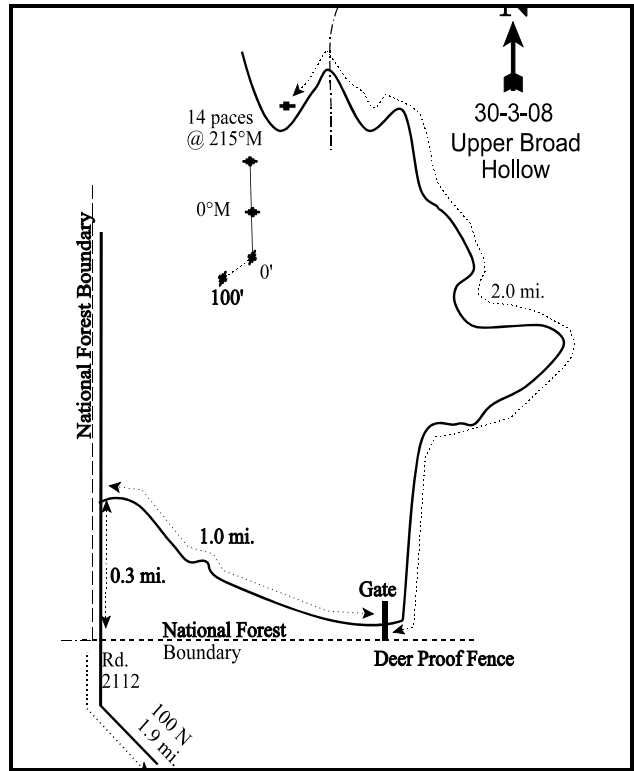
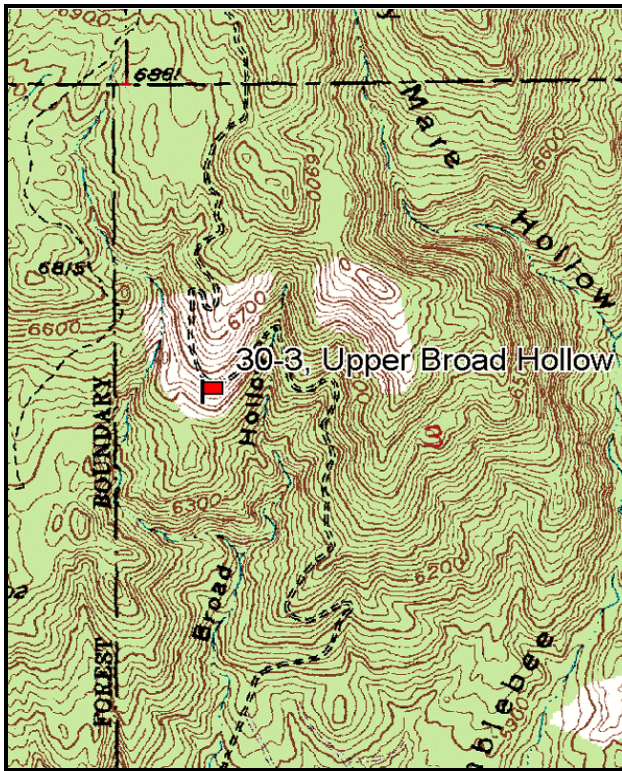
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 215 degrees magnetic. (Line 2 & 3, 0°M)

Frequency belt placement: line 1 (8 & 89ft), line 2 (34 & 71ft), line 3 (59ft). Rebar: belt 3 on 1ft.

LOCATION DESCRIPTION

From the intersection of Harmony Drive and 100 N. in New Harmony, drive north 1.9 miles to the Dixie National Forest boundary. From the boundary, proceed north on Pace Draw Road (Road 2112) for 0.30 miles. Turn right onto Harmony Mountain Road and travel 1.0 miles, at which point there will be a gate. Go through the gate, turn left and travel 2.0 miles to a sharp right-hand turn in the road. On the southwestern side of the road is a witness post. Walk 14 paces at 215 degrees magnetic to the 300-foot stake. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.



Map Name: Stoddard Mountain

Diagrammatic Sketch

Township 38S, Range 13W, Section 3

GPS: NAD 83, UTM 12S 296194 E, 4155175 N

## DISCUSSION

### Upper Broad Hollow - Trend Study No. 30-3

#### Study Information

This site at Upper Broad Hollow is intermediate in elevation, but is still critical deer winter range [elevation: 6,500 feet (1,981 m), slope: 35%, aspect: south]. It is located about three miles north of the town of New Harmony on the Harmony Mountains. The range type is mixed mountain brush, which varies somewhat in composition depending upon slope, exposure, and micro-site characteristics. On steeper south or west slopes, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) prevail. On more easterly slopes, there is more shrub-live oak (*Quercus turbinella*) and Utah serviceberry (*Amelanchier utahensis*) with considerable amounts of bitterbrush, and occasional clumps of Gambel oak (*Quercus gambelii*). Deer use of the entire area, judging from levels of utilization and the number of pellet groups observed, is moderate to heavy. Data from the nearby DWR Broad Hollow pellet group transect taken from 1988 through 1992, indicated heavy deer use with an average of 75 deer days use/acre (185 ddu/ha), the highest average on the herd unit (Jense et al. 1992). A pellet group transect read along the trend study site baseline in 1998 estimated a very high level of deer use at 110 deer days use/acre (272 ddu/ha), high use at 87 ddu/acre in 2003 (215 ddu/ha), and very high use at 160 ddu/acre (395 ddu/ha) in 2008. No signs of livestock grazing were noted during any of the readings.

#### Soils

Soils are relatively shallow and very rocky, derived from limestone parent material. Effective rooting depth is estimated at just over 7 inches. Rocks are very common on the surface and within the soil profile. There is little bare soil exposed, therefore erosion is not a serious problem due to the abundant protective ground cover. Relative combined vegetation and litter cover has been high at 69%-73% from 1998 to 2008. Relative bare ground cover was low at 5%-7% from 1998 to 2003, and increased slightly to 9% in 2008. The erosion condition rating was classified as stable in 2003 and slight in 2008 due to surface litter movement and flow patterns.

#### Browse

The key browse species are Utah Serviceberry, mountain big sagebrush, and antelope bitterbrush. Important secondary species would include curlleaf mountain mahogany (*Cercocarpus ledifolius*). Mountain big sagebrush provides about 25% of the total browse cover on the site. The sagebrush population remained at a relatively constant density between 1982 and 1998 at around 2,300 plants/acre, but declined 25% to 1,720 plants/acre in 2003 with little change in 2008. Utilization of sagebrush has been light to moderate with little heavy use in all sample years. All sagebrush plants displayed good vigor in the 1982 and 1992 surveys, but plants displaying poor vigor have steadily increased from 8% in 1998 to 21% in 2008. Sagebrush decadence has ranged from 18%-36% from 1982 to 2008, with the highest level in 2003. Reproduction of sagebrush was good from 1982 to 2003 with young plants comprising 6%-16% of the total population, but young plants decreased to just 1% in 2008.

Bitterbrush displayed heavier use than sagebrush, especially in 1992 when 69% of the plants were classified as heavily hedged. Density has ranged from 2,133 plants/acre in 1982 to 780 plants/acre in 2008. Some of the differences in numbers between years may be due to problems counting individual plants of this relatively low growing sprawling shrub which had an average crown diameter of 4 feet in 2008. It appears, however, that the population has declined slightly since 1998. Recruitment of young bitterbrush plants has decreased slightly from 12% of the population in 2003 to 5% in 2008.

Utah serviceberry, curlleaf mountain mahogany, and shrub-live oak are mainly large plants with mature populations. Serviceberry was encountered in higher density with the larger sample area used in 1998. Serviceberry density was estimated to be 1,880 plants/acre in 1998, then decreasing 61% to 740 plants/acre in

2003 and 2008. The average mature plant was about 4 feet in height in 1998, 2003, and 2008. Utilization has been mostly light to moderate with some heavy use on certain plants. Vigor has been normal and decadence low during all readings. Reproduction has been good with young plants comprising 16%-30% of the population from 1998 to 2008.

Occasional shrubs which occur on the site include true mountain mahogany (*Cercocarpus montanus* ssp. *montanus*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), grey horsebrush (*Tetradymia canescens*), broom snakeweed (*Gutierrezia sarothrae*), yellowleaf silktassel (*Garrya flavescens*), pinyon pine (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*). Point-quarter data estimated 28 pinyon trees/acre and 40 juniper trees/acre in 2003, and 31 pinyon trees/acre and 32 juniper trees/acre in 2008. Average basal diameter for pinyon was estimated at 7 inches in 2003 and 2008, and for juniper at 5.4 inches in 2003 and 7.9 in 2008.

#### Herbaceous Understory

The herbaceous understory is diverse but only moderately abundant. Total grass cover was estimated at 24% in 1998, but only 12% and 13% in 2003 and 2008, respectively. The most common species is mutton bluegrass (*Poa fendleriana*) which provided 54% of the total grass cover in 1998, 57% in 2003, and 76% in 2008. The annual, cheatgrass (*Bromus tectorum*), is also common providing an additional 39% of the grass cover in 1998, declining to 23% in 2003, and declining further to 12% in 2008. All other grasses occur occasionally. Forbs are diverse, but their total cover was only 5% in 1998 and 2003, and decreased to only 2% in 2008. The common species include false dandelion (*Agoseris glauca*), milkvetch (*Astragalus* spp.), tansy mustard (*Descurainia pinnata*), and an annual Gilia (*Gilia* sp.).

#### 1992 TREND ASSESSMENT

Trend for browse is down due to declining populations of mountain big sagebrush and especially bitterbrush. Bitterbrush declined 50% in density and decadence increased to 31%. The number of bitterbrush plants displaying poor vigor also increased to 13%. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, both grass and forb trends are considered to be stable with increased quadrat frequency for perennial grasses and slightly decreased quadrat frequency of perennial forbs.

browse - down (-2)

grass - stable (0)

forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for key browse species, mountain big sagebrush, bitterbrush and serviceberry, appear stable. Differences in browse density may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Sagebrush displays improved reproduction, and relatively low decadence at 24%. Bitterbrush vigor has improved and decadence has declined from 31% to 14%. Serviceberry shows good vigor and low decadence. Trend for the grasses is slightly down. Sum of nested frequency for perennial grasses has declined slightly, with a significant increase in nested frequency for mutton bluegrass and significant decrease in nested frequency of bottlebrush squirreltail. There was also large increase in the nested frequency of the annual invasive cheatgrass which may have been due to the increased sample area. Trend for forbs is up. The sum of nested frequency of perennial forbs has increased.

winter range condition (DCI) - good (78) High potential scale

browse - stable (0)

grass - slightly down (-1)

forb - up (+2)

#### 2003 TREND ASSESSMENT

Trend for the key browse species, serviceberry, mountain big sagebrush, and bitterbrush, is mixed. Trend for serviceberry and bitterbrush is relatively stable. Vigor remains good and decadence low in both species. Density estimates have declined for both species, however, it appears that density was overestimated in 1998 since cover numbers are similar between readings and few dead plants were sampled in 2003. Mountain big

sagebrush shows a downward trend. Density has declined 25%, and the proportion of decadent plants increased from 24% in 1998 to 36%. Recruitment has declined with only 6% of the sagebrush population comprised of young plants, down from 16% in 1998. Trend for browse is considered slightly down. Trend for the grasses is slightly down. Sum of nested frequency has declined slightly for perennial grasses, and cover of perennial grasses declined from 15% in 1998 to 9%. The key grasses, mutton bluegrass and bottlebrush squirreltail, both declined significantly. One positive aspect of the grass composition is the significant decline in nested frequency of cheatgrass. The trend for forbs is down. The sum of nested frequency of perennial forbs declined 47% from 1998, and perennial forb cover decreased from 4% in 1998 to 2%. Total herbaceous production was poor this year, likely due to drought conditions. In 1998, total herbaceous cover was estimated at nearly 30% (24% grasses 5% forbs). During the 2003 reading, total herbaceous cover was estimated at only 16%. Total forb cover remained at 5% but total grass cover declined to only 12%. Part of the decline is due to the drop in cheatgrass cover, 9.5% to 3% cover, but cover of mutton bluegrass also declined by 50% (13% to 6.6%).

winter range condition (DCI) - fair-good (70) High potential scale  
browse - slightly down (-1)      grass - slightly down (-1)      forb - down (-2)

**2008 TREND ASSESSMENT**

Trend for the key browse species, serviceberry, mountain big sagebrush, and antelope bitterbrush, is stable. Serviceberry density, vigor, and recruitment of young plants has remained similar to 2003 levels. Decadence in serviceberry has increased slightly to 14%, but is still considered low. Sagebrush density and decadence are similar to 2003 levels. Sagebrush plants displaying poor vigor have increased slightly to 21% and recruitment has decreased with just 1% of the population being comprised of young plants. Bitterbrush density has decreased slightly, but vigor remains good in the population. Decadence in bitterbrush increased from 9% in 2003 to 23%, and recruitment of young plants decreased from 12% of the population to 5%. The trend for grasses is stable. There was little to no change in the sum of nested frequency of any grass species, though the cover of perennial species increased slightly and cover of annual species (i.e. cheatgrass) decreased slightly. The trend for forbs is up. The sum of nested frequency of perennial forbs increased by 60% from 2003, though the cover of perennial forbs has remained similar.

winter range condition (DCI) - fair-good (70) High potential scale  
browse - stable (0)      grass - stable (0)      forb - up (+2)

**HERBACEOUS TRENDS --**  
**Management unit 30 , Study no: 3**

| T<br>y<br>p<br>e | Species             |                  |                  |                  |                  | Average Cover % |      |      |
|------------------|---------------------|------------------|------------------|------------------|------------------|-----------------|------|------|
|                  |                     | '92              | '98              | '03              | '08              | '98             | '03  | '08  |
| G                | Agropyron cristatum | -                | -                | -                | 1                | .03             | -    | .00  |
| G                | Bouteloua gracilis  | 2                | 3                | 2                | 3                | .15             | .03  | .03  |
| G                | Bromus tectorum (a) | -                | <sub>b</sub> 264 | <sub>a</sub> 124 | <sub>a</sub> 131 | 9.47            | 2.66 | 1.56 |
| G                | Festuca ovina       | -                | 3                | -                | -                | .00             | -    | -    |
| G                | Koeleria cristata   | 34               | 31               | 27               | 20               | .81             | .94  | .81  |
| G                | Poa fendleriana     | <sub>a</sub> 166 | <sub>b</sub> 216 | <sub>a</sub> 155 | <sub>a</sub> 158 | 13.11           | 6.58 | 9.60 |
| G                | Sitanion hystrix    | 118              | 19               | 26               | 29               | .31             | .90  | .57  |
| G                | Stipa comata        | 7                | 6                | 10               | 5                | .36             | .39  | .12  |

| Type | Species                             |     |      |      |      | Average Cover % |       |       |
|------|-------------------------------------|-----|------|------|------|-----------------|-------|-------|
|      |                                     | '92 | '98  | '03  | '08  | '98             | '03   | '08   |
|      | Total for Annual Grasses            | 0   | 264  | 124  | 131  | 9.47            | 2.66  | 1.56  |
|      | Total for Perennial Grasses         | 327 | 278  | 220  | 216  | 14.79           | 8.85  | 11.13 |
|      | Total for Grasses                   | 327 | 542  | 344  | 347  | 24.26           | 11.52 | 12.69 |
| F    | <i>Agoseris glauca</i>              | a6  | c46  | ab26 | bc43 | .58             | .18   | .38   |
| F    | <i>Allium</i> sp.                   | -   | 10   | -    | -    | .04             | -     | -     |
| F    | <i>Androstephium breviflorum</i>    | 1   | -    | -    | -    | -               | -     | -     |
| F    | <i>Arabis</i> sp.                   | -   | -    | 2    | -    | -               | .00   | -     |
| F    | <i>Artemisia ludoviciana</i>        | b18 | a-   | a-   | ab6  | -               | -     | .03   |
| F    | <i>Arenaria macradenia</i>          | a-  | a-   | b16  | a1   | -               | 1.09  | .15   |
| F    | <i>Astragalus straturensis</i>      | 7   | -    | -    | -    | -               | -     | -     |
| F    | <i>Aster</i> sp.                    | -   | 1    | -    | -    | .00             | -     | -     |
| F    | <i>Astragalus</i> sp.               | c32 | bc19 | a5   | ab9  | .91             | .04   | .21   |
| F    | <i>Astragalus utahensis</i>         | -   | -    | -    | -    | .03             | -     | -     |
| F    | <i>Brodiaea pulchella</i>           | a-  | a-   | a-   | b43  | -               | -     | .18   |
| F    | <i>Castilleja linariaefolia</i>     | b23 | ab6  | a1   | a4   | .06             | .01   | .01   |
| F    | <i>Calochortus nuttallii</i>        | -   | -    | 2    | 1    | -               | .00   | .00   |
| F    | <i>Collomia linearis</i> (a)        | a-  | a-   | b19  | a-   | -               | .37   | -     |
| F    | <i>Comandra pallida</i>             | -   | -    | 5    | -    | -               | .06   | -     |
| F    | <i>Collinsia parviflora</i> (a)     | -   | a14  | b53  | a29  | .03             | .55   | .09   |
| F    | <i>Cymopterus</i> sp.               | -   | 8    | -    | 3    | .06             | -     | .03   |
| F    | <i>Descurainia pinnata</i> (a)      | -   | b57  | b67  | a6   | .38             | .99   | .01   |
| F    | <i>Dichelostemma pulchellum</i>     | a-  | b33  | a-   | a-   | 1.55            | -     | -     |
| F    | <i>Draba</i> sp. (a)                | -   | 2    | 6    | 6    | .00             | .01   | .01   |
| F    | <i>Erysimum asperum</i>             | 4   | 3    | -    | -    | .03             | -     | -     |
| F    | <i>Erodium cicutarium</i> (a)       | -   | b13  | a-   | a1   | .52             | -     | .00   |
| F    | <i>Eriogonum</i> sp.                | -   | -    | 1    | -    | -               | .00   | -     |
| F    | <i>Erigeron pumilus</i>             | 1   | 8    | 7    | 5    | .07             | .18   | .18   |
| F    | <i>Eriogonum racemosum</i>          | -   | -    | 1    | -    | -               | .00   | -     |
| F    | <i>Gilia</i> sp. (a)                | -   | a-   | c103 | b22  | -               | 1.01  | .07   |
| F    | <i>Lappula occidentalis</i> (a)     | -   | -    | 3    | 6    | -               | .00   | .01   |
| F    | <i>Lactuca serriola</i>             | 6   | -    | -    | -    | -               | -     | -     |
| F    | <i>Microsteris gracilis</i> (a)     | -   | a10  | b30  | a6   | .03             | .12   | .02   |
| F    | <i>Orobanche fasciculata</i>        | -   | -    | -    | 2    | -               | -     | .01   |
| F    | <i>Phlox hoodii</i>                 | -   | -    | 1    | 5    | -               | .03   | .16   |
| F    | <i>Senecio multilobatus</i>         | -   | -    | 4    | 5    | -               | .01   | .06   |
| F    | <i>Sphaeralcea grossulariifolia</i> | -   | 6    | 4    | 7    | .06             | .04   | .21   |

| T<br>y<br>p<br>e          | Species                         |                  |                  |                 |                | Average Cover % |      |      |
|---------------------------|---------------------------------|------------------|------------------|-----------------|----------------|-----------------|------|------|
|                           |                                 | '92              | '98              | '03             | '08            | '98             | '03  | '08  |
| F                         | <i>Stephanomeria tenuifolia</i> | <sub>b</sub> .16 | <sub>b</sub> .16 | <sub>b</sub> .8 | <sub>a</sub> - | .13             | .19  | -    |
| F                         | <i>Zigadenus paniculatus</i>    | -                | 3                | 1               | -              | .00             | .00  | -    |
| Total for Annual Forbs    |                                 | 0                | 96               | 281             | 76             | 0.97            | 3.07 | 0.22 |
| Total for Perennial Forbs |                                 | 114              | 159              | 84              | 134            | 3.57            | 1.88 | 1.63 |
| Total for Forbs           |                                 | 114              | 255              | 365             | 210            | 4.54            | 4.96 | 1.86 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 3

| T<br>y<br>p<br>e | Species  | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | <i>Amelanchier utahensis</i>                     | 30              | 23  | 24  | 12.87           | 11.09 | 10.02 |
| B                | <i>Artemisia nova</i>                            | 0               | 1   | 0   | -               | .15   | -     |
| B                | <i>Artemisia tridentata vaseyana</i>             | 64              | 57  | 55  | 8.79            | 6.16  | 8.01  |
| B                | <i>Chrysothamnus parryi</i>                      | 6               | 4   | 10  | .30             | 1.32  | .55   |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 5               | 0   | 5   | .15             | -     | .66   |
| B                | <i>Garrya flavescens</i>                         | 4               | 2   | 5   | .00             | 1.00  | 1.48  |
| B                | <i>Gutierrezia sarothrae</i>                     | 1               | 3   | 1   | .00             | .18   | .00   |
| B                | <i>Juniperus osteosperma</i>                     | 1               | 1   | 1   | .78             | 1.85  | 4.56  |
| B                | <i>Opuntia sp.</i>                               | 3               | 5   | 1   | .15             | .15   | .00   |
| B                | <i>Pinus edulis</i>                              | 3               | 1   | 2   | 2.99            | 3.12  | 3.00  |
| B                | <i>Purshia tridentata</i>                        | 34              | 30  | 27  | 5.40            | 3.85  | 5.18  |
| B                | <i>Quercus turbinella</i>                        | 4               | 2   | 5   | .39             | 1.61  | 1.48  |
| B                | <i>Tetradymia canescens</i>                      | 1               | 3   | 5   | .03             | .03   | .03   |
| Total for Browse |  | 156             | 132 | 131 | 31.87           | 30.53 | 34.98 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 3

| Species                                   | Percent Cover |       |      |
|---|---------------|-------|------|
|   | '98           | '03   | '08  |
| Amelanchier utahensis                     | -             | 11.76 | 9.48 |
| Artemisia tridentata vaseyana             | -             | 5.96  | 8.96 |
| Chrysothamnus parryi                      | -             | .88   | .28  |
| Chrysothamnus viscidiflorus viscidiflorus | -             | .40   | .56  |
| Garrya flavescens                         | -             | .81   | 1.93 |
| Gutierrezia sarothrae                     | -             | -     | .16  |
| Juniperus osteosperma                     | 5.00          | 8.00  | 6.73 |
| Pinus edulis                              | 3.59          | 3.98  | 5.09 |
| Purshia tridentata                        | -             | 5.09  | 6.76 |
| Quercus turbinella                        | -             | 1.53  | 1.14 |
| Tetradymia canescens                      | -             | -     | .16  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 3

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 1.2                        | 0.9 |
| Artemisia tridentata vaseyana | 1.3                        | 0.8 |
| Purshia tridentata            | 1.4                        | 0.8 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 3

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 31             | 40  | 32  |
| Pinus edulis          | 26             | 28  | 31  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 7.2                   | 5.4 | 7.9 |
| 8.2                   | 7.0 | 7.1 |

BASIC COVER --

Management unit 30 , Study no: 3

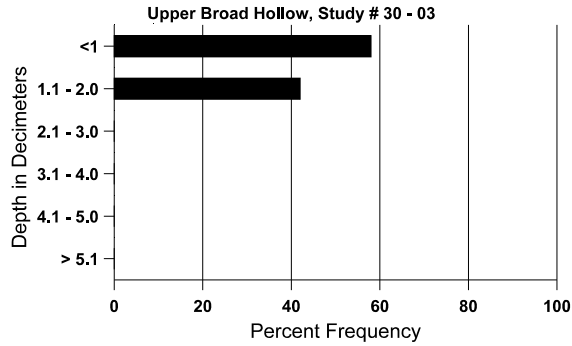
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 0               | 15.25 | 50.70 | 44.51 | 43.36 |
| Rock        | 0               | 19.50 | 27.54 | 20.95 | 21.54 |
| Pavement    | 0               | 4.25  | 5.34  | 3.90  | 6.08  |
| Litter      | 0               | 51.75 | 45.95 | 47.70 | 43.67 |
| Cryptogams  | 0               | 0     | .03   | 0     | .00   |
| Bare Ground | 21.50           | 9.25  | 7.44  | 8.52  | 11.37 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 3, Study Name: Upper Broad Hollow

| Effective rooting depth (in) | Temp °F (depth) | pH |        |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |    | % sand | % silt | % clay |     |       |       |      |
| 7.3                          | 43.5 (11.2)     | -  | -      | -      | -      | -   | -     | -     | -    |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 3

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 29                | 10  | 38  |
| Deer   | 59                | 32  | 38  |

| Days use per acre (ha) |          |           |
|------------------------|----------|-----------|
| '98                    | '03      | '08       |
| -                      | -        | -         |
| 110 (271)              | 87 (215) | 160 (395) |



BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 3

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>199</b>                            | -  | -     | 199    | -        | -    | 33          | 0       | 0          | -       | 0            | 33/41                     |
| 92                                   | <b>332</b>                            | -  | 133   | 199    | -        | -    | 0           | 40      | 0          | -       | 0            | 34/36                     |
| 98                                   | <b>1880</b>                           | 320                                      | 300   | 1480   | 100      | 240  | 27          | 2       | 5          | 2       | 2            | 50/55                     |
| 03                                   | <b>740</b>                            | 20                                       | 220   | 500    | 20       | 40   | 32          | 11      | 3          | -       | 0            | 51/72                     |
| 08                                   | <b>740</b>                            | 180                                      | 200   | 440    | 100      | 100  | 8           | 3       | 14         | -       | 0            | 50/65                     |
| <b>Artemisia nova</b>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 6/15                      |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>2598</b>                           | -  | 199   | 1933   | 466      | -    | 31          | 10      | 18         | -       | 0            | 18/26                     |
| 92                                   | <b>2198</b>                           | 66                                       | 266   | 1466   | 466      | -    | 48          | 9       | 21         | -       | 0            | 16/18                     |
| 98                                   | <b>2300</b>                           | 120                                      | 360   | 1380   | 560      | 980  | 24          | .86     | 24         | 8       | 8            | 20/30                     |
| 03                                   | <b>1720</b>                           | -  | 100   | 1000   | 620      | 640  | 10          | 0       | 36         | 15      | 15           | 21/30                     |
| 08                                   | <b>1700</b>                           | 20                                       | 20    | 1200   | 480      | 680  | 14          | 2       | 28         | 20      | 21           | 23/35                     |
| <b>Cercocarpus ledifolius</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>133</b>                            | -  | -     | 133    | -        | -    | 0           | 0       | -          | -       | 0            | 47/51                     |
| 92                                   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 100     | -          | -       | 0            | 106/106                   |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 60/40                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 33/41                     |
| <b>Chrysothamnus parryi</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                                   | <b>520</b>                            | -  | 40    | 480    | -        | -    | 0           | 0       | 0          | -       | 0            | 12/15                     |
| 03                                   | <b>120</b>                            | -  | -     | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | 20/28                     |
| 08                                   | <b>540</b>                            | 120                                      | 80    | 360    | 100      | -    | 0           | 70      | 19         | -       | 7            | 9/19                      |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98   | 160                                   | -  | 40    | 120    | -        | -    | 0           | 0       | 0          | -       | 0            | 14/24                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 15/28                     |
| 08   | 120                                   | -  | -     | 60     | 60       | -    | 0           | 0       | 50         | 17      | 17           | 14/28                     |
| <b>Garrya flavescens</b>                         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98   | 200                                   | -  | -     | 180    | 20       | -    | 0           | 0       | 10         | -       | 0            | 55/56                     |
| 03   | 40                                    | -  | -     | 40     | -        | 20   | 0           | 0       | 0          | -       | 0            | 56/67                     |
| 08   | 100                                   | -  | -     | 100    | -        | 40   | 20          | 0       | 0          | -       | 20           | 37/55                     |
| <b>Gutierrezia sarothrae</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 40                                    | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 10/15                     |
| 03   | 100                                   | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 12/17                     |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 5/6                       |
| <b>Juniperus osteosperma</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 199                                   | -  | -     | 133    | 66       | -    | 0           | 0       | 33         | -       | 0            | 3/8                       |
| 92   | 199                                   | -  | -     | 199    | -        | -    | 0           | 0       | 0          | -       | 67           | 6/8                       |
| 98   | 60                                    | -  | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 5/11                      |
| 03   | 100                                   | -  | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/15                      |
| 08   | 20                                    | -  | -     | -      | 20       | 20   | 0           | 0       | 100        | -       | 100          | 5/9                       |
| <b>Pinus edulis</b>                              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 60                                    | -  | 20    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 20                                    | 20                                       | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 40                                    | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                             |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                        | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Purshia tridentata</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                          | <b>2133</b>                           | -  | -     | 2133   | -        | -    | 31          | 22      | 0          | -       | 0            | 24/32                     |
| 92                          | <b>1065</b>                           | -  | 333   | 399    | 333      | -    | 13          | 69      | 31         | -       | 13           | 20/35                     |
| 98                          | <b>1320</b>                           | 100                                      | 80    | 1060   | 180      | 40   | 32          | 55      | 14         | 5       | 5            | 26/39                     |
| 03                          | <b>860</b>                            | 20                                       | 100   | 680    | 80       | 80   | 44          | 30      | 9          | 7       | 7            | 27/50                     |
| 08                          | <b>780</b>                            | 40                                       | 40    | 560    | 180      | 80   | 8           | 49      | 23         | 3       | 3            | 27/46                     |
| <b>Quercus turbinella</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                          | <b>265</b>                            | -  | 66    | 199    | -        | -    | 0           | 0       | 0          | -       | 0            | 45/55                     |
| 92                          | <b>398</b>                            | -  | 133   | 66     | 199      | -    | 17          | 50      | 50         | -       | 0            | 39/47                     |
| 98                          | <b>120</b>                            | -  | 60    | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 36/40                     |
| 03                          | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 23/43                     |
| 08                          | <b>160</b>                            | 180                                      | 100   | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 21/19                     |
| <b>Tetradymia canescens</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                          | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                          | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 7/8                       |
| 03                          | <b>60</b>                             | -  | -     | 40     | 20       | -    | 0           | 0       | 33         | -       | 0            | 13/13                     |
| 08                          | <b>120</b>                            | -  | 40    | 60     | 20       | -    | 0           | 0       | 17         | -       | 0            | 11/13                     |

Trend Study 30-5-08

Study site name: Harmony Mountain Summit .

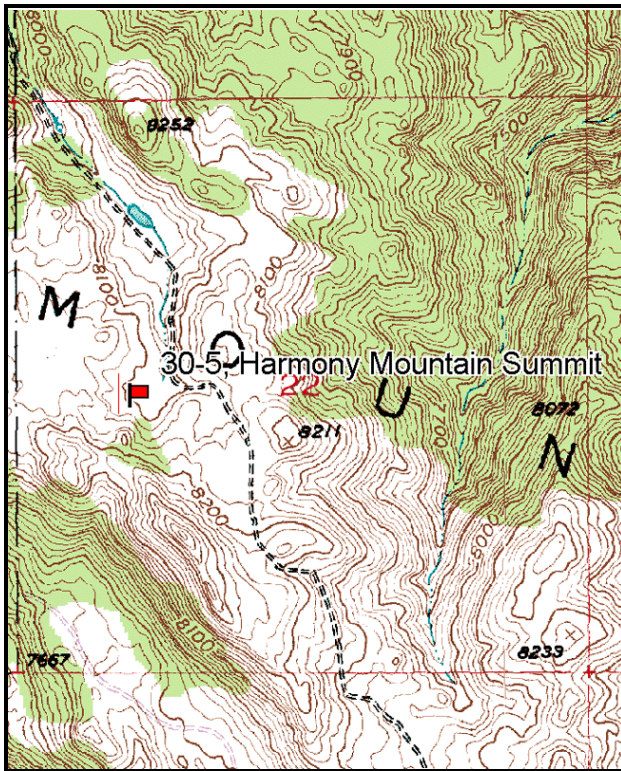
Vegetation type: Low Rabbitbrush .

Compass bearing: frequency baseline 266 degrees magnetic. (Lines 3 & 4, 202°M)

Frequency belt placement: line 1 (12 & 87ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 3 on 1ft.

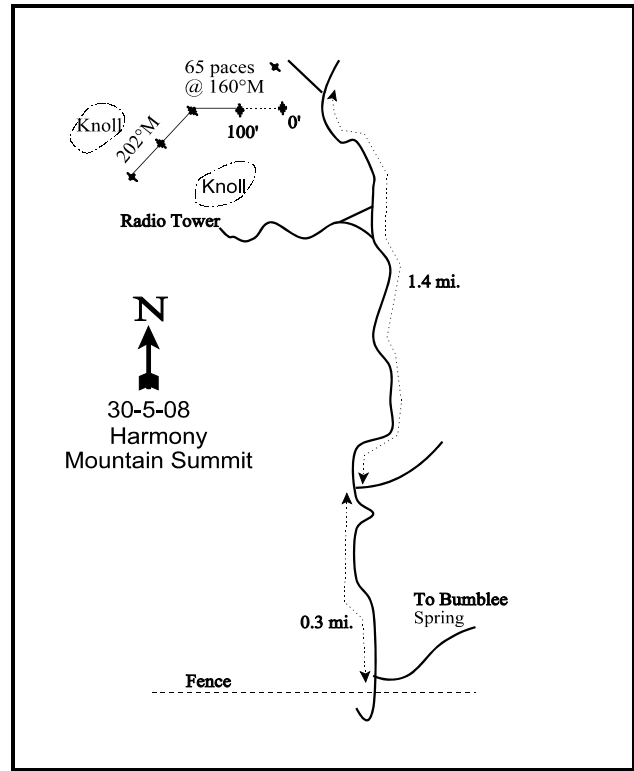
LOCATION DESCRIPTION

From the Dixie National Forest boundary north of New Harmony, proceed north 0.3 miles on Pace Draw Road. Turn right on Harmony Mountain Road and drive 1.0 miles, at which point you should come to a gate. From the fence continue on the main road 4.7 miles to a fork. Stay left and continue on the main road. At 0.3 miles stay left again and continue on the main road 1.4 miles to a fork. Continue left less that 0.1 miles to a witness post on the left (south) side of the road. From the witness post walk 65 paces at 160 degrees magnetic to the 0-foot stake. The study is marked by green steel fence posts approximately 18 to 24 inches in height.



Map Name: Stoddard Mountain

Township 37S, Range 13W, Section 22



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 296480 E, 4160026 N

## DISCUSSION

### Harmony Mountain Summit - Trend Study No. 30-5

#### Study Information

The study monitors deer summer range, characterized by open parks interspersed with scattered aspen and oak clones [elevation: 8,100 feet (2,469 m), slope:10%-15%, aspect: northeast]. The area has been heavily impacted by domestic livestock grazing and undergone a nearly complete type conversion to stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). What formerly was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)-grass type is now dominated by stickyleaf low rabbitbrush, needlegrass species (*Stipa* spp.), and limited numbers of increaser forb species. Cattle were using the site during the 1992 reading in mid-June. Deer utilize the area in summer as two does were encountered on the site during the 1992 reading. Pellet group data estimated heavy deer use in 1998 and 2003 (73 deer days use/acre:180 ddu/acre and 88 ddu/acre:216 ddu/ha, respectively), and decreased to moderate use in 2008 (40 ddu/acre:99 ddu/ha). Cattle use was estimated to be moderate in 1998, 2003, and 2008 (26 cow days use/acre: 64 cdu/ha,32 cdu/acre: 79 cdu/ha, and 27 cdu/acre:66 cdu/ha, respectively).

#### Soils

Soils are relatively deep and formed by sedimentation from surrounding ridges. Effective rooting depth is estimated at just over 17 inches. Soil texture is a sandy loam which is strongly acidic (pH 5.4). Soil organic matter is comparatively high at 4.5%. The principal soil disturbance comes from pocket gopher and rock squirrel activity, as well as livestock trampling. The relative combined average vegetation and litter cover has been high at 87%-91% from 1998 to 2008. The erosion condition was classified as stable in 2003 and 2008.

#### Browse

This area is considered summer range for deer, therefore shrubs are not the key vegetational component. However, the key browse species present on the site is mountain big sagebrush which provided 37% of the browse cover in 1998 and 2008, and 49% cover in 2003. Density of sagebrush increased from 1,532 plants/acre in 1982 to 8,640 plants/acre in 2003, before decreasing slightly to 5,820 plants/acre in 2008. Seedling and young recruitment was good from 1992 to 2003, but decreased significantly in 2008. Utilization is mostly light, vigor good, and decadence was low from 1992 to 2003. Sagebrush decadence increased from 5% in 2003 to 25% in 2008.

Stickyleaf low rabbitbrush is the most abundant shrub on the site. It provided 62% of the total shrub cover in 1998, 50% in 2003, and 60% in 2008. It has had an average density of about 12,000 plants/acre between 1992 and 2008. Young recruitment has been excellent to good with each reading, yet the population is becoming increasingly mature as it has apparently reached its carrying capacity. Most plants are not utilized and are in good vigor. Other browse species found on the site include Parry rabbitbrush (*Chrysothamnus parryi*), slenderbush eriogonum (*Eriogonum microthecum*), barberry (*Mahonia repens*), and snowberry (*Symphoricarpos oreophilus*). A few aspen (*Populus tremuloides*) trees are also found near the baseline.

#### Herbaceous Understory

The herbaceous understory is abundant and diverse although composition consists largely of increaser species. The grass composition is dominated by Letterman needlegrass (*Stipa lettermani*), subalpine needlegrass (*Stipa columbiana*), and needle-and-thread grass (*Stipa comata*). These grasses accounted for 92% of the grass cover in 1998, and 94% in 2003 and 2008. Virtually all grass plants were 30% to 50% utilized in 1982. Many of the grasses were grazed in 1992, but utilization was not estimated. More preferred grasses, which could be considered decreaser species on this site, include low numbers of slender wheatgrass (*Agropyron trachycaulum*) and mountain brome (*Bromus carinatus*).

Forbs are also abundant, except composition consists largely of increasers like pale agoseris (*Agoseris glauca*),

common dandelion (*Taraxacum officinale*), and the poisonous silky lupine (*Lupinus sericeus*). The more palatable species, Indian paintbrush (*Castilleja linariaefolia*) and redroot eriogonum (*Eriogonum racemosum*), have shown evidence of at least moderate use in the past. Pale agoseris and silky lupine produced 69% of the total forb cover in 1998, and 72% in 2003 and 2008. Most other forbs produced less than one-half of 1% cover. Other, more preferred forbs are present, but in low numbers.

#### 1992 TREND ASSESSMENT

The trend for browse is mixed. The key browse species, mountain big sagebrush, has increased dramatically since the last reading. It has good vigor and low decadence. Slender eriogonum has also increased in density. On the downside, the increaser stickyleaf low rabbitbrush has also increased on the site and has an age structure that indicates possible continued increase, especially with continued heavy use of the herbaceous understory by livestock. Trend for browse is up slightly, but close attention should be given to stickyleaf low rabbitbrush in the future. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, the trend for both grasses and forbs is also slightly up, even though they are dominated by less desirable increaser species and poisonous plants.

browse - slightly up (+1)

grass - slightly up (+1)

forb - slightly up (+1)

#### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. The mountain big sagebrush population has become more mature, yet young plants are still common. Sagebrush vigor has remained good, and decadence low at only 7%. Stickyleaf low rabbitbrush is still the most abundant shrub on the site. Young rabbitbrush plants are still common, vigor is good, and decadence is low at 8%. Trend for grasses is slightly down. Sum of nested frequency for perennial grasses has declined by 16%, with the nested frequency of subalpine needlegrass declining significantly. The trend for forbs is down. The sum of nested frequency of perennial forbs declined by 27%. Nested frequency of pale agoseris, Indian paintbrush, redroot eriogonum, and silky lupine all declined significantly.

browse - stable (0)

grass - slightly down (-1)

forb - down (-2)

#### 2003 TREND ASSESSMENT

Trend for browse is up, but on a summer range this it not necessarily desirable. Density of mountain big sagebrush has increased by 30% since 1998 to a very high 8,640 plants/acre. The population is dynamic with high numbers of seedlings and young. The increaser, stickyleaf low rabbitbrush, still dominates the browse composition and it has also increased in density to 12,100 plants/acre. This population is also dynamic with abundant young plants. The shrubs together produced 38% cover in 2003. Trend for grasses is slightly down and species composition remains poor due to domination of increaser species. Sum of nested frequency for perennial grasses has declined by 12% with a significant decline in both needle-and-thread and Letterman needlegrass. The average cover of perennial grasses decreased from 20% in 1992 to about 13%. The trend for forbs is down. Sum of nested frequency for perennial forbs declined sharply by 32%. Total forb cover declined from 10% in 1998 to 4%. Some of the decline in grasses and especially forbs is likely due to the incredibly dry conditions during the past few years. Herbaceous plants are the most important vegetational aspect of this site since it is considered summer range. For deer, perennial forbs are very important especially in the spring and early summer. More desirable grasses and forbs are not abundant.

browse - up (+2)

grass - slightly down (-1)

forb - down (-2)

#### 2008 TREND ASSESSMENT

Trend for browse is down. Density of mountain big sagebrush has decreased by 33% to 5,820 plants/acre. Sagebrush plants displaying poor vigor increased to 13%, and decadence increased to 25%. Recruitment of

new sagebrush plants declined drastically with only 3% of the population being comprised of young plants. The density of stickyleaf low rabbitbrush decreased slightly to 10,280 plants/acre. Vigor of rabbitbrush remained good and decadence was low. Recruitment of rabbitbrush also declined with only 2% of the population being comprised of young plants. Trend for grasses is stable. Sum of nested frequency of perennial grasses has declined slightly, but there was no significant change in any species nested frequency. The cover of perennial grasses also increased slightly to 15%. The trend for forbs is down. The sum of nested frequency of perennial forbs declined by 32% primarily due to a significant decrease in the nested frequency of pale agoseris. The nested frequency of the poisonous forb silvery lupine increased significantly.

browse - down (-2)

grass - stable (0)

forb - down (-2)

HERBACEOUS TRENDS --  
Management unit 30 , Study no: 5

| T<br>y<br>p<br>e            | Species                    |                  |                   |                   |                  | Average Cover % |       |       |
|-----------------------------|----------------------------|------------------|-------------------|-------------------|------------------|-----------------|-------|-------|
|                             |                            | '92              | '98               | '03               | '08              | '98             | '03   | '08   |
| G                           | Agropyron trachycaulum     | -                | 4                 | 3                 | -                | .09             | .00   | -     |
| G                           | Bromus carinatus           | <sub>ab</sub> 8  | <sub>b</sub> 7    | <sub>ab</sub> 3   | <sub>a</sub> -   | .13             | .06   | -     |
| G                           | Carex sp.                  | 7                | 11                | 5                 | 3                | .56             | .41   | .03   |
| G                           | Poa fendleriana            | 3                | 7                 | 4                 | 11               | .21             | .06   | .34   |
| G                           | Poa pratensis              | 27               | 20                | 10                | 21               | .55             | .18   | .41   |
| G                           | Stipa columbiana           | <sub>c</sub> 289 | <sub>ab</sub> 208 | <sub>bc</sub> 250 | <sub>a</sub> 195 | 5.40            | 4.10  | 3.76  |
| G                           | Stipa comata               | <sub>b</sub> 119 | <sub>b</sub> 112  | <sub>a</sub> 54   | <sub>ab</sub> 86 | 2.92            | .99   | 1.89  |
| G                           | Stipa lettermani           | <sub>b</sub> 287 | <sub>b</sub> 256  | <sub>a</sub> 220  | <sub>a</sub> 190 | 10.28           | 6.90  | 8.37  |
| Total for Annual Grasses    |                            | 0                | 0                 | 0                 | 0                | 0               | 0     | 0     |
| Total for Perennial Grasses |                            | 740              | 625               | 549               | 506              | 20.17           | 12.73 | 14.83 |
| Total for Grasses           |                            | 740              | 625               | 549               | 506              | 20.17           | 12.73 | 14.83 |
| F                           | Achillea millefolium       | -                | 7                 | 3                 | -                | .18             | .00   | -     |
| F                           | Agoseris glauca            | <sub>c</sub> 251 | <sub>b</sub> 187  | <sub>b</sub> 172  | <sub>a</sub> 82  | 3.87            | 2.25  | .48   |
| F                           | Antennaria rosea           | 3                | -                 | -                 | -                | -               | -     | -     |
| F                           | Artemisia ludoviciana      | 3                | -                 | -                 | -                | -               | -     | -     |
| F                           | Astragalus sp.             | 4                | 2                 | -                 | -                | .03             | -     | -     |
| F                           | Astragalus utahensis       | -                | 6                 | -                 | -                | .18             | -     | -     |
| F                           | Castilleja linariaefolia   | <sub>c</sub> 53  | <sub>b</sub> 23   | <sub>a</sub> 1    | <sub>a</sub> 3   | .27             | .00   | .00   |
| F                           | Calochortus nuttallii      | -                | 2                 | 2                 | -                | .01             | .01   | -     |
| F                           | Chenopodium fremontii (a)  | -                | 28                | 25                | 18               | .13             | .10   | .04   |
| F                           | Collinsia parviflora (a)   | -                | 14                | 3                 | 2                | .13             | .01   | .00   |
| F                           | Crepis acuminata           | <sub>a</sub> -   | <sub>b</sub> 34   | <sub>a</sub> -    | <sub>a</sub> 3   | .34             | -     | .00   |
| F                           | Delphinium nuttallianum    | <sub>a</sub> -   | <sub>a</sub> 1    | <sub>b</sub> 15   | <sub>a</sub> -   | .03             | .06   | -     |
| F                           | Epilobium brachycarpum (a) | -                | 3                 | 1                 | -                | .00             | .00   | -     |
| F                           | Erigeron eatonii           | -                | 1                 | 8                 | 4                | .01             | .07   | .01   |
| F                           | Erigeron pumilus           | 3                | 2                 | 2                 | -                | .01             | .00   | -     |

| T<br>y<br>p<br>e          | Species                            |                  |                  |                  |                  | Average Cover % |      |      |
|---------------------------|------------------------------------|------------------|------------------|------------------|------------------|-----------------|------|------|
|                           |                                    | '92              | '98              | '03              | '08              | '98             | '03  | '08  |
| F                         | <i>Eriogonum racemosum</i>         | <sub>a</sub> 4   | <sub>b</sub> 12  | <sub>ab</sub> 9  | <sub>b</sub> 13  | .30             | .07  | .10  |
| F                         | <i>Fritillaria atropurpurea</i>    | 1                | -                | -                | -                | -               | -    | -    |
| F                         | <i>Galium</i> sp.                  | <sub>a</sub> -   | <sub>b</sub> 13  | <sub>a</sub> -   | <sub>a</sub> -   | .21             | -    | -    |
| F                         | <i>Gayophytum ramosissimum</i> (a) | -                | -                | 3                | 6                | -               | .00  | .03  |
| F                         | <i>Hackelia patens</i>             | <sub>a</sub> 10  | <sub>b</sub> 28  | <sub>ab</sub> 20 | <sub>ab</sub> 17 | .56             | .58  | .64  |
| F                         | <i>Hymenoxys acaulis</i>           | -                | 6                | -                | -                | .01             | -    | -    |
| F                         | <i>Hydrophyllum occidentale</i>    | 3                | -                | -                | -                | -               | -    | .00  |
| F                         | <i>Lomatium</i> sp.                | -                | 1                | 6                | -                | .00             | .01  | -    |
| F                         | <i>Lupinus sericeus</i>            | <sub>c</sub> 219 | <sub>b</sub> 86  | <sub>a</sub> 35  | <sub>b</sub> 66  | 3.59            | .94  | 3.39 |
| F                         | <i>Orthocarpus</i> sp. (a)         | -                | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 24  | -               | -    | .29  |
| F                         | <i>Penstemon</i> sp.               | -                | 3                | -                | -                | .03             | -    | .00  |
| F                         | <i>Polygonum douglasii</i> (a)     | -                | <sub>c</sub> 156 | <sub>a</sub> 22  | <sub>b</sub> 75  | .72             | .05  | .32  |
| F                         | <i>Taraxacum officinale</i>        | <sub>c</sub> 32  | <sub>ab</sub> 15 | <sub>b</sub> 17  | <sub>a</sub> 8   | .22             | .17  | .02  |
| Total for Annual Forbs    |                                    | 0                | 201              | 54               | 125              | 0.98            | 0.17 | 0.69 |
| Total for Perennial Forbs |                                    | 586              | 429              | 290              | 196              | 9.90            | 4.20 | 4.68 |
| Total for Forbs           |                                    | 586              | 630              | 344              | 321              | 10.89           | 4.38 | 5.37 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 5

| T<br>y<br>p<br>e | Species  | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | <i>Artemisia tridentata vaseyana</i>             | 92              | 98  | 88  | 13.89           | 18.95 | 13.56 |
| B                | <i>Chrysothamnus nauseosus</i>                   | 0               | 0   | 0   | -               | .03   | -     |
| B                | <i>Chrysothamnus parryi</i>                      | 0               | 16  | 30  | -               | .32   | .72   |
| B                | <i>Chrysothamnus viscidiflorus viscidiflorus</i> | 96              | 96  | 92  | 23.36           | 19.12 | 21.96 |
| B                | <i>Mahonia repens</i>                            | 1               | 3   | 3   | .06             | .01   | .00   |
| B                | <i>Populus tremuloides</i>                       | 1               | 0   | 0   | .18             | -     | -     |
| B                | <i>Symphoricarpos oreophilus</i>                 | 1               | 3   | 4   | .18             | .18   | .33   |
| Total for Browse |  | 191             | 216 | 217 | 37.68           | 38.61 | 36.58 |



CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 5

| Species                                      | Percent Cover |       |
|--|---------------|-------|
|  | '03           | '08   |
| Artemisia tridentata vaseyana                | 16.51         | 17.58 |
| Chrysothamnus parryi                         | .46           | 2.46  |
| Chrysothamnus viscidiflorus<br>viscidiflorus | 22.04         | 30.28 |
| Mahonia repens                               | .10           | -     |
| Populus tremuloides                          | 3.79          | -     |
| Symphoricarpos oreophilus                    | .91           | 1.36  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 5

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.0                        | 1.4 |

BASIC COVER --

Management unit 30 , Study no: 5

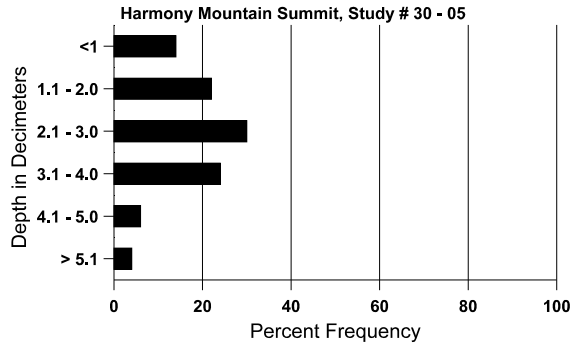
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 29.00           | 33.00 | 60.90 | 53.04 | 58.30 |
| Rock        | 0               | 0     | 2.23  | 1.72  | 1.69  |
| Pavement    | 0               | .25   | 1.01  | .90   | 4.48  |
| Litter      | 61.75           | 63.25 | 63.82 | 54.71 | 40.27 |
| Cryptogams  | 0               | 0     | 0     | 0     | 0     |
| Bare Ground | 9.25            | 3.50  | 8.60  | 9.82  | 7.96  |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 5, Study Name: Harmony Mountain Summit

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 17.2                         | 47.8<br>(16.1)  | 5.4 | 62.0       | 19.4   | 18.6   | 4.5 | 41.9  | 268.8 | 0.4  |

## Stoniness Index



### PELLET GROUP DATA --

Management unit 30 , Study no: 5

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | 2                 | -   | -   |
| Rabbit | -                 | 4   | 1   |
| Grouse | -                 | -   | 2   |
| Deer   | 44                | 50  | 28  |
| Cattle | 18                | 11  | 24  |

| Days use per acre (ha) |          |         |
|------------------------|----------|---------|
| '98                    | '03      | '08     |
| -                      | -        | -       |
| -                      | -        | -       |
| -                      | -        | -       |
| 73 (180)               | 88 (217) | 40 (99) |
| 26 (64)                | 32 (79)  | 27 (66) |

### BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 5

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 16/19                     |
| 08                                   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | 1531                                  | -  | 66    | 799    | 666      | -    | 57          | 0       | 44         | -       | 0            | 15/12                     |
| 92                                   | 6664                                  | 1933                                     | 4266  | 1999   | 399      | -    | 14          | 1       | 6          | .60     | 5            | 15/30                     |
| 98                                   | 6060                                  | 880                                      | 1580  | 4060   | 420      | 240  | 3           | 0       | 7          | -       | .33          | 16/24                     |
| 03                                   | 8640                                  | 340                                      | 2500  | 5740   | 400      | 80   | 15          | 5       | 5          | 2       | 2            | 15/24                     |
| 08                                   | 5820                                  | 260                                      | 200   | 4160   | 1460     | 520  | 16          | .34     | 25         | 10      | 13           | 17/24                     |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus parryi</b>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | 665                                   | 133                                      | 266   | 399    | -        | -    | 30          | 0       | 0          | -       | 0            | 7/6                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | 780                                   | -  | 100   | 540    | 140      | -    | 36          | 0       | 18         | 3       | 3            | 6/8                       |
| 08   | 1860                                  | 120                                      | 220   | 1640   | -        | -    | 0           | 0       | 0          | -       | 0            | 9/11                      |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 8665                                  | -  | 2133  | 4999   | 1533     | -    | 0           | 0       | 18         | -       | 0            | 12/15                     |
| 92   | 14131                                 | 399                                      | 3466  | 9666   | 999      | -    | 11          | 1       | 7          | -       | 2            | 11/13                     |
| 98   | 11140                                 | 220                                      | 1860  | 8420   | 860      | 20   | .35         | 0       | 8          | -       | 0            | 13/21                     |
| 03   | 12100                                 | -  | 1660  | 9780   | 660      | 40   | .16         | 0       | 5          | .16     | .16          | 11/18                     |
| 08   | 10280                                 | 100                                      | 240   | 9660   | 380      | 180  | 2           | 0       | 4          | .19     | .19          | 15/23                     |
| <b>Eriogonum microthecum</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 4731                                  | -  | 1399  | 2933   | 399      | -    | 4           | 0       | 8          | -       | 0            | 10/12                     |
| 92   | 10798                                 | -  | 5933  | 4599   | 266      | -    | 6           | 0       | 2          | -       | 3            | 5/7                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Mahonia repens</b>                            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 120                                   | -  | -     | 120    | -        | -    | 0           | 0       | -          | -       | 0            | 5/7                       |
| 03   | 140                                   | -  | -     | 140    | -        | -    | 0           | 0       | -          | -       | 0            | 2/3                       |
| 08   | 140                                   | -  | 120   | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/6                       |
| <b>Populus tremuloides</b>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 20                                    | 20                                       | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Quercus gambelii</b>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 157/106                   |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 16/15                     |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 15/40                     |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b>Ribes viscosissimum</b>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 31/31                     |  |
| 03                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 47/48                     |  |
| 08                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 39/40                     |  |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                               | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                               | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 25/51                     |  |
| 03                               | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 23/47                     |  |
| 08                               | <b>100</b>                            | -  | 40    | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 22/48                     |  |

Trend Study 30-13-08

Study site name: Black Ridge .

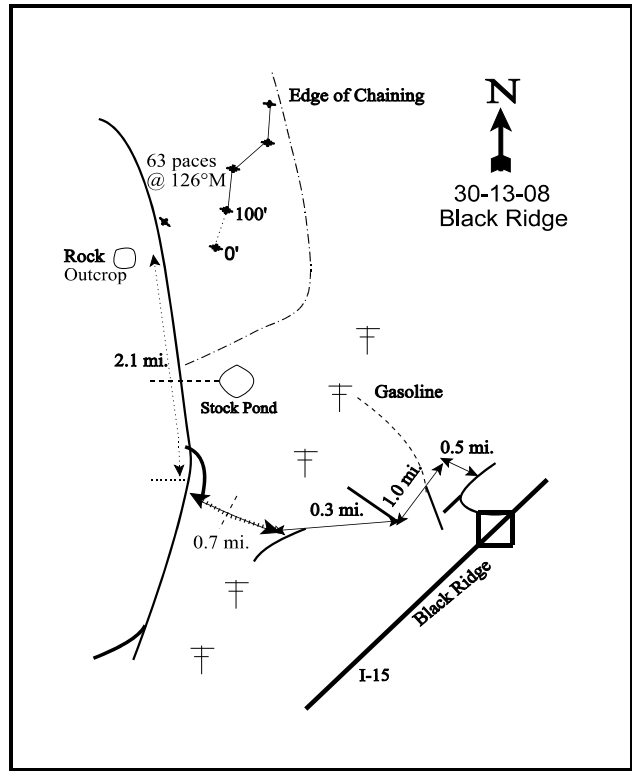
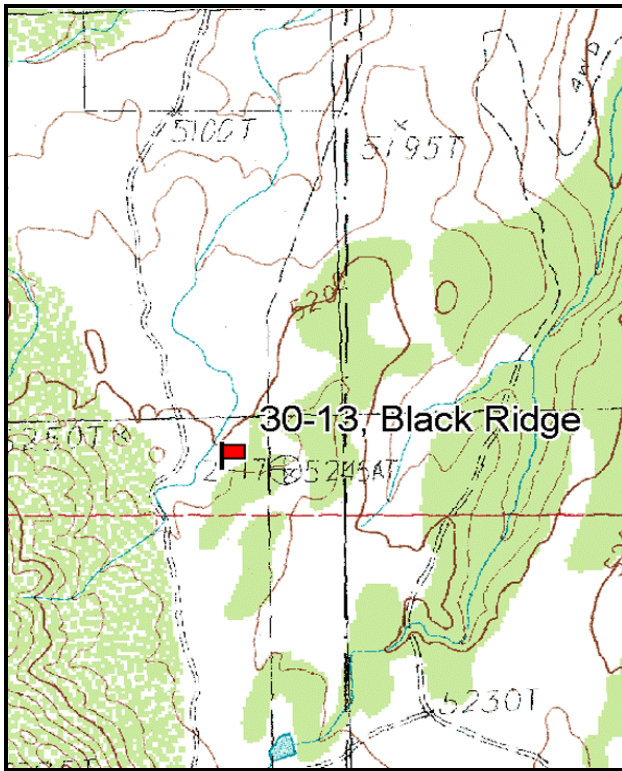
Vegetation type: Chained, seeded P-J .

Compass bearing: frequency baseline 2 degrees magnetic.

Frequency belt placement: line 1 (15 & 84ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

Traveling south on I-15 from Cedar City, take the Black Ridge exit (exit #36). Go west for a short distance to a frontage road. Turn north (right) on the frontage road and then take the first left turn onto Escalante's Path in the Kolob Estates heading west. Travel 0.5 miles and take a left turn onto a dirt road. Continue on this dirt road, keeping to the right at the fork. After approximately 1 mile, you will come to a corral. Stay to the left and continue on this road for 0.3 miles and turn right at the intersection at the power lines. Proceed on this road for another 0.7 miles, at which point there will be another intersection. Turn right at the intersection and travel 2.1 miles, then stop. On the left side of the road is a large rock outcrop. On the right side of the road is a witness post. The 0-foot baseline stake is located 63 paces at a bearing of 126 degrees magnetic from the witness post. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height. The 0-foot baseline stake is marked with a browse tag #7003.



Map Name: New Harmony

Diagrammatic Sketch

Township 39S, Range 13W, Section 2

GPS: NAD 83, UTM 12S 298668 E, 4144077 N

## DISCUSSION

### Black Ridge - Trend Study No. 30-13

#### Study Information

This study is located on a chained and seeded pinyon-juniper site [elevation: 5,200 feet (1,585 m), slope: 8%-10%, aspect: northwest]. This area has been critical winter range for deer in the past, but currently receives little use because of low deer populations in the area. Cattle were observed in the area during the 1992 reading. Pellet group data taken on the site estimated light use by deer in 1998 and 2003 (21 deer days use/acre: 52 ddu/ha, and 19 ddu/acre: 47 ddu/ha, respectively), and moderate use in 2008 (31 ddu/acre: 76 ddu/ha). No sign of cattle use was encountered within the vicinity of the transect in 1998, 2003, or 2008.

#### Soils

Soils are igneous in origin, dark-colored, shallow in places, and very rocky. The soil is actually quite deep once you get past the rocky surface. Effective rooting depth is estimated at 24 inches. Soil texture is a clay loam which is moderately acidic (pH 6.0). Phosphorus is 4.2 ppm, which is considered to have low availability for plant growth (Tiedemann and Lopez 2004). There has been erosion occurring on the site in the past as evidenced by the presence of gullies and fairly extensive areas of rock and erosion pavement. However, erosion appears to be controlled since the chaining treatment. Relative combined vegetation and litter cover has ranged from 52%-57% from 1998 to 2008. Relative combined rock and pavement cover has ranged from 34%-40% from 1998 to 2008. The soil erosion condition was classified as stable in 2008.

#### Browse

This chaining is becoming increasingly dominated by shrubs and trees. During the 1982 reading, browse was not abundant on the site. Mountain big sagebrush (*Artemisia tridentata vaseyana*) (599 plants/acre) and Utah serviceberry (*Amelanchier utahensis*) (333 plants/acre) were the most common. Sagebrush on the site appears to be a hybrid between black sagebrush (*Artemisia nova*) and mountain big sagebrush. However, all sagebrush has been classified as mountain big sagebrush. Mountain big sagebrush increased 94% by 1992 to 10,199 plants/acre. Seedlings were abundant and young plants accounted for 61% of the population. The larger sample size used in 1998 estimated 6,080 plants/acre. The change in density came mostly from the young age class which declined to 32% of the population in 1998. Density of mature plants remained comparable, and seedlings were still abundant. Sagebrush density increased 15% in 2003 to 7,120 plants/acre, but decreased again to 6,240 plants/acre in 2008. Recruitment continued to decline with 11% of the population being comprised of young plants in 2003 and 6% in 2008. The population is mostly lightly browsed and in good vigor.

Serviceberry is scattered throughout the site at a density of around 100 plants/acre. Mature shrubs average nearly 4 feet in height, and utilization is mostly light. Another preferred species, antelope bitterbrush (*Purshia tridentata*), also occurs in limited numbers. It shows moderate to heavy use. Small populations of Gambel oak (*Quercus gambelii*) and shrub-live oak (*Q. turbinella*) also occur on the site. The increaser, broom snakeweed (*Gutierrezia sarothrae*), appeared in the density plots for the first time in 1992. Density was estimated at 2,066 plants/acre with an equal number of seedlings. By 1998, the number of broom snakeweed increased to 3,240 plants/acre. The population declined by 68% to 1,040 plants/acre in 2003, and another 56% to 460 plants/acre in 2008.

Juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) trees are abundant and regaining dominance on this site. Point-quarter data estimated 104 juniper trees/acre with an average basal diameter of 6.6 inches in 2003, and 157 juniper trees/acre with a basal diameter of 5.8 inches in 2008. Total line-intercept canopy cover was estimated at 12% in 2003, and 14% in 2008. A photo point comparison between readings suggests that juniper has increased significantly in size since the first reading.

### Herbaceous Understory

Seeded and native grasses are well established on the site even though they have steadily declined in abundance since 1992. Crested wheatgrass (*Agropyron cristatum*) dominated with lesser amounts of mutton bluegrass (*Poa fendleriana*) and prairie junegrass (*Koeleria cristata*) from 1992 to 2003. In 2008, Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Sitanion hystrix*) were as dominant as crested wheatgrass and mutton bluegrass. Forbs are diverse, although not particularly numerous. Yellow sweetclover (*Melilotus officinalis*) was the only seeded forb encountered during any reading. It has persisted on the site and is one of the most abundant forbs. Other common native perennials include sego lily (*Calochortus nuttallii*), thistle (*Cirsium sp.*), low fleabane (*Erigeron pumilus*), and sulfur eriogonum (*Eriogonum umbellatum*).

### 1992 TREND ASSESSMENT

The browse trend has improved with increased densities of mountain big sagebrush. However, the density of broom snakeweed also increased and has an age class structure indicating an expanding population. The trend for browse is up. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. The herbaceous trend is difficult to determine by looking solely at the data. Quadrat frequency of both grasses and forbs have increased. However, by looking at the photos it is apparent that grasses have declined in stature and vigor. Trend for grasses is therefore, slightly down and for forbs is stable.

browse - up (+2)

grass - slightly down (-1)

forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush appears stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Sagebrush vigor is good and decadence has increased, but it is still low at 11%. Juniper trees have greatly increased in size and overhead canopy cover averages 5%. Trend for the grasses is stable. Sum of nested frequency for perennial grasses has remained similar to 1992. Nested frequency of crested wheatgrass declined significantly. The trend for forbs is up. There was a three-fold increase in the sum of nested frequency of perennial forbs.

winter range condition (DCI) - good (78) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - up (+2)

### 2003 TREND ASSESSMENT

Trend for the browse is considered slightly up. The primary browse species, mountain big sagebrush, density has increased 15% since 1998 to 7,120 plants/acre. Sagebrush vigor is normal and decadence low at 18%. It appears that the rapid expansion of sagebrush has slowed on this site. No seedlings were encountered in 2003, and recruitment of young plants has decreased to 11% of the population, but are still fairly numerous. Drought conditions for the past several years in this area may have helped slow expansion of sagebrush. There was also a 68% decline of broom snakeweed to 1,040 plants/acre. One negative aspect of the browse trend is the increase in density and size of juniper trees. Average line intercept canopy cover of juniper has more than doubled since 1998 (5% to 12%). The trend for both grasses and forbs is down. The sum of nested frequency of perennial grasses has declined by 49% since 1998, and the primary seeded grass, crested wheatgrass, has declined significantly with each reading. All other grasses sampled in 2003 also have declining nested frequency values. Average cover of grasses has fallen decreased from 12% in 1998 to 4%. The sum of nested frequency of perennial forbs has declined by 62%, while forb cover has declined from 17% in 1998 to 7%.

winter range condition (DCI) - poor (48) Mid-level potential scale

browse - slightly up (+1)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

Trend for browse is slightly down. Density of the primary browse species, mountain big sagebrush, has

decreased by 12% from 2003 to 6,240 plants/acre. Sagebrush vigor has remained good and decadence low at 21%. Recruitment has declined to 6% of the population being comprised of young plants. The density of stickyleaf low rabbitbrush decreased by 56% from 2003 to 460 plants/acre. The density of juniper increased to 157 trees/acre, but the basal diameter decreased slightly. The line intercept canopy cover of juniper increased to 14%. The trend for grasses is stable with a change in species composition. The sum of nested frequency of perennial grass remained similar to 2003. The nested frequency of crested wheatgrass decreased significantly, while the nested frequency of Sandberg bluegrass and bottlebrush squirreltail increased significantly. Sandberg bluegrass and bottlebrush squirreltail became co-dominant species with crested wheatgrass and mutton bluegrass. Cover of perennial grasses decreased to 2% with mutton bluegrass having the highest cover. The annual invasive grass cheatgrass (*Bromus tectorum*) decreased significantly in frequency and decreased in cover. The trend for forbs is up. The sum of nested frequency for perennial forbs increased by 43% from 2003, with a significant increase in the nested frequency of sego lily and sulphur eriogonum.

winter range condition (DCI) - poor (40) Mid-level potential scale  
 browse - slightly down (-1)      grass - stable (0)      forb - up (+2)

HERBACEOUS TRENDS --  
 Management unit 30 , Study no: 13

| Type                        | Species               |                  |                  |                  |                  | Average Cover % |      |      |
|-----------------------------|-----------------------|------------------|------------------|------------------|------------------|-----------------|------|------|
|                             |                       | '92              | '98              | '03              | '08              | '98             | '03  | '08  |
| G                           | Agropyron cristatum   | <sub>d</sub> 249 | <sub>c</sub> 192 | <sub>b</sub> 106 | <sub>a</sub> 47  | 5.53            | 1.84 | .40  |
| G                           | Agropyron intermedium | <sub>ab</sub> 3  | <sub>ab</sub> 3  | <sub>a</sub> -   | <sub>b</sub> 11  | .03             | -    | .02  |
| G                           | Bromus tectorum (a)   | -                | <sub>c</sub> 113 | <sub>b</sub> 53  | <sub>a</sub> 17  | 1.32            | .20  | .04  |
| G                           | Elymus junceus        | <sub>b</sub> 10  | <sub>ab</sub> 3  | <sub>a</sub> -   | <sub>a</sub> -   | .03             | -    | -    |
| G                           | Koeleria cristata     | <sub>b</sub> 26  | <sub>c</sub> 63  | <sub>b</sub> 31  | <sub>a</sub> -   | 2.53            | .43  | -    |
| G                           | Poa fendleriana       | 47               | 58               | 30               | 40               | 2.14            | 1.50 | .51  |
| G                           | Poa secunda           | <sub>a</sub> -   | <sub>a</sub> 4   | <sub>a</sub> -   | <sub>b</sub> 48  | .06             | -    | .36  |
| G                           | Sitanion hystrix      | <sub>bc</sub> 32 | <sub>ab</sub> 17 | <sub>a</sub> 7   | <sub>c</sub> 49  | .33             | .33  | .35  |
| G                           | Vulpia octoflora (a)  | -                | <sub>b</sub> 11  | <sub>ab</sub> 11 | <sub>a</sub> -   | .05             | .07  | .00  |
| Total for Annual Grasses    |                       | 0                | 124              | 64               | 17               | 1.37            | 0.27 | 0.04 |
| Total for Perennial Grasses |                       | 367              | 340              | 174              | 195              | 10.67           | 4.11 | 1.65 |
| Total for Grasses           |                       | 367              | 464              | 238              | 212              | 12.05           | 4.38 | 1.69 |
| F                           | Agoseris glauca       | <sub>a</sub> -   | <sub>b</sub> 18  | <sub>a</sub> -   | <sub>ab</sub> 10 | .12             | -    | .02  |
| F                           | Antennaria rosea      | 3                | -                | -                | -                | -               | -    | -    |
| F                           | Arabis sp.            | 2                | 4                | -                | 1                | .01             | -    | .00  |
| F                           | Artemesia biennis     | 1                | -                | -                | -                | -               | -    | -    |
| F                           | Aster sp.             | 2                | 5                | 3                | 9                | .04             | .03  | .07  |
| F                           | Astragalus sp.        | -                | 7                | 2                | 3                | .09             | .00  | .03  |
| F                           | Balsamorhiza hookeri  | 2                | -                | -                | -                | -               | .03  | .03  |
| F                           | Calochortus nuttallii | <sub>a</sub> -   | <sub>bc</sub> 20 | <sub>ab</sub> 5  | <sub>c</sub> 31  | .05             | .01  | .07  |
| F                           | Cirsium calcareum     | <sub>a</sub> 4   | <sub>b</sub> 17  | <sub>ab</sub> 13 | <sub>ab</sub> 11 | .49             | .63  | .07  |
| F                           | Comandra pallida      | -                | -                | 2                | -                | -               | .00  | -    |



| T<br>y<br>p<br>e          | Species                             |                 |                 |                  |                 | Average Cover % |      |      |
|---------------------------|-------------------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------|------|
|                           |                                     | '92             | '98             | '03              | '08             | '98             | '03  | '08  |
| F                         | <i>Collinsia parviflora</i> (a)     | <sub>b</sub> 43 | <sub>a</sub> 17 | <sub>a</sub> 7   | <sub>a</sub> 20 | .05             | .01  | .05  |
| F                         | <i>Cordylanthus</i> sp. (a)         | -               | <sub>c</sub> 80 | <sub>b</sub> 44  | <sub>a</sub> 15 | .56             | .72  | .11  |
| F                         | <i>Crepis acuminata</i>             | -               | -               | 2                | 4               | -               | .15  | .01  |
| F                         | <i>Crepis occidentalis</i>          | 1               | -               | -                | -               | -               | -    | -    |
| F                         | <i>Descurainia pinnata</i> (a)      | -               | -               | 3                | -               | -               | .03  | -    |
| F                         | <i>Draba</i> sp. (a)                | -               | <sub>b</sub> 30 | <sub>ab</sub> 12 | <sub>a</sub> 7  | .15             | .03  | .02  |
| F                         | <i>Epilobium brachycarpum</i> (a)   | -               | <sub>c</sub> 29 | <sub>a</sub> -   | <sub>b</sub> 9  | .06             | -    | .02  |
| F                         | <i>Erigeron pumilus</i>             | <sub>a</sub> 2  | <sub>b</sub> 34 | <sub>a</sub> 4   | <sub>a</sub> -  | .24             | .03  | -    |
| F                         | <i>Eriogonum racemosum</i>          | <sub>a</sub> -  | <sub>a</sub> -  | <sub>b</sub> 13  | <sub>ab</sub> 6 | -               | .07  | .04  |
| F                         | <i>Eriogonum umbellatum</i>         | <sub>a</sub> 15 | <sub>b</sub> 40 | <sub>a</sub> 17  | <sub>b</sub> 43 | .65             | .13  | .59  |
| F                         | <i>Lithospermum</i> sp.             | -               | 4               | 4                | -               | .03             | .06  | -    |
| F                         | <i>Lithophragma</i> sp.             | -               | -               | -                | 5               | -               | -    | .01  |
| F                         | <i>Lomatium</i> sp.                 | -               | 7               | 9                | 5               | .02             | .02  | .01  |
| F                         | <i>Lotus utahensis</i>              | -               | -               | -                | 6               | -               | -    | .04  |
| F                         | <i>Lupinus argenteus</i>            | <sub>a</sub> -  | <sub>b</sub> 12 | <sub>a</sub> -   | <sub>a</sub> -  | .19             | -    | -    |
| F                         | <i>Melilotus officinalis</i>        | <sub>b</sub> 28 | <sub>c</sub> 60 | <sub>ab</sub> 23 | <sub>a</sub> 3  | 1.88            | .33  | .01  |
| F                         | <i>Microsteris gracilis</i> (a)     | <sub>a</sub> -  | <sub>b</sub> 13 | <sub>d</sub> 73  | <sub>c</sub> 43 | .04             | .63  | .09  |
| F                         | <i>Phlox longifolia</i>             | <sub>a</sub> -  | <sub>b</sub> 6  | <sub>b</sub> 9   | <sub>c</sub> 21 | .01             | .04  | .06  |
| F                         | <i>Polygonum douglasii</i> (a)      | -               | <sub>b</sub> 14 | <sub>a</sub> -   | <sub>c</sub> 34 | .03             | -    | .08  |
| F                         | <i>Ranunculus</i> sp.               | -               | <sub>b</sub> 54 | <sub>a</sub> -   | <sub>a</sub> -  | .22             | -    | -    |
| F                         | <i>Ranunculus testiculatus</i> (a)  | -               | -               | -                | 1               | -               | -    | .00  |
| F                         | <i>Sphaeralcea grossulariifolia</i> | -               | -               | 3                | -               | -               | .00  | -    |
| F                         | <i>Tragopogon dubius</i>            | 1               | -               | -                | -               | -               | -    | -    |
| F                         | Unknown forb-annual (a)             | -               | <sub>a</sub> -  | <sub>a</sub> -   | <sub>b</sub> 39 | -               | -    | .13  |
| F                         | <i>Viguiera multiflora</i>          | <sub>b</sub> 35 | <sub>a</sub> 5  | <sub>a</sub> -   | <sub>a</sub> -  | .18             | -    | -    |
| F                         | <i>Zigadenus paniculatus</i>        | -               | 3               | 3                | 2               | .01             | .03  | .00  |
| Total for Annual Forbs    |                                     | 43              | 183             | 139              | 168             | 0.90            | 1.43 | 0.52 |
| Total for Perennial Forbs |                                     | 96              | 296             | 112              | 160             | 4.27            | 1.61 | 1.09 |
| Total for Forbs           |                                     | 139             | 479             | 251              | 328             | 5.17            | 3.04 | 1.62 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 13

| Type             | Species                            | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                    | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Amelanchier utahensis              | 5               | 4   | 3   | 1.08            | 1.54  | 1.19  |
| B                | Artemisia tridentata vaseyana      | 89              | 89  | 86  | 14.92           | 13.55 | 15.66 |
| B                | Chrysothamnus nauseosus hololeucus | 1               | 0   | 0   | .00             | -     | -     |
| B                | Gutierrezia sarothrae              | 41              | 24  | 17  | 1.74            | .43   | .10   |
| B                | Juniperus osteosperma              | 14              | 17  | 13  | 3.59            | 8.79  | 6.79  |
| B                | Opuntia sp.                        | 2               | 2   | 1   | .00             | .00   | .00   |
| B                | Purshia tridentata                 | 1               | 2   | 2   | .15             | .00   | .00   |
| B                | Quercus gambelii                   | 3               | 4   | 4   | 1.41            | .45   | .33   |
| B                | Quercus turbinella                 | 1               | 2   | 2   | .38             | .53   | .03   |
| Total for Browse |                                    | 157             | 144 | 128 | 23.30           | 25.29 | 24.11 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 13

| Species                       | Percent Cover |       |       |
|-------------------------------|---------------|-------|-------|
|                               | '98           | '03   | '08   |
| Amelanchier utahensis         | -             | 1.41  | 2.75  |
| Artemisia tridentata vaseyana | -             | 16.33 | 18.18 |
| Gutierrezia sarothrae         | -             | .35   | .05   |
| Juniperus osteosperma         | 5.00          | 11.80 | 14.01 |
| Opuntia sp.                   | -             | .03   | -     |
| Pinus edulis                  | -             | -     | .71   |
| Pinus monophylla              | .60           | .63   | -     |
| Purshia tridentata            | -             | .38   | .50   |
| Quercus gambelii              | -             | 1.68  | 1.08  |
| Quercus turbinella            | -             | -     | .76   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 13

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 1.4                        | 1.0 |
| Artemisia tridentata vaseyana | 3.1                        | 0.9 |

POINT-QUARTER TREE DATA --  
Management unit 30 , Study no: 13

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 90             | 104 | 157 |
| Pinus monophylla      | 6              | <18 | 25  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 3.8                   | 6.6 | 5.8 |
| 4.0                   | -   | 3.4 |

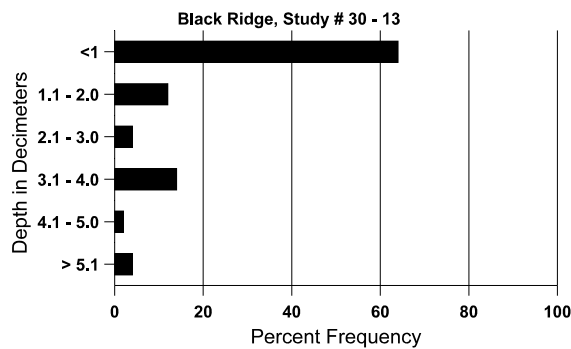
BASIC COVER --  
Management unit 30 , Study no: 13

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 12.00           | 6.75  | 36.18 | 30.42 | 25.81 |
| Rock        | 17.25           | 34.50 | 40.43 | 35.95 | 36.70 |
| Pavement    | 5.25            | 6.00  | 11.23 | 5.14  | 9.95  |
| Litter      | 57.00           | 44.00 | 39.61 | 38.73 | 35.27 |
| Cryptogams  | 1.50            | .75   | .32   | .19   | .13   |
| Bare Ground | 7.00            | 8.75  | 6.98  | 10.60 | 9.80  |

SOIL ANALYSIS DATA --  
Management unit 30, Study no: 13, Study Name: Black Ridge

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand    | % silt | % clay |     |       |       |      |
| 24.2                         | 44.8 (17.7)     | 6.0 | 32.0      | 33.4   | 34.6   | 2.1 | 4.2   | 76.8  | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 13

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 12                | 12  | 72  |
| Deer   | 17                | 4   | 27  |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| 21 (52)                | 19 (46) | 31 (76) |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 13

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>333</b>                            | -  | -     | 333    | -        | -    | 20          | 0       | 0          | -       | 0            | 11/18                     |
| 92  | <b>133</b>                            | -  | 133   | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98  | <b>1140</b>                           | -  | 380   | 760    | -        | -    | 2           | 0       | 0          | -       | 0            | 41/45                     |
| 03  | <b>120</b>                            | -  | 40    | 60     | 20       | -    | 17          | 0       | 17         | -       | 0            | 47/53                     |
| 08  | <b>60</b>                             | 140                                      | -     | 60     | -        | -    | 0           | 0       | 0          | -       | 0            | 48/55                     |
| <b>Artemisia tridentata vaseyana</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>599</b>                            | -  | 133   | 466    | -        | -    | 0           | 0       | 0          | -       | 0            | 14/25                     |
| 92  | <b>10198</b>                          | 5466                                     | 6266  | 3799   | 133      | -    | 7           | 0       | 1          | -       | .65          | 14/18                     |
| 98  | <b>6080</b>                           | 2360                                     | 1940  | 3480   | 660      | 200  | 12          | 0       | 11         | 4       | 7            | 19/31                     |
| 03  | <b>7120</b>                           | -  | 780   | 5060   | 1280     | 380  | 14          | 0       | 18         | 6       | 6            | 20/25                     |
| 08  | <b>6240</b>                           | 500                                      | 360   | 4560   | 1320     | 360  | 34          | 3       | 21         | 9       | 9            | 20/31                     |
| <b>Chrysothamnus nauseosus hololeucus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98  | <b>40</b>                             | -  | -     | -      | 40       | -    | 0           | 0       | 100        | 100     | 100          | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Gutierrezia sarothrae</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | <b>2065</b>                           | 2733                                     | 399   | 1666   | -        | -    | 0           | 0       | 0          | -       | 0            | 9/9                       |
| 98  | <b>3240</b>                           | -  | 500   | 2660   | 80       | 20   | 0           | 0       | 2          | .61     | .61          | 6/8                       |
| 03  | <b>1040</b>                           | -  | 20    | 900    | 120      | 20   | 0           | 0       | 12         | 6       | 6            | 8/8                       |
| 08  | <b>460</b>                            | 60                                       | 120   | 320    | 20       | 120  | 0           | 0       | 4          | 4       | 4            | 6/5                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Juniperus osteosperma</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>799</b>                            | -  | 133   | 666    | -        | -    | 0           | 0       | 0          | -       | 0            | 47/27                     |
| 92                           | <b>332</b>                            | 66                                       | 133   | 199    | -        | -    | 0           | 0       | 0          | -       | 0            | 30/62                     |
| 98                           | <b>320</b>                            | -  | 120   | 200    | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                           | <b>420</b>                            | -  | 80    | 300    | 40       | -    | 0           | 0       | 10         | -       | 0            | -/-                       |
| 08                           | <b>280</b>                            | 60                                       | 100   | 180    | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>132</b>                            | -  | 66    | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 11/17                     |
| 98                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 4/3                       |
| 03                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 6/9                       |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/12                      |
| <b>Pinus monophylla</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 12/100                    |
| 03                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 67      | -          | -       | 0            | 16/34                     |
| 08                           | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 50      | -          | -       | 0            | 21/48                     |
| <b>Quercus gambelii</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>133</b>                            | -  | 133   | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>140</b>                            | -  | -     | 140    | -        | 40   | 0           | 0       | -          | -       | 0            | 60/41                     |
| 03                           | <b>220</b>                            | -  | 120   | 100    | -        | 40   | 0           | 0       | -          | -       | 0            | 39/24                     |
| 08                           | <b>380</b>                            | -  | 220   | 160    | -        | 40   | 0           | 0       | -          | -       | 0            | 43/35                     |
| <b>Quercus turbinella</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>200</b>                            | -  | -     | 200    | -        | -    | 0           | 0       | -          | -       | 0            | 61/28                     |
| 03                           | <b>160</b>                            | -  | -     | 160    | -        | -    | 0           | 0       | -          | -       | 0            | 62/11                     |
| 08                           | <b>180</b>                            | 20                                       | -     | 180    | -        | -    | 0           | 0       | -          | -       | 0            | 67/26                     |

Trend Study 30-26-08

Study site name: Grassy Flat Ridge .

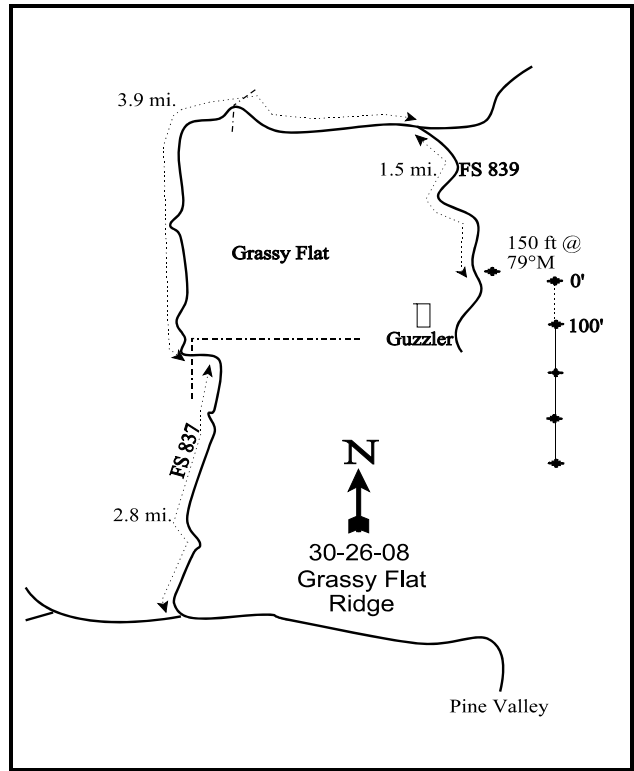
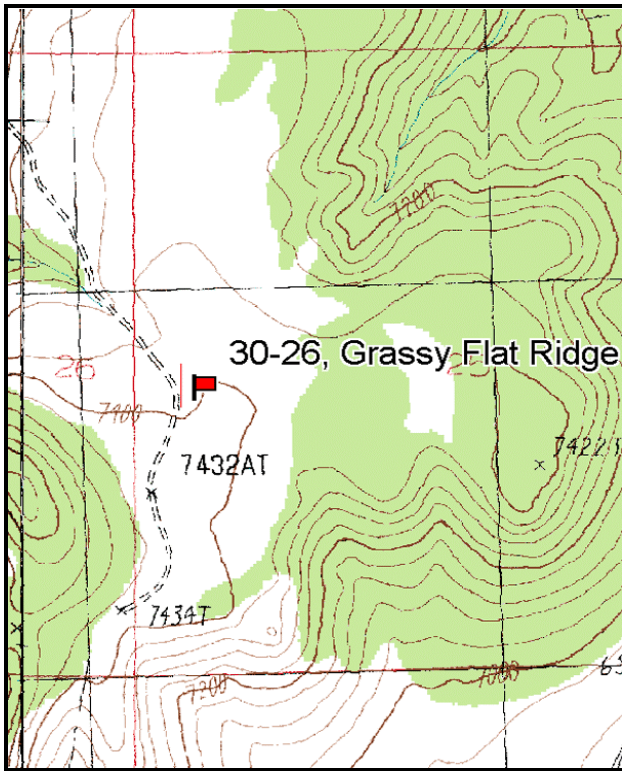
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (16 & 89ft), line 2 (39ft), line 3 (48ft), line 4 (63ft). Rebar: belt 2 on 1ft, belt 3 on 4ft.

LOCATION DESCRIPTION

From the town of Pine Valley, travel west towards Central 1.5 miles to the dirt road to Pinto. Continue west 0.75 miles to the Gray's Ranch-Grassy Flat Road on the north side (right) of the road. Go north on this road approximately 2.8 miles and turn left. From here, continue on the road for 3.9 miles to Forest Service road #839. Bear right (south) and travel 1.5 miles to a witness post on the left (east) side of the road. A large guzzler can be found further down the road on the right (west) side. From the witness post, the 0-foot stake is 150 feet away at 79 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height



Map Name: Grass Valley & Central East

Diagrammatic Sketch

Township 38S, Range 15W, Section 25

GPS: NAD 83, UTM 12S 279212 E, 4147914 N

## DISCUSSION

### Grassy Flat Ridge - Trend Study No. 30-26

#### Study Information

This study is located on a relatively low elevation summer range near the summit of the ridge, lying between the South Fork of Pinto Creek and Grassy Flat [elevation: 7,400 feet (2,256 m), slope: 5%-10%, aspect: west]. The vegetative type is sagebrush-grass with low abundance of seeded grasses. A guzzler is located about 200 yards to the southwest of the study site. Wildlife and livestock use has been reported high in the past, most likely due to the close proximity of the guzzler. Pellet group data taken on the site estimated moderate use by deer in 1998 (32 deer days use/acre:79 ddu/ha), and high use in 2003 and 2008 (52 ddu/acre:129 ddu/ha and 57 ddu/acre:141 ddu/ha, respectively). No livestock use was noted in 1998, and was light in 2003 and 2008 (7 cow days use/acre:17 cdu/ha and 11 cdu/acre:20 cdu/ha, respectively). Livestock grazing typically occurs from July 1-August 15 on a deferred rotation system.

#### Soils

Soils are igneous in origin, coarse in texture, and very rocky over most of the area. Effective rooting depth is estimated at almost 12 inches. Texture is a clay loam which is moderately acidic (pH 5.8). Phosphorus may be marginally available for plant production at 7.2 ppm (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover was 82% in 1998 and 2008, and 59% in 2003. Relative combined rock and pavement cover increased from 13% in 1998 to 28% in 2003, then decreased to 12% in 2008. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

As this is considered summer range, browse is not as important of a component as the herbaceous understory. The key browse species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). Sagebrush accounted for 54% of the total browse cover in 1998, 72% in 2003, and 81% in 2008. Density of big sagebrush was estimated at 2,333 plants/acre in 1982. No seedlings or young plants were encountered. The population increased 64% to 6,399 plants/acre by 1992. Seedlings and young plants were then very abundant. Density increased an additional 12% by 1998 to 7,260 plants/acre, nearly doubled in 2003 to 13,440 plants/acre, and decreased slightly to 10,380 plants/acre in 2008. Seedlings were abundant and young plants accounted for a large proportion of the population in all sample years. Utilization of sagebrush has been mostly light to moderate over the years with a few individuals displaying heavy hedging. Sagebrush vigor has been good and decadence has remained low in all sample years.

Antelope bitterbrush has a relatively small population. It increased slightly in density in 1992 and 1998 to around 700 plants/acre, declined in 2003 to 580 plants/acre, and declined further in 2008 to 400 plants/acre. Utilization of bitterbrush was mostly moderate in 1982, but has been extremely heavy since. Most plants are partly unavailable due to the high level of use. Even with this heavy use, vigor is still normal on most plants and decadence was moderately low at 17% in 1998. However, decadence increased to 31% in 2003, and further to 60% in 2008. The population has poor recruitment and has decreased in average height and crown measurements since 1998. Annual leader growth, only found in protected areas, averaged only around 1 inch in 2003 and 2008. There was no sign of flowering in 2003.

Secondary browse species include Utah serviceberry (*Amelanchier utahensis*), dwarf rabbitbrush (*Chrysothamnus depressus*), and occasional individuals of Gambel oak (*Quercus gambelii*) and curlleaf mountain mahogany (*Cercocarpus ledifolius*). Serviceberry plants also have displayed heavy use but many plants have become partly unavailable due to height. Broom snakeweed (*Gutierrezia sarothrae*), an invader/increaser, also occurs on the site in moderate numbers.

### Herbaceous Understory

The herbaceous understory is moderately abundant and diverse. Six perennial grasses dominate the grass composition. These include intermediate wheatgrass (*Agropyron intermedium*), western wheatgrass (*Agropyron smithii*), mutton bluegrass (*Poa fendleriana*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and Letterman needlegrass (*Stipa lettermani*). Forbs are diverse, but the composition consists primarily of increasers, poisonous plants, and other low-growing species of minimal forage value. The most abundant forbs are wild onion (*Allium acuminatum*), littleleaf pussytoes (*Antennaria parvifolia*), and foothill deathcamas (*Zigadenus paniculatus*). Sulfur eriogonum (*Eriogonum umbellatum*) and Eaton fleabane (*Erigeron eatonii*) have also been fairly common.

### 1992 TREND ASSESSMENT

The trend for browse is slightly up. The key browse species, mountain big sagebrush and antelope bitterbrush, have both increased and should be able to tolerate the increase of broom snakeweed. The broom snakeweed population is expanding and should be monitored closely. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. The grass species are mostly palatable and the quadrat frequencies have increased for most species. The trend for grasses is slightly up. The forb species are mostly unpalatable and composition is poor. The quadrat frequencies increased slightly for many forbs. The trend for forbs is stable.

browse - slightly up (+1)

grass - slightly up (+1)

forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for the key browse species is mixed. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big sagebrush displays an upward trend due to good reproduction, normal vigor, and lower decadence. Bitterbrush shows a stable to slightly downward trend. The bitterbrush population reproduction is limited with just enough young plants to replace decadent & dying plants. With this in mind, trend for browse is considered stable. Trends for both grasses and forbs are slightly down. Sum of nested frequency for both grasses and forbs has declined. Forb composition is still poor.

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

### 2003 TREND ASSESSMENT

Trend for browse is up for sagebrush and slightly down for the more preferred browse, bitterbrush, although bitterbrush only contributes 10% of the browse cover. Density of mountain big sagebrush has grown to 13,440 plants/acre. Cover has increased from 9% in 1998 to 15%. Young recruitment remains extremely high, vigor remains good, and decadence is low. Bitterbrush has declined 17% in density and has increased in decadence to 31%. No seedlings or young plants were sampled and there was no sign of flowering in 2003. Overall, the browse trend is considered up due to the increase in sagebrush which contributes 72% of the browse cover. Trend for the grasses is down. Sum of nested frequency for perennial grasses declined and average cover of grasses fell from 14% in 1998 to only 3%. There was significant declines in the nested frequency of Letterman needlegrass, bottlebrush squirreltail, and mutton bluegrass. Trend is up for forbs. Sum of nested frequency for perennial forbs increased 33% and average cover increased from 6% in 1998 to 9%. The improvement comes from significant increases in wild onion, sego lily (*Calochortus nuttallii*), desert parsley (*Lomatium sp.*), and foothill deathcamas, all bulb or large tap root forbs.

browse - up (+2)

grass - down (-2)

forb - up (+2)

### 2008 TREND ASSESSMENT

Trend for browse is slightly down. The primary browse species, mountain big sagebrush, density decreased by 23% from 2003 to 10,380 plants/acre. Sagebrush vigor remains good, but decadence has increased slightly from 4% in 2003 to 17%. Recruitment of young sagebrush has also decreased, but still remains high with 26%



of the population comprised of young plants. The density of bitterbrush decreased by 31% from 2003 to 400 plants/acre. Bitterbrush plants displaying poor vigor has increased to 35% and decadence has increased to 60%. Recruitment has increased, but remains low with young plants accounting for 10% of the population. The trend for grasses is up. The sum of nested frequency of perennial grasses increased by 64% from 2003, and cover of perennial grasses increased from 3% in 2003 to 10%. The nested frequency of crested wheatgrass, intermediate wheatgrass, and Sandberg bluegrass all increased significantly. The trend for forbs is down. The sum of nested frequency of perennial forbs decreased by 37% from 2003, and cover of perennial forbs decreased from 9% in 2003 to 2%. There was a significant decrease in the nested frequency of desert parsley and foothill deathcamas.

browse - slightly down (-1)

grass - up (+2)

forb - down (-2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 26

| T<br>y<br>p<br>e            | Species                  |       |      |      |       | Average Cover % |      |       |
|-----------------------------|--------------------------|-------|------|------|-------|-----------------|------|-------|
|                             |                          | '92   | '98  | '03  | '08   | '98             | '03  | '08   |
| G                           | Agropyron cristatum      | a17   | a5   | a30  | b57   | .06             | .33  | 1.50  |
| G                           | Agropyron intermedium    | a39   | a46  | a28  | b112  | 3.02            | .81  | 3.77  |
| G                           | Agropyron smithii        | b110  | a29  | a43  | a25   | .21             | .29  | .79   |
| G                           | Bromus inermis           | -     | -    | -    | 3     | -               | -    | .15   |
| G                           | Bromus tectorum (a)      | -     | 5    | -    | 5     | .15             | -    | .01   |
| G                           | Koeleria cristata        | b32   | ab27 | a10  | a10   | .74             | .05  | .19   |
| G                           | Poa bulbosa              | a-    | ab11 | b23  | a-    | .33             | .51  | -     |
| G                           | Poa fendleriana          | bc144 | c162 | a71  | ab104 | 5.16            | .55  | 2.38  |
| G                           | Poa secunda              | b44   | a3   | a6   | b64   | .00             | .15  | .66   |
| G                           | Sitanion hystrix         | b153  | b138 | a31  | a20   | 2.67            | .26  | .39   |
| G                           | Stipa lettermani         | b65   | b61  | a20  | ab35  | 1.72            | .13  | .60   |
| Total for Annual Grasses    |                          | 0     | 5    | 0    | 5     | 0.15            | 0    | 0.01  |
| Total for Perennial Grasses |                          | 604   | 482  | 262  | 430   | 13.94           | 3.09 | 10.46 |
| Total for Grasses           |                          | 604   | 487  | 262  | 435   | 14.09           | 3.09 | 10.47 |
| F                           | Achillea millefolium     | 3     | -    | -    | -     | -               | -    | -     |
| F                           | Agoseris glauca          | b24   | a11  | a10  | a13   | .05             | .10  | .08   |
| F                           | Allium acuminatum        | a158  | b267 | c302 | a169  | 2.50            | 6.21 | .73   |
| F                           | Antennaria parvifolia    | b111  | a38  | a19  | 23    | .71             | .17  | .16   |
| F                           | Arabis sp.               | 9     | 3    | 2    | 6     | .01             | .00  | .02   |
| F                           | Artemisia ludoviciana    | -     | -    | -    | 1     | -               | -    | .00   |
| F                           | Astragalus agrestis      | b10   | ab13 | a-   | a-    | .12             | -    | -     |
| F                           | Astragalus argophyllus   | 1     | 6    | -    | -     | .04             | -    | -     |
| F                           | Astragalus sp.           | 8     | -    | 2    | 1     | -               | .00  | .03   |
| F                           | Balsamorhiza sagittata   | -     | -    | 2    | -     | -               | .03  | -     |
| F                           | Castilleja linariaefolia | -     | -    | 1    | -     | -               | .00  | -     |

| Type                      | Species                             |                 |                  |                  |                  | Average Cover % |      |      |
|---------------------------|-------------------------------------|-----------------|------------------|------------------|------------------|-----------------|------|------|
|                           |                                     | '92             | '98              | '03              | '08              | '98             | '03  | '08  |
| F                         | <i>Calochortus nuttallii</i>        | <sub>a</sub> 11 | <sub>a</sub> 12  | <sub>b</sub> 74  | <sub>b</sub> 53  | .05             | .39  | .27  |
| F                         | <i>Chenopodium leptophyllum</i> (a) | -               | -                | -                | 4                | -               | -    | .00  |
| F                         | <i>Cirsium wheeleri</i>             | 5               | 7                | -                | -                | .06             | -    | .00  |
| F                         | <i>Comandra pallida</i>             | -               | -                | 6                | -                | -               | .06  | -    |
| F                         | <i>Collinsia parviflora</i> (a)     | -               | <sub>a</sub> 61  | <sub>a</sub> 68  | <sub>b</sub> 101 | .18             | .35  | .44  |
| F                         | <i>Crepis acuminata</i>             | -               | 3                | 3                | -                | .01             | .00  | -    |
| F                         | <i>Delphinium nuttallianum</i>      | <sub>a</sub> -  | <sub>a</sub> -   | <sub>b</sub> 7   | <sub>ab</sub> 8  | -               | .03  | .01  |
| F                         | <i>Descurainia pinnata</i> (a)      | -               | -                | 3                | -                | -               | .15  | -    |
| F                         | <i>Epilobium brachycarpum</i> (a)   | -               | <sub>b</sub> 27  | <sub>a</sub> -   | <sub>b</sub> 27  | .10             | -    | .06  |
| F                         | <i>Erigeron eatonii</i>             | <sub>b</sub> 56 | <sub>a</sub> 7   | <sub>a</sub> 2   | <sub>a</sub> -   | .21             | .01  | -    |
| F                         | <i>Eriogonum</i> sp.                | -               | -                | -                | -                | -               | -    | .00  |
| F                         | <i>Erigeron pumilus</i>             | <sub>a</sub> 4  | <sub>b</sub> 13  | <sub>a</sub> 4   | <sub>a</sub> -   | .06             | .01  | -    |
| F                         | <i>Eriogonum umbellatum</i>         | <sub>b</sub> 76 | <sub>a</sub> 28  | <sub>a</sub> 21  | <sub>a</sub> 6   | .41             | .07  | .01  |
| F                         | <i>Gayophytum ramosissimum</i> (a)  | -               | -                | 4                | 5                | -               | .01  | .01  |
| F                         | <i>Haplopappus</i> sp.              | 1               | -                | -                | -                | -               | -    | -    |
| F                         | <i>Hymenoxys richardsonii</i>       | 4               | -                | -                | -                | -               | -    | -    |
| F                         | <i>Ipomopsis aggregata</i>          | <sub>a</sub> -  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 20  | -               | -    | .04  |
| F                         | <i>Lappula occidentalis</i> (a)     | -               | -                | -                | 1                | -               | -    | .00  |
| F                         | <i>Lomatium</i> sp.                 | <sub>a</sub> 1  | <sub>a</sub> 6   | <sub>c</sub> 102 | <sub>b</sub> 43  | .03             | .67  | .16  |
| F                         | <i>Lupinus argenteus</i>            | 2               | -                | -                | -                | -               | -    | -    |
| F                         | <i>Machaeranthera canescens</i>     | 3               | -                | 2                | 1                | -               | .00  | .03  |
| F                         | <i>Microsteris gracilis</i> (a)     | -               | <sub>a</sub> 1   | <sub>a</sub> -   | <sub>b</sub> 37  | .00             | -    | .11  |
| F                         | <i>Penstemon caespitosus</i>        | 1               | -                | -                | -                | -               | -    | -    |
| F                         | <i>Penstemon</i> sp.                | -               | -                | -                | 2                | -               | -    | .00  |
| F                         | <i>Phlox longifolia</i>             | 7               | 6                | 3                | 4                | .03             | .01  | .02  |
| F                         | <i>Polygonum douglasii</i> (a)      | -               | <sub>b</sub> 77  | <sub>a</sub> 12  | <sub>c</sub> 126 | .21             | .04  | .37  |
| F                         | <i>Ranunculus testiculatus</i> (a)  | -               | -                | 8                | 1                | -               | .02  | .00  |
| F                         | <i>Sphaeralcea coccinea</i>         | <sub>ab</sub> 3 | <sub>a</sub> 1   | <sub>a</sub> -   | <sub>b</sub> 11  | .00             | -    | .03  |
| F                         | <i>Tragopogon dubius</i>            | -               | 3                | -                | -                | .00             | -    | -    |
| F                         | <i>Trifolium</i> sp.                | -               | -                | -                | 2                | -               | -    | .00  |
| F                         | <i>Viguiera multiflora</i>          | 1               | -                | -                | -                | -               | -    | -    |
| F                         | <i>Zigadenus paniculatus</i>        | <sub>b</sub> 93 | <sub>ab</sub> 69 | <sub>b</sub> 94  | <sub>a</sub> 48  | .67             | 1.01 | .65  |
| Total for Annual Forbs    |                                     | 0               | 166              | 95               | 302              | 0.50            | 0.57 | 1.01 |
| Total for Perennial Forbs |                                     | 592             | 493              | 656              | 411              | 5.01            | 8.81 | 2.29 |
| Total for Forbs           |                                     | 592             | 659              | 751              | 713              | 5.51            | 9.39 | 3.30 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 26

| Type             | Species                       | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|-------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                               | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Amelanchier utahensis         | 12              | 14  | 10  | 1.54            | 1.52  | .87   |
| B                | Artemisia tridentata vaseyana | 93              | 95  | 92  | 9.15            | 14.67 | 16.11 |
| B                | Cercocarpus ledifolius        | 2               | 1   | 2   | .15             | .85   | .85   |
| B                | Cercocarpus montanus          | 0               | 1   | 2   | -               | .00   | .00   |
| B                | Chrysothamnus depressus       | 29              | 17  | 7   | .42             | .10   | .10   |
| B                | Gutierrezia sarothrae         | 45              | 44  | 49  | .39             | .40   | .67   |
| B                | Opuntia sp.                   | 17              | 15  | 13  | .31             | .33   | .56   |
| B                | Pediocactus simpsonii         | 0               | 0   | 1   | -               | -     | .00   |
| B                | Pinus edulis                  | 2               | 3   | 4   | .38             | .38   | .63   |
| B                | Purshia tridentata            | 29              | 23  | 16  | 4.09            | 1.97  | .01   |
| B                | Quercus gambelii              | 5               | 7   | 4   | .56             | .18   | .03   |
| B                | Tetradymia canescens          | 4               | 0   | 2   | .03             | -     | .00   |
| Total for Browse |                               | 238             | 220 | 202 | 17.04           | 20.43 | 19.86 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 26

| Species                       | Percent Cover |       |
|-------------------------------|---------------|-------|
|                               | '03           | '08   |
| Amelanchier utahensis         | 2.36          | .61   |
| Artemisia tridentata vaseyana | 17.23         | 20.38 |
| Cercocarpus ledifolius        | .46           | -     |
| Cercocarpus montanus          | -             | .23   |
| Chrysothamnus depressus       | .06           | -     |
| Gutierrezia sarothrae         | .46           | .76   |
| Opuntia sp.                   | .86           | 1.31  |
| Pinus edulis                  | .26           | .63   |
| Purshia tridentata            | 1.46          | .31   |
| Quercus gambelii              | .80           | .63   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 26

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.2                        | 0.8 |
| Purshia tridentata            | 1.0                        | 0.7 |

BASIC COVER --

Management unit 30 , Study no: 26

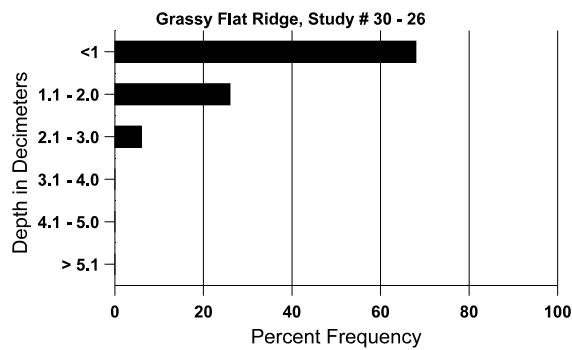
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 0               | 9.75  | 37.62 | 35.23 | 33.04 |
| Rock        | 0               | 28.75 | 35.28 | 36.70 | 31.49 |
| Pavement    | 0               | 17.75 | 5.62  | 3.02  | 8.41  |
| Litter      | 0               | 25.00 | 29.13 | 17.67 | 23.30 |
| Cryptogams  | 0               | 0     | .15   | .06   | .26   |
| Bare Ground | 32.75           | 18.75 | 19.05 | 18.20 | 18.19 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 26, Study Name: Grassy Flat Ridge

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand     | %silt | %clay |     |       |       |      |
| 11.6                         | 58.6<br>(13.8)  | 5.8 | 36.0      | 31.4  | 32.6  | 1.5 | 7.2   | 83.2  | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 26

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | 2                 | -   | -   |
| Rabbit | 3                 | 1   | 29  |
| Deer   | 31                | 16  | 24  |
| Cattle | 4                 | -   | 5   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| -                      | -        | -        |
| 32 (79)                | 52 (129) | 57 (141) |
| -                      | 7 (18)   | 8 (20)   |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 26

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>199</b>                            | -  | -     | 199    | -        | -    | 100         | 0       | 0          | -       | 0            | 20/24                     |
| 92                                   | <b>333</b>                            | -  | -     | 333    | -        | -    | 20          | 80      | 0          | -       | 0            | 29/26                     |
| 98                                   | <b>380</b>                            | 20                                       | 20    | 360    | -        | -    | 32          | 47      | 0          | -       | 0            | 38/40                     |
| 03                                   | <b>360</b>                            | 20                                       | 80    | 140    | 140      | 40   | 0           | 94      | 39         | 11      | 11           | 31/34                     |
| 08                                   | <b>220</b>                            | 20                                       | 40    | 80     | 100      | 60   | 9           | 55      | 45         | 18      | 18           | 41/45                     |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>2332</b>                           | -  | -     | 2199   | 133      | -    | 6           | 0       | 6          | -       | 6            | 11/18                     |
| 92                                   | <b>6398</b>                           | 3733                                     | 3599  | 1866   | 933      | -    | 22          | 9       | 15         | -       | 4            | 18/21                     |
| 98                                   | <b>7260</b>                           | 1400                                     | 3120  | 3860   | 280      | 620  | 21          | .82     | 4          | 2       | 4            | 24/26                     |
| 03                                   | <b>13440</b>                          | 620                                      | 4440  | 8500   | 500      | 540  | 11          | 2       | 4          | .74     | .74          | 12/21                     |
| 08                                   | <b>10380</b>                          | 4960                                     | 2660  | 5920   | 1800     | 1220 | 34          | 4       | 17         | 5       | 6            | 11/22                     |
| <b>Cercocarpus ledifolius</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 50      | -          | -       | 0            | 44/50                     |
| 03                                   | <b>40</b>                             | -  | 20    | 20     | -        | 20   | 0           | 50      | -          | -       | 0            | 60/44                     |
| 08                                   | <b>60</b>                             | -  | 40    | 20     | -        | -    | 0           | 33      | -          | -       | 0            | 52/39                     |
| <b>Cercocarpus montanus</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>40</b>                             | -  | -     | 40     | -        | -    | 100         | 0       | -          | -       | 0            | 35/35                     |
| <b>Chrysothamnus depressus</b>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>1132</b>                           | -  | 133   | 999    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/9                       |
| 92                                   | <b>3732</b>                           | 399                                      | 1666  | 1733   | 333      | -    | 14          | 13      | 9          | -       | 0            | 4/8                       |
| 98                                   | <b>1680</b>                           | 40                                       | 340   | 1280   | 60       | -    | 17          | 1       | 4          | -       | 0            | 6/11                      |
| 03                                   | <b>560</b>                            | -  | 20    | 520    | 20       | -    | 25          | 21      | 4          | 4       | 4            | 5/10                      |
| 08                                   | <b>180</b>                            | 60                                       | -     | 120    | 60       | -    | 0           | 78      | 33         | -       | 0            | 5/8                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Gutierrezia sarothrae</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>1332</b>                           | -  | 1266  | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 9/10                      |
| 92                           | <b>5198</b>                           | 466                                      | 1399  | 3733   | 66       | -    | 0           | 0       | 1          | -       | 0            | 12/7                      |
| 98                           | <b>2720</b>                           | -  | 880   | 1840   | -        | -    | 2           | 1       | 0          | -       | 0            | 7/6                       |
| 03                           | <b>3060</b>                           | -  | 160   | 2800   | 100      | -    | 0           | 0       | 3          | 2       | 2            | 4/5                       |
| 08                           | <b>5340</b>                           | 400                                      | 380   | 4740   | 220      | 40   | .74         | 4       | 4          | .74     | 1            | 4/5                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>199</b>                            | -  | -     | 199    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/15                      |
| 92                           | <b>399</b>                            | -  | -     | 333    | 66       | -    | 0           | 0       | 17         | -       | 17           | 7/9                       |
| 98                           | <b>380</b>                            | -  | 20    | 320    | 40       | 40   | 0           | 0       | 11         | 11      | 11           | 7/20                      |
| 03                           | <b>420</b>                            | 20                                       | -     | 320    | 100      | -    | 0           | 0       | 24         | 14      | 24           | 6/14                      |
| 08                           | <b>380</b>                            | -  | -     | 260    | 120      | 20   | 0           | 0       | 32         | -       | 11           | 6/17                      |
| <b>Pediocactus simpsonii</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus edulis</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>60</b>                             | 20                                       | 40    | 20     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>80</b>                             | -  | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>533</b>                            | -  | -     | 533    | -        | -    | 88          | 0       | 0          | -       | 0            | 16/22                     |
| 92                           | <b>732</b>                            | -  | 133   | 466    | 133      | -    | 0           | 82      | 18         | -       | 0            | 11/25                     |
| 98                           | <b>700</b>                            | -  | 60    | 520    | 120      | 120  | 9           | 83      | 17         | 9       | 9            | 12/34                     |
| 03                           | <b>580</b>                            | -  | -     | 400    | 180      | 60   | 17          | 79      | 31         | 14      | 14           | 9/29                      |
| 08                           | <b>400</b>                            | -  | 40    | 120    | 240      | 40   | 0           | 90      | 60         | 35      | 35           | 10/25                     |
| <b>Quercus gambelii</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                           | <b>460</b>                            | -  | 280   | 40     | 140      | 60   | 35          | 0       | 30         | 17      | 17           | 38/48                     |
| 03                           | <b>1240</b>                           | -  | 1140  | 100    | -        | 20   | 0           | 0       | 0          | -       | 0            | 42/48                     |
| 08                           | <b>680</b>                            | -  | -     | 560    | 120      | 380  | 0           | 0       | 18         | 18      | 35           | 60/12                     |

|                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Tetradymia canescens |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                   | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | 0          | -       | 0            | 6/9                       |
| 03                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                   | <b>40</b>                             | -  | -     | 20     | 20       | -    | 50          | 50      | 50         | -       | 0            | -/-                       |

Trend Study 30-29-08

Study site name: Southwest of New Castle .

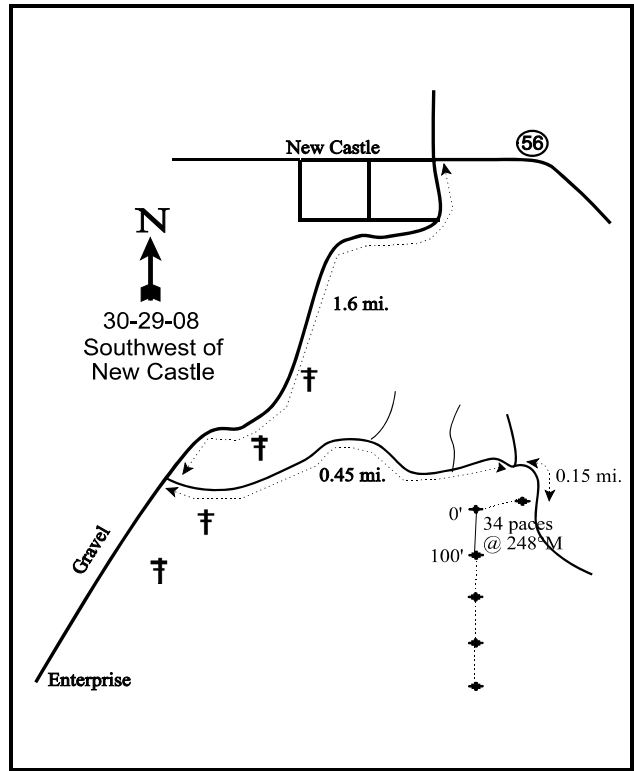
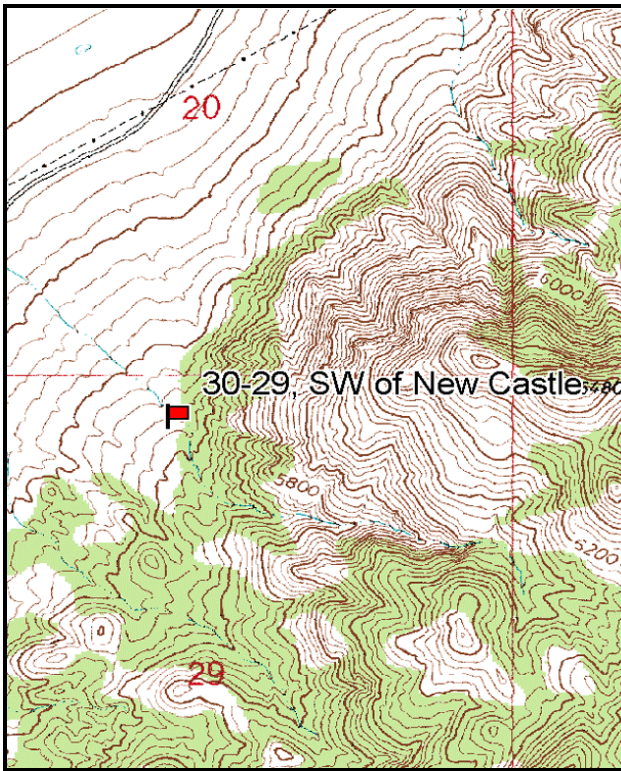
Vegetation type: Sagebrush-Grass .

Compass bearing: frequency baseline 176 degrees magnetic.

Frequency belt placement: line 1 (12 & 92ft), line 2 (39ft), line 3 (50ft), line 4 (79ft). Rebar: All belts on 1ft.

LOCATION DESCRIPTION

From the intersection of Pinto-Canyon Road and Main Street in New Castle, proceed south on Main Street 1.0 mile towards Enterprise. Turn left (east) and travel 0.45 miles until you come to a fork. Take a right and continue 0.15 miles to a witness post on the right side of the road. From the witness post walk 34 paces at 248 degrees magnetic to the 0-foot stake. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.



Map Name: New Castle

Diagrammatic Sketch

Township 36S, Range 15W, Section 20

GPS: NAD 83, UTM 12S 274236 E, 41696174 N



## DISCUSSION

### Southwest of Newcastle - Trend Study No. 30-29

#### Study Information

This study surveys winter range southwest of the town of Newcastle [elevation: 5,600 feet (1,707 m), slope: 11%, aspect: west]. The site is an alluvial fan occupied by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) underlain by a sparse herbaceous understory. The photo transects show that a lop and scatter treatment was done sometime between 2003 and 2008 to remove singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*). Pellet group data estimated heavy deer use in 1998 and 2003 (68 deer days use/acre:168 ddu/ha and 58 ddu/acre:144 ddu/ha, respectively), and very high use in 2008 (102 ddu/acre:251 ddu/ha). No sign of cattle grazing was noted during any of the readings.

#### Soil

Soil is alluvially deposited from basalt parent material. Effective rooting depth is estimated at just over 15 inches. Soil texture is a sandy clay loam which is slightly acidic (pH 6.4). The surface of the soil is covered by gravel 0.25 to 2 inches in size with some larger rocks mixed in. Rock is also common throughout the profile. Bare ground mostly occurs in small shrub interspaces associated with the rocky surface. Ground cover is composed mostly of shrub crowns and ephemeral litter from dead cheatgrass. Soil movement was widespread in 1982 with several small rills and gullies present. Relative combined vegetation and litter cover ranged from 52%-68% from 1998 to 2008. Relative combined rock and pavement cover ranged from 24%-36% from 1998 to 2008. Currently, erosion appears minimal and the erosion condition class was determined to be stable in 2003 and 2008.

#### Browse

Wyoming big sagebrush is the prominent and key browse species. Its population increased from 3,633 plants/acre to 5,799 plants/acre between 1982 and 1992. Density declined to 4,860 plants/acre in 1998 due to a reduction in the number of young and decadent plants. The number of dead plants in the population more than accounts for the decrease in the estimated population. In 2003, the sagebrush population was estimated at 3,680 plants/acre, a 24% decline since 1998. Sagebrush density decreased a further 28% to 2,660 plants/acre in 2008. Utilization of sagebrush was light in 1982, but heavy in 1992 with many plants displaying a clubbed growth form and stunted growth. During the 1998 reading, utilization was more moderate, yet heavy use was still noted on 20% of the sagebrush. Utilization of sagebrush was rated as heavy in 2003, and light to moderate in 2008. Overall, vigor was good from 1992 to 1998, but plants displaying poor vigor increased to 91% in 2003, before decreasing to 21% in 2008. Decadence was low to moderate from 1982 to 1998, increased drastically to 93% in 2003, and decreased to 54% in 2008. Recruitment of young plants was high in 1992, but young plants decreased to just 2% of the population in 1998, remained low at 1% in 2003, and increased slightly to 15% in 2008. During the 2003 reading, the population of Wyoming big sagebrush looked very poor after being subjected to several years of extreme drought. Weather station data from Enterprise show that only 37% of the normal precipitation fell in 2002. The spring of 2002 was exceptionally dry at 13% of normal and the spring of 2003 was 79% of normal. Spring precipitation in 2008 was 56% of normal (Utah Climate Summaries 2008).

The only other shrub of significance is narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) which numbered 920 plants/acre in 1998, decreased slightly to 880 plants/acre in 2003, then increased to 2,160 plants/acre. Broom snakeweed (*Gutierrezia sarothrae*) and prickly pear cactus (*Opuntia* sp.) are both present in small quantities, but pose little threat to the community at this time. The larger sample used in 1998, picked up a few green ephedra (*Ephedra nevadensis*) which provide some additional forage.

Prior to the lop and scatter treatment, singleleaf pinyon pine and Utah juniper trees were increasing down slope from the tree dominated hills to the east. Photo point comparisons suggest an increase in density and size of

the trees, but no point-quarter data is available from 1982 or 1992. Point-center quarter data estimated pinyon density to be 26 trees/acre in 1998, increasing to 31 trees/acre in 2003, and remaining similar at 32 trees/acre in 2008 even with the lop and scatter treatment. The average basal diameter of pinyon was 2.3 inches in 1998, increasing to 3.2 inches in 2003, and decreasing to 1 inch in 2008. Juniper density was estimated to be 32 trees/acre in 1998, increasing to 57 trees/acre in 2003, and decreasing to 47 trees/acre in 2008, after the lop and scatter treatment. The average basal diameter of juniper was 6.8 inches in 1998, decreasing to 3.7 inches in 2003, and increasing slightly to 4 inches in 2008.

#### Herbaceous Understory

Perennial grasses and forbs occur infrequently and are of little significance as a forage source. The two most abundant perennial grasses are galleta grass (*Hilaria jamesii*) and Sandberg bluegrass (*Poa secunda*). Indian ricegrass (*Oryzopsis hymenoides*) and bottlebrush squirreltail (*Sitanion hystrix*) are also fairly common. Cheatgrass (*Bromus tectorum*) was present in 1982 but not widespread. By 1998, it represented the most abundant grass on the site, providing 65% of the total grass cover and 63% of the total herbaceous cover. Sixweeks fescue (*Vulpia octoflora*) was also fairly abundant in 1998. Annual grasses and forbs were not included in samples before 1998, so no comparisons can be made. By 2003, There was a decline in cheatgrass frequency and cover most likely caused by drought conditions. Cheatgrass frequency increased significantly again in 2008. Perennial grasses also declined in cover in 2003, but only bottlebrush squirreltail declined significantly in nested frequency. The cover and frequency of perennial grasses increased again in 2008, though Sandberg bluegrass frequency decreased significantly. Forbs are fairly diverse but are rare in their occurrence. Total forb cover averaged less than 1% in 1998, 2003, and 2008. The most common species are annuals.

#### 1992 TREND ASSESSMENT

Trend for browse is stable. Density of Wyoming big sagebrush has increased 37%. Vigor is good, though decadence has increased slightly to 37%. Narrowleaf low rabbitbrush is stable and doesn't appear to be increasing. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, the trend for grasses is slightly up, and the trend for forbs is stable. All grass species increased in quadrat frequency and forbs increased in species composition, but are still rare.

browse - slightly up (+1)

grass - slightly up (+1)

forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. The proportion of sagebrush displaying poor vigor has increased from 9% in 1992 to 15%. Decadence has declined slightly from 37% to 33%. Reproduction is currently poor, with few seedlings and young plants representing only 2% of the population. Trend for the grasses is slightly down and composition is still considered poor. The sum of nested frequency of perennial grasses has decreased by 20% from 1992 with a significant decrease in the frequency of bottlebrush squirreltail. Annual grasses are dominant on the site with cheatgrass providing 63% of the total herbaceous cover and sixweeks fescue being common on the site. The trend for forbs is up with a three-fold increase in the sum of nested frequency of perennial forbs, but perennial forbs are still lacking.

winter range condition (DCI) - poor (25) Low potential scale

browse - stable (0)

grasses - slightly down (-1)

forb - up (+2)

#### 2003 TREND ASSESSMENT

This site has been greatly effected by drought which has caused downward trends in most areas. Trend for the key browse species, Wyoming big sagebrush, is down. Total population density declined only 24% yet the remaining shrubs are nearly all decadent and dying. Only 220 relatively healthy mature sagebrush plants/acre were sampled. Decadent plants represented 93% of the 3,680 plants/acre estimated and the proportion of

plants displaying poor vigor increased to 91%. Young recruitment is poor with young plants comprising only 1% of the population. Line-intercept cover of live sagebrush crowns was estimated at only 1.6%. Trend for the grasses is slightly down. Sum of nested frequency for perennial grasses declined by 10% from 1998 levels, and cover decreased from 9% in 1998 to 5%. There was a significant decline in the nested frequency of bottlebrush squirreltail, but there was also a significant decline in the nested frequency of the cheatgrass. Cover of cheatgrass also declined from 18% in 1998 to less than one tenth of 1%. Trend for forbs is down. There was a decrease of 59% in the sum of nested frequency of perennial forbs from 1998, but perennial forbs are rare. During the 2003 reading, fewer forbs were encountered than in 1998 even though average cover remained similar. Most of the cover of forbs was provided by annual species.

winter range condition (DCI) - very poor (7) Low potential scale  
browse - down (-2)                      grass - slightly down (-1)                      forb - down (-2)

#### 2008 TREND ASSESSMENT

Trend for browse is considered to be slightly up. Density of the primary browse species, Wyoming big sagebrush, has decreased by 28% to 2,660 plants, but the condition of the population has improved. Plants displaying poor vigor has declined from 91% in 2003 to 21%, and decadence has declined from 93% in 2003 to 54%. Reproduction and recruitment have also improved markedly with many seedlings and young plants comprising 15% of the population. The density of narrowleaf low rabbitbrush, considered to be an increaser species, has increased 59% from 2003 to 2,160 plants/acre. Trend for the grasses is up. The sum of nested frequency of perennial grasses increased by 21%, and cover increased from 5% in 2003 to 8%. The nested frequency of bottlebrush squirreltail and cheatgrass both increased significantly. Trend for forbs is slightly up. There was a two-fold increase in the sum of nested frequency of perennial forbs, and cover of perennial forbs increased. The composition of forbs is still poor and dominated by annual species.

winter range condition (DCI) - fair (27) Low potential scale  
browse - slightly up (+1)                      grass - up (+2)                      forb - slightly up (+1)

HERBACEOUS TRENDS --  
Management unit 30 , Study no: 29

| Type                        | Species                             |                  |                   |                   |                  | Average Cover % |      |       |
|-----------------------------|-------------------------------------|------------------|-------------------|-------------------|------------------|-----------------|------|-------|
|                             |                                     | '92              | '98               | '03               | '08              | '98             | '03  | '08   |
| G                           | <i>Bromus tectorum</i> (a)          | -                | <sub>c</sub> 368  | <sub>a</sub> 35   | <sub>b</sub> 342 | 18.18           | .09  | 5.43  |
| G                           | <i>Hilaria jamesii</i>              | <sub>a</sub> 124 | <sub>ab</sub> 151 | <sub>ab</sub> 147 | <sub>b</sub> 176 | 4.36            | 3.01 | 5.41  |
| G                           | <i>Oryzopsis hymenoides</i>         | 26               | 30                | 19                | 28               | 1.47            | .33  | .49   |
| G                           | <i>Poa secunda</i>                  | <sub>ab</sub> 77 | <sub>ab</sub> 85  | <sub>b</sub> 104  | <sub>a</sub> 63  | 2.15            | 1.79 | 1.00  |
| G                           | <i>Sitanion hystrix</i>             | <sub>c</sub> 151 | <sub>b</sub> 36   | <sub>a</sub> 1    | <sub>b</sub> 62  | 1.02            | .00  | 1.38  |
| G                           | <i>Vulpia octoflora</i> (a)         | -                | <sub>b</sub> 150  | <sub>a</sub> -    | <sub>a</sub> 7   | .98             | -    | .01   |
| Total for Annual Grasses    |                                     | 0                | 518               | 35                | 349              | 19.17           | 0.09 | 5.44  |
| Total for Perennial Grasses |                                     | 378              | 302               | 271               | 329              | 9.01            | 5.16 | 8.30  |
| Total for Grasses           |                                     | 378              | 820               | 306               | 678              | 28.18           | 5.25 | 13.75 |
| F                           | <i>Arabis</i> sp.                   | -                | 2                 | -                 | -                | .03             | -    | -     |
| F                           | <i>Astragalus</i> sp.               | 2                | -                 | -                 | 1                | -               | -    | .03   |
| F                           | <i>Calochortus flexuosus</i>        | <sub>a</sub> 3   | <sub>ab</sub> 16  | <sub>b</sub> 22   | <sub>ab</sub> 14 | .04             | .06  | .04   |
| F                           | <i>Castilleja linariaefolia</i>     | <sub>a</sub> -   | <sub>a</sub> 1    | <sub>a</sub> -    | <sub>b</sub> 12  | .03             | -    | .08   |
| F                           | <i>Collomia linearis</i> (a)        | -                | 3                 | -                 | -                | .00             | -    | -     |
| F                           | <i>Cryptantha</i> sp.               | <sub>a</sub> -   | <sub>b</sub> 32   | <sub>a</sub> -    | <sub>a</sub> 9   | .19             | -    | .02   |
| F                           | <i>Cymopterus</i> sp.               | <sub>a</sub> -   | <sub>ab</sub> 9   | <sub>a</sub> 2    | <sub>b</sub> 17  | .02             | .03  | .06   |
| F                           | <i>Descurainia pinnata</i> (a)      | -                | <sub>b</sub> 24   | <sub>a</sub> -    | <sub>a</sub> -   | .08             | -    | -     |
| F                           | <i>Draba</i> sp. (a)                | -                | <sub>b</sub> 14   | <sub>a</sub> -    | <sub>a</sub> -   | .05             | -    | -     |
| F                           | <i>Eriogonum cernuum</i> (a)        | -                | -                 | -                 | 3                | -               | -    | .00   |
| F                           | <i>Eriogonum</i> sp.                | 4                | 2                 | -                 | -                | .00             | -    | -     |
| F                           | <i>Erigeron pumilus</i>             | 3                | 7                 | -                 | -                | .02             | -    | -     |
| F                           | <i>Gilia</i> sp. (a)                | -                | 49                | 27                | 45               | .19             | .36  | .10   |
| F                           | <i>Heterotheca villosa</i>          | -                | -                 | -                 | 1                | -               | -    | .00   |
| F                           | <i>Lupinus argenteus</i>            | -                | 4                 | -                 | -                | .01             | -    | -     |
| F                           | <i>Lupinus brevicaulis</i> (a)      | -                | -                 | -                 | 8                | -               | -    | .02   |
| F                           | <i>Navarretia intertexta</i> (a)    | -                | <sub>a</sub> 37   | <sub>a</sub> 29   | <sub>b</sub> 164 | .07             | .10  | .37   |
| F                           | <i>Phlox longifolia</i>             | 14               | 22                | 15                | 24               | .08             | .06  | .09   |
| F                           | <i>Sisymbrium altissimum</i> (a)    | -                | -                 | -                 | 9                | -               | -    | .04   |
| F                           | <i>Sphaeralcea grossulariifolia</i> | -                | -                 | -                 | -                | -               | -    | .03   |
| F                           | <i>Swertia albomarginata</i>        | -                | 1                 | -                 | -                | .03             | -    | -     |
| Total for Annual Forbs      |                                     | 0                | 127               | 56                | 229              | 0.41            | 0.46 | 0.55  |
| Total for Perennial Forbs   |                                     | 26               | 96                | 39                | 78               | 0.45            | 0.15 | 0.35  |
| Total for Forbs             |                                     | 26               | 223               | 95                | 307              | 0.87            | 0.62 | 0.90  |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 29

| Type             | Species                                   | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|---|-----------------|-----|-----|-----------------|-------|-------|
|                  |   | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Artemisia tridentata wyomingensis         | 89              | 80  | 73  | 11.61           | 6.51  | 6.20  |
| B                | Chrysothamnus viscidiflorus stenophyllus  | 32              | 31  | 53  | 1.56            | 1.24  | 3.65  |
| B                | Chrysothamnus viscidiflorus viscidiflorus | 0               | 0   | 0   | -               | 1.31  | -     |
| B                | Ephedra nevadensis                        | 3               | 3   | 4   | .00             | .15   | .03   |
| B                | Gutierrezia sarothrae                     | 1               | 0   | 1   | .15             | -     | .00   |
| B                | Juniperus osteosperma                     | 2               | 4   | 2   | .00             | .00   | .00   |
| B                | Pediocactus simpsonii                     | 8               | 9   | 7   | .00             | .00   | .00   |
| B                | Opuntia sp.                               | 0               | 2   | 0   | .91             | .71   | 1.76  |
| B                | Pinus monophylla                          | 1               | 2   | 1   | 1.41            | 1.70  | .66   |
| B                | Sclerocactus sp.                          | 1               | 0   | 0   | .00             | -     | -     |
| Total for Browse |   | 137             | 131 | 141 | 15.65           | 11.63 | 12.32 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 29

| Species                                  | Percent Cover |      |
|--|---------------|------|
|  | '03           | '08  |
| Artemisia tridentata wyomingensis        | 1.54          | 8.83 |
| Chrysothamnus viscidiflorus stenophyllus | 1.28          | 4.13 |
| Ephedra nevadensis                       | .03           | .15  |
| Opuntia sp.                              | .86           | 1.51 |
| Pinus monophylla                         | 1.54          | .96  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 29

| Species                           | Average leader growth (in) |     |
|-----------------------------------|----------------------------|-----|
|                                   | '03                        | '08 |
| Artemisia tridentata wyomingensis | 1.7                        | 1.5 |

POINT-QUARTER TREE DATA --  
Management unit 30 , Study no: 29

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 32             | 57  | 47  |
| Pinus monophylla      | 26             | 31  | 32  |

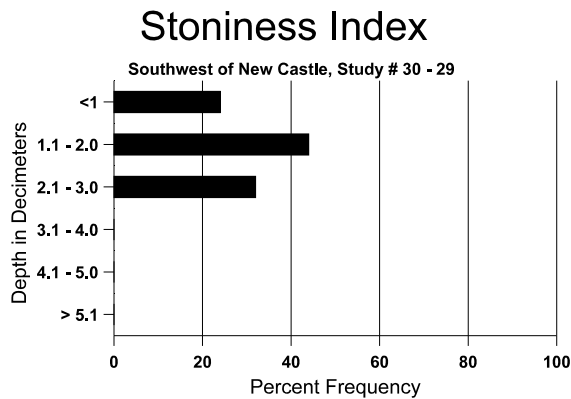
| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 6.8                   | 3.7 | 4.0 |
| 2.3                   | 3.2 | 0.9 |

BASIC COVER --  
Management unit 30 , Study no: 29

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 4.00            | 24.25 | 43.79 | 19.89 | 28.57 |
| Rock        | 11.50           | 10.50 | 7.65  | 7.56  | 6.74  |
| Pavement    | 0               | 3.75  | 22.60 | 31.62 | 23.55 |
| Litter      | 36.50           | 54.00 | 30.99 | 35.59 | 50.98 |
| Cryptogams  | .25             | 0     | .39   | .80   | .17   |
| Bare Ground | 47.75           | 7.50  | 18.28 | 12.09 | 7.30  |

SOIL ANALYSIS DATA --  
Management unit 30, Study no: 29, Study Name: Southwest of New Castle

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand          | % silt | % clay |     |       |       |      |
| 15.2                         | 49.0 (16.8)     | 6.4 | 54.0            | 21.4   | 24.6   | 1.6 | 9.4   | 105.6 | 0.6  |



PELLET GROUP DATA --  
Management unit 30 , Study no: 29

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 31                | 22  | 93  |
| Deer   | 54                | 51  | 37  |

| Days use per acre (ha) |          |           |
|------------------------|----------|-----------|
| '98                    | '03      | '08       |
| -                      | -        | -         |
| 68 (168)               | 58 (144) | 102 (251) |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 29

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year  | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata wyomingensis</i>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>3631</b>                           | 499                                      | 533   | 2399   | 699      | -    | 3           | 0       | 19         | -       | 2            | 20/33                     |
| 92  | <b>5798</b>                           | 99                                       | 1533  | 2099   | 2166     | -    | 34          | 57      | 37         | 4       | 9            | 17/22                     |
| 98  | <b>4860</b>                           | 40                                       | 100   | 3160   | 1600     | 1380 | 56          | 20      | 33         | 12      | 15           | 16/24                     |
| 03  | <b>3680</b>                           | 40                                       | 40    | 220    | 3420     | 2440 | 9           | 85      | 93         | 89      | 91           | 13/20                     |
| 08  | <b>2660</b>                           | 2640                                     | 400   | 820    | 1440     | 2380 | 37          | 11      | 54         | 21      | 21           | 15/23                     |
| <i>Chrysothamnus viscidiflorus stenophyllus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | <b>465</b>                            | -  | 99    | 366    | -        | -    | 0           | 0       | 0          | -       | 0            | 11/11                     |
| 98  | <b>920</b>                            | -  | 60    | 860    | -        | 20   | 0           | 0       | 0          | -       | 0            | 12/18                     |
| 03  | <b>880</b>                            | -  | 20    | 300    | 560      | 140  | 0           | 2       | 64         | 41      | 41           | 10/13                     |
| 08  | <b>2160</b>                           | 540                                      | 940   | 840    | 380      | 60   | 3           | 3       | 18         | 3       | 3            | 13/20                     |
| <i>Ephedra nevadensis</i>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98  | <b>100</b>                            | -  | 20    | 80     | -        | -    | 80          | 0       | 0          | -       | 0            | 10/21                     |
| 03  | <b>80</b>                             | -  | -     | 80     | -        | -    | 0           | 25      | 0          | -       | 25           | 8/12                      |
| 08  | <b>220</b>                            | -  | -     | -      | 220      | -    | 0           | 91      | 100        | 18      | 36           | 18/24                     |
| <i>Gutierrezia sarothrae</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>433</b>                            | -  | -     | 433    | -        | -    | 46          | 0       | -          | -       | 0            | 8/7                       |
| 92  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98  | <b>40</b>                             | 20                                       | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 5/4                       |
| <i>Juniperus osteosperma</i>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98  | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03  | <b>80</b>                             | -  | 80    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08  | <b>40</b>                             | 40                                       | 20    | -      | 20       | -    | 0           | 0       | 50         | -       | 50           | 9/9                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                           | <b>33</b>                             | -  | -     | 33     | -        | -    | 0           | 0       | 0          | -       | 0            | 4/17                      |  |
| 92                           | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 5/14                      |  |
| 98                           | <b>220</b>                            | -  | 20    | 200    | -        | -    | 0           | 0       | 0          | -       | 0            | 7/13                      |  |
| 03                           | <b>200</b>                            | -  | -     | 180    | 20       | -    | 0           | 0       | 10         | -       | 10           | 8/23                      |  |
| 08                           | <b>180</b>                            | -  | -     | 140    | 40       | 20   | 11          | 0       | 22         | 11      | 11           | 10/28                     |  |
| <b>Pediocactus simpsonii</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 1/3                       |  |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| <b>Pinus monophylla</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                           | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                           | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 50           | -/-                       |  |
| 08                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 17/9                      |  |
| <b>Sclerocactus sp.</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 98                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 1/2                       |  |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 2/2                       |  |



Trend Study 30-35-08

Study site name: Deep Canyon .

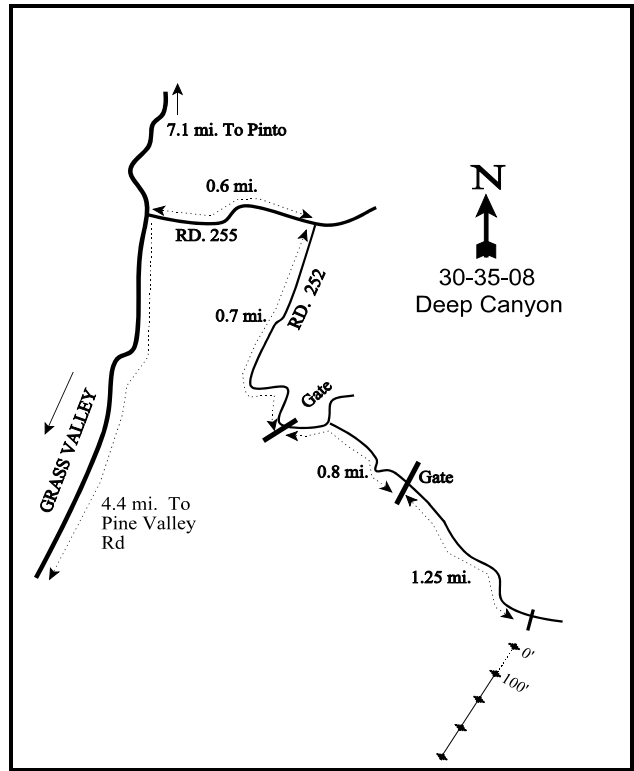
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 199 degrees magnetic.

Frequency belt placement: line 1 (19 & 88ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

From Pinto, drive south 7.1 miles toward Grass Valley. Turn left (east) on the road toward Whiterocks trail. Proceed on this road for 0.6 miles, at which point there will be an intersection. Go right (southeast) for 0.7 miles to a gate. Proceed through the gate for 0.8 miles to a second gate. Go through the second gate and drive 1.25 miles to the end of the road. There will be a witness post on the right side of the road at the base of a twin trunk *Pinus flexilis*. From the witness post walk uphill 33 paces at 193 degrees magnetic to the 0-foot stake. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map Name: New Harmony

Diagrammatic Sketch

Township 39S , Range 15W , Section unsurveyed

GPS: NAD 83, UTM 12S 283016 E, 4144857 N

## DISCUSSION

### Deep Canyon - Trend Study No. 30-35

#### Study Information

This study is located on fawn rearing habitat in the Deep Creek drainage on the south side of Grass Valley [elevation: 7,500 feet (2,286 m), slope: 50%-65%, aspect: north). There is ample vegetation for browsing, escape, and thermal cover. A small stream is located approximately a quarter mile away at the base of the hill. The study area is mixed mountain brush which is predominantly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and curleaf mountain mahogany (*Cercocarpus ledifolius*). The study is located on the USFS Pine Valley allotment and is grazed from July 15-October 15, although livestock do not appear to be using the steeper slopes. Pellet group data estimated deer use to be moderately heavy in 1998 and 2008 (both years estimated at 40 deer days use/acre:99 ddu/ha), and very heavy in 2003 (75 ddu/acre:185 ddu/ha). Cattle use has been estimated to be very light in all three sample years (3 to 4 cow days use/acre:7 to 10 cdu/ha). This area would normally be considered summer range except during mild years when spring and fall use may also occur.

#### Soils

Soils are shallow in places and rocky on the surface and throughout the profile. There is some exposed bedrock. Soil depth is variable, but moderately deep overall with an estimated effective rooting depth of almost 16 inches. Texture is a sandy loam which is moderately acidic (pH 5.8). Soil movement is apparent, causing considerable pedestalling on the uphill side of shrubs and trees. Wildlife and livestock also trail across the slope causing substantial terracing. Ground cover is patchy with abundant rock and pavement cover. Relative combined vegetation and litter cover was 32% in 1998, and increased to 58% in 2003 and 2008. Relative combined rock and pavement cover has ranged from 26%-29% from 1998 to 2008. The high rock cover tends to accelerate runoff, and herbaceous vegetation cover is not sufficient to hold the soil. The erosion condition class was determined to be slight in 2003 and 2008 due to flow patterns on game trails and surface litter, surface rock, and soil movement.

#### Browse

Browse composition is divided among several species. The taller growth forms include pinyon pine (*Pinus edulis*), curleaf mountain mahogany, and a few mature Gambel oak (*Quercus gambelii*). Lower growing, more available browse plants include mountain big sagebrush, slenderbush eriogonum (*Eriogonum microthecum*), mountain snowberry (*Symphoricarpos oreophilus*), young curleaf mahogany, young Gambel oak, and Utah serviceberry (*Amelanchier utahensis*). Curleaf mountain mahogany provided 35% of the browse cover in 1998, 22% in 2003, and 23% in 2008. They numbered 420 plants/acre in 1998, increasing to 580 plants/acre in 2003, and decreasing to 440 plants/acre in 2008. Most plants are at least partly available to browsing while some are tree-like and unavailable due to height. Overhead canopy cover averaged about 30% in 1998, 2003, and 2008. Use of the available curleaf mahogany has been moderate to heavy with the heaviest use reported in 1992. Vigor remains normal and decadence low. Seedling and young recruitment has been good during all readings.

The primary understory shrubs include mountain big sagebrush, slenderbush eriogonum, and snowberry. Sagebrush provided 31% of the browse cover in 1998, increasing to 53% in 2003, and decreasing to 43% in 2008. The sagebrush population has increased steadily with each reading from 1,266 plants/acre in 1982 to 4,920 by 2008. Use has been mostly light, vigor good, and decadence low. Slenderbush eriogonum and snowberry appear to have stable populations displaying light to moderate use, good vigor, and low decadence. Other preferred shrubs that occur in small numbers include Utah serviceberry and antelope bitterbrush (*Purshia tridentata*).

### Herbaceous Understory

The herbaceous understory is moderately abundant, yet provides irregular ground cover. Perennial grasses are diverse with mutton bluegrass (*Poa fendleriana*) and Letterman needlegrass (*Stipa lettermani*) combining to produce 76% of the grass cover in 1998 and 78% in 2003. In 2008, mutton bluegrass produced 70% of the grass cover and Letterman needlegrass produced only 3%. Blue grama (*Bouteloua gracilis*), bottlebrush squirreltail (*Sitanion hystrix*), and subalpine needlegrass (*Stipa columbiana*) are also fairly abundant.

Forbs are abundant and diverse and produce as much cover as the grasses. However, composition could be better as annuals like blue-eyed Mary (*Collinsia parviflora*) and slender phlox (*Microsteris gracilis*) dominate and account for much of the forb cover. The most common perennial forbs include Eaton fleabane (*Erigeron eatonii*), redroot eriogonum (*Eriogonum racemosum*), Bonneville pea (*Lathyrus brachycalyx*), and desert phlox (*Phlox austromontana*).

### 1992 TREND ASSESSMENT

Trend for browse is up slightly. The density of the primary browse species', mountain big sagebrush and curleaf mountain mahogany, both increased. Vigor was good and decadence was low for both species. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, the trend for grasses is slightly up with increases in quadrat frequency of most species. The trend for forbs is stable. Forb quadrat frequencies stayed fairly stable with only a few select forbs increasing.

browse - slightly up (+1)      grass - slightly up (+1)      forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big sagebrush vigor is good and decadence is low. Trend for the grasses is stable. There was little change in the sum of nested frequency for perennial grasses, though there was a significant decline in the nested frequency of mutton bluegrass. Trend for forbs is slightly down. Sum of nested frequency for perennial forbs has declined by 25% from 1992, with several forbs abundant in 1992 declining significantly in frequency.

browse - stable (0)      grass - stable (0)      forb - slightly down (-1)

### 2003 TREND ASSESSMENT

Trend for browse is up for the key species, curleaf mountain mahogany and mountain big sagebrush. Mahogany has increased in density by 28% from 1998. Mahogany vigor remains good and no decadent plants were sampled. Mountain big sagebrush provides most of the understory shrub cover. It has increased 25% in density from 1998 to 4,660 plants/acre. Sagebrush vigor remains good and decadence is low. Due to the high elevation, aspect, and importance of this area as fawning habitat, shrubs are not the most important vegetational aspect. The herbaceous understory, especially forbs is much more important for deer in the early spring. The herbaceous understory on this site is fairly abundant but patchy in its distribution. The trend for grasses is down. The sum of nested frequency of perennial grasses declined by 28% from 1998, and cover decreased from 11% in 1998 to 5%. There was a significant decrease in the nested frequency of bottlebrush squirreltail and letterman needlegrass. Trend for forbs is stable. There was little change in the sum of nested frequency of perennial forbs, though cover of perennial forbs declined slightly from 6% in 1998 to 4%.

browse - up (+2)      grass - down (-2)      forb - stable (0)

### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of mountain big sagebrush increased slightly to 4,920 plants/acre. Sagebrush vigor is good and decadence remains low. Curleaf mahogany density declined slightly to 440 plants/acre. Mahogany vigor remained good and decadence low. Trend for both grasses and forbs is up. Sum

of nested frequency of perennial grasses has increased by 25% from 2003, and perennial grass cover increased from 5% in 2003 to 11%. Nested frequency of mutton bluegrass increased significantly. Sum of nested frequency of perennial forbs increased by 50% from 2003, and cover increased from 4% in 2003 to 6%.

browse - stable (0)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 35

| T<br>y<br>p<br>e            | Species                    |      |      |      |      | Average Cover % |      |       |
|-----------------------------|----------------------------|------|------|------|------|-----------------|------|-------|
|                             |                            | '92  | '98  | '03  | '08  | '98             | '03  | '08   |
| G                           | Agropyron trachycaulum     | a5   | a2   | a-   | b24  | .18             | -    | .25   |
| G                           | Bouteloua gracilis         | 14   | 11   | 10   | 13   | .83             | .04  | .60   |
| G                           | Bromus tectorum (a)        | -    | 8    | 9    | -    | .01             | .04  | -     |
| G                           | Carex sp.                  | 3    | -    | -    | 3    | -               | -    | .01   |
| G                           | Koeleria cristata          | -    | 4    | -    | -    | .15             | -    | -     |
| G                           | Poa fendleriana            | b217 | a152 | a118 | b211 | 3.85            | 2.59 | 7.96  |
| G                           | Poa pratensis              | a-   | a-   | b10  | a-   | .03             | .08  | -     |
| G                           | Poa secunda                | a-   | c34  | ab8  | bc11 | .45             | .04  | .22   |
| G                           | Sitanion hystrix           | b89  | b76  | a37  | ab62 | .71             | .28  | .73   |
| G                           | Stipa columbiana           | a8   | a9   | a12  | b42  | .24             | .11  | 1.22  |
| G                           | Stipa comata               | a5   | a-   | b44  | a-   | -               | .45  | -     |
| G                           | Stipa lettermani           | c137 | c141 | b69  | a18  | 4.42            | 1.23 | .29   |
| Total for Annual Grasses    |                            | 0    | 8    | 9    | 0    | 0.01            | 0.04 | 0     |
| Total for Perennial Grasses |                            | 478  | 429  | 308  | 384  | 10.88           | 4.84 | 11.30 |
| Total for Grasses           |                            | 478  | 437  | 317  | 384  | 10.90           | 4.89 | 11.30 |
| F                           | Agoseris glauca            | -    | a18  | b28  | bc48 | c.06            | .19  | .38   |
| F                           | Antennaria rosea           | a10  | ab14 | b25  | a6   | .60             | .49  | .21   |
| F                           | Arabis sp.                 | ab9  | ab12 | a2   | b22  | .02             | .03  | .05   |
| F                           | Astragalus argophyllus     | b13  | a-   | a-   | a-   | -               | -    | -     |
| F                           | Astragalus concordius      | -    | -    | -    | 7    | -               | -    | .18   |
| F                           | Aster sp.                  | a-   | a-   | a1   | b17  | -               | .00  | .12   |
| F                           | Astragalus sp.             | 7    | 2    | 1    | -    | .30             | .00  | -     |
| F                           | Balsamorhiza sagittata     | -    | 3    | 7    | 1    | .15             | .08  | .03   |
| F                           | Calochortus nuttallii      | a-   | a1   | b14  | ab7  | .00             | .05  | .01   |
| F                           | Chenopodium fremontii (a)  | -    | -    | 2    | 3    | -               | .01  | .03   |
| F                           | Comandra pallida           | -    | -    | 2    | -    | -               | .00  | -     |
| F                           | Collinsia parviflora (a)   | -    | a152 | b211 | a187 | 2.54            | 3.04 | .79   |
| F                           | Crepis acuminata           | a-   | b25  | a4   | a5   | .15             | .07  | .06   |
| F                           | Delphinium nuttallianum    | a-   | a-   | b17  | b23  | -               | .07  | .06   |
| F                           | Epilobium brachycarpum (a) | -    | 8    | -    | 3    | .02             | -    | .01   |

| T<br>y<br>p<br>e          | Species                         |                 |                  |                  |                 | Average Cover % |      |      |
|---------------------------|---------------------------------|-----------------|------------------|------------------|-----------------|-----------------|------|------|
|                           |                                 | '92             | '98              | '03              | '08             | '98             | '03  | '08  |
| F                         | <i>Erigeron eatonii</i>         | <sub>b</sub> 91 | <sub>b</sub> 82  | <sub>a</sub> 41  | <sub>a</sub> 42 | 1.14            | .31  | .38  |
| F                         | <i>Eriogonum racemosum</i>      | <sub>b</sub> 70 | <sub>a</sub> 19  | <sub>a</sub> 13  | <sub>a</sub> 30 | .10             | .16  | .16  |
| F                         | <i>Eriogonum umbellatum</i>     | <sub>a</sub> -  | <sub>ab</sub> 4  | <sub>ab</sub> 4  | <sub>b</sub> 9  | .03             | .03  | .08  |
| F                         | <i>Fritillaria atropurpurea</i> | -               | -                | 9                | 1               | -               | .04  | .00  |
| F                         | <i>Galium</i> sp.               | -               | 8                | 2                | -               | .07             | .00  | -    |
| F                         | <i>Hackelia patens</i>          | <sub>b</sub> 56 | <sub>a</sub> 18  | <sub>ab</sub> 36 | <sub>c</sub> 96 | .37             | .54  | 2.37 |
| F                         | <i>Heuchera parvifolia</i>      | 2               | -                | -                | 6               | -               | -    | .05  |
| F                         | <i>Lathyrus brachycalyx</i>     | <sub>b</sub> 60 | <sub>a</sub> 21  | <sub>a</sub> 13  | <sub>a</sub> 14 | .45             | .10  | .06  |
| F                         | <i>Lappula occidentalis</i> (a) | -               | <sub>b</sub> 29  | <sub>a</sub> -   | <sub>a</sub> 1  | .41             | -    | .00  |
| F                         | <i>Lithospermum ruderales</i>   | -               | -                | -                | -               | -               | -    | .00  |
| F                         | <i>Lithophragma tenella</i>     | <sub>a</sub> -  | <sub>a</sub> -   | <sub>b</sub> 25  | <sub>c</sub> 60 | -               | .14  | .42  |
| F                         | <i>Lomatium</i> sp.             | <sub>a</sub> -  | <sub>a</sub> 4   | <sub>b</sub> 32  | <sub>b</sub> 37 | .01             | .35  | .41  |
| F                         | <i>Lupinus argenteus</i>        | <sub>c</sub> 23 | <sub>bc</sub> 19 | <sub>ab</sub> 5  | <sub>a</sub> 3  | .55             | .21  | .06  |
| F                         | <i>Machaeranthera canescens</i> | <sub>b</sub> 8  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -  | .01             | -    | -    |
| F                         | <i>Microsteris gracilis</i> (a) | -               | <sub>b</sub> 95  | <sub>a</sub> 1   | <sub>a</sub> 3  | 1.41            | .00  | .00  |
| F                         | <i>Pedicularis centranthera</i> | 3               | -                | -                | -               | -               | -    | -    |
| F                         | <i>Petroradia pumila</i>        | <sub>ab</sub> 9 | <sub>b</sub> 18  | <sub>a</sub> 4   | <sub>a</sub> 4  | .71             | .02  | .07  |
| F                         | <i>Phlox austromontana</i>      | 79              | 63               | 45               | 54              | 1.04            | .71  | .86  |
| F                         | <i>Polygonum douglasii</i> (a)  | <sub>a</sub> -  | <sub>c</sub> 38  | <sub>b</sub> 7   | <sub>ab</sub> 6 | .08             | .05  | .02  |
| F                         | <i>Senecio multilobatus</i>     | 3               | -                | 3                | 2               | -               | .01  | .00  |
| F                         | <i>Silene douglasii</i>         | <sub>b</sub> 8  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -  | -               | -    | -    |
| F                         | <i>Taraxacum officinale</i>     | 14              | 18               | 4                | 10              | .13             | .03  | .10  |
| F                         | <i>Zigadenus paniculatus</i>    | -               | -                | -                | -               | -               | .00  | -    |
| Total for Annual Forbs    |                                 | 0               | 322              | 221              | 203             | 4.47            | 3.10 | 0.85 |
| Total for Perennial Forbs |                                 | 465             | 349              | 337              | 504             | 5.96            | 3.71 | 6.18 |
| Total for Forbs           |                                 | 465             | 671              | 558              | 707             | 10.44           | 6.82 | 7.04 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 35

| Type             | Species                       | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|-------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                               | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Abies concolor                | 2               | 4   | 7   | .00             | .00   | .76   |
| B                | Amelanchier utahensis         | 4               | 1   | 4   | .00             | .15   | .15   |
| B                | Artemisia tridentata vaseyana | 75              | 79  | 82  | 6.40            | 11.10 | 6.72  |
| B                | Cercocarpus ledifolius        | 18              | 15  | 14  | 7.19            | 4.61  | 3.55  |
| B                | Cercocarpus montanus          | 0               | 0   | 1   | -               | -     | .00   |
| B                | Chrysothamnus parryi          | 3               | 1   | 3   | .00             | .00   | .00   |
| B                | Eriogonum microthecum         | 75              | 51  | 71  | 4.66            | 1.89  | 2.75  |
| B                | Mahonia repens                | 2               | 4   | 4   | .15             | .04   | .30   |
| B                | Opuntia sp.                   | 11              | 13  | 9   | .01             | .06   | .03   |
| B                | Pachistima myrsinites         | 4               | 15  | 0   | .00             | .90   | -     |
| B                | Pinus edulis                  | 4               | 2   | 4   | .15             | .38   | .00   |
| B                | Purshia tridentata            | 3               | 0   | 0   | .00             | -     | -     |
| B                | Quercus gambelii              | 7               | 2   | 2   | .03             | .18   | .00   |
| B                | Symphoricarpos oreophilus     | 30              | 25  | 27  | 2.00            | 1.80  | 1.37  |
| Total for Browse |                               | 238             | 212 | 228 | 20.61           | 21.14 | 15.67 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 35

| Species                       | Percent Cover |       |       |
|-------------------------------|---------------|-------|-------|
|                               | '98           | '03   | '08   |
| Abies concolor                | -             | .68   | 1.41  |
| Amelanchier utahensis         | -             | 6.73  | .05   |
| Artemisia tridentata vaseyana | -             | 8.69  | 10.00 |
| Cercocarpus ledifolius        | 30.00         | 28.79 | 33.09 |
| Chrysothamnus parryi          | -             | -     | .15   |
| Eriogonum microthecum         | -             | 1.85  | 5.41  |
| Mahonia repens                | -             | -     | .21   |
| Opuntia sp.                   | -             | .26   | .23   |
| Pachistima myrsinites         | -             | .63   | -     |
| Pinus edulis                  | 1.20          | .76   | 2.00  |
| Quercus gambelii              | -             | .08   | -     |
| Symphoricarpos oreophilus     | -             | 1.39  | 3.31  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 35

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.7                        | 1.5 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 35

| Species                | Trees per Acre |     | Average diameter (in) |     |
|------------------------|----------------|-----|-----------------------|-----|
|                        | '03            | '08 | '03                   | '08 |
| Cercocarpus ledifolius | 117            | 107 | 6.5                   | 8.1 |

BASIC COVER --

Management unit 30 , Study no: 35

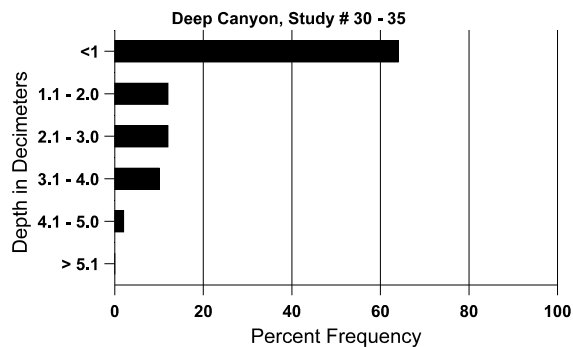
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 3.75            | 7.75  | 36.31 | 33.45 | 33.51 |
| Rock        | 9.00            | 12.25 | 23.92 | 22.54 | 20.59 |
| Pavement    | 1.50            | 17.00 | 11.67 | 7.75  | 12.37 |
| Litter      | 44.50           | 46.00 | 31.70 | 33.90 | 34.54 |
| Cryptogams  | .25             | .50   | .47   | .10   | .16   |
| Bare Ground | 41.00           | 16.50 | 20.27 | 18.53 | 15.23 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 35, Study Name: Deep Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 15.5                         | 51.4 (16.5)     | 5.8 | 68.0       | 17.4  | 14.6  | 3.4 | 12.1  | 163.2 | 0.5  |

Stoniness Index



PELLET GROUP DATA --  
 Management unit 30 , Study no: 35

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | 1                 | -   | -   |
| Rabbit | 1                 | 5   | 13  |
| Deer   | 26                | 23  | 36  |
| Cattle | 4                 | 1   | 1   |

| Days use per acre (ha) |          |         |
|------------------------|----------|---------|
| '98                    | '03      | '08     |
| -                      | -        | -       |
| -                      | -        | -       |
| 40 (99)                | 75 (185) | 40 (99) |
| 2 (5)                  | 4 (11)   | 4 (9)   |

BROWSE CHARACTERISTICS --  
 Management unit 30 , Study no: 35

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                 | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Abies concolor</b>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>66</b>                             | -  | 66    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>60</b>                             | -  | 60    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>80</b>                             | 40                                       | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>160</b>                            | 20                                       | 120   | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                                   | <b>100</b>                            | -  | 40    | 40     | 20       | -    | 20          | 20      | 20         | 20      | 20           | 26/21                     |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 14/17                     |
| 08                                   | <b>100</b>                            | -  | 20    | 60     | 20       | -    | 0           | 80      | 20         | -       | 0            | 3/14                      |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>1265</b>                           | -  | 333   | 599    | 333      | -    | 0           | 0       | 26         | -       | 0            | 19/27                     |
| 92                                   | <b>2664</b>                           | 1066                                     | 1266  | 999    | 399      | -    | 18          | 3       | 15         | -       | 8            | 20/26                     |
| 98                                   | <b>3500</b>                           | 780                                      | 840   | 2340   | 320      | 220  | 7           | 1       | 9          | .57     | 4            | 22/30                     |
| 03                                   | <b>4660</b>                           | 260                                      | 1620  | 2520   | 520      | 360  | 0           | 0       | 11         | 3       | 3            | 16/30                     |
| 08                                   | <b>4920</b>                           | 1400                                     | 1580  | 2320   | 1020     | 680  | 19          | 2       | 21         | 9       | 12           | 12/23                     |
| <b>Cercocarpus ledifolius</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>865</b>                            | -  | 199   | 666    | -        | -    | 31          | 0       | 0          | -       | 0            | 40/42                     |
| 92                                   | <b>1199</b>                           | 599                                      | 333   | 733    | 133      | -    | 11          | 56      | 11         | -       | 0            | 57/35                     |
| 98                                   | <b>420</b>                            | 200                                      | 100   | 300    | 20       | 20   | 24          | 10      | 5          | -       | 0            | 102/101                   |
| 03                                   | <b>580</b>                            | 100                                      | 180   | 400    | -        | 20   | 14          | 31      | 0          | -       | 0            | 78/66                     |
| 08                                   | <b>440</b>                            | 100                                      | 140   | 260    | 40       | 60   | 5           | 45      | 9          | 5       | 5            | 43/35                     |



|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Cercocarpus montanus</b>  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 20                                    | -  | 20    | -      | -        | -    | 0           | 100     | -          | -       | 100          | -/-                       |
| <b>Chrysothamnus parryi</b>  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 66                                    | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 21/22                     |
| 92                           | 66                                    | -  | 66    | -      | -        | -    | 0           | 100     | 0          | -       | 0            | -/-                       |
| 98                           | 100                                   | -  | 20    | 80     | -        | -    | 20          | 0       | 0          | -       | 0            | 6/7                       |
| 03                           | 100                                   | -  | -     | 100    | -        | -    | 0           | 100     | 0          | -       | 0            | 5/7                       |
| 08                           | 80                                    | -  | -     | 60     | 20       | -    | 50          | 25      | 25         | 25      | 25           | 6/8                       |
| <b>Eriogonum microthecum</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 2266                                  | -  | -     | 2266   | -        | -    | 9           | 0       | 0          | -       | 0            | 9/18                      |
| 92                           | 6198                                  | -  | 1866  | 4266   | 66       | -    | 41          | 3       | 1          | -       | 2            | 7/8                       |
| 98                           | 4920                                  | 60                                       | 660   | 4240   | 20       | 40   | 16          | 0       | 0          | -       | 0            | 7/12                      |
| 03                           | 3560                                  | 20                                       | 220   | 3240   | 100      | 120  | 0           | 0       | 3          | .56     | .56          | 5/10                      |
| 08                           | 5760                                  | 940                                      | 1240  | 4220   | 300      | 40   | 15          | 5       | 5          | 1       | 1            | 8/15                      |
| <b>Gutierrezia sarothrae</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/5                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Mahonia repens</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                           | 180                                   | -  | -     | 180    | -        | -    | 0           | 0       | 0          | -       | 0            | 5/8                       |
| 03                           | 720                                   | 20                                       | 160   | 540    | 20       | -    | 0           | 0       | 3          | 3       | 3            | 3/3                       |
| 08                           | 1720                                  | -  | 260   | 1180   | 280      | -    | 0           | 0       | 16         | -       | 0            | 6/5                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 133                                   | -  | -     | 133    | -        | -    | 0           | 0       | 0          | -       | 0            | 4/5                       |
| 92                           | 398                                   | -  | 66    | 266    | 66       | -    | 0           | 0       | 17         | 5       | 17           | 7/9                       |
| 98                           | 220                                   | -  | 40    | 160    | 20       | 20   | 0           | 0       | 9          | 9       | 9            | 6/21                      |
| 03                           | 400                                   | -  | -     | 280    | 120      | -    | 0           | 0       | 30         | 30      | 30           | 6/15                      |
| 08                           | 320                                   | 20                                       | 20    | 200    | 100      | -    | 0           | 0       | 31         | 6       | 25           | 7/12                      |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Pachistima myrsinites</b>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 120                                   | -  | 20    | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 5/4                       |
| 03                               | 880                                   | -  | -     | 880    | -        | -    | 41          | 36      | -          | -       | 0            | 3/8                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus edulis</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 80                                    | 40                                       | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 40                                    | 20                                       | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | 80                                    | 40                                       | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 120                                   | -  | 40    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Quercus gambelii</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 599                                   | -  | -     | 599    | -        | -    | 0           | 100     | 0          | -       | 0            | 12/5                      |
| 92                               | 133                                   | 133                                      | 133   | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                               | 480                                   | 120                                      | 360   | 100    | 20       | 20   | 0           | 0       | 4          | -       | 0            | 59/61                     |
| 03                               | 60                                    | 820                                      | 60    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 16/14                     |
| 08                               | 740                                   | -  | 740   | -      | -        | -    | 3           | 0       | 0          | -       | 3            | -/-                       |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 998                                   | -  | 199   | 799    | -        | -    | 47          | 0       | 0          | -       | 0            | 22/24                     |
| 92                               | 1398                                  | 399                                      | 599   | 666    | 133      | -    | 5           | 38      | 10         | -       | 0            | 20/26                     |
| 98                               | 1120                                  | 180                                      | 300   | 680    | 140      | 40   | 13          | 0       | 13         | -       | 0            | 13/28                     |
| 03                               | 1100                                  | 100                                      | 280   | 800    | 20       | 60   | 4           | 13      | 2          | 2       | 2            | 13/28                     |
| 08                               | 1400                                  | 100                                      | 420   | 800    | 180      | -    | 26          | 19      | 13         | 4       | 4            | 14/27                     |

Trend Study 30-38-08

Study site name: Wide Canyon .

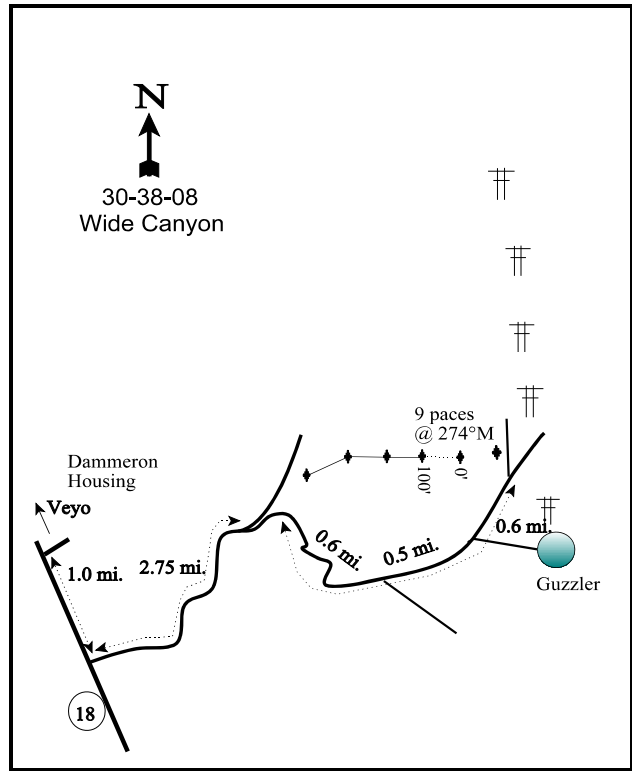
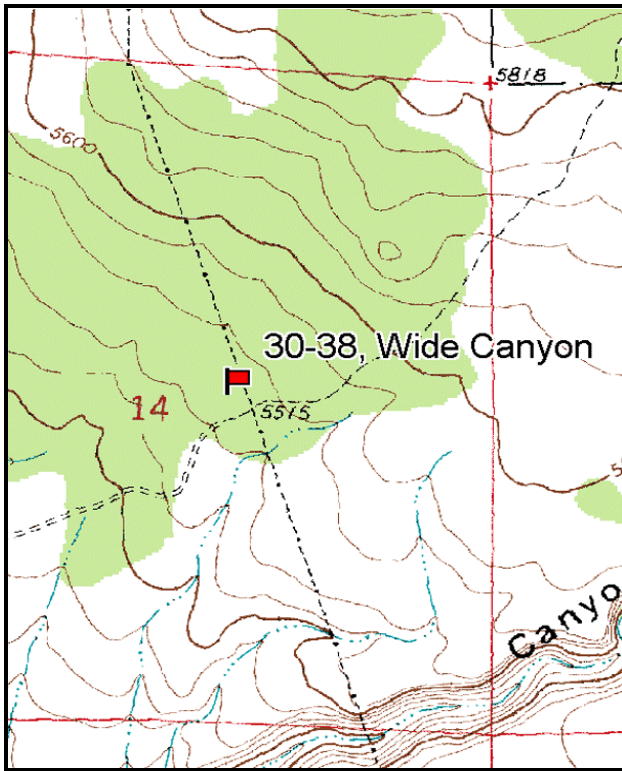
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 276 degrees magnetic. (Line 4, 228°M)

Frequency belt placement: line 1 (8 & 85ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Veyo at the intersection of Hwy 18 and Center Street, proceed south 3.8 miles, at which point a road takes off to the east. Proceed east on this road for approximately 2.75 miles to a fork in the road. Take the right fork for an additional 1.75 miles to the point where the road crosses under power lines. At this point there is a road going north. The witness post is about 100 yards down this road. From the witness post the 0-foot stake is 9 paces at 274 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height. Line 3 is only 90 feet long.



Map Name: Saddle Mountain

Diagrammatic Sketch

Township 40S , Range 16W , Section 14

GPS: NAD 83, UTM 12S 268337 E, 4132238 N

## DISCUSSION

### Wide Canyon - Trend Study No. 30-38

#### Study Information

This study is located on deer winter range on the north side of Wide Canyon [elevation: 5,500 feet (1,676 m), slope: 3%-7%, aspect: south]. Vegetation characteristics of the community were essentially two-tiered. There was a scattered overstory of Utah juniper (*Juniperus osteosperma*) and large tree-like Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) underlain by a rather sparse cover of lower growing shrubs and a dense carpet of cheatgrass (*Bromus tectorum*). The Dameron complex fire burned 3,380 acres (1,368 ha) in the area in 2004 and the area was aerially seeded that winter. Deer use, estimated by a nearby DWR pellet group transect, averaged 23 deer days use/acre (57 ddu/ha) between 1982 and 1992, with a high of 39 ddu/acre (96 ddu/ha) in 1989-90, and a low of 14 ddu/acre (35 ddu/ha) in 1991-92. Pellet group data taken along the study site baseline estimated deer use to be very heavy in 1998 (121 ddu/acre:299 ddu/ha), and decreased to heavy use in 2003 and 2008 (64 ddu/acre:158 ddu/ha and 45 ddu/acre:111 ddu/ha, respectively). Cattle use has been estimated to be very light to light from 1998 to 2008 (4 to 11 days cattle use/acre:9 to 27 cdu/ha).

#### Soil

This study is located on a lava flow with many variable sized basalt rocks littering the ground surface. However, these are interspersed with larger areas occupied by smaller size fragments. Much of this finer material has probably been deposited through sedimentation from above. Effective rooting depth was estimated at almost 17 inches. Soil texture is a clay loam which is slightly acidic (pH 6.5). Erosion is not a problem on this site due to the level terrain, combined with adequate protective ground cover. Relative combined vegetation and litter cover ranged from 55%-66% from 1998 to 2008. Relative combined pavement and litter ranged from 22%-26% from 1998 to 2008. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

Due to the recent fire, most of the browse species were highly reduced in 2008. The key browse species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Sagebrush density is low on this site producing only 4% cover in 1998 and 3% in 2003. Density increased from 799 plants/acre in 1982, to 1,599 by 1992, and 1,560 by 1998. Reproduction was good in 1992 with excellent seed production. By 1998, recruitment is still adequate but seed production was poor. The sagebrush population declined by 53% to 740 plants/acre in 2003, most likely due to drought conditions. Young plants also declined in 2003 to just 8% of the population. Utilization of sagebrush on this site has been moderate to heavy during most readings. There were no sagebrush encountered in 2008.

Prior to the fire, the cliffrose plants were principally large tree-like forms which were at least partially unavailable because of height. Utilization of the available portion was moderate to heavy. Density of cliffrose decreased steadily from 466 plants/acre in 1992 to 80 plants/acre in 2003, and to just 20 plants/acre after the fire in 2008. Seedling and young recruitment was low to absent from 1998 to 2008. Green ephedra (*Ephedra viridis*) offered some additional forage for wintering big game. It was moderately abundant from 1992 to 2003, but was mostly unutilized. No ephedra was encountered in 2008. A small number of the seeded species forage kochia (*Kochia prostrata*) were sampled in 2008.

Large juniper trees were found throughout the site prior to the fire. Juniper accounted for 40% of the total browse cover in 1998, 50% in 2003, and 41% in 2008, with a line intercept canopy cover value of 17%, 18%, and 4%, respectively. Point-quarter data from 1998 and 2003 estimated 34 juniper trees/acre with an average basal diameter of 11 inches. There was only one tree measured on the site in 2008, so point-quarter estimates are less than 18 trees/acre.

### Herbaceous Understory

The herbaceous understory is very poor and perennial grasses and forbs are quite rare. Cheatgrass is very abundant, but was not included in sampling prior to the 1998 reading because it is an annual. Cheatgrass made up 99% of the total grass cover in 1998 and 2003, and 86% of the cover in 2008, after the fire. A few perennial grasses including galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*) are occasionally found. A few seeded perennial grass species were sampled in 2008, but at very low frequency and cover. Forbs combine to produce less than 2% cover in 1998 to 2003, but increased markedly in 2008 to 14%.

Dameron Fire Aerial Seed Mix

| <b>Seeded Species</b> | <b>lbs./acre</b> |
|-----------------------|------------------|
| Pubescent Wheatgrass  | 2.50             |
| Hycrest Wheatgrass    | 2.50             |
| Indian Ricegrass      | 0.50             |
| Sideoats Grama        | 0.50             |
| Galleta               | 0.20             |
| Thickspike Wheatgrass | 0.50             |
| Sand Dropseed         | 0.20             |
| Lewis Flax            | 0.50             |
| Small Burnet          | 0.50             |
| Alfalfa               | 0.50             |
| Yellow Sweetclover    | 0.50             |
| Bee Plant             | 0.10             |
| Fourwing Saltbush     | 0.10             |
| Winterfat             | 0.25             |
| Blanket Flower        | 0.10             |
| Forage Kochia         | 1.00             |

### 1992 TREND ASSESSMENT

Trend for browse is slightly up. The density of the primary browse species, mountain big sagebrush, increased by 50% from 1982 to 1,599 plants/acre. Sagebrush vigor was good, and decadence was low. The population of Stansbury cliffrose stayed relatively constant, though decadence increased to 36%. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With that in mind, trend for both grasses and forbs is considered to be stable. Grass and forb species are slightly increasing and are not utilized much on this site.

browse - slightly up (+1)

grass - stable (0)

forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for browse is slightly down. Mountain big sagebrush makes up 19% of the browse cover, or 80% of the preferred browse cover. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Sagebrush decadence has increased from 19% in 1992 to 29%, and vigor declined with the proportion of plants with poor vigor increased from 6% in 1992 to 18%. Recruitment of sagebrush was good with young plants comprising 22% of the population. Cliffrose vigor is normal and there are currently no plants classified as decadent. A negative aspect of the browse trend is the relatively large density of broom snakeweed (*Gutierrezia sarothrae*) at 7,400

plants/acre. Most of the plants are mature (93%) indicating a possibly stable population. Trend for both the grasses and forbs is down. Perennial grasses and forbs are lacking and both have declined in sum of nested frequency since 1992. The herbaceous understory is totally dominated by cheatgrass which has a cover value of 23%. It actually accounts for 99% of the grass cover and 93% of the total herbaceous cover.

winter range condition (DCI) - very poor (13) Mid-level potential scale

browse - slightly down (-1)

grass - down (-2)

forb - down (-2)

### 2003 TREND ASSESSMENT

Trend for browse is down. The key browse species, mountain big sagebrush, has declined 53% in density to 740 plants/acre. The number of plants displaying poor vigor also increased from 18% in 1998 to 35%. No seedlings were encountered and young plants were rare. Cliffrose has also declined in density and increased in poor vigor and decadence. One positive aspect of the browse trend is the 99% decline in density of broom snakeweed (7,400 plants/acre to 60 plants/acre). The herbaceous understory is still very poor and totally dominated by cheatgrass and annual forbs. The trend for grasses is down. Only one perennial grass, galleta, was encountered on the site in 2003, and it occurred in only 2 quadrats. The trend for forbs is down. The forb composition is still very poor and dominated by annuals. The sum of nested frequency of perennial forbs decreased by 35% from 1998. The 13 species found in 2003 produced less than 2% total cover. The most common species were annuals, storksbill (*Erodium cicutarium*) and wooly plantain (*Plantago patagonica*).

winter range condition (DCI) - very poor (11) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

There was a fire in 2004 that changed the composition of the site by diminishing the browse species. Trend for browse is down, since the fire removed all of the mountain big sagebrush and diminished the Stansbury cliffrose density to just 20 plants/acre. The trend for both grasses and forbs are up. The sum of nested frequency of perennial grasses increased markedly with significant increases in the frequency of galleta and bottlebrush squirreltail from 2003. There was also a significant decrease from 2003 in the frequency of cheatgrass. The sum of nested frequency and cover of perennial forbs also increased dramatically. The perennial forbs gooseberry leaf globemallow (*Sphaeralcea grossulariifolia*) and Suksdorf's monkeyflower (*Mimulus suksdorfii*) were the dominant perennial forbs on the site.

winter range condition (DCI) - very poor (7) Mid-level potential scale

browse - down (-2)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 38

| T<br>y<br>p<br>e            | Species                  |     |      |      |      | Average Cover % |       |      |
|-----------------------------|--------------------------|-----|------|------|------|-----------------|-------|------|
|                             |                          | '92 | '98  | '03  | '08  | '98             | '03   | '08  |
| G                           | Agropyron cristatum      | -   | -    | -    | -    | -               | -     | .01  |
| G                           | Agropyron intermedium    | -   | -    | -    | 1    | -               | -     | .03  |
| G                           | Agropyron sp.            | 9   | -    | -    | -    | -               | -     | -    |
| G                           | Bouteloua gracilis       | -   | -    | -    | 8    | -               | -     | .10  |
| G                           | Bromus rubens (a)        | -   | -    | -    | 1    | -               | -     | .01  |
| G                           | Bromus tectorum (a)      | -   | c348 | b306 | a233 | 23.06           | 12.98 | 8.50 |
| G                           | Hilaria jamesii          | a-  | a3   | a7   | b25  | .06             | .03   | 1.06 |
| G                           | Oryzopsis hymenoides     | -   | 2    | -    | -    | .00             | -     | .00  |
| G                           | Poa fendleriana          | b13 | a-   | a-   | a-   | -               | -     | -    |
| G                           | Poa secunda              | b22 | a-   | a-   | a3   | -               | -     | .00  |
| G                           | Sitanion hystrix         | b12 | b14  | a-   | b14  | .11             | -     | .06  |
| G                           | Vulpia octoflora (a)     | -   | ab17 | a11  | b23  | .09             | .05   | .13  |
| Total for Annual Grasses    |                          | 0   | 365  | 317  | 257  | 23.15           | 13.04 | 8.64 |
| Total for Perennial Grasses |                          | 56  | 19   | 7    | 51   | 0.18            | 0.03  | 1.27 |
| Total for Grasses           |                          | 56  | 384  | 324  | 308  | 23.34           | 13.07 | 9.91 |
| F                           | Agoseris glauca          | 3   | -    | 3    | -    | -               | .04   | -    |
| F                           | Alyssum alyssoides (a)   | -   | 2    | -    | -    | .00             | -     | -    |
| F                           | Boraginaceae             | a-  | a-   | a-   | b19  | -               | -     | .55  |
| F                           | Brodiaea pulchella       | a-  | a-   | a-   | b10  | -               | -     | .02  |
| F                           | Calochortus flexuosus    | a9  | ab9  | bc31 | c35  | .05             | .11   | .18  |
| F                           | Calochortus nuttallii    | a-  | a-   | a-   | b16  | -               | -     | .09  |
| F                           | Cymopterus sp.           | -   | -    | 1    | 1    | -               | .03   | .03  |
| F                           | Descurainia pinnata (a)  | -   | -    | 2    | 7    | -               | .01   | .05  |
| F                           | Draba sp. (a)            | -   | b28  | a4   | c60  | .16             | .01   | .29  |
| F                           | Erodium cicutarium (a)   | -   | 38   | 38   | 31   | .39             | .82   | 2.00 |
| F                           | Eriogonum sp.            | -   | -    | -    | 2    | -               | -     | .03  |
| F                           | Eriogonum umbellatum     | -   | -    | -    | 3    | -               | -     | .15  |
| F                           | Euphorbia sp.            | -   | -    | -    | 13   | -               | -     | .07  |
| F                           | Gilia sp. (a)            | -   | -    | 22   | 23   | -               | .11   | .11  |
| F                           | Lappula occidentalis (a) | -   | a-   | c32  | b12  | -               | .15   | .05  |
| F                           | Lactuca serriola         | a-  | a-   | a-   | b17  | -               | -     | .56  |
| F                           | Linum lewisii            | -   | -    | -    | 2    | -               | -     | .00  |
| F                           | Lupinus argenteus        | -   | 2    | -    | -    | .04             | -     | -    |
| F                           | Lupinus sp. (a)          | -   | -    | -    | 4    | -               | -     | .04  |

| T<br>y<br>p<br>e          | Species                      |                |                 |                |                  | Average Cover % |      |       |
|---------------------------|------------------------------|----------------|-----------------|----------------|------------------|-----------------|------|-------|
|                           |                              | '92            | '98             | '03            | '08              | '98             | '03  | '08   |
| F                         | Malcolmia africana           | -              | -               | -              | 2                | -               | -    | .00   |
| F                         | Mentzelia albicaulis (a)     | -              | -               | -              | 3                | -               | -    | .00   |
| F                         | Medicago sativa              | -              | -               | -              | 1                | -               | -    | .00   |
| F                         | Microsteris gracilis (a)     | -              | <sub>b</sub> 65 | <sub>a</sub> 4 | <sub>a</sub> -   | .30             | .01  | -     |
| F                         | Mimulus suksdorfii           | <sub>a</sub> - | <sub>a</sub> -  | <sub>a</sub> - | <sub>b</sub> 194 | -               | -    | 4.19  |
| F                         | Navarretia intertexta (a)    | -              | -               | -              | 6                | -               | .00  | .01   |
| F                         | Phacelia fremontii           | <sub>a</sub> - | <sub>a</sub> -  | <sub>a</sub> - | <sub>b</sub> 13  | -               | -    | 1.37  |
| F                         | Plantago patagonica (a)      | -              | 30              | 27             | 27               | .47             | .32  | .15   |
| F                         | Salsola iberica (a)          | -              | <sub>a</sub> -  | <sub>a</sub> - | <sub>b</sub> 18  | -               | -    | .38   |
| F                         | Sisymbrium altissimum (a)    | -              | <sub>a</sub> -  | <sub>a</sub> - | <sub>b</sub> 15  | -               | -    | .49   |
| F                         | Sphaeralcea grossulariifolia | <sub>a</sub> 8 | <sub>a</sub> -  | <sub>a</sub> - | <sub>b</sub> 28  | -               | -    | 6.25  |
| F                         | Thysanocarpus curvipes       | -              | 2               | -              | -                | .03             | -    | -     |
| F                         | Unknown forb-annual (a)      | -              | 2               | 6              | -                | .03             | .04  | -     |
| F                         | Viguiera multiflora          | -              | -               | 3              | -                | -               | .03  | -     |
| Total for Annual Forbs    |                              | 0              | 165             | 135            | 206              | 1.37            | 1.48 | 3.59  |
| Total for Perennial Forbs |                              | 20             | 13              | 38             | 356              | 0.12            | 0.21 | 13.54 |
| Total for Forbs           |                              | 20             | 178             | 173            | 562              | 1.50            | 1.69 | 17.14 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 38

| T<br>y<br>p<br>e | Species                       | Strip Frequency |     |     | Average Cover % |       |      |
|------------------|-------------------------------|-----------------|-----|-----|-----------------|-------|------|
|                  |                               | '98             | '03 | '08 | '98             | '03   | '08  |
| B                | Artemisia tridentata vaseyana | 42              | 28  | 0   | 4.34            | 2.58  | -    |
| B                | Cowania mexicana stansburiana | 6               | 4   | 1   | 1.17            | .93   | .00  |
| B                | Ephedra viridis               | 21              | 23  | 0   | 4.46            | 4.88  | -    |
| B                | Gutierrezia sarothrae         | 76              | 3   | 6   | 3.73            | .06   | .21  |
| B                | Juniperus osteosperma         | 5               | 4   | 0   | 9.19            | 9.00  | .38  |
| B                | Kochia prostrata              | 0               | 0   | 7   | -               | -     | .33  |
| B                | Prunus fasciculata            | 1               | 1   | 0   | .15             | .63   | -    |
| B                | Yucca baccata                 | 1               | 0   | 0   | .00             | -     | -    |
| Total for Browse |                               | 152             | 63  | 14  | 23.05           | 18.08 | 0.92 |



CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 38

| Species                       | Percent Cover |       |      |
|-------------------------------|---------------|-------|------|
|                               | '98           | '03   | '08  |
| Artemisia tridentata vaseyana | -             | 2.18  | -    |
| Cowania mexicana stansburiana | -             | 2.61  | -    |
| Ephedra viridis               | -             | 6.55  | -    |
| Gutierrezia sarothrae         | -             | .01   | .85  |
| Juniperus osteosperma         | 16.79         | 18.13 | 3.79 |
| Kochia prostrata              | -             | -     | .26  |
| Prunus fasciculata            | -             | .36   | -    |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 38

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 2.7                        | -   |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 38

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 34             | 34  | 18  |

| Average diameter (in) |      |      |
|-----------------------|------|------|
| '98                   | '03  | '08  |
| 12.4                  | 10.2 | 22.4 |

BASIC COVER --

Management unit 30 , Study no: 38

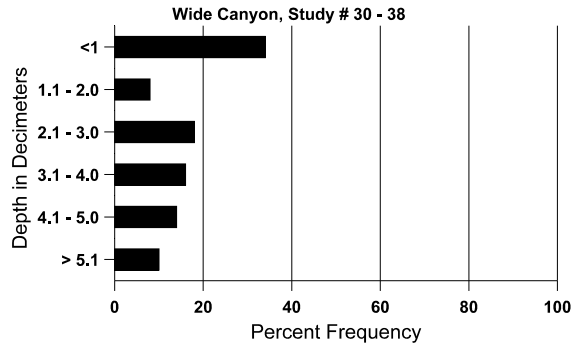
| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | .75             | .75   | 45.48 | 32.25 | 27.45 |
| Rock        | 20.75           | 28.25 | 23.15 | 23.25 | 24.39 |
| Pavement    | 11.25           | 10.75 | 6.17  | 3.37  | 5.74  |
| Litter      | 55.00           | 41.00 | 44.79 | 43.21 | 35.23 |
| Cryptogams  | 1.00            | 4.00  | 1.56  | .17   | .00   |
| Bare Ground | 11.25           | 15.25 | 14.72 | 14.47 | 21.97 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 38, Study Name: Wide Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 16.6                         | 49.0<br>(17.7)  | 6.5 | 40.0   | 33.4   | 26.6   | 1.4 | 11.1  | 150.4 | 0.6  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 38

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 12                | 24  | 80  |
| Deer   | 45                | 32  | 56  |
| Cattle | -                 | -   | 2   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| 121 (299)              | 64 (157) | 45 (111) |
| 2 (5)                  | 11 (27)  | 4 (9)    |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 38

|                                      |  | Age class distribution (plants per acre) |       |        |          |      | Utilization   |            |               |            |                    |                                    |
|--------------------------------------|--|--|-------|--------|----------|------|---------------|------------|---------------|------------|--------------------|------------------------------------|
| Y<br>e<br>a<br>r                     | Plants per<br>Acre<br>(excluding<br>seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | %<br>moderate | %<br>heavy | %<br>decadent | %<br>dying | %<br>poor<br>vigor | Average<br>Height<br>Crown<br>(in) |
| <i>Artemisia tridentata vaseyana</i> |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 82                                   | <b>798</b>                                     | -  | 33    | 699    | 66       | -    | 21            | 13         | 8             | 5          | 8                  | 22/26                              |
| 92                                   | <b>1598</b>                                    | 299                                      | 733   | 566    | 299      | -    | 69            | 13         | 19            | -          | 6                  | 19/23                              |
| 98                                   | <b>1560</b>                                    | 60                                       | 340   | 760    | 460      | 1240 | 23            | 3          | 29            | 18         | 18                 | 17/24                              |
| 03                                   | <b>740</b>                                     | -  | 60    | 280    | 400      | 1540 | 14            | 16         | 54            | 32         | 35                 | 15/21                              |
| 08                                   | <b>0</b>                                       | -  | -     | -      | -        | -    | 0             | 0          | 0             | -          | 0                  | 16/20                              |
| <i>Cowania mexicana stansburiana</i> |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 82                                   | <b>466</b>                                     | -  | -     | 466    | -        | -    | 57            | 14         | 0             | -          | 0                  | 32/31                              |
| 92                                   | <b>464</b>                                     | 133                                      | 199   | 99     | 166      | -    | 21            | 29         | 36            | -          | 7                  | 33/29                              |
| 98                                   | <b>120</b>                                     | 100                                      | 20    | 100    | -        | -    | 33            | 33         | 0             | -          | 0                  | 85/85                              |
| 03                                   | <b>80</b>                                      | -  | -     | 40     | 40       | -    | 50            | 25         | 50            | -          | 0                  | 82/82                              |
| 08                                   | <b>20</b>                                      | -  | 20    | -      | -        | -    | 100           | 0          | 0             | -          | 0                  | 22/14                              |
| <i>Ephedra viridis</i>               |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 82                                   | <b>199</b>                                     | -  | -     | 199    | -        | -    | 0             | 0          | 0             | -          | 0                  | 24/26                              |
| 92                                   | <b>298</b>                                     | -  | 99    | 199    | -        | -    | 33            | 0          | 0             | -          | 0                  | 24/36                              |
| 98                                   | <b>480</b>                                     | -  | 20    | 440    | 20       | 20   | 13            | 8          | 4             | 4          | 4                  | 34/40                              |
| 03                                   | <b>500</b>                                     | -  | 40    | 400    | 60       | 20   | 4             | 0          | 12            | 4          | 4                  | 33/44                              |
| 08                                   | <b>0</b>                                       | -  | -     | -      | -        | -    | 0             | 0          | 0             | -          | 0                  | 28/29                              |
| <i>Gutierrezia sarothrae</i>         |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 82                                   | <b>3265</b>                                    | -  | 266   | 2833   | 166      | -    | 0             | 0          | 5             | 3          | 5                  | 8/9                                |
| 92                                   | <b>3898</b>                                    | 30033                                    | 466   | 3399   | 33       | -    | 0             | 0          | 1             | .51        | 3                  | 13/12                              |
| 98                                   | <b>7400</b>                                    | 280                                      | 260   | 6880   | 260      | 280  | 0             | 0          | 4             | 2          | 2                  | 8/10                               |
| 03                                   | <b>60</b>                                      | -  | -     | 60     | -        | 340  | 0             | 0          | 0             | -          | 0                  | 14/18                              |
| 08                                   | <b>160</b>                                     | 40                                       | -     | 160    | -        | -    | 0             | 0          | 0             | -          | 0                  | 12/19                              |
| <i>Juniperus osteosperma</i>         |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 82                                   | <b>33</b>                                      | -  | 33    | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 92                                   | <b>33</b>                                      | 66                                       | 33    | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 98                                   | <b>140</b>                                     | -  | 40    | 100    | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 03                                   | <b>100</b>                                     | -  | 20    | 80     | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 08                                   | <b>0</b>                                       | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Kochia prostrata</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                        | 180                                   | 20                                       | 60    | 100    | 20       | -    | 0           | 0       | 11         | -       | 0            | 9/15                      |
| <b>Opuntia sp.</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 12/30                     |
| <b>Prunus fasciculata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                        | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 25/59                     |
| 03                        | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 31/65                     |
| 08                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Yucca baccata</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                        | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 33/45                     |
| 03                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 37/56                     |
| 08                        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-40-08

Study site name: Telegraph Draw.

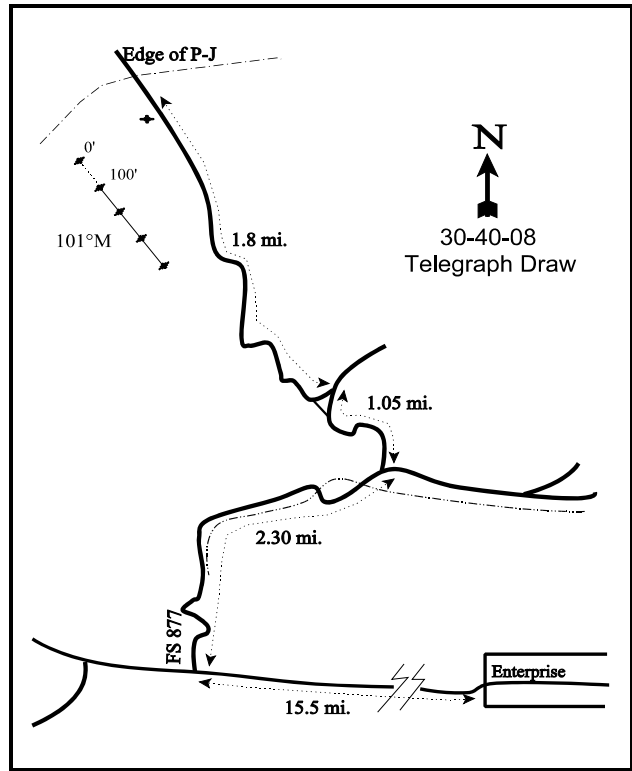
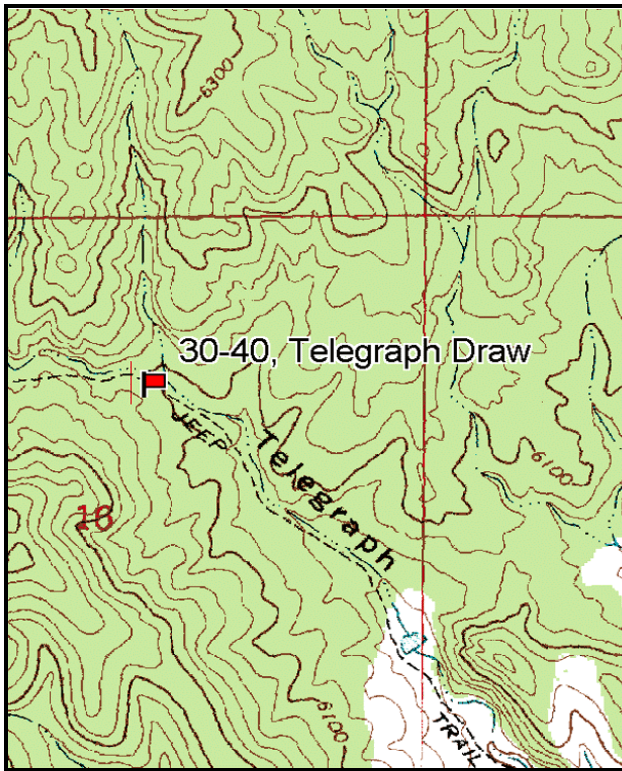
Vegetation type: Chained, seeded P-J.

Compass bearing: frequency baseline 101 degrees magnetic.

Frequency belt placement: line 1 (14 & 81ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

From Center and Main in Enterprise, go west on the Shoal Creek road for 15.5 miles then turn right (north). Clover Valley road is 0.1 miles too far. Stay on the main road heading north for approximately 2.3 miles (at 1.3 miles, stay to the south of the wash; the north road is washed out). At this point, there will be a fork in the road. Go to the left (north) on F.S. road 1014 for approximately 1.05 miles to a triangle of roads at the top of the ridge. Stay to the left on the road that goes down into the draw for 1.8 miles, at which point the road enters pinyon-juniper. Just as you come to the pinyon-juniper, stop at the witness post on the left side of the road. The 0-foot baseline stake is located 49 paces from the witness post at 139 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height. The 0-foot stake is marked by browse tag #287.



Map Name: Mount Escalante

Diagrammatic Sketch

Township 36S, Range 19W, Section 16

GPS: NAD 83, UTM 12S 236896 E, 4172114 N

## DISCUSSION

### Telegraph Draw - Trend Study No. 30-40

#### Study Information

This trend study is located on winter range in Telegraph Draw [elevation: 6,080 feet (1,853 m), slope: 10%, aspect: southeast]. The area has been chained and seeded, although the long range success of the seeded species has been minimal and singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) trees are still abundant. Vegetative cover on the study site is considerably improved over the surrounding pinyon-juniper woodland, but is still rather sparse and variably dispersed. The community is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) interspersed with young pinyon and juniper trees. Deer use is primarily during the winter, however fresh pellet groups were observed during the summer of 1992. In addition, wild horses and stud piles were observed nearby, and fresh unshod pony tracks were encountered on the study site in 1992. This study is located in an area of the USFS Terryshoal Creek allotment that receives no use by livestock and is set aside for wild horses and burros. Pellet group data from the site estimated use by deer to be light in 1998, 2003, and 2008 (14 deer days use/acre:35 ddu/ha, 4 ddu/acre:10 ddu/ha, and 6 ddu/acre:15 ddu/ha, respectively). Use by wild horses was also estimated to be light in 1998, 2003, and 2008 (14 days use/acre:36 hdu/ha, 9 hdu/acre:23 hdu/ha, and 5 hdu/acre:12 hdu/ha, respectively). Several wild horses were also seen near the site in 1998.

#### Soil

Soil is relatively deep and rocky with an effective rooting depth of 17 inches. Soil parent material is granite and rocks are common on the surface. Texture is a sandy clay which is moderately acidic (pH 5.6). The soil is sandy on the surface with a compacted clay layer encountered at a depth of 4 inches. This granitic soil is very low in phosphorus with a value of only 3.8 ppm. Values less than 6 ppm are considered to have low availability for plant growth and development (Tiedemann and Lopez 2004). Some surface erosion has taken place, whereas active erosion has been greatly reduced from what occurs on untreated areas. Relative combined vegetation and litter cover has been high and ranged from 67%-71% from 1998 to 2008. Relative bare ground cover has been fairly low at 15% in 1998 and 2003, and decreased to 11% in 2008. The erosion condition rating was classified as stable in 2003 and slight in 2008 due primarily to flow patterns.

#### Browse

The key browse is Wyoming big sagebrush which has hybridized with black sagebrush (*Artemisia nova*) in some areas. All sagebrush has been classified as Wyoming big sagebrush. Population density was estimated at 6,166 plants/acre in 1982 when the site was established. The stand is dynamic with abundant seedling and young recruitment causing major fluctuations in density over the years. Data from 2008 estimate a population of 8,160 plants/acre. Utilization has been mostly light during all readings and vigor was good on most plants. Decadence in sagebrush has been low, but increased from 15% in 2003 to 33% in 2008.

Other preferred browse include a small population of antelope bitterbrush (*Purshia tridentata*). Presumably, the bitterbrush were seeded after the chaining. These plants had moderate to heavy use from 1982 to 1998, but mostly light use in 2003 and 2008. Bitterbrush plants displayed good vigor from 1992 to 2003, with the proportion of plants displaying poor vigor increasing in 2008. Decadence in bitterbrush was also low from 1982 to 2003, with an increase in decadence in 2008. Young recruitment has been good since 1982.

Increaser shrubs, including stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*), appeared to be increasing on the site. However, drought conditions have caused major declines in their respective population densities.

Pinyon and juniper trees have increased in density and stature. Point-quarter data from 1998 estimated 160 singleleaf pinyon trees/acre and 56 juniper trees/acre. Average basal diameter was 2.5 inches for pinyon and 3.6 inches for juniper. Point-quarter data from 2003 and 2008 estimate similar densities for both species. Average basal diameter remained similar for pinyon in 2003 and 2008, but the average basal diameter of juniper increased to 9 inches in 2008. In 2003, about 40% of the trees were 8 feet tall or greater, increasing to 50% in 2008. Line intercept canopy cover of juniper was 7% in 2003 and 8% in 2008. Line intercept canopy cover of pinyon was 8% in 2003 and 11% in 2008.

#### Herbaceous Understory

The herbaceous understory is poor. Grasses are fairly diverse, yet they only produced 5% cover in 1998, less than 1% in 2003, and 1.5% in 2008. Cheatgrass (*Bromus tectorum*) provided 52% of the grass cover in 1998, 39% in 2003, but only 10% in 2008. The only fairly common perennial grasses include crested wheatgrass (*Agropyron cristatum*), Indian ricegrass (*Oryzopsis hymenoides*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*). Forbs outnumber grasses in abundance and species diversity. The principal species are desert phlox (*Phlox austromontana*) and rock goldenrod (*Petradoria pumila*). Hooker balsamroot (*Balsamorhiza hookeri*), bastard toadflax (*Comandra pallida*), and sulfur eriogonum (*Eriogonum umbellatum*) are also fairly abundant. No seeded forbs were encountered or observed.

#### 1992 TREND ASSESSMENT

The trend for browse is up. The key browse species, Wyoming big sagebrush, has nearly doubled in density. Data from 1982 for the herbaceous understory is limited to species quadrat frequency. With that in mind, the trend for both the forbs and grasses is stable. Grasses have increased slightly in quadrat frequency and the quadrat frequency of forbs have remained similar. Forbs are abundant and diverse but consist of poor forage species. No seeded forbs were encountered.

browse - up (+2)

grass - stable (0)

forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for browse stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Sagebrush vigor and decadence are similar to 1992 levels. Reproduction and recruitment was also good with abundant seedlings and young. Vigor for bitterbush is good and decadence declined from 20% in 1992 to 6%. Trend for both the grasses and forbs is stable. Sum of nested frequency for perennial grasses and forbs has remained similar to 1992 levels. Composition is poor with cheatgrass providing 52% of the grass cover, and rock goldenrod and desert phlox providing 51% of the forb cover.

winter range condition (DCI) - good-excellent (64) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

### 2003 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush and antelope bitterbrush is up. Both species have increased in density, 36% for sagebrush and 28% for bitterbrush since 1998. Sagebrush has mostly good vigor and decadence was low at 15%. Young recruitment remains excellent indicating a dynamic and expanding population. Bitterbrush shows good vigor and excellent young recruitment. Decadence in bitterbrush has increased from 6% of the population in 1998 to 23%, but this is still relatively low. The only down side to the browse trend is the continued increase in density and cover of pinyon and juniper trees which are slowly regaining their dominance of this old chaining. Current line-intercept canopy cover is estimated at 7% for juniper and 8% for pinyon. Trend for both the grasses and forbs is down. Sum of nested frequency of perennial grasses has declined by 53%, and cover of perennial grasses decreased from 2% in 1998 to less than 1%. Most perennial grasses have declined significantly in nested frequency. The only positive change in the grass composition is the significant decline in nested frequency of cheatgrass. The sum of nested frequency of perennial forbs declined by 37% from 1998, and cover decreased from 6% in 1998 to 3%. The forb composition is diverse, but only toadflax, rock goldenrod, and desert phlox are fairly common. Twenty four species of forbs were sampled in 1998 and only 18 in 2003.

winter range condition (DCI) - good (56) Low potential scale

browse - up (+2)

grass - down (-2)

forb - down (-2)

### 2008 TREND ASSESSMENT

Trend for browse is slightly up. The primary browse species, Wyoming big sagebrush, increased by 17% from 2003 to 8,160 plants/acre. Vigor of sagebrush remains good, but decadence has increased from 15% in 2003 to 33%, though it is still considered low. Reproduction and recruitment of young sagebrush remains good with plentiful seedlings and young plants. The preferred browse species, antelope bitterbrush, has decreased slightly in density. The proportion of bitterbrush plants displaying poor vigor increased from 5% in 2003 to 28%, and decadence increased from 23% in 2003 to 51%. Recruitment of young bitterbrush was good with young plants comprising 13% of the population, but no seedling bitterbrush were encountered. Trend for both grasses and forbs is up. The sum of nested frequency of perennial grasses had a 2 fold increase from 2003, with significant increases in the frequency of crested wheatgrass, bottlebrush squirreltail, and needle and thread grass (*Stipa comata*). The nested frequency of the annual, cheatgrass, declined significantly, and cover declined markedly. The sum of nested frequency of perennial forbs increased by 23% from 2003, with 24 species being encountered.

winter range condition (DCI) - fair-good (45) Low potential scale

browse - slightly up (+1)

grass - up (+2)

forb - up (+2)



HERBACEOUS TRENDS --

Management unit 30 , Study no: 40

| T<br>y<br>p<br>e            | Species                    |                 |                  |                  |                  | Average Cover % |      |      |
|-----------------------------|----------------------------|-----------------|------------------|------------------|------------------|-----------------|------|------|
|                             |                            | '92             | '98              | '03              | '08              | '98             | '03  | '08  |
| G                           | Agropyron cristatum        | <sub>a</sub> 12 | <sub>a</sub> 12  | <sub>a</sub> 17  | <sub>b</sub> 35  | .11             | .25  | .42  |
| G                           | Bromus tectorum (a)        | -               | <sub>c</sub> 163 | <sub>b</sub> 82  | <sub>a</sub> 45  | 2.52            | .35  | .15  |
| G                           | Elymus junceus             | 9               | -                | -                | -                | -               | -    | -    |
| G                           | Hilaria jamesii            | -               | 4                | -                | -                | .03             | -    | -    |
| G                           | Koeleria cristata          | 3               | -                | -                | -                | -               | -    | -    |
| G                           | Oryzopsis hymenoides       | <sub>a</sub> 5  | <sub>c</sub> 50  | <sub>ab</sub> 16 | <sub>bc</sub> 29 | 1.05            | .06  | .20  |
| G                           | Poa fendleriana            | <sub>a</sub> 2  | <sub>b</sub> 30  | <sub>a</sub> 6   | <sub>a</sub> 1   | .47             | .04  | .03  |
| G                           | Poa secunda                | -               | 2                | -                | 3                | .00             | -    | .00  |
| G                           | Sitanion hystrix           | <sub>c</sub> 65 | <sub>b</sub> 43  | <sub>a</sub> 5   | <sub>b</sub> 37  | .57             | .02  | .47  |
| G                           | Stipa comata               | <sub>a</sub> 3  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 22  | -               | -    | .09  |
| G                           | Stipa coronata depauperata | <sub>b</sub> 45 | <sub>a</sub> 5   | <sub>a</sub> -   | <sub>a</sub> 3   | .06             | -    | .01  |
| G                           | Stipa lettermani           | <sub>a</sub> -  | <sub>a</sub> -   | <sub>b</sub> 24  | <sub>a</sub> 7   | -               | .16  | .10  |
| Total for Annual Grasses    |                            | 0               | 163              | 82               | 45               | 2.52            | 0.35 | 0.15 |
| Total for Perennial Grasses |                            | 144             | 146              | 68               | 137              | 2.30            | 0.54 | 1.35 |
| Total for Grasses           |                            | 144             | 309              | 150              | 182              | 4.83            | 0.89 | 1.50 |
| F                           | Agoseris glauca            | -               | -                | -                | 1                | -               | -    | .03  |
| F                           | Alyssum alyssoides (a)     | -               | 1                | -                | -                | .00             | -    | -    |
| F                           | Allium sp.                 | -               | 1                | -                | -                | .00             | -    | -    |
| F                           | Antennaria rosea           | -               | -                | 2                | 8                | -               | .00  | .01  |
| F                           | Astragalus sp.             | 1               | 2                | -                | -                | .03             | -    | .03  |
| F                           | Balsamorhiza hookeri       | <sub>a</sub> 1  | <sub>b</sub> 23  | <sub>b</sub> 18  | <sub>ab</sub> 11 | .57             | .72  | .39  |
| F                           | Calochortus nuttallii      | -               | -                | -                | 6                | -               | -    | .01  |
| F                           | Chenopodium album (a)      | -               | -                | -                | 3                | -               | -    | .38  |
| F                           | Chaenactis douglasii       | <sub>a</sub> 5  | <sub>b</sub> 20  | <sub>a</sub> -   | <sub>a</sub> -   | .09             | -    | -    |
| F                           | Comandra pallida           | <sub>a</sub> 9  | <sub>a</sub> 30  | <sub>b</sub> 55  | <sub>b</sub> 60  | .24             | .45  | .36  |
| F                           | Collinsia parviflora (a)   | -               | <sub>a</sub> 6   | <sub>a</sub> 22  | <sub>b</sub> 37  | .02             | .04  | .09  |
| F                           | Crepis acuminata           | 2               | -                | 1                | 3                | -               | .09  | .00  |
| F                           | Dalea searlsiae            | <sub>b</sub> 12 | <sub>a</sub> -   | <sub>a</sub> -   | <sub>a</sub> -   | -               | -    | -    |
| F                           | Descurainia pinnata (a)    | -               | -                | 2                | -                | -               | .00  | -    |
| F                           | Eriogonum cernuum (a)      | -               | 5                | -                | 10               | .06             | -    | .02  |
| F                           | Erigeron sp.               | -               | 3                | -                | -                | .03             | -    | -    |
| F                           | Eriogonum sp.              | -               | 7                | -                | -                | .16             | -    | -    |
| F                           | Eriogonum racemosum        | <sub>ab</sub> 8 | <sub>b</sub> 9   | <sub>a</sub> -   | <sub>ab</sub> 5  | .10             | -    | .07  |
| F                           | Eriogonum shockleyi        | 1               | -                | 5                | 6                | -               | .15  | .06  |

| Type                      | Species                      |                  |                 |                 |                  | Average Cover % |      |      |
|---------------------------|------------------------------|------------------|-----------------|-----------------|------------------|-----------------|------|------|
|                           |                              | '92              | '98             | '03             | '08              | '98             | '03  | '08  |
| F                         | Eriogonum umbellatum         | <sub>a</sub> 34  | <sub>b</sub> 39 | <sub>a</sub> 19 | <sub>ab</sub> 21 | .29             | .16  | .26  |
| F                         | Gilia sp. (a)                | -                | 6               | -               | -                | .04             | -    | -    |
| F                         | Hymenopappus filifolius      | 1                | -               | -               | -                | -               | -    | -    |
| F                         | Ipomopsis aggregata          | 1                | -               | -               | 4                | -               | -    | .01  |
| F                         | Lappula occidentalis (a)     | -                | 12              | 14              | 1                | .05             | .03  | .00  |
| F                         | Lesquerella sp.              | -                | -               | -               | 1                | -               | -    | .00  |
| F                         | Lomatium sp.                 | -                | 4               | 13              | 14               | .04             | .03  | .06  |
| F                         | Lotus utahensis              | <sub>b</sub> 8   | <sub>ab</sub> 3 | <sub>a</sub> -  | <sub>ab</sub> 1  | .03             | -    | .00  |
| F                         | Lupinus argenteus            | <sub>b</sub> 17  | <sub>a</sub> 4  | <sub>a</sub> 2  | <sub>a</sub> 3   | .06             | .00  | .01  |
| F                         | Machaeranthera canescens     | 5                | -               | -               | -                | -               | -    | -    |
| F                         | Microsteris gracilis (a)     | -                | <sub>b</sub> 80 | <sub>a</sub> 6  | <sub>a</sub> -   | .20             | .01  | -    |
| F                         | Orobanche fasciculata        | -                | -               | 1               | -                | -               | .00  | -    |
| F                         | Penstemon caespitosus        | <sub>b</sub> 45  | <sub>a</sub> -  | <sub>a</sub> -  | <sub>a</sub> 8   | -               | -    | .16  |
| F                         | Penstemon sp.                | 8                | 7               | -               | 6                | .07             | -    | .13  |
| F                         | Petrorhiza pumila            | 55               | 52              | 37              | 30               | 1.41            | .74  | .59  |
| F                         | Phlox austromontana          | <sub>ab</sub> 63 | <sub>b</sub> 76 | <sub>a</sub> 34 | <sub>a</sub> 29  | 1.62            | .38  | .36  |
| F                         | Phlox longifolia             | 14               | 6               | 7               | 12               | .03             | .04  | .03  |
| F                         | Polygonum douglasii (a)      | -                | -               | 1               | -                | -               | .00  | -    |
| F                         | Ranunculus testiculatus (a)  | -                | -               | -               | 2                | -               | -    | .00  |
| F                         | Senecio multilobatus         | 9                | -               | -               | 2                | -               | -    | .00  |
| F                         | Sphaeralcea grossulariifolia | 1                | -               | -               | -                | -               | -    | -    |
| F                         | Streptanthus cordatus        | -                | <sub>b</sub> 30 | <sub>a</sub> -  | <sub>a</sub> 4   | .64             | -    | .03  |
| F                         | Trifolium sp.                | <sub>b</sub> 22  | <sub>a</sub> 12 | <sub>a</sub> 13 | <sub>ab</sub> 20 | .06             | .05  | .09  |
| Total for Annual Forbs    |                              | 0                | 110             | 45              | 53               | 0.38            | 0.09 | 0.50 |
| Total for Perennial Forbs |                              | 322              | 328             | 207             | 255              | 5.52            | 2.87 | 2.77 |
| Total for Forbs           |                              | 322              | 438             | 252             | 308              | 5.91            | 2.97 | 3.27 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 40

| Type             | Species                              | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|-------|-------|
|                  |                                      | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Artemisia tridentata<br>wyomingensis | 80              | 82  | 89  | 14.61           | 21.35 | 14.10 |
| B                | Ceanothus greggii                    | 0               | 1   | 0   | -               | .03   | .06   |
| B                | Chrysothamnus depressus              | 33              | 8   | 26  | .44             | .21   | 1.18  |
| B                | Chrysothamnus viscidiflorus          | 29              | 12  | 20  | 1.47            | .57   | .37   |
| B                | Gutierrezia sarothrae                | 20              | 17  | 6   | .17             | .28   | .06   |
| B                | Juniperus osteosperma                | 7               | 10  | 7   | 2.04            | 4.28  | 3.13  |
| B                | Opuntia sp.                          | 0               | 1   | 1   | -               | .00   | .03   |
| B                | Pinus monophylla                     | 18              | 15  | 16  | 5.69            | 4.85  | 6.29  |
| B                | Polygala subspinosa<br>subspinosa    | 0               | 6   | 3   | -               | .01   | .02   |
| B                | Purshia tridentata                   | 26              | 28  | 31  | 3.97            | 6.86  | 4.49  |
| Total for Browse |                                      | 213             | 180 | 205 | 28.41           | 38.46 | 29.78 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 40

| Species                              | Percent Cover |       |       |
|--------------------------------------|---------------|-------|-------|
|                                      | '98           | '03   | '08   |
| Artemisia tridentata<br>wyomingensis | -             | 16.96 | 18.21 |
| Ceanothus greggii                    | -             | .03   | -     |
| Chrysothamnus depressus              | -             | .11   | .11   |
| Chrysothamnus viscidiflorus          | -             | .35   | 1.16  |
| Gutierrezia sarothrae                | -             | .10   | .06   |
| Juniperus osteosperma                | 1.00          | 7.05  | 7.90  |
| Pinus monophylla                     | -             | 7.76  | 10.96 |
| Purshia tridentata                   | -             | 7.18  | 5.59  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 40

| Species                              | Average leader growth (in) |     |
|--------------------------------------|----------------------------|-----|
|                                      | '03                        | '08 |
| Artemisia tridentata<br>wyomingensis | 1.0                        | 0.8 |
| Purshia tridentata                   | 0.6                        | 0.4 |

POINT-QUARTER TREE DATA --  
 Management unit 30 , Study no: 40

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 56             | 59  | 57  |
| Pinus monophylla      | 161            | 122 | 168 |

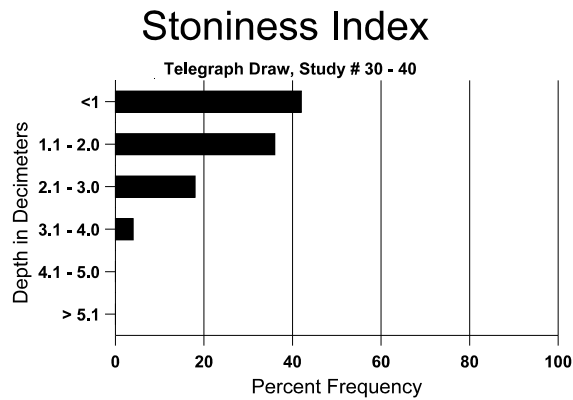
| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 3.9                   | 6.4 | 9.0 |
| 2.5                   | 3.3 | 2.6 |

BASIC COVER --  
 Management unit 30 , Study no: 40

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 1.50            | 4.25  | 39.52 | 39.01 | 34.21 |
| Rock        | 6.00            | 6.00  | 10.70 | 8.96  | 11.21 |
| Pavement    | 7.75            | 22.25 | 13.13 | 8.37  | 11.05 |
| Litter      | 56.50           | 58.00 | 51.14 | 44.97 | 52.30 |
| Cryptogams  | .25             | 0     | .17   | .07   | .33   |
| Bare Ground | 27.25           | 9.50  | 20.32 | 17.92 | 12.88 |

SOIL ANALYSIS DATA --  
 Management unit 30, Study no: 40, Study Name: Telegraph Draw

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 16.9                         | 43.6<br>(17.7)  | 5.6 | 46.0       | 17.4  | 36.6  | 2.4 | 3.8   | 310.4 | 0.4  |



PELLET GROUP DATA --

Management unit 30 , Study no: 40

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 8                 | 2   | 59  |
| Horse  | 3                 | 4   | 3   |
| Deer   | 9                 | 3   | 9   |

| Days use per acre (ha) |        |        |
|------------------------|--------|--------|
| '98                    | '03    | '08    |
| -                      | -      | -      |
| 16 (40)                | 9 (23) | 5 (12) |
| 21 (52)                | 4 (10) | 6 (15) |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 40

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y  | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata wyomingensis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>6165</b>                           | 466                                      | 3299  | 2866   | -        | -    | 6           | 2       | 0          | -       | 0            | 16/18                     |
| 92                                       | <b>11831</b>                          | 833                                      | 4699  | 6533   | 599      | -    | 17          | 2       | 5          | .33     | 5            | 13/15                     |
| 98                                       | <b>4560</b>                           | 1260                                     | 1120  | 3280   | 160      | 20   | 29          | 1       | 4          | 1       | 1            | 19/29                     |
| 03                                       | <b>6740</b>                           | 40                                       | 1200  | 4560   | 980      | 180  | 0           | 0       | 15         | 5       | 5            | 20/27                     |
| 08                                       | <b>8160</b>                           | 1120                                     | 940   | 4560   | 2660     | 480  | 4           | 1       | 33         | 6       | 8            | 17/25                     |
| <i>Ceanothus greggii</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | 5/12                      |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/39                     |
| <i>Chrysothamnus depressus</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                                       | <b>2300</b>                           | 220                                      | 640   | 1600   | 60       | -    | 0           | 0       | 3          | 3       | 3            | 4/6                       |
| 03                                       | <b>280</b>                            | 20                                       | 20    | 240    | 20       | -    | 7           | 14      | 7          | -       | 0            | 4/6                       |
| 08                                       | <b>1080</b>                           | 140                                      | 300   | 720    | 60       | -    | 24          | 28      | 6          | 2       | 2            | 3/5                       |
| <i>Chrysothamnus nauseosus</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 5/8                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus viscidiflorus</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | 132                                   | -  | 99    | -      | 33       | -    | 0           | 0       | 25         | 15      | 25           | -/-                       |
| 98  | 1360                                  | -  | 260   | 1040   | 60       | -    | 0           | 0       | 4          | 1       | 1            | 11/16                     |
| 03  | 520                                   | -  | 80    | 340    | 100      | 20   | 0           | 4       | 19         | 12      | 12           | 13/18                     |
| 08  | 920                                   | 40                                       | 40    | 720    | 160      | 20   | 2           | 30      | 17         | 4       | 7            | 8/10                      |
| <b>Gutierrezia sarothrae</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | 66                                    | -  | 33    | 33     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/4                       |
| 98  | 1420                                  | 580                                      | 300   | 1100   | 20       | 20   | 0           | 0       | 1          | 1       | 1            | 6/10                      |
| 03  | 720                                   | -  | 100   | 620    | -        | 120  | 0           | 0       | 0          | -       | 0            | 5/6                       |
| 08  | 440                                   | 40                                       | 20    | 380    | 40       | 20   | 41          | 14      | 9          | -       | 0            | 4/4                       |
| <b>Juniperus osteosperma</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 166                                   | -  | -     | 166    | -        | -    | 0           | 0       | -          | -       | 0            | 39/26                     |
| 92  | 99                                    | -  | 66    | 33     | -        | -    | 0           | 0       | -          | -       | 0            | 81/54                     |
| 98  | 140                                   | -  | 40    | 100    | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 220                                   | -  | 80    | 140    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 140                                   | -  | 40    | 100    | -        | 100  | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03  | 20                                    | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 7/16                      |
| 08  | 20                                    | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | 5/13                      |
| <b>Pinus monophylla</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 166                                   | -  | -     | 166    | -        | -    | 0           | 0       | 0          | -       | 0            | 32/31                     |
| 92  | 332                                   | 33                                       | 266   | 33     | 33       | -    | 10          | 0       | 10         | -       | 10           | 110/74                    |
| 98  | 380                                   | 60                                       | 240   | 140    | -        | 20   | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03  | 400                                   | 40                                       | 260   | 120    | 20       | 20   | 0           | 0       | 5          | 5       | 5            | -/-                       |
| 08  | 360                                   | 60                                       | 200   | 140    | 20       | 40   | 0           | 0       | 6          | 6       | 6            | -/-                       |
| <b>Polygala subspinososa subspinososa</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82  | 66                                    | -  | -     | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 5/8                       |
| 92  | 266                                   | -  | 33    | 233    | -        | -    | 0           | 0       | -          | -       | 0            | 3/4                       |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 140                                   | -  | 20    | 120    | -        | -    | 0           | 0       | -          | -       | 0            | 3/3                       |
| 08  | 80                                    | -  | -     | 80     | -        | -    | 25          | 0       | -          | -       | 0            | 2/3                       |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Purshia tridentata</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | <b>199</b>                            | -  | -     | 199    | -        | -    | 50          | 17      | 0          | -       | 0            | 26/31                     |
| 92                        | <b>332</b>                            | 66                                       | 33    | 233    | 66       | -    | 10          | 20      | 20         | -       | 0            | 34/43                     |
| 98                        | <b>620</b>                            | 240                                      | 140   | 440    | 40       | 20   | 48          | 16      | 6          | -       | 0            | 34/49                     |
| 03                        | <b>860</b>                            | 20                                       | 220   | 440    | 200      | -    | 12          | 5       | 23         | 5       | 5            | 38/53                     |
| 08                        | <b>780</b>                            | -  | 100   | 280    | 400      | 20   | 10          | 3       | 51         | 23      | 28           | 27/37                     |
| <i>Ribes</i> sp.          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 40/65                     |
| 08                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-41-08

Study site name: Joe Spring.

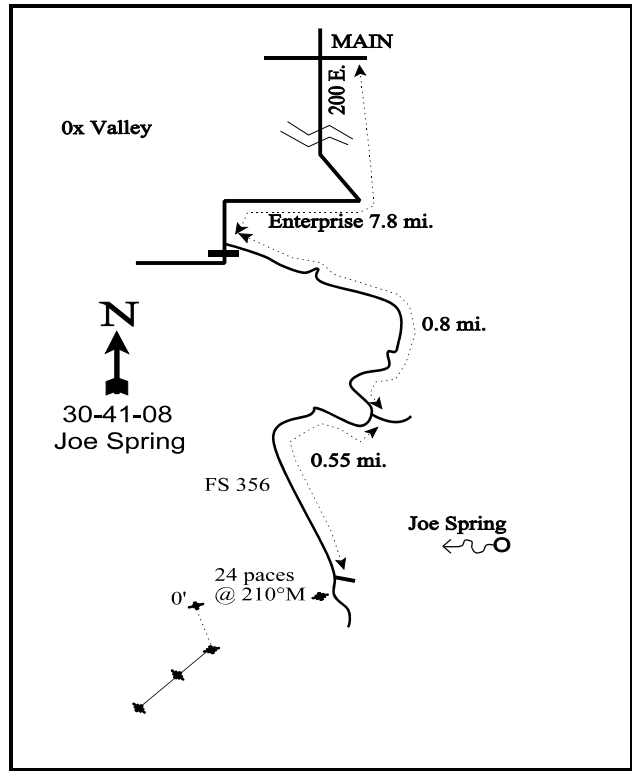
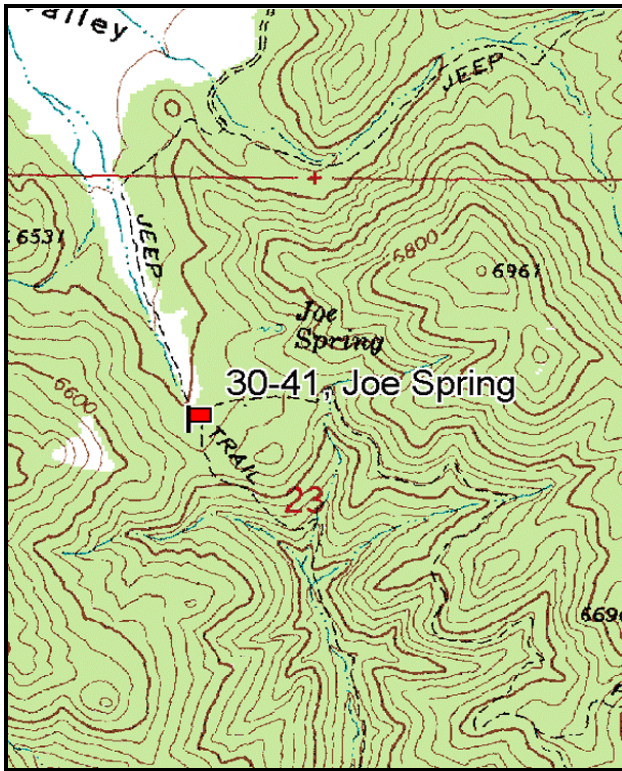
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 152 degrees magnetic. (Lines 2 & 3, 231°M)

Frequency belt placement: line 1 (1 & 93ft), line 2 (71ft), line 3 (34 & 59ft).

LOCATION DESCRIPTION

From 200 East and Main in Enterprise, travel southwest 7.8 miles to Ox Valley. Take a left at the ranch gate and continue east and south 0.8 miles to the next fork. Turn right on FS road 356 and travel 0.55 miles to the next fork at Joe Spring. From the intersection walk up the right fork 32 paces to a full-high marker post on the right side of the road. The 0-foot baseline is 24 paces at 210 degrees magnetic and is marked by browse tag #7015. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map Name: Central West

Diagrammatic Sketch

Township 38S, Range 17W, Section 23

GPS: NAD 83, UTM 12S 258687 E, 4150397 N



## DISCUSSION

### Joe Spring - Trend Study No. 30-41

#### Study Information

This study is located on deer transitional/summer range on the south end of Ox Valley [elevation: 6,400 feet (1,950 m), slope: 15%-24%, aspect: east]. The vegetation type is mixed mountain brush. The entire area surrounding Ox Valley receives heavy deer and cattle use. During study site establishment in 1982, cattle were in the area and several does with fawns were also observed. Pellet group transect data estimated deer use to be moderately heavy in 1998 and 2008 (58 deer days use/acre:143 ddu/ha and 44 ddu/acre:107 ddu/ha, respectively), with more moderate use in 2003 (32 ddu/acre:79 ddu/ha). Cattle use was estimated to be light in 1998 and 2003 (10 cow days use/acre:25 cdu/ha and 5 cdu/acre:12 cdu/ha, respectively), with slightly more moderate use in 2008 (18 cdu/acre:45 cdu/ha). There is a water source and salt lick within a half mile of the site. A grouse and deer were seen on the site in 2008. Mormon crickets were abundant in 2003 and 2008.

#### Soil

Soils are coarse textured and rocky, but deep. Parent material is granite. Effective rooting depth is estimated at 18 inches. Texture is a sandy loam which is moderately acidic (pH 5.7). Relative combined vegetation and litter cover has been high at a range of 72%-76% from 1998 to 2008. Relative bare ground cover has ranged from 15%-17% from 1998 to 2003. Bare ground is largely the result of livestock trailing and some deer trails which terrace the slope. There is some limited erosion occurring and the erosion condition rating was classified as slight in 2003 primarily due to pedestaling of plants, but was stable in 2008.

#### Browse

Browse composition is diverse and overall productivity is high. The principal species include mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Gambel oak (*Quercus gambelii*), Utah serviceberry (*Amelanchier utahensis*), mountain snowberry (*Symphoricarpos oreophilus*), and a few less desirable shrubs. Utah serviceberry decreased in density between 1982 and 1992. Decadence increased and the proportion of individuals heavily hedged went up (33% to 43%). In 1998, a larger sample area was used that better estimates shrub densities which are very clumped on the Joe Spring site. As a result, density of many of the shrub species changed. The estimates of serviceberry density has also fluctuated over the sample years, mostly due to sample techniques. In 1998 and 2003, individual stems were counted as individual plants, but in previous years (1982 and 1992) and in 2008 clumps of stems were counted as individual plants. Because of this, cover is probably a better estimate of population growth. The average cover of serviceberry ranged from 24%-30% from 1998 to 2008. Utilization has been moderate to heavy where available, vigor was good, and decadence has been low in all sample years.

Mountain big sagebrush has a moderate density which has declined steadily since 1998 from 2,220 plants/acre to 1,700 plants/acre in 2008. It has displayed mostly light to moderate use during all readings and normal vigor on most plants. The number of decadent plants in the population remained low between 1982 and 1998, although it has risen to a moderate level of 30% in 2003 and 33% in 2008. Reproduction was good in previous years, but no seedlings or young were encountered in 2003. Reproduction and recruitment of sagebrush improved again in 2008

True mountain mahogany (*Cercocarpus montanus*) was very clumped in its distribution and it appears that past samples overestimated mahogany density. Density was estimated at 1,732 plants/acre in 1982 and 1,132 in 1992. These plants displayed heavy use with reduced vigor. Density counts from 1998 estimate only 20 mature plants/acre, all of which displayed heavy use. There were no dead plants sampled, so it appears that the change in sample size is the reason for the decline in density. No mahogany was sampled within the shrub density strips in 2003, but some plants were measured for height and crown. No true mountain mahogany were sampled in 2008.

A relatively stable population of Gambel oak provides about one-third of the total browse cover. Vigor was reduced in 29% of the plants sampled in 1998. This was due to the late frosts from the spring of that year but average vigor was normal in 2003 and 2008. Utilization of oak was moderate to heavy in 1982 and 1992, but has been light since 1998.

#### Herbaceous Understory

Grasses, although fairly diverse, are not very abundant. Eight perennial grass species were encountered in 1998 and seven species in 2003 and 2008. Mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail (*Sitanion hystrix*), mountain brome (*Bromus carinatus*), and intermediate wheatgrass (*Agropyron intermedium*) are the most common perennial grasses. Cheatgrass brome (*Bromus tectorum*) was present in 1992 and it appeared to have increased significantly since the first reading in 1982. It was reported to dominate the understory in 1992, however annuals were not included in the previous surveys. Cheatgrass has dominated the herbaceous understory by providing an average of 73% of the total grass cover and an average of 41% of the total herbaceous cover since 1998.

Forbs are fairly diverse and abundant, yet probably still below optimum for this type of site. The more important forbs include silvery lupine (*Lupinus argenteus*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and redroot eriogonum (*Eriogonum racemosum*). Overall, utilization of forbs is moderate with slightly heavier use on silvery lupine, redroot eriogonum, and American vetch (*Vicia americana*). The annual forb, littleflower collinsia (*Collinsia parviflora*), is very abundant and was growing in thick patches in 1998. It provided 28% of the forb cover in 1998, but only 9% in 2003, and was negligible in 2008. The native perennial forbs, desert phlox (*Phlox austromontana*) and arrowleaf balsamroot, are the most abundant species, producing 28% of the forb cover in 1998, 62% in 2003, and 77% in 2008.

#### 1992 TREND ASSESSMENT

The browse trend is slightly down due to decreases in density and increases in decadence of the two preferred browse species, Utah serviceberry and mountain mahogany. Utah serviceberry decreased in density by 71% from 1,599 plants/acre in 1982 to 466 plants/acre, while the proportion of decadent plants increased slightly. Mountain mahogany saw a 35% decrease in its density from 1,732 plants/acre in 1982 to 1,132 plants/acre, and an increase in decadence from 15% to 41%. Data for the herbaceous understory from 1982 is limited to quadrat frequency for species. Considering the limited data, trend for both the grasses and forbs is stable. Quadrat frequency of perennial grasses remained basically unchanged. Quadrat frequency of forbs increased slightly.

browse - slightly down (-1)

grass - stable (0)

forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for the key browse species, serviceberry and mountain big sagebrush, is slightly up. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Decadence of serviceberry has declined from 14% in 1992 to 6%, however, reproduction is poor. Sagebrush displays improved vigor, lower decadence, and good reproduction. Only one mountain mahogany plant was encountered with the larger sampling design. It appears that there are only a few isolated clumps on the site. They are heavily utilized, but do not occur in high enough numbers to be considered a key browse species. Gambel oak appears to be increasing. It was reportedly heavily hedged in 1992, but current use is light. A continued increase in oak will come at the expense of more desirable shrubs and herbaceous plants. Trend for the grasses is stable. Sum of nested frequency for perennial grasses has remained similar to 1992 levels. Trend for forbs is up. The sum of nested frequency of forbs has doubled, with significant increases in the nested frequency of American vetch, arrowleaf balsamroot, false dandelion (*Agoseris glauca*), spring parsley (*Cymopterus sp.*), desert phlox, and spotted stickseed (*Hackelia patens*).

winter range condition (DCI) - fair (63) Mid-level potential scale

browse - slightly up (+1)

grass - stable (0)

forb - up (+2)

### 2003 TREND ASSESSMENT

Trend for the key browse species, serviceberry and mountain big sagebrush, is stable. The population density of serviceberry increased slightly. Individual rooted stems were counted in 1998 and 2003. However, due to the large numbers of stems and difficulty counting within thick clones, it is better to concentrate on other factors to determine trend. Average cover of serviceberry declined slightly from 8.6% in 1998 to 7% in 2003. Strip frequency remained similar. Vigor remained good and the number of decadent stems is low. Mountain big sagebrush declined slightly in density (11%) and remained at nearly 2,000 plants/acre. Recruitment of young sagebrush declined with no seedlings or young plants encountered. Sagebrush vigor was normal on most plants, though the number of decadent plants did increase to 30%. It appears that drought combined with the thick competitive cheatgrass understory contributed to these trends. Annual leader growth of sagebrush was good in 2003 averaging nearly 2 inches. This area is considered transitional/summer range so the herbaceous component is the most important aspect. The trend for grasses is stable, but poor. Perennial grasses are not abundant and confined mostly to growing within shrub canopies. Cheatgrass still dominates the herbaceous understory by providing 82% of the grass cover and 49% of the total herbaceous cover. The only somewhat common perennial grasses are mutton bluegrass, prairie junegrass (*Koeleria cristata*), and bottlebrush squirreltail. There was a significant increase in the nested frequency of intermediate wheatgrass and bottlebrush squirreltail, with a significant decrease in mutton bluegrass. The trend for forbs is down. Sum of nested frequency of perennial forbs declined by 55% from 1998. Forbs are very diverse with 22 species sampled in 2003, but few species are abundant. They include arrowleaf balsamroot, silky lupine, desert phlox and American vetch. Drought conditions combined with Mormon cricket use may have contributed to the decline in the nested frequency of perennial forbs. Eleven perennial species declined significantly in nested frequency since 1998.

winter range condition (DCI) - poor-fair (52) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - down (-2)

## 2008 TREND ASSESSMENT

Trend for browse is slightly down. The density of the primary browse species, mountain big sagebrush, has declined by 14% from 2003 to 1,700 plants/acre. The proportion of sagebrush plants displaying poor vigor has increased from 9% in 2003 to 15%, which is still low. Recruitment has improved with young plants comprising 11% of the population. Due to differences in sampling techniques and difficulties in counting, density has declined drastically in the preferred browse species Utah serviceberry. Other factors may be better to determine trends in serviceberry. The line-intercept cover for serviceberry increased from 8% in 2003 to 10%. Vigor in serviceberry has remained good, but decadence increased from 6% in 2003 to 20%. True mountain mahogany, which had already declined in density and was only sampled for height and crown data in 2003, was not sampled in any measurement on the site. Trend for grasses is up. The sum of nested frequency of perennial grasses increased by 31% since 2003 mostly due to significant increases in the nested frequency of intermediate wheatgrass and mutton bluegrass. The nested frequency of cheatgrass remained similar to 2003 levels, but cheatgrass cover declined from 82% of the total grass cover in 2003 to 70% of the grass cover. Trend for forbs is stable. Sum of nested frequency of perennial forbs has increased by 17% since 2003, but cover of perennial forbs has declined slightly from 11% in 2003 to 9%.

winter range condition (DCI) - fair (56) Mid-level potential scale

browse - slightly down (-1)

grass - up (+2)

forb - stable (0)

### HERBACEOUS TRENDS --

Management unit 30 , Study no: 41

| T<br>y<br>p<br>e            | Species               | Average Cover %  |                  |                 |                  |       |       |       |
|-----------------------------|-----------------------|------------------|------------------|-----------------|------------------|-------|-------|-------|
|                             |                       | '92              | '98              | '03             | '08              | '98   | '03   | '08   |
| G                           | Agropyron intermedium | ab <sub>12</sub> | a <sub>1</sub>   | b <sub>22</sub> | c <sub>46</sub>  | .00   | .32   | .63   |
| G                           | Agropyron smithii     | b <sub>16</sub>  | ab <sub>6</sub>  | a <sub>-</sub>  | b <sub>12</sub>  | .02   | -     | .07   |
| G                           | Agropyron spicatum    | b <sub>56</sub>  | a <sub>11</sub>  | a <sub>1</sub>  | a <sub>-</sub>   | .19   | .03   | -     |
| G                           | Bouteloua gracilis    | 10               | -                | 3               | 3                | -     | .06   | .15   |
| G                           | Bromus carinatus      | 13               | 22               | 3               | 20               | .37   | .03   | .40   |
| G                           | Bromus tectorum (a)   | -                | 285              | 273             | 269              | 12.32 | 15.36 | 10.94 |
| G                           | Koeleria cristata     | a <sub>-</sub>   | a <sub>-</sub>   | b <sub>47</sub> | a <sub>-</sub>   | -     | .68   | -     |
| G                           | Oryzopsis hymenoides  | 2                | -                | -               | 6                | -     | -     | .06   |
| G                           | Poa fendleriana       | a <sub>3</sub>   | c <sub>85</sub>  | b <sub>48</sub> | c <sub>108</sub> | 4.46  | 1.70  | 3.33  |
| G                           | Poa pratensis         | -                | 8                | -               | -                | .18   | -     | -     |
| G                           | Sitanion hystrix      | bc <sub>30</sub> | ab <sub>15</sub> | c <sub>30</sub> | a <sub>6</sub>   | .63   | .64   | .07   |
| G                           | Stipa comata          | 9                | 2                | -               | -                | .03   | -     | -     |
| Total for Annual Grasses    |                       | 0                | 285              | 273             | 269              | 12.32 | 15.36 | 10.94 |
| Total for Perennial Grasses |                       | 151              | 150              | 154             | 201              | 5.89  | 3.47  | 4.72  |
| Total for Grasses           |                       | 151              | 435              | 427             | 470              | 18.22 | 18.84 | 15.67 |
| F                           | Agoseris glauca       | a <sub>-</sub>   | c <sub>34</sub>  | a <sub>9</sub>  | b <sub>17</sub>  | .29   | .02   | .15   |
| F                           | Allium sp.            | a <sub>-</sub>   | b <sub>57</sub>  | a <sub>-</sub>  | a <sub>-</sub>   | .48   | -     | -     |

| Type | Species                      |     |      |       |       | Average Cover % |      |      |
|------|------------------------------|-----|------|-------|-------|-----------------|------|------|
|      |                              | '92 | '98  | '03   | '08   | '98             | '03  | '08  |
| F    | Arabis sp.                   | -   | 5    | -     | 4     | .16             | .00  | .03  |
| F    | Artemisia ludoviciana        | b30 | a3   | a5    | a5    | .00             | .06  | .06  |
| F    | Aster chilensis              | a-  | b28  | a-    | a-    | .09             | -    | -    |
| F    | Astragalus sp.               | a2  | b13  | a-    | ab5   | .11             | -    | .01  |
| F    | Balsamorhiza sagittata       | a3  | b33  | b27   | b32   | 2.40            | 5.38 | 3.90 |
| F    | Brodiaea pulchella           | a-  | a-   | a-    | b35   | -               | -    | .12  |
| F    | Calochortus nuttallii        | a-  | b8   | a-    | ab3   | .03             | -    | .01  |
| F    | Chaenactis douglasii         | -   | -    | -     | 2     | -               | -    | .03  |
| F    | Collomia linearis (a)        | -   | -    | 1     | -     | -               | .00  | -    |
| F    | Comandra pallida             | 17  | 18   | 13    | 8     | .16             | .10  | .10  |
| F    | Collinsia parviflora (a)     | -   | b283 | a102  | a70   | 6.48            | 1.16 | .26  |
| F    | Crepis acuminata             | a-  | b11  | a-    | a1    | .27             | -    | .00  |
| F    | Cryptantha sp.               | -   | -    | -     | 2     | -               | -    | .00  |
| F    | Cymopterus sp.               | a-  | c36  | a-    | b15   | .32             | -    | .09  |
| F    | Epilobium brachycarpum (a)   | -   | -    | 2     | -     | -               | .03  | -    |
| F    | Erigeron eatonii             | 11  | 15   | 24    | 14    | .35             | .26  | .29  |
| F    | Erigeron sp.                 | a-  | b17  | a2    | a3    | .17             | .00  | .03  |
| F    | Eriogonum racemosum          | 2   | 6    | 3     | 2     | .21             | .00  | .03  |
| F    | Eriogonum umbellatum         | -   | -    | 2     | -     | -               | .00  | -    |
| F    | Galium sp.                   | a-  | ab7  | ab12  | b14   | .01             | .71  | .12  |
| F    | Gayophytum ramosissimum(a)   | -   | -    | -     | 7     | -               | -    | .02  |
| F    | Hackelia patens              | a-  | b22  | a-    | a3    | .30             | -    | .01  |
| F    | Hydrophyllum occidentale     | -   | -    | 3     | -     | -               | .03  | -    |
| F    | Lappula occidentalis (a)     | -   | a-   | a4    | b28   | -               | .16  | .15  |
| F    | Linum lewisii                | -   | 2    | -     | -     | .15             | -    | -    |
| F    | Lomatium sp.                 | -   | 1    | -     | -     | .03             | -    | -    |
| F    | Lupinus argenteus            | b84 | a30  | a15   | a8    | 1.29            | 1.52 | .18  |
| F    | Machaeranthera canescens     | b18 | a3   | a-    | ab4   | .00             | -    | .03  |
| F    | Microsteris gracilis (a)     | -   | b25  | ab11  | a9    | .16             | .13  | .02  |
| F    | Penstemon sp.                | -   | 4    | -     | 5     | .04             | -    | .09  |
| F    | Phlox austromontana          | a85 | b124 | ab112 | ab102 | 6.40            | 2.80 | 3.67 |
| F    | Phacelia heterophylla        | 1   | 6    | -     | 1     | .79             | -    | .00  |
| F    | Polygonum douglasii (a)      | -   | a-   | a2    | b21   | -               | .00  | .07  |
| F    | Senecio multilobatus         | a-  | a-   | b14   | a-    | -               | .07  | -    |
| F    | Sphaeralcea grossulariifolia | -   | 1    | 2     | 4     | .03             | .03  | .04  |
| F    | Stephanomeria tenuifolia     | a-  | b11  | a-    | a-    | .12             | -    | -    |

| T<br>y<br>p<br>e          | Species                 |                 |                  |                 |                 | Average Cover % |       |      |
|---------------------------|-------------------------|-----------------|------------------|-----------------|-----------------|-----------------|-------|------|
|                           |                         | '92             | '98              | '03             | '08             | '98             | '03   | '08  |
| F                         | Unknown forb-annual (a) | -               | 4                | -               | -               | .09             | -     | -    |
| F                         | Unknown forb-perennial  | -               | 5                | -               | -               | .03             | -     | -    |
| F                         | Vicia americana         | <sub>b</sub> 54 | <sub>c</sub> 101 | <sub>a</sub> 29 | <sub>a</sub> 24 | 2.21            | .19   | .17  |
| F                         | Viguiera multiflora     | -               | -                | -               | 5               | -               | -     | .06  |
| Total for Annual Forbs    |                         | 0               | 312              | 122             | 135             | 6.73            | 1.49  | 0.53 |
| Total for Perennial Forbs |                         | 307             | 601              | 272             | 318             | 16.52           | 11.22 | 9.29 |
| Total for Forbs           |                         | 307             | 913              | 394             | 453             | 23.25           | 12.72 | 9.82 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 41

| T<br>y<br>p<br>e | Species                                      | Strip Frequency |     |     | Average Cover % |       |       |
|------------------|--|-----------------|-----|-----|-----------------|-------|-------|
|                  |  | '98             | '03 | '08 | '98             | '03   | '08   |
| B                | Amelanchier utahensis                        | 26              | 25  | 23  | 8.55            | 7.09  | 8.37  |
| B                | Artemisia tridentata vaseyana                | 61              | 53  | 48  | 10.19           | 8.72  | 7.01  |
| B                | Cercocarpus ledifolius                       | 1               | 0   | 0   | .00             | -     | -     |
| B                | Cercocarpus montanus                         | 1               | 0   | 0   | .00             | -     | -     |
| B                | Chrysothamnus depressus                      | 3               | 0   | 1   | .03             | -     | .00   |
| B                | Chrysothamnus viscidiflorus<br>viscidiflorus | 26              | 25  | 27  | 1.43            | 1.46  | 2.20  |
| B                | Eriogonum microthecum                        | 0               | 6   | 3   | -               | .57   | .06   |
| B                | Gutierrezia sarothrae                        | 0               | 0   | 1   | -               | -     | .00   |
| B                | Opuntia sp.                                  | 1               | 1   | 0   | .03             | .15   | .03   |
| B                | Quercus gambelii                             | 34              | 34  | 30  | 10.28           | 10.94 | 8.88  |
| B                | Ribes sp.                                    | 1               | 1   | 1   | .38             | .00   | .38   |
| B                | Symphoricarpos oreophilus                    | 3               | 2   | 2   | .33             | .18   | .15   |
| B                | Tetradymia canescens                         | 0               | 2   | 0   | .03             | .03   | .38   |
| Total for Browse |  | 157             | 149 | 136 | 31.28           | 29.14 | 27.48 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 41

| Species                                   | Percent Cover |       |       |
|---|---------------|-------|-------|
|   | '98           | '03   | '08   |
| Amelanchier utahensis                     | -             | 7.59  | 9.66  |
| Artemisia tridentata vaseyana             | -             | 9.23  | 13.85 |
| Chrysothamnus viscidiflorus viscidiflorus | -             | 1.85  | 3.00  |
| Eriogonum microthecum                     | -             | .16   | .13   |
| Quercus gambelii                          | 10.80         | 13.93 | 13.66 |
| Ribes sp.                                 | -             | -     | 2.45  |
| Symphoricarpos oreophilus                 | -             | .28   | .45   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 41

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 2.4                        | 1.2 |
| Artemisia tridentata vaseyana | 1.8                        | 1.0 |

BASIC COVER --

Management unit 30 , Study no: 41

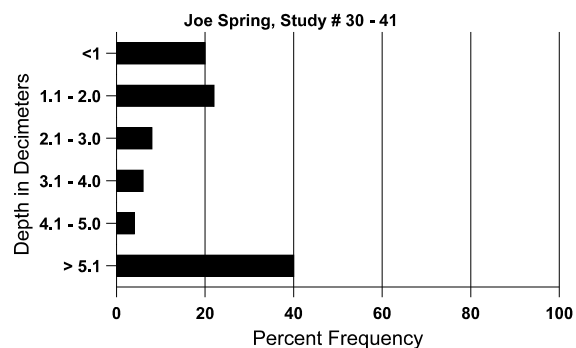
| Cover Type  | Average Cover % |     |       |       |       |
|-------------|-----------------|-----|-------|-------|-------|
|             | '82             | '92 | '98   | '03   | '08   |
| Vegetation  | 2.75            | 0   | 59.19 | 56.87 | 48.65 |
| Rock        | 1.25            | 0   | 7.60  | 7.53  | 6.96  |
| Pavement    | .50             | 0   | 4.94  | 6.17  | 6.16  |
| Litter      | 67.25           | 0   | 46.79 | 35.79 | 40.06 |
| Cryptogams  | 0               | 0   | 0     | 0     | 0     |
| Bare Ground | 28.25           | 0   | 20.56 | 18.29 | 21.29 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 41, Study Name: Joe Spring

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 18.0                         | 41.8 (16.7)     | 5.7 | 68.0       | 17.4   | 14.6   | 1.8 | 15.0  | 150.4 | 0.4  |

## Stoniness Index



### PELLET GROUP DATA --

Management unit 30 , Study no: 41

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 3                 | 3   | 29  |
| Deer   | 29                | 11  | 37  |
| Cattle | 2                 | 3   | 6   |

| Days use per acre (ha) |         |          |
|------------------------|---------|----------|
| '98                    | '03     | '08      |
| -                      | -       | -        |
| 39 (96)                | 32 (79) | 44 (107) |
| 10 (25)                | 5 (13)  | 18 (45)  |

### BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 41

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>1598</b>                           | 66                                       | 199   | 1333   | 66       | -    | 0           | 33      | 4          | -       | 0            | 46/11                     |
| 92                                   | <b>464</b>                            | -  | 199   | 199    | 66       | -    | 0           | 43      | 14         | -       | 0            | 20/36                     |
| 98                                   | <b>4640</b>                           | -  | 60    | 4300   | 280      | 220  | 51          | 13      | 6          | -       | 0            | 45/33                     |
| 03                                   | <b>5480</b>                           | 60                                       | 300   | 4860   | 320      | 420  | .72         | 36      | 6          | 3       | 3            | 47/47                     |
| 08                                   | <b>700</b>                            | 200                                      | 60    | 500    | 140      | 40   | 26          | 60      | 20         | 6       | 6            | 47/50                     |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>1265</b>                           | -  | 133   | 999    | 133      | -    | 5           | 0       | 11         | -       | 0            | 24/32                     |
| 92                                   | <b>1331</b>                           | 66                                       | 266   | 799    | 266      | -    | 15          | 5       | 20         | 2       | 15           | 22/27                     |
| 98                                   | <b>2220</b>                           | 500                                      | 460   | 1480   | 280      | 420  | 29          | 5       | 13         | 3       | 3            | 22/33                     |
| 03                                   | <b>1980</b>                           | -  | -     | 1380   | 600      | 220  | 20          | 9       | 30         | 9       | 9            | 24/29                     |
| 08                                   | <b>1700</b>                           | 60                                       | 180   | 980    | 540      | 280  | 27          | 18      | 32         | 11      | 15           | 21/33                     |



|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Cercocarpus ledifolius</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 66                                    | -  | 66    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 40                                    | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 17/36                     |
| <b>Cercocarpus montanus</b>                      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 1731                                  | -  | 1066  | 399    | 266      | -    | 0           | 100     | 15         | -       | 15           | 8/6                       |
| 92   | 1132                                  | 199                                      | 533   | 133    | 466      | -    | 35          | 53      | 41         | 5       | 18           | 6/7                       |
| 98   | 20                                    | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 14/20                     |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 22/29                     |
| 08   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <b>Chrysothamnus depressus</b>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 80                                    | -  | -     | 80     | -        | -    | 25          | 0       | -          | -       | 0            | 8/15                      |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 80                                    | -  | -     | 80     | -        | -    | 0           | 100     | -          | -       | 0            | 6/3                       |
| <b>Chrysothamnus viscidiflorus viscidiflorus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 1066                                  | -  | -     | 1066   | -        | -    | 0           | 0       | 0          | -       | 0            | 15/29                     |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98   | 960                                   | 40                                       | 140   | 780    | 40       | 60   | 0           | 4       | 4          | -       | 0            | 14/24                     |
| 03   | 700                                   | -  | 20    | 660    | 20       | -    | 0           | 0       | 3          | -       | 0            | 14/18                     |
| 08   | 880                                   | -  | 60    | 700    | 120      | -    | 7           | 20      | 14         | -       | 2            | 10/20                     |
| <b>Eriogonum microthecum</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 266                                   | -  | -     | 266    | -        | -    | 0           | 0       | 0          | -       | 0            | 5/15                      |
| 92   | 66                                    | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 6/9                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 03   | 180                                   | -  | 20    | 160    | -        | -    | 11          | 0       | 0          | -       | 0            | 7/16                      |
| 08   | 60                                    | -  | -     | 40     | 20       | -    | 33          | 33      | 33         | -       | 0            | 9/20                      |
| <b>Gutierrezia sarothrae</b>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | 100                                   | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 5/8                       |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Opuntia sp.</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/20                      |
| 08                               | 0                                     | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/20                      |
| <b>Quercus gambelii</b>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 1066                                  | -  | 333   | 733    | -        | -    | 13          | 31      | 0          | -       | 0            | 47/23                     |
| 92                               | 1865                                  | 799                                      | 733   | 466    | 666      | -    | 7           | 79      | 36         | -       | 0            | 71/47                     |
| 98                               | 4920                                  | 340                                      | 1180  | 3360   | 380      | 240  | 6           | 0       | 8          | 3       | 29           | 35/31                     |
| 03                               | 8720                                  | 20                                       | 1900  | 6320   | 500      | 540  | 18          | 1       | 6          | .91     | .91          | 37/22                     |
| 08                               | 7680                                  | 80                                       | 1480  | 4380   | 1640     | 720  | 3           | 7       | 22         | 4       | 4            | 33/19                     |
| <b>Quercus turbinella</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 35/20                     |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Ribes sp.</b>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 57/58                     |
| 03                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 54/40                     |
| 08                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 45/51                     |
| <b>Symphoricarpos oreophilus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 666                                   | -  | -     | 666    | -        | -    | 0           | 0       | 0          | -       | 0            | 25/22                     |
| 92                               | 598                                   | -  | 333   | 199    | 66       | -    | 22          | 0       | 11         | -       | 0            | 19/29                     |
| 98                               | 560                                   | 120                                      | 300   | 260    | -        | -    | 14          | 0       | 0          | -       | 0            | 12/17                     |
| 03                               | 80                                    | -  | -     | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 20/41                     |
| 08                               | 100                                   | -  | 20    | 80     | -        | -    | 0           | 0       | 0          | -       | 0            | 17/31                     |
| <b>Tetradymia canescens</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                               | 66                                    | -  | -     | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 12/15                     |
| 92                               | 199                                   | -  | 133   | 66     | -        | -    | 33          | 0       | -          | -       | 0            | 11/14                     |
| 98                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 80                                    | -  | 60    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 31/36                     |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-42-08

Study site name: Grapevine Spring.

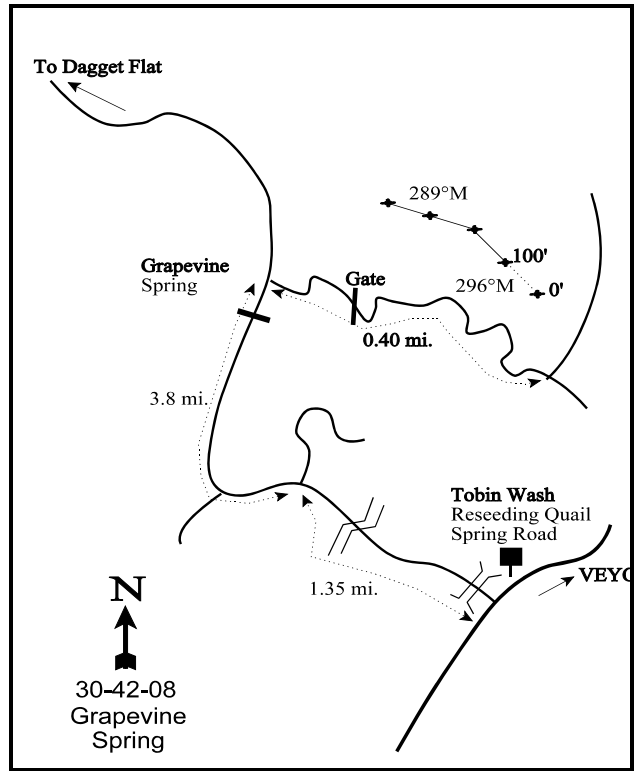
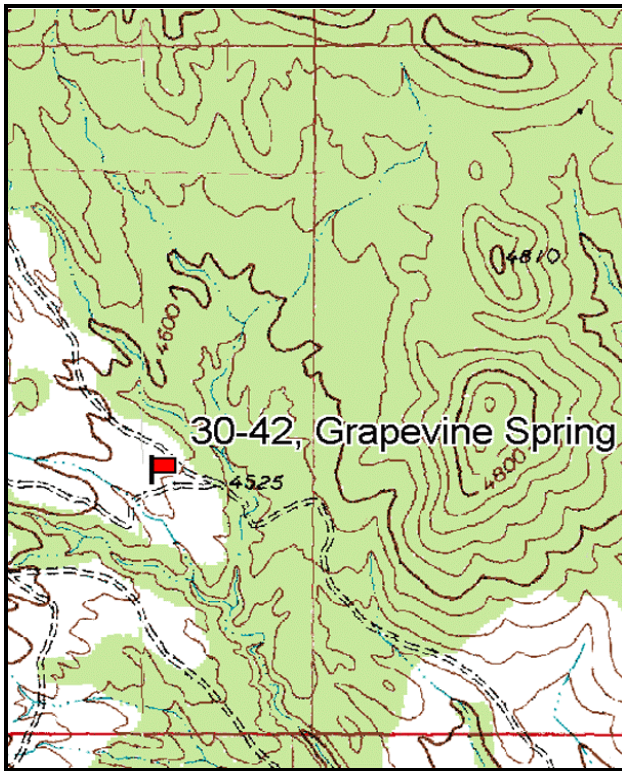
Vegetation type: Mtn. Brush Chaining.

Compass bearing: frequency baseline 296 degrees magnetic. (Lines 3 & 4, 289°M)

Frequency belt placement: line 1 (10 & 92ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

From the town of Veyo, proceed west on Gunlock Road (center street) 5.7 miles until you come to a sign saying Tobin Wash and with Eagle Mountain Ranch just off the road. Turn right (west) at Eagle Mt. Ranch and travel 1.35 miles on the main road. Turn left, across a small creek, and proceed 3.8 miles to Grapevine Spring. Just past Grapevine Spring, take the fork to the right. Travel 0.40 miles till you come to another fork in the road to the left and stop. From the fork in the road, the 0-foot baseline stake is 10 paces away at a bearing of 296 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height. The baseline is marked with browse tag #7098.



Map Name: Gunlock

Diagrammatic Sketch

Township 39S, Range 17W, Section 32

GPS: NAD 83, UTM 12S 252683 E, 4137441 N

## DISCUSSION

### Grapevine Spring - Trend Study No. 30-42

#### Study Information

This trend study is located within critical deer winter range, one-half mile east of Grapevine Spring [elevation: 4,600 feet (1,402 m), slope: 5%-10%, aspect: southeast]. The study lies within an old singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) chaining that currently supports a mixed browse stand. The Bull Complex fire burned the area in 2006 and the area was aerially seeded afterward. Pellet group data estimated deer use to be moderate in 1998 and 2003 (32 deer days use/acre:79 ddu/ha and 29 ddu/acre:73 ddu/ha, respectively), and very light in 2008 (1 ddu/acre:3 ddu/ha) probably due to the fire. There were only a few cattle pats encountered in 1998 (2 cow days use/acre:5 cdu/ha) with no sign of cattle encountered in 2003 or 2008.

#### Soil

Soils are shallow, moderately rocky, and generally lack effective cover. Effective rooting depth was estimated at 14 inches in 1998. Soil texture is a sandy clay loam which is neutral in reactivity (pH 6.7). Phosphorus has marginal availability for plant growth at 8.5 ppm (Tiedemann and Lopez 2004). There is a considerable amount of pavement concentrated on the ground surface in the shrub interspaces. Relative combined vegetation and litter cover was 59% in 1998 and 65% in 2003, and decreased after the fire to 31%. Litter consists largely of dead cheatgrass. Relative bare ground was 20% in 1998, decreasing to 11% in 2003, and increasing again after the fire to 29% in 2008. Some erosion is occurring, yet it is less severe than on untreated pinyon-juniper woodlands in the immediate area. The gentle, almost flat terrain helps prevent serious soil loss. The erosion condition class was rated as stable in 2003 and 2008.

#### Browse

The key browse species is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with lesser amounts of desert ceanothus (*Ceanothus greggii*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). The population of big sagebrush steadily increased from 566 plants/acre in 1982 to 4,380 by 1998. In 2003, density of sagebrush declined by 51%. There were nearly as many dead as live sagebrush. No seedlings were encountered and young plants declined to only 3% of the population. Sagebrush density was just 20 plants/acre in 2008, due to the fire in 2005.

Desert ceanothus increased 53% in density between 1982 and 1992, but estimates from 1998 are similar to 1982 levels. The population follows the same trend as sagebrush in 2003 with a 50% decline in density. Half of the remaining population was decadent. Desert ceanothus survived the fire well and actually increased slightly in the 2008 reading. Stansbury cliffrose occurred in similar densities as desert ceanothus through 2003, but no cliffrose was sampled in the density strips in 2008. Utilization of cliffrose prior to the fire was light to moderate. Other preferred browse species found on the site include a few scattered green ephedra (*Ephedra viridis*), and forage kochia (*Kochia prostrata*) was encountered in 2008 after the fire, presumably due to reseeding .

The most abundant browse species in 1992 was the increaser broom snakeweed (*Gutierrezia sarothrae*) which had expanded from 8,799 plants/acre in 1982 to 11,933 by 1992. Seedlings and young were numerous, characterizing an expanding population at that time. During the 1998 reading, population density actually

declined 74% to 3,080 plants/acre. Drought conditions have caused the population to decline even further to only 760 plants/acre by 2003. After the fire, snakeweed density increased to 5,860 plants/acre in 2008. Surviving pinyon and juniper trees were increasing in size on the site prior to the fire. Point-quarter data from 2003 estimated 52 pinyon trees/acre and 70 juniper trees/acre. Average basal diameter was estimated at 3.6 inches for pinyon and 4.4 inches for juniper. Average cover for pinyon and juniper doubled between 1998 and 2003. Total line-intercept canopy cover was estimated at 2% for pinyon and 3% for juniper in 2003. Because of the reduction of pinyon and juniper from the fire, no trees were sampled within the point-quarter sample area in 2008.

Herbaceous Understory

The herbaceous understory is poor producing only 9% cover in 1998 and 4% in 2003. After the fire, the cover of herbaceous understory increased to 25% in 2008, mostly due to increases in forbs. Grass composition consists of both native and seeded species which are not very vigorous and produce little available forage. The principal species, intermediate wheatgrass (*Agropyron intermedium*) and bottlebrush squirreltail (*Sitanion hystrix*), had sustained approximately 30% utilization during the 1982 reading. The annual grasses, cheatgrass brome (*Bromus tectorum*) and foxtail brome (*Bromus rubens*), are also present and more numerous than the perennial grasses. These annual grasses provided over half of the total grass cover in 1998, 88% in 2003, and 89% in 2008. Prior to the fire, perennial forbs were sparse with relatively few species found more than occasionally. After the fire, forbs increased in both nested frequency and cover in 2008.

Seed Mix - Bull Complex Fire

| Seeded Species     | lbs./acre |
|--------------------|-----------|
| Pubescent          | 3.0       |
| Hycrest Wheatgrass | 1.0       |
| Sideoats Grama     | 2.0       |
| Smooth Brome       | 1.0       |
| Small Burnett      | 1.0       |
| Alfalfa            | 1.0       |
| Palmer Penstemon   | 0.1       |
| Yellow Sweetclover | 0.5       |
| Prostrate Kochia   | 1.0       |

1992 TREND ASSESSMENT

The browse trend is up due to significant increases in the density and reproductive potentials of key shrub species. However, broom snakeweed is abundant and has also increased. Data for herbaceous species from 1982 is limited to quadrat frequency. Considering this limited data trend for grasses is slightly down. There was a large decrease in the quadrat frequency of perennial grasses, especially seeded species. Trend for forbs is stable. There was a slight decrease in the quadrat frequency of forbs.

browse - up (+2)

grass - slightly down (-1)

forb - stable (0)

1998 TREND ASSESSMENT

Trend for browse is up stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big

sagebrush had good vigor, low decadence, and contributes 60% of the browse cover. Both desert ceanothus and cliffrose appear to have stable populations. Trend for the grasses is slightly up, although total production is poor with a total grass cover value of only 3%. Sum of nested frequency for perennial grasses increased slightly, with a significant increase in the nested frequency of bottlebrush squirreltail. Trend for forbs is up. Nested frequency for perennial forbs increased eleven-fold, and several new forb species were encountered in the larger sample.

winter range condition (DCI) - fair-good (65) Mid-level potential scale  
browse - stable (0)                      grass - slightly up (+1)                      forb - up (+2)

### 2003 TREND ASSESSMENT

Trend for browse is down. Density of the key species, mountain big sagebrush, has declined by 51% from 1998 to 2,160 plants/acre. The number of decadent shrubs has increased to 33%, young recruitment is down, and no seedlings were encountered. Dead sagebrush increased from only 180 plants/acre in 1998 to 2,040 plants/acre. It appears that the drought has caused a significant die-off of sagebrush on this site. Drought may have also caused an increase in decadent and dead desert ceanothus plants. Cliffrose has declined slightly in density, but maintained good vigor. Juniper and pinyon trees are slowly increasing in size and provide additional competition for resources. Tree density was estimated at 122 pinyon and juniper trees/acre with a line-intercept cover value of 5%. Many of the juniper trees in the area displayed brown leaves due to drought. The trend for both grasses and forbs is down. The herbaceous understory is poor and produces little cover (4%). The sum of nested frequency of perennial grasses declined by 95% from 1998, and cover of perennial forbs declined to less than 0.05%. Only one perennial grass, bottlebrush squirreltail, was encountered on the site in 2003. Annual grasses, foxtail and cheatgrass brome, have also declined in frequency and cover. However, they along with sixweeks fescue (*Vulpia octoflora*), remain the most abundant grasses. The sum of nested frequency of perennial forbs has declined by 36% from 1998, and cover of perennial forbs declined to 3%. The forb composition is diverse but the most common species in 2003 were annuals which provided 72% of the total forb cover.

winter range condition (DCI) - very poor (26) Mid-level potential scale  
browse - down (-2)                      grass - down (-2)                      forb - down (-2)

### 2008 TREND ASSESSMENT

A fire burned the site in 2005 and removed many of the preferred browse species. Trend for browse is down. The primary browse species, mountain big sagebrush, was reduced in density to only 20 plants/acre. The density of desert ceanothus increased slightly to 180 plants/acre, with improved vigor and decreased decadence. Stansbury cliffrose was not encountered in the density strip. The seeded species, forage kochia, was encountered for the first time in 2008. Trend for grasses is stable. Sum of nested frequency of perennial grasses is up, but perennial grasses are rare and provide only 7% of the total grass cover. The nested frequency of cheatgrass increased significantly and cheatgrass comprised 82% of the total grass cover. Trend for forbs is up. Sum of nested frequency of perennial forbs increased markedly, and cover of perennial forbs increased to 12%. There were eleven perennial species sampled in 2008 that had not been encountered on the site in previous readings.

winter range condition (DCI) - very poor (9) Mid-level potential scale  
browse - down (-2)                      grass - stable (0)                      forb - up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 42

| T<br>y<br>p<br>e            | Species                          |                 |                  |                  |                  | Average Cover % |      |      |
|-----------------------------|----------------------------------|-----------------|------------------|------------------|------------------|-----------------|------|------|
|                             |                                  | '92             | '98              | '03              | '08              | '98             | '03  | '08  |
| G                           | <i>Agropyron cristatum</i>       | -               | 5                | -                | 3                | .15             | -    | .00  |
| G                           | <i>Agropyron intermedium</i>     | 8               | 10               | -                | -                | .07             | -    | -    |
| G                           | <i>Bouteloua curtipendula</i>    | -               | -                | -                | 6                | -               | -    | .09  |
| G                           | <i>Bromus rubens</i> (a)         | -               | 11               | 7                | 17               | .37             | .20  | .13  |
| G                           | <i>Bromus tectorum</i> (a)       | -               | <sub>b</sub> 121 | <sub>a</sub> 34  | <sub>b</sub> 111 | 1.02            | .72  | 1.62 |
| G                           | <i>Sitanion hystrix</i>          | <sub>b</sub> 32 | <sub>c</sub> 50  | <sub>a</sub> 3   | <sub>a</sub> 11  | .96             | .03  | .05  |
| G                           | <i>Vulpia octoflora</i> (a)      | -               | <sub>a</sub> 12  | <sub>ab</sub> 25 | <sub>b</sub> 25  | .02             | .11  | .07  |
| Total for Annual Grasses    |                                  | 0               | 144              | 66               | 153              | 1.42            | 1.03 | 1.83 |
| Total for Perennial Grasses |                                  | 40              | 65               | 3                | 20               | 1.19            | 0.02 | 0.14 |
| Total for Grasses           |                                  | 40              | 209              | 69               | 173              | 2.62            | 1.06 | 1.97 |
| F                           | <i>Agoseris glauca</i>           | -               | -                | 1                | -                | -               | .00  | -    |
| F                           | <i>Calochortus flexuosus</i>     | -               | <sub>b</sub> 15  | <sub>a</sub> 3   | <sub>b</sub> 26  | .04             | .01  | .08  |
| F                           | <i>Castilleja linariaefolia</i>  | -               | 2                | 6                | -                | .00             | .01  | -    |
| F                           | <i>Cirsium</i> sp.               | -               | 1                | 3                | -                | .00             | .00  | -    |
| F                           | <i>Cordylanthus parviflorus</i>  | 9               | -                | -                | -                | -               | -    | -    |
| F                           | <i>Dalea searlsiae</i>           | <sub>a</sub> -  | <sub>c</sub> 33  | <sub>bc</sub> 18 | <sub>b</sub> 8   | 3.84            | .12  | .75  |
| F                           | <i>Descurainia pinnata</i> (a)   | -               | <sub>a</sub> -   | <sub>a</sub> 1   | <sub>b</sub> 19  | -               | .00  | 1.87 |
| F                           | <i>Draba</i> sp. (a)             | -               | <sub>b</sub> 66  | <sub>b</sub> 78  | <sub>a</sub> 31  | .48             | 1.33 | .10  |
| F                           | <i>Erodium cicutarium</i> (a)    | -               | <sub>a</sub> -   | <sub>a</sub> 1   | <sub>b</sub> 73  | -               | .15  | 7.43 |
| F                           | <i>Eriogonum</i> sp.             | <sub>a</sub> -  | <sub>a</sub> -   | <sub>a</sub> 4   | <sub>b</sub> 80  | -               | .04  | .45  |
| F                           | <i>Euphorbia</i> sp.             | <sub>a</sub> -  | <sub>b</sub> 28  | <sub>b</sub> 31  | <sub>c</sub> 96  | .28             | .20  | 1.12 |
| F                           | <i>Frasera albomarginata</i>     | -               | 13               | -                | 4                | .25             | -    | .24  |
| F                           | <i>Gilia</i> sp. (a)             | -               | <sub>a</sub> -   | <sub>b</sub> 12  | <sub>b</sub> 16  | -               | .12  | .07  |
| F                           | <i>Lactuca serriola</i>          | <sub>a</sub> -  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 33  | -               | -    | .14  |
| F                           | <i>Lomatium</i> sp.              | -               | 1                | -                | -                | .00             | -    | -    |
| F                           | <i>Lotus plebeius</i>            | <sub>a</sub> 6  | <sub>b</sub> 34  | <sub>a</sub> 8   | <sub>a</sub> 11  | .57             | .01  | .37  |
| F                           | <i>Medicago sativa</i>           | -               | -                | -                | 1                | -               | -    | .03  |
| F                           | <i>Microsteris gracilis</i> (a)  | -               | 3                | -                | -                | .00             | -    | -    |
| F                           | <i>Navarretia intertexta</i> (a) | -               | <sub>a</sub> -   | <sub>b</sub> 31  | <sub>c</sub> 88  | -               | .39  | .54  |
| F                           | <i>Nicotiana attenuata</i> (a)   | -               | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 11  | -               | -    | .03  |
| F                           | <i>Oenothera albicaulis</i> (a)  | -               | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 13  | -               | -    | .03  |
| F                           | <i>Penstemon humilis</i>         | -               | -                | -                | 1                | -               | -    | .00  |
| F                           | <i>Penstemon</i> sp.             | <sub>a</sub> -  | <sub>ab</sub> 6  | <sub>b</sub> 11  | <sub>c</sub> 32  | .06             | .05  | .07  |
| F                           | <i>Penstemon palmeri</i>         | -               | -                | -                | 2                | -               | -    | .71  |

| Type                      | Species                      |     |     |                |                 | Average Cover % |      |       |
|---------------------------|------------------------------|-----|-----|----------------|-----------------|-----------------|------|-------|
|                           |                              | '92 | '98 | '03            | '08             | '98             | '03  | '08   |
| F                         | Phacelia fremontii           | a-  | a-  | a-             | b <sup>37</sup> | -               | -    | .35   |
| F                         | Phlox hoodii                 | 4   | 9   | -              | -               | .33             | -    | -     |
| F                         | Salsola iberica (a)          | -   | a-  | a-             | b <sup>20</sup> | -               | -    | .05   |
| F                         | Sanguisorba minor            | -   | -   | -              | 1               | -               | -    | .00   |
| F                         | Senecio multilobatus         | -   | -   | -              | 3               | -               | -    | .15   |
| F                         | Sisymbrium altissimum (a)    | -   | -   | -              | 6               | -               | -    | .53   |
| F                         | Sphaeralcea grossulariifolia | -   | a-  | a <sup>3</sup> | b <sup>25</sup> | -               | .16  | 5.68  |
| F                         | Trifolium sp.                | -   | -   | -              | 2               | -               | -    | .00   |
| F                         | Unknown forb-annual (a)      | -   | -   | 11             | -               | -               | .04  | -     |
| F                         | Unknown forb-perennial       | -   | 3   | 5              | -               | .00             | .12  | -     |
| F                         | Verbena gooddingii           | a-  | a-  | a-             | b <sup>19</sup> | -               | -    | 1.04  |
| F                         | Viguiera multiflora          | -   | 5   | 3              | 6               | .04             | .03  | .67   |
| Total for Annual Forbs    |                              | 0   | 69  | 134            | 277             | 0.49            | 2.04 | 10.66 |
| Total for Perennial Forbs |                              | 19  | 150 | 96             | 387             | 5.45            | 0.78 | 11.90 |
| Total for Forbs           |                              | 19  | 219 | 230            | 664             | 5.94            | 2.83 | 22.57 |

Values with different subscript letters are significantly different at alpha = 0.10



BROWSE TRENDS --

Management unit 30 , Study no: 42

| T<br>y<br>p<br>e | Species                              | Strip Frequency |     |     | Average Cover % |       |      |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|-------|------|
|                  |                                      | '98             | '03 | '08 | '98             | '03   | '08  |
| B                | <i>Artemisia tridentata vaseyana</i> | 82              | 63  | 1   | 20.35           | 10.23 | .00  |
| B                | <i>Ceanothus greggii</i>             | 9               | 4   | 7   | .00             | 1.28  | .01  |
| B                | <i>Cowania mexicana stansburiana</i> | 12              | 5   | 0   | 3.59            | 2.09  | -    |
| B                | <i>Ephedra viridis</i>               | 0               | 0   | 0   | .15             | -     | -    |
| B                | <i>Eriodictyon angustifolium</i>     | 6               | 7   | 5   | .00             | .83   | .36  |
| B                | <i>Garrya flavescens</i>             | 2               | 3   | 0   | 1.00            | 1.23  | -    |
| B                | <i>Gutierrezia sarothrae</i>         | 45              | 11  | 43  | 2.53            | .23   | 3.27 |
| B                | <i>Juniperus osteosperma</i>         | 3               | 4   | 0   | 1.75            | 2.74  | -    |
| B                | <i>Kochia prostrata</i>              | 0               | 0   | 4   | -               | -     | .03  |
| B                | <i>Opuntia sp.</i>                   | 0               | 1   | 0   | -               | .00   | -    |
| B                | <i>Pinus edulis</i>                  | 0               | 0   | 0   | -               | .15   | -    |
| B                | <i>Pinus monophylla</i>              | 1               | 3   | 0   | .53             | 1.69  | .00  |
| B                | <i>Quercus turbinella</i>            | 9               | 5   | 5   | 3.96            | 7.51  | .58  |
| B                | <i>Ribes sp.</i>                     | 0               | 0   | 0   | -               | -     | .00  |
| Total for Browse |                                      | 169             | 106 | 65  | 33.90           | 28.02 | 4.28 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 42

| Species                              | Percent Cover |      |      |
|--------------------------------------|---------------|------|------|
|                                      | '98           | '03  | '08  |
| <i>Artemisia tridentata vaseyana</i> | -             | 8.48 | -    |
| <i>Ceanothus greggii</i>             | -             | .83  | -    |
| <i>Cowania mexicana stansburiana</i> | -             | 3.29 | -    |
| <i>Eriodictyon angustifolium</i>     | -             | .60  | 1.63 |
| <i>Gutierrezia sarothrae</i>         | -             | .08  | 7.56 |
| <i>Juniperus osteosperma</i>         | 2.20          | 2.76 | -    |
| <i>Pinus monophylla</i>              | 1.20          | 2.29 | -    |
| <i>Quercus turbinella</i>            | -             | 8.80 | 1.11 |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 42

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 1.2                        | -   |
| Cowania mexicana stansburiana | 1.4                        | -   |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 42

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 54             | 70  | <18 |
| Pinus monophylla      | 47             | 52  | <18 |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 3.1                   | 4.4 | -   |
| 2.6                   | 3.6 | -   |

BASIC COVER --

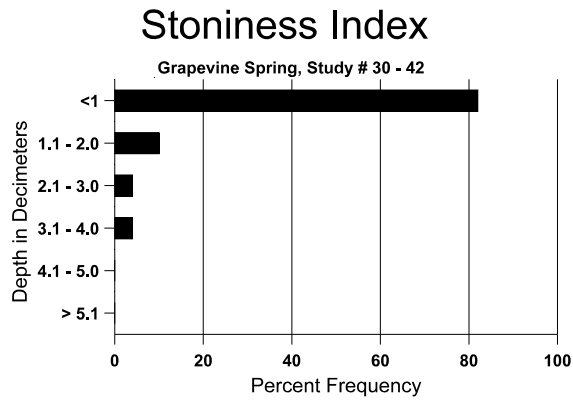
Management unit 30 , Study no: 42

| Cover Type  | Average Cover % |     |       |       |       |
|-------------|-----------------|-----|-------|-------|-------|
|             | '82             | '92 | '98   | '03   | '08   |
| Vegetation  | 1.00            | 0   | 39.41 | 31.20 | 29.64 |
| Rock        | 1.50            | 0   | 7.40  | 10.19 | 15.32 |
| Pavement    | 19.75           | 0   | 22.61 | 18.88 | 30.04 |
| Litter      | 60.00           | 0   | 45.50 | 46.26 | 5.44  |
| Cryptogams  | 0               | 0   | .05   | .18   | 0     |
| Bare Ground | 17.75           | 0   | 28.76 | 12.70 | 32.65 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 42, Study Name: Grapevine Spring

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand           | %silt | %clay |     |       |       |      |
| 14.3                         | 55.2 (14.2)     | 6.7 | 48.0            | 25.4  | 26.6  | 1.8 | 8.5   | 108.8 | 0.6  |



PELLET GROUP DATA --

Management unit 30 , Study no: 42

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 17                | 7   | 47  |
| Deer   | 22                | 18  | 11  |
| Cattle | 1                 | -   | -   |

| Days use per acre (ha) |         |       |
|------------------------|---------|-------|
| '98                    | '03     | '08   |
| -                      | -       | -     |
| 32 (79)                | 29 (73) | 1 (3) |
| 2 (5)                  | -       | -     |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 42

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>565</b>                            | 166                                      | 266   | 299    | -        | -    | 0           | 0       | 0          | -       | 0            | 15/20                     |
| 92                                   | <b>2431</b>                           | 199                                      | 766   | 1599   | 66       | -    | 27          | 1       | 3          | -       | 0            | 26/32                     |
| 98                                   | <b>4380</b>                           | 1740                                     | 760   | 3520   | 100      | 180  | 27          | 0       | 2          | 1       | 2            | 22/33                     |
| 03                                   | <b>2160</b>                           | -  | 60    | 1380   | 720      | 2040 | 2           | 0       | 33         | 15      | 16           | 22/29                     |
| 08                                   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 15/16                     |
| <b>Ceanothus greggii</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>233</b>                            | -  | -     | 233    | -        | -    | 0           | 14      | 0          | -       | 0            | 31/29                     |
| 92                                   | <b>498</b>                            | 299                                      | 166   | 299    | 33       | -    | 13          | 27      | 7          | -       | 0            | 26/40                     |
| 98                                   | <b>240</b>                            | 20                                       | 20    | 180    | 40       | 40   | 17          | 0       | 17         | 8       | 8            | 27/42                     |
| 03                                   | <b>120</b>                            | -  | -     | 60     | 60       | 140  | 17          | 0       | 50         | 33      | 33           | 27/41                     |
| 08                                   | <b>180</b>                            | 320                                      | 180   | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 5/9                       |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>533</b>                            | -  | -     | 533    | -        | -    | 0           | 0       | -          | -       | 0            | 11/16                     |
| 92   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Cowania mexicana stansburiana</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>99</b>                             | -  | 33    | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 31/44                     |
| 92   | <b>532</b>                            | 66                                       | 333   | 166    | 33       | -    | 38          | 6       | 6          | -       | 0            | 61/66                     |
| 98   | <b>260</b>                            | 60                                       | 80    | 180    | -        | -    | 38          | 0       | 0          | -       | 0            | 58/71                     |
| 03   | <b>120</b>                            | -  | 20    | 100    | -        | -    | 50          | 0       | 0          | -       | 0            | 64/74                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 15/37                     |
| <i>Ephedra viridis</i>                           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 29/42                     |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 27/31                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 29/39                     |
| <i>Eriodictyon angustifolium</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 20/22                     |
| 98   | <b>640</b>                            | -  | 20    | 520    | 100      | -    | 0           | 0       | 16         | 3       | 3            | 24/16                     |
| 03   | <b>320</b>                            | -  | 20    | 140    | 160      | 120  | 44          | 13      | 50         | 25      | 25           | 17/15                     |
| 08   | <b>220</b>                            | 20                                       | -     | 220    | -        | -    | 0           | 0       | 0          | -       | 73           | 13/21                     |
| <i>Garrya flavescens</i>                         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>33</b>                             | -  | -     | 33     | -        | -    | 0           | 0       | 0          | -       | 0            | 24/30                     |
| 92   | <b>33</b>                             | -  | -     | 33     | -        | -    | 0           | 0       | 0          | -       | 0            | 20/24                     |
| 98   | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 50      | 0          | -       | 0            | 22/31                     |
| 03   | <b>60</b>                             | -  | 20    | -      | 40       | -    | 0           | 0       | 67         | 67      | 67           | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Gutierrezia sarothrae</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>8799</b>                           | -  | 533   | 8266   | -        | -    | 0           | 0       | 0          | -       | 0            | 12/12                     |
| 92   | <b>11931</b>                          | 2333                                     | 899   | 9999   | 1033     | -    | .27         | 0       | 9          | -       | .55          | 10/12                     |
| 98   | <b>3080</b>                           | 880                                      | 580   | 2200   | 300      | 500  | 0           | 1       | 10         | 7       | 7            | 8/10                      |
| 03   | <b>760</b>                            | 360                                      | 400   | 360    | -        | 260  | 0           | 0       | 0          | -       | 0            | 9/10                      |
| 08   | <b>5860</b>                           | 980                                      | -     | 5860   | -        | 20   | 0           | 0       | 0          | -       | 0            | 12/16                     |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Juniperus osteosperma</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>132</b>                            | -  | 33    | 99     | -        | -    | 0           | 0       | -          | -       | 0            | 53/43                     |
| 92                           | <b>199</b>                            | 33                                       | 66    | 133    | -        | -    | 33          | 0       | -          | -       | 0            | 73/58                     |
| 98                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>100</b>                            | -  | 40    | 60     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Kochia prostrata</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>80</b>                             | -  | 60    | 20     | -        | -    | 0           | 25      | -          | -       | 0            | 2/6                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/13                      |
| 03                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 9/19                      |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Pinus monophylla</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>33</b>                             | -  | 33    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Quercus gambelii</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 37/75                     |
| <b>Quercus turbinella</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>33</b>                             | -  | -     | 33     | -        | -    | 0           | 0       | 0          | -       | 0            | 44/59                     |
| 92                           | <b>66</b>                             | 266                                      | -     | 66     | -        | -    | 100         | 0       | 0          | -       | 0            | 51/49                     |
| 98                           | <b>460</b>                            | 60                                       | 20    | 440    | -        | 40   | 0           | 0       | 0          | -       | 0            | 55/68                     |
| 03                           | <b>100</b>                            | 20                                       | -     | 80     | 20       | -    | 0           | 0       | 20         | -       | 0            | 65/101                    |
| 08                           | <b>780</b>                            | -  | 80    | 700    | -        | -    | 0           | 0       | 0          | -       | 100          | 31/35                     |

|           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Ribes sp. |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03        | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08        | 0                                     | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-45-08

Study site name: Flat Top Mountain.

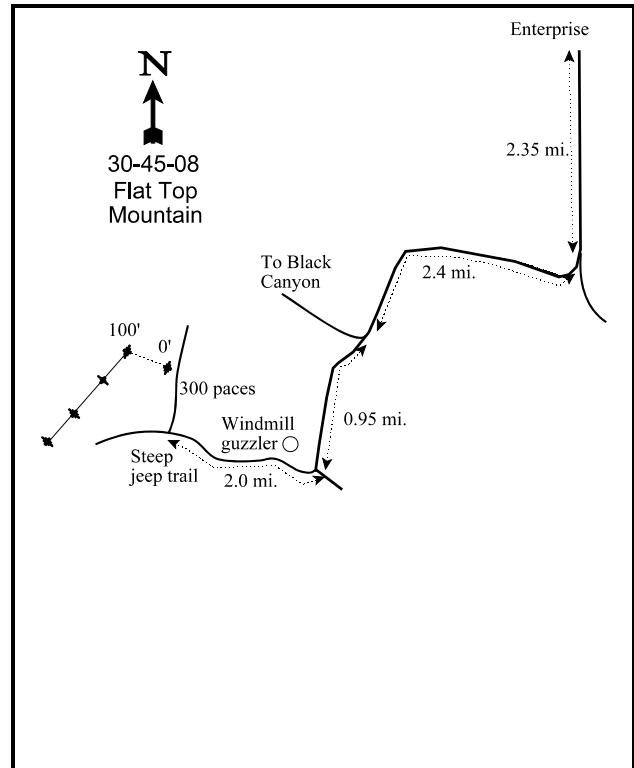
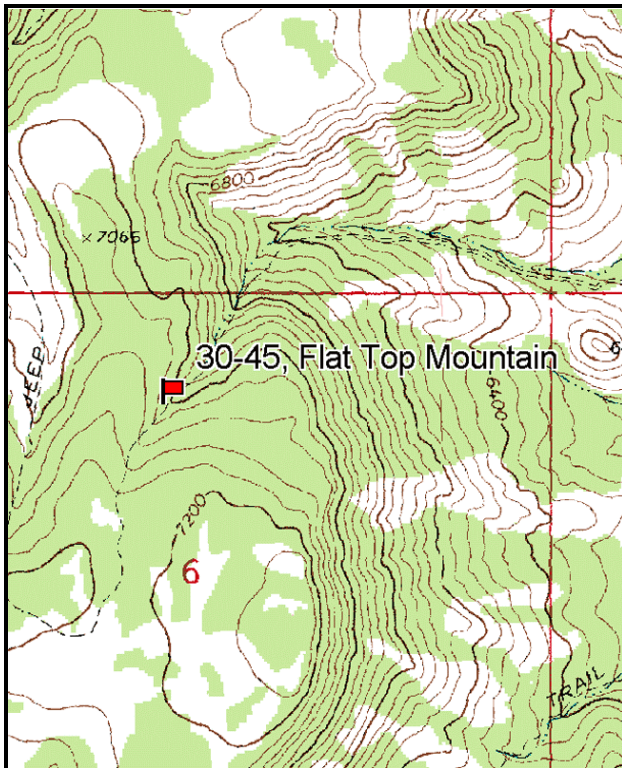
Vegetation type: Oakbrush.

Compass bearing: frequency baseline 285 degrees magnetic. (Lines 2-4, 220°M)

Frequency belt placement: line 1 (1 & 92ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 8ft.

LOCATION DESCRIPTION

From the town of Enterprise, go south on 200 East for 2.45 miles, at which point there will be a fork in the road. Take a right and head towards Calf Springs. Stay on the main road for 2.3 miles until arriving at another fork in the road marked by a sign “Black Canyon.” Do not proceed towards Black Canyon. Take the left fork for 0.95 miles until arriving at another fork in the road. Take the right fork (F.S. Road 351) for 2.0 miles until the road turns into a steep jeep trail. Approximately 0.15 miles up the road from where it first becomes steep and rough will be an intersection (you can drive all the way to the intersection). Walk 14 paces at 230 degrees from the intersection. The 0-foot baseline stake is located 11 paces north of the road. The study is marked by green steel “T” fence posts approximately 12 to 18 inches in height.



Map Name: Hebron

Diagrammatic Sketch

Township 38S, Range 17W, Section 6

GPS: NAD 83, UTM 12S 252466 E, 4155606 N

## DISCUSSION

### Flat Top Mountain - Trend Study No. 30-45

#### Study Information

This study is within deer summer range on the east side of Flat Top Mountain [elevation: 7,000 (2,134 m), slope: 5%-25%, aspect: east]. The vegetation type is mountain brush intermixed with dense Gambel oak (*Quercus gambelii*) clones which vary in stature from 12 to 15 feet in some areas and waist high in others. There was a fire on the site between the 2003 and 2008 readings, likely the Hawkins Fire in 2004. Deer appeared to be utilizing the area in 1982 as pellet groups and bedding areas were abundant. Pellet group data estimated a moderate amount of deer use in 1998, 2003, and 2008 (40 deer days use/acre:99 ddu/ha, 68 ddu/acre:167 ddu/ha, and 50 ddu/acre:122 ddu/ha, respectively). The site was also being utilized by a small number of Mormon crickets in 2003.

#### Soil

Soil is derived from basalt parent material. Basalt rocks are common on the soil surface, especially on the ridge top. Soil depth is deep with an estimated effective rooting depth of 16 inches. Texture is a loam which is moderately acidic (pH 5.6). Soil organic matter is relatively high at 5.2%. Relative combined vegetation and litter cover has been high at 78% in 1998 and 74% in 2003, and after the fire decreased slightly to 60% in 2008. Relative bare ground cover was low at 4%-7% in 1998 and 2003, but increased to 18% in 2008. The erosion condition class was rated as stable in 2003 and slight in 2008 due primarily to surface litter movement and to flow patterns.

#### Browse

Being summer range, shrubs are not as important a forage source as grasses and forbs are. However, the most abundant browse species on the site is Gambel oak. It provided 65% of the browse cover in 1998, 84% in 2003, and 63% in 2008. Prior to the fire, oak varied in size from tall tree-like forms that are 12 to 15 feet in height, to lower growing forms that were only waist high. In 2008, oak density increased with a higher proportion of young and decadent plants. Prior to the fire, oak had shown mostly light to moderate use, displayed good vigor with few decadent plants. In 2008, the proportion of oak plants displaying poor vigor increased to 83% and decadent plants increased to 49%.

Understory shrubs include Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and snowberry (*Symphoricarpos oreophilus*). Prior to the fire, mature serviceberry averaged about 5 feet in height in 2003. They were mostly heavily hedged where available, but they were in good vigor. Mountain big sagebrush occurred in limited numbers. They were classified as heavily hedged in 1998, but showed light to moderate use in 2003. Snowberry appeared to be unutilized. There were also a few antelope bitterbrush (*Purshia tridentata*) on the site that were not abundant enough to be adequately sampled. In 2008, mountain big sagebrush declined in density to just 80 plants/acre and the proportion of plants displaying poor vigor increased to 75%. The density of serviceberry remained similar to 2003 levels, but there was heavy utilization on 100% of the plants and plants displaying poor vigor increased to 33%. There was little change in snowberry measurements.



### Herbaceous Understory

The herbaceous understory is dominated by forbs which provided 83% of the total herbaceous cover in 1998, and 74% in 2003 and 2008. Perennial grasses were represented by only one species, mutton bluegrass (*Poa fendleriana*) in 1998. Composition improved and mountain brome (*Bromus carinatus*), bottlebrush squirreltail (*Sitanion hystrix*), and subalpine needlegrass (*Stipa columbiana*) were encountered in 2008. The annual grass, cheatgrass (*Bromus tectorum*), was also encountered for the first time in 2008. Forbs are diverse and abundant with the primary species consisting of arrowleaf balsamroot (*Balsamorhiza sagittata*), western waterleaf (*Hydrophyllum occidentale*), tuber starwort (*Stellaria jamesiana*), an aster sp., and American vetch (*Vicia americana*).

### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Reproduction of the primary browse species, Utah serviceberry and mountain big sagebrush, appears adequate to maintain their populations. Data for herbaceous species from 1982 is limited to quadrat frequency. Trend for both grasses and forbs is up slightly. Quadrat frequency of mutton bluegrass increased from 2% in 1982 to 41%. Quadrat frequency of perennial forbs also increased.

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

### 2003 TREND ASSESSMENT

Trend for browse is considered slightly down. Mountain big sagebrush density declined 31% from 1998 to 540 plants/acre and the number of decadent plants increased to 30% of the population. No sagebrush seedlings or young were sampled. Utah serviceberry density declined by 95% from 1998 to 40 plants/acre. Serviceberry vigor and decadence remained good. Gambel oak has nearly doubled in cover. The increase in oak could have a negative effect on understory shrubs. The most important aspect of this site is the herbaceous understory since this site is used primarily as summer range. Trend for grasses is stable. There was little change in the sum of nested frequency of perennial grasses from 1998, and cover of grasses remained similar. Trend for forbs is down. There was 41% decline in the sum of nested frequency for perennial species from 1998, and cover of perennial forbs declined from 28% in 1998 to 18%. The primary species, an aster spp., arrowleaf balsamroot, western waterleaf, tuber sandwort, and American vetch all declined significantly in nested frequency. Drought conditions for the past few years are the likely reason for these trends. An unknown amount of Mormon cricket use has also helped determine changes in trend.

browse - slightly down (-1)

grass - stable (0)

forb - down (-2)

### 2008 TREND ASSESSMENT

There was a fire on the site between the 2003 and 2008 reading. No data was available for the fire. Trend for browse is down. Mountain big sagebrush density declined 85% from 2003 to 80 plants/acre, and the proportion of plants displaying poor vigor increased to 75%. Serviceberry density remained similar to 2003 levels, but plants displaying poor vigor increased to 33%. Gambel oak density increased by 59% from 2003 to 25,240 stems/acre. Oak plants displaying poor vigor increased to 83% and decadence increased to 49% since 2003. Trend for grasses stable. There was little change in the sum of nested frequency of perennial grasses, though the nested frequency of mountain brome increased significantly. The invasive annual, cheatgrass, was

sampled for the first time in 2008. Trend for forbs is slightly up. Sum of nested frequency of perennial forbs has increased 18% since 2003, and cover of perennial forbs increased from 18% in 2003 to 21%.

browse - down (-2)

grass - stable (0)

forb - slightly up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 45

| Type                        | Species                   | Strip Frequency |      |     | Average Cover % |       |       |
|-----------------------------|---------------------------|-----------------|------|-----|-----------------|-------|-------|
|                             |                           | '98             | '03  | '08 | '98             | '03   | '08   |
| G                           | Bromus carinatus          | a-              | ab8  | b19 | -               | .24   | .77   |
| G                           | Bromus tectorum (a)       | a-              | a-   | b36 | -               | -     | .74   |
| G                           | Poa fendleriana           | 110             | 103  | 94  | 5.82            | 6.05  | 6.25  |
| G                           | Sitanion hystrix          | -               | -    | 5   | -               | -     | .09   |
| G                           | Stipa columbiana          | -               | 6    | 3   | -               | .10   | .01   |
| Total for Annual Grasses    |                           | 0               | 0    | 36  | 0               | 0     | 0.74  |
| Total for Perennial Grasses |                           | 110             | 117  | 121 | 5.82            | 6.40  | 7.13  |
| Total for Grasses           |                           | 110             | 117  | 157 | 5.82            | 6.40  | 7.87  |
| F                           | Agoseris glauca           | 1               | -    | -   | .00             | -     | -     |
| F                           | Allium sp.                | b44             | a7   | a21 | .46             | .02   | .07   |
| F                           | Arabis sp.                | a1              | a7   | b81 | .00             | .04   | 1.85  |
| F                           | Aster sp.                 | b49             | ab32 | a31 | 1.05            | 1.42  | 1.59  |
| F                           | Astragalus sp.            | -               | -    | 2   | -               | -     | .00   |
| F                           | Balsamorhiza sagittata    | c108            | b85  | a59 | 11.13           | 12.56 | 11.46 |
| F                           | Calochortus nuttallii     | 1               | -    | 2   | .03             | -     | .00   |
| F                           | Chenopodium fremontii (a) | a-              | a7   | b44 | -               | .01   | .57   |
| F                           | Conium maculatum          | -               | 5    | 3   | -               | .42   | .15   |
| F                           | Comandra pallida          | -               | -    | 4   | -               | -     | .00   |
| F                           | Collinsia parviflora (a)  | 1               | 9    | 8   | .00             | .02   | .02   |
| F                           | Crepis acuminata          | 1               | 3    | 3   | .00             | .00   | .03   |
| F                           | Cymopterus sp.            | 9               | -    | -   | .22             | -     | -     |
| F                           | Erigeron eatonii          | -               | -    | 14  | -               | -     | .36   |
| F                           | Galium sp.                | -               | 2    | 1   | -               | .00   | .00   |
| F                           | Hydrophyllum occidentale  | b99             | a45  | a48 | 6.28            | .91   | 2.62  |
| F                           | Lappula occidentalis (a)  | -               | -    | 2   | -               | -     | .00   |
| F                           | Lithophragma tenella      | -               | -    | 5   | -               | -     | .01   |
| F                           | Lupinus argenteus         | 4               | 2    | -   | .15             | .03   | .03   |
| F                           | Microsteris gracilis (a)  | b34             | b21  | a1  | .15             | .13   | .00   |
| F                           | Nicotiana attenuata (a)   | -               | -    | 3   | -               | -     | .03   |

| T<br>y<br>p<br>e          | Species                      | Strip Frequency  |                  |                 | Average Cover % |       |       |
|---------------------------|------------------------------|------------------|------------------|-----------------|-----------------|-------|-------|
|                           |                              | '98              | '03              | '08             | '98             | '03   | '08   |
|                           |                              | F                | Penstemon sp.    | -               | -               | 1     | -     |
| F                         | Petradoria pumila            | 8                | 7                | -               | .21             | .24   | -     |
| F                         | Phlox austromontana          | 10               | 4                | 2               | .45             | .04   | .03   |
| F                         | Phlox longifolia             | -                | 3                | -               | -               | .03   | -     |
| F                         | Polygonum douglasii (a)      | <sub>a</sub> -   | <sub>a</sub> 3   | <sub>b</sub> 19 | -               | .00   | .21   |
| F                         | Senecio multilobatus         | 9                | 13               | 2               | .24             | .11   | .01   |
| F                         | Sphaeralcea grossulariifolia | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 26 | -               | -     | 1.37  |
| F                         | Stellaria jamesiana          | <sub>c</sub> 191 | <sub>b</sub> 121 | <sub>a</sub> 66 | 6.17            | 1.90  | .41   |
| F                         | Taraxacum officinale         | 3                | -                | 1               | .03             | -     | .00   |
| F                         | Vicia americana              | <sub>b</sub> 77  | <sub>a</sub> 27  | <sub>b</sub> 61 | 1.09            | .11   | 1.27  |
| F                         | Zigadenus paniculatus        | 6                | 4                | -               | .03             | .01   | -     |
| Total for Annual Forbs    |                              | 35               | 40               | 77              | 0.15            | 0.17  | 0.84  |
| Total for Perennial Forbs |                              | 621              | 367              | 433             | 27.60           | 17.88 | 21.35 |
| Total for Forbs           |                              | 656              | 407              | 510             | 27.76           | 18.06 | 22.20 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 45

| T<br>y<br>p<br>e | Species                                      | Strip Frequency |                       |     | Average Cover % |       |       |
|------------------|--|-----------------|-----------------------|-----|-----------------|-------|-------|
|                  |  | '98             | '03                   | '08 | '98             | '03   | '08   |
|                  |  | B               | Amelanchier utahensis | 9   | 2               | 3     | .19   |
| B                | Artemisia tridentata vaseyana                | 16              | 13                    | 2   | 2.12            | 1.44  | .03   |
| B                | Chrysothamnus depressus                      | 2               | 1                     | 0   | .00             | .15   | -     |
| B                | Chrysothamnus viscidiflorus<br>viscidiflorus | 1               | 0                     | 0   | .03             | -     | -     |
| B                | Opuntia sp.                                  | 3               | 3                     | 0   | .00             | .00   | -     |
| B                | Prunus virginiana                            | 0               | 1                     | 0   | -               | .00   | -     |
| B                | Quercus gambelii                             | 67              | 68                    | 64  | 11.91           | 22.98 | 8.64  |
| B                | Symphoricarpos oreophilus                    | 14              | 15                    | 9   | 4.13            | 1.93  | 4.94  |
| Total for Browse |  | 112             | 103                   | 78  | 18.40           | 27.33 | 13.65 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 45

| Species                       | Percent Cover |       |       |
|-------------------------------|---------------|-------|-------|
|                               | '98           | '03   | '08   |
| Amelanchier utahensis         | -             | 2.40  | .30   |
| Artemisia tridentata vaseyana | -             | 2.25  | -     |
| Opuntia sp.                   | -             | .33   | -     |
| Quercus gambelii              | 8.60          | 44.20 | 13.16 |
| Symphoricarpos oreophilus     | -             | 4.23  | 6.91  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 45

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 2.8                        | 1.6 |
| Artemisia tridentata vaseyana | 1.0                        | 1.1 |
| Purshia tridentata            | 2.4                        | -   |

BASIC COVER --

Management unit 30 , Study no: 45

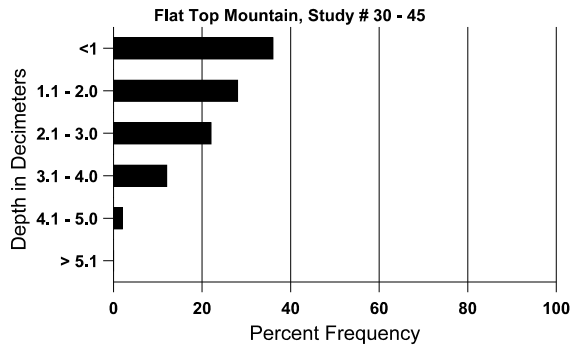
| Cover Type  | Average Cover % |       |       |       |
|-------------|-----------------|-------|-------|-------|
|             | '82             | '98   | '03   | '08   |
| Vegetation  | 0               | 46.23 | 48.97 | 40.34 |
| Rock        | 0               | 21.60 | 22.73 | 22.74 |
| Pavement    | 0               | 2.88  | 1.31  | 3.88  |
| Litter      | 0               | 58.93 | 43.52 | 29.81 |
| Bare Ground | 6.25            | 5.19  | 8.32  | 20.83 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 45, Study Name: Flat Top Mountain

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand          | % silt | % clay |     |       |       |      |
| 16.3                         | 37.0<br>(15.9)  | 5.6 | 38.0            | 37.4   | 24.5   | 5.2 | 52.1  | 435.2 | 0.6  |

## Stoniness Index



### PELLET GROUP DATA --

Management unit 30 , Study no: 45

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | -                 | 1   | 4   |
| Elk    | -                 | -   | -   |
| Deer   | 17                | 9   | 36  |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| -                      | -        | 1 (2)    |
| 40 (99)                | 68 (167) | 50 (122) |

### BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 45

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>199</b>                            | -  | -     | 199    | -        | -    | 0           | 0       | -          | -       | 0            | 10/10                     |
| 98                                   | <b>800</b>                            | 180                                      | 280   | 520    | -        | 20   | 70          | 0       | -          | -       | 0            | 46/31                     |
| 03                                   | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 50      | -          | -       | 0            | 64/67                     |
| 08                                   | <b>60</b>                             | -  | 20    | 40     | -        | 20   | 0           | 100     | -          | -       | 33           | 13/20                     |
| <b>Artemisia tridentata vaseyana</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 15/16                     |
| 98                                   | <b>780</b>                            | -  | 20    | 740    | 20       | 80   | 36          | 59      | 3          | 3       | 3            | 13/27                     |
| 03                                   | <b>540</b>                            | -  | -     | 380    | 160      | 80   | 30          | 7       | 30         | 4       | 4            | 14/27                     |
| 08                                   | <b>80</b>                             | -  | 60    | 20     | -        | -    | 0           | 25      | 0          | -       | 75           | 4/9                       |
| <b>Chrysothamnus depressus</b>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>133</b>                            | -  | -     | 133    | -        | -    | 100         | 0       | -          | -       | 0            | 7/16                      |
| 98                                   | <b>440</b>                            | -  | 420   | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 8/15                      |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 7/19                      |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Chrysothamnus viscidiflorus viscidiflorus</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 30/61                     |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>                               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>80</b>                             | -  | -     | 80     | -        | -    | 0           | 0       | -          | -       | 75           | 8/17                      |
| 03   | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 6/15                      |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Prunus virginiana</i>                         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>1066</b>                           | -  | -     | 1066   | -        | -    | 0           | 0       | -          | -       | 0            | 10/5                      |
| 98   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Purshia tridentata</i>                        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Quercus gambelii</i>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>7599</b>                           | 66                                       | 1133  | 6466   | -        | -    | 30          | 4       | 0          | -       | 0            | 19/20                     |
| 98   | <b>6760</b>                           | 160                                      | 1320  | 5320   | 120      | 740  | 21          | 0       | 2          | -       | 0            | 44/30                     |
| 03   | <b>10420</b>                          | 40                                       | 2780  | 6500   | 1140     | 1120 | 12          | 7       | 11         | 4       | 4            | 46/30                     |
| 08   | <b>25240</b>                          | 500                                      | 3540  | 9400   | 12300    | 1040 | 7           | .47     | 49         | .39     | 83           | 25/15                     |
| <i>Symphoricarpos oreophilus</i>                 |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98   | <b>980</b>                            | 100                                      | 100   | 880    | -        | -    | 0           | 0       | -          | -       | 0            | 21/30                     |
| 03   | <b>1160</b>                           | -  | 180   | 980    | -        | -    | 0           | 5       | -          | -       | 0            | 17/42                     |
| 08   | <b>740</b>                            | 20                                       | 20    | 720    | -        | -    | 0           | 0       | -          | -       | 0            | 23/60                     |

Trend Study 30-46-08

Study site name: Pahcoon Bench.

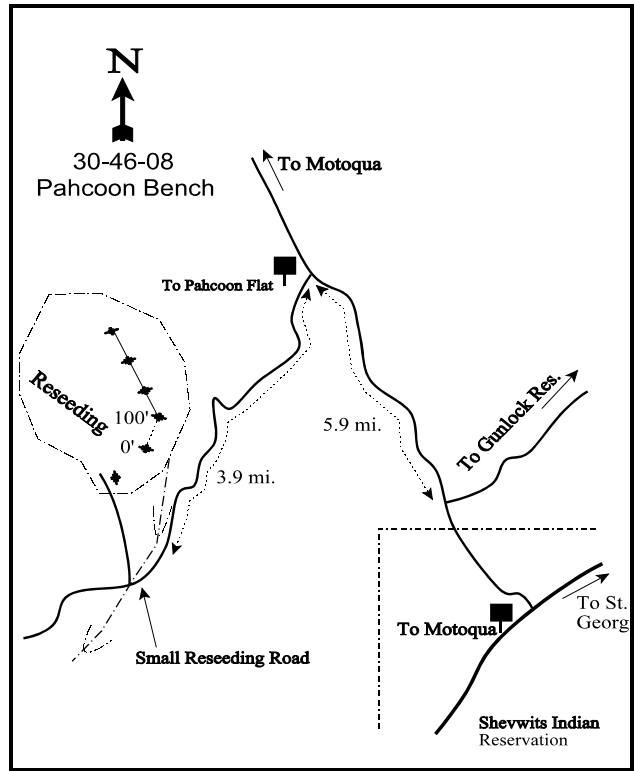
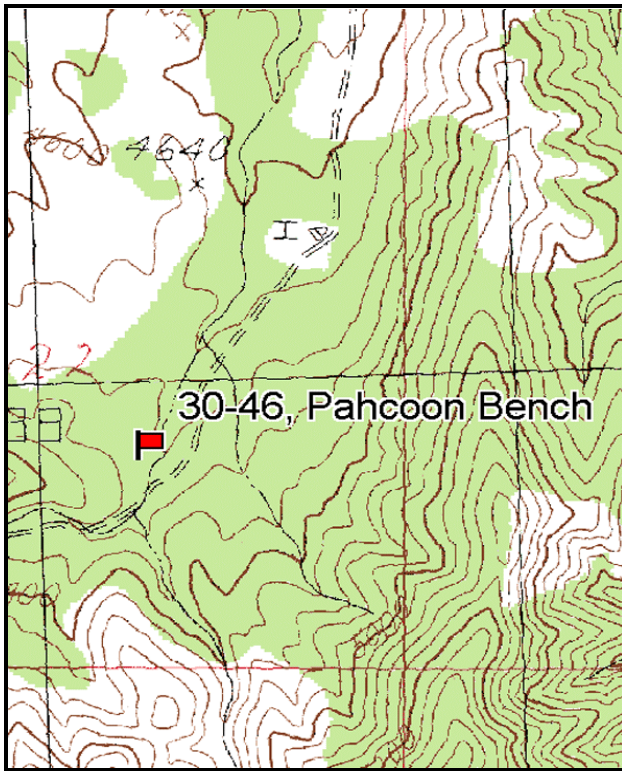
Vegetation type: Burn-Seeding.

Compass bearing: frequency baseline 22 degrees magnetic. (Lines 2-4, 336°M)

Frequency belt placement: line 1 (18 & 96ft), line 2 (57ft), line 3 (20ft), line 4 (73ft). Rebar: Belt 1 on 50ft and 100ft (because of road), belt 5 on 1ft, and belt 4 on 7ft.

LOCATION DESCRIPTION

Proceed past Shivwits approximately 0.9 mile and turn north on the Jackson Springs-Motoqua road. Proceed 5.9 miles on this road past a road to Motoqua to a fork on the left towards Pahcoon Flat. Take the road towards Pahcoon Flat for 3.9 miles, traveling through a seeding. At 3.9 miles, there will be a small, obscure road to the right. Walk 67 paces up the road to the witness post off the east side of the road. The 0-foot baseline stake is 2.5 paces from the witness post at 22 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height. The 0-foot stake is marked by browse tag #471.



Map Name: Shivwits

Diagrammatic Sketch

Township 41S, Range 18W, Section 22

GPS: NAD 83, UTM 12S 247139 E, 4121023 N

## DISCUSSION

### Pahcoon Bench - Trend Study No. 30-46

#### Study Information

This trend study is located on severe winter range on the east side of the Beaver Dam Mountains [elevation: 4,670 feet (1,423 m), slope: 3%-5%, aspect: northeast]. It is placed near the south end of Pahcoon Flat on a 1979 chained and seeded singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) woodland. The area is dry, yet has responded well to treatment. The area has burned multiple times over the years. The Pahcoon fire burned 6,363 acres (2,575 ha) in the area in the summer of 1998 after the sampling for that year, with only a few juniper trees and shrubs surviving. The site burned again in 2003 when the Apex fire burned 29,933 acres (12,113 ha) in the area. Utilization of the area by cattle and wildlife appears light, even with a guzzler nearby. Pellet group data estimated deer use to be lightly moderate in 1998 and 2003 (20 deer days use/acre:49 ddu/ha and 25 ddu/acre:62 ddu/ha, respectively), and light in 2008 (7 ddu/acre:18 ddu/ha). Cattle use was estimated to be light in 1998 and 2003 (13 cow days use/acre:32 cdu/ha and 8 cdu/acre:20 cdu/ha, respectively), and lightly moderate in 2008 (27 cdu/acre:66 cdu/ha).

#### Soil

The soil is relatively shallow and moderately rocky. Effective rooting depth is estimated at just over 10 inches. Soil is hard and compacted. Texture is a loam which is neutral in reaction (pH 7.0). Parent material is limestone, some of which has a white calcium carbonate coating. Relative combined vegetation and litter cover ranged from 72%-79% from 1998 to 2008. Relative bare ground was low at 5% in 1998, but increased after the fire to 13% in 2003 and 11% in 2008. The erosion condition class was rated as stable in 2003 and 2008.

#### Browse

In 1998, key browse species consisted of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with lesser amounts of antelope bitterbrush (*Purshia tridentata*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Sagebrush was well established, but declined in density from 4,866 plants/acre in 1982, to 3,400 in 1992, and 800 plants/acre by 1998. The number of dead plants can only explain about 10% of the decrease from 1992, therefore the difference is likely due to the larger sample area utilized in 1998. The larger sample area gives more accurate population estimates for shrubs that have discontinuous and/or clumped distributions. Reproduction of sagebrush has been good in the past with abundant seedlings and young plants sampled in 1982 and 1992, however, recruitment was poor in 1998. Utilization was light in 1982 and 1992, but some moderate use was reported in 1998. The wildfire that burned the area in the summer of 1998 eliminated most of the mountain big sagebrush on the site. Density was estimated at only 120 plants/acre in 2003, with more than one-half of these being young plants. After the second fire in 2003, no sagebrush plants were encountered in the density strip in 2008. Sagebrush vigor was normal on most plants and decadence low in all the other sample years.

Secondary browse species, antelope bitterbrush and desert bitterbrush (*Purshia landulosa*), are also well established and contained healthy age class structures prior to the burn. Individuals were large and vigorous and displayed abundant annual growth in 1992. Utilization of all shrubs appeared light to moderate. During the 1998 reading, all bitterbrush was classified as antelope bitterbrush. There may have been a classification problem between desert bitterbrush and cliffrose in 1982 and 1992. Density of the bitterbrush species was



estimated at 732 plants/acre in 1992. This density declined to 60 plants/acre by 1998. Density of cliffrose increased from 66 to 260 plants/acre between 1992 and 1998. There were no dead plants within the population, therefore the changes in density are likely due to the larger sample size used in 1998 and confusion between desert bitterbrush and cliffrose. The antelope bitterbrush displayed moderate to heavy use in 1998. Vigor was normal, but reproduction limited. Cliffrose increased dramatically in size between 1992 and 1998 according to photo point comparisons. Mature plants averaged 5 feet in height with a crown diameter of 4 feet in 1998. Plants showed moderate to heavy use, yet vigor was good and percent decadence low at 8%. The 1998 wildfire reduced these respective populations. Only 20 cliffrose plants/acre and 20 bitterbrush plants/acre were estimated in 2003. Population density estimates from both cliffrose and bitterbrush declined to 0 plants/acre in 2008. Some seeded forage kochia (*Kochia prostrata*) was encountered in 2003 at an estimated density of 260 plant/acre and increased to 1,080 plants/acre in 2008.

Threadleaf snakeweed (*Gutierrezia microrcephala*) was the most abundant shrub on the site prior to and after the fire. It increased dramatically in density from 1982 when its density was only 466 plants/acre, to 3,933 plants/acre in 1992, and to 7,360 plants/acre in 1998. After the fire, density was estimated at 17,600 plants/acre in 2003. Density of snakeweed declined after the fire in 2003 by 92% to 1,340 plants/acre in 2008.

Juniper trees were also found on the site in small numbers prior the fire. Point-quarter data from 1998 estimated 90 juniper trees/acre with an average basal diameter of 3.3 inches. Of these trees, 21% were larger, tipped over trees that were still alive since the chaining. Average basal diameter of these trees was 7 inches. All juniper trees were killed by fires which burned the area in 1998 and 2003.

#### Herbaceous Understory

The seeded grass species, crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*), had been fairly successful in 1982 and 1992, then declined in 1998. The annuals, cheatgrass (*Bromus tectorum*) and foxtail brome (*B. rubens*), were both common. Cheatgrass appeared to have increased in abundance creating a fire hazard on this site. These annuals accounted for 89% of the grass cover in 1998. After the 1998 wildfire, abundance of perennial grasses declined and dominance of annual grasses increased in 2003. Very little crested and intermediate wheatgrass remained on the site in 2003. Neither crested or intermediate wheatgrass was encountered in 2008.

The forb composition is deficient with all species providing only 2% cover in 1998. The only forb included in the chaining seed mixture was yellow sweetclover (*Melilotus officinalis*), which is a short-lived perennial. No sweet clover was encountered during any reading. Annual forbs such as a Draba sp., storksbill (*Erodium cicutarium*), and slender phlox (*Microsteris gracilis*), dominated the forb composition in 1998 producing 95% of the forb cover. After the fire, these same annuals still provide nearly all of the forb cover. The most prominent perennial species prior to and after the 1998 wildfire is gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*).

#### 1992 TREND ASSESSMENT

The browse trend is mixed. Mountain big sagebrush has decreased slightly in density. No young plants were encountered, but abundant seedlings were counted. Secondary species have healthy populations, good vigor, and adequate reproductive potentials. On the down side, threadleaf snakeweed has increased dramatically and is currently the most numerous shrub with an estimated density of 3,933 plants/acre. Overall, the browse trend is stable. Data for herbaceous species from 1982 is limited to quadrat frequency. With that in mind, trend for

both grasses and forbs is stable, but in very poor condition. Herbaceous plants are dominated by seeded grasses and cheatgrass. Quadrat frequencies of perennial grasses have not changed since 1982. Forbs are severely deficient. Only one perennial forb, gooseberryleaf globemallow, was encountered either year.

browse - stable (0)

grass - stable (0)

forb - stable (0)

#### 1998 TREND ASSESSMENT

Trend for browse is slightly down. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. The primary browse species, mountain big sagebrush, vigor and decadence remained good. Recruitment was poor with young plants comprising only 3% of the population. There appears to have been an identification problem with desert bitterbrush and cliffrose in the 1982 and 1992 readings. Cliffrose and bitterbrush vigor remains normal and decadence was low. Trend for the grasses is down and in poor condition due to the dominance of annual cheatgrass and foxtail brome. Sum of nested frequency for perennial grasses has declined by 29% since 1992. Nested frequency for intermediate wheatgrass declined significantly. The trend for forbs is slightly up, but in poor condition. Sum of nested frequency of perennial forbs increased, although perennial forbs are still scarce, and annual forbs comprised 95% of the forb cover.

winter range condition (DCI) - very poor (10) Mid-level potential scale

browse - slightly down (-1)

grass - down (-2)

forb - slightly up (+1)

#### 2003 TREND ASSESSMENT

A wildfire, which burned the site in 1998, has caused downward trends in all categories. Trend for browse is down with the most preferred species nearly being eliminated by fire. Only 120 sagebrush plants/acre, 20 cliffrose plants/acre, and 20 bitterbrush plants/acre were estimated. The invasive increaser, threadleaf snakeweed, has increased dramatically to 17,600 plants/acre. It now provides 93% of the total shrub cover. Some prostrate kochia was seeded after the fire and had a density of 260 plants/acre. Trend for grasses is also down. Sum of nested frequency for perennial grasses declined by 92% from 1998, and there are few perennial grasses left on the site. Annuals, cheatgrass and foxtail brome totally dominate the grass composition by providing 94% of the grass cover. The trend for forbs is slightly up, but is still poor. The sum of nested frequency of perennial forbs increased three-fold, but perennial cover is still only 1%. The sum of nested frequency of annual forbs declined, but cover of annual forbs increased from 2% in 1998 to 16%. Annual forbs dominate the forb composition, especially storksbill which provides 83% of the forb cover. The only fairly common perennial forb remains gooseberryleaf globemallow.

winter range condition (DCI) - very poor (-9) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - slightly up (+1)

#### 2008 TREND ASSESSMENT

This area burned again in July of 2003 as part of the Apex fire. This increase in the burn frequency will likely only push the community more toward an annual dominated type and limit the areas usefulness as deer winter range. The fire that burned the site only exasperated the downward trend for browse. The native preferred browse species, mountain big sagebrush, cliffrose, and bitterbrush, were eliminated by the fire. The density of the seeded species, prostrate kochia, increased by 76% from 2003 to 1,080 plants/acre. Threadleaf snakeweed density declined by 92% from 2003 to 1,340 plants/acre. Trend for both the grasses and forbs is stable, but

very poor. There was little change in the sum of nested frequency of perennial grasses or perennial forbs. Cheatgrass comprised 93% of the total grass cover and only one perennial grass, sand dropseed (*Sporobolus cryptandrus*), was sampled on the site. Cover of perennial forbs increased from 1% in 2003 to nearly 3%, but cover of annual forbs also increased from 16% in 2003 to 43%.

winter range condition (DCI) - very poor (2) Mid-level potential scale  
browse - down (-2)                      grass - stable (0)                      forb - stable (0)

HERBACEOUS TRENDS --  
 Management unit 30 , Study no: 46

| T<br>y<br>p<br>e            | Species                   |                  |                  |                  |                  | Average Cover % |       |       |
|-----------------------------|---------------------------|------------------|------------------|------------------|------------------|-----------------|-------|-------|
|                             |                           | '92              | '98              | '03              | '08              | '98             | '03   | '08   |
| G                           | Agropyron cristatum       | <sub>b</sub> 44  | <sub>b</sub> 52  | <sub>a</sub> -   | <sub>a</sub> -   | 1.23            | .00   | .00   |
| G                           | Agropyron intermedium     | <sub>c</sub> 136 | <sub>b</sub> 79  | <sub>a</sub> 2   | <sub>a</sub> -   | 1.89            | .15   | -     |
| G                           | Bromus rubens (a)         | -                | <sub>c</sub> 169 | <sub>b</sub> 113 | <sub>a</sub> 8   | 4.65            | 1.62  | .02   |
| G                           | Bromus tectorum (a)       | -                | <sub>b</sub> 366 | <sub>a</sub> 304 | <sub>a</sub> 285 | 29.75           | 13.42 | 6.41  |
| G                           | Elymus junceus            | 3                | -                | -                | -                | -               | -     | -     |
| G                           | Poa pratensis             | 4                | -                | -                | -                | -               | -     | -     |
| G                           | Poa secunda               | -                | 4                | 9                | -                | .01             | .04   | -     |
| G                           | Sitanion hystrix          | -                | 1                | -                | -                | .00             | -     | -     |
| G                           | Sporobolus cryptandrus    | <sub>ab</sub> 4  | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 11  | -               | .00   | .39   |
| G                           | Vulpia octoflora (a)      | -                | <sub>b</sub> 94  | <sub>b</sub> 104 | <sub>a</sub> 19  | 1.13            | .80   | .03   |
| Total for Annual Grasses    |                           | 0                | 629              | 521              | 312              | 35.54           | 15.85 | 6.46  |
| Total for Perennial Grasses |                           | 191              | 136              | 11               | 11               | 3.14            | 0.20  | 0.40  |
| Total for Grasses           |                           | 191              | 765              | 532              | 323              | 38.68           | 16.05 | 6.87  |
| F                           | Alyssum alyssoides (a)    | -                | -                | 5                | 5                | -               | .01   | .04   |
| F                           | Allium sp.                | -                | 2                | -                | -                | .01             | -     | -     |
| F                           | Astragalus sp.            | -                | 2                | -                | 1                | .01             | -     | .03   |
| F                           | Calochortus nuttallii     | -                | 7                | 3                | 3                | .01             | .00   | .03   |
| F                           | Chenopodium fremontii (a) | -                | <sub>a</sub> -   | <sub>b</sub> 11  | <sub>a</sub> 3   | -               | .02   | .00   |
| F                           | Descurainia pinnata (a)   | -                | 7                | 3                | -                | .01             | .00   | -     |
| F                           | Draba sp. (a)             | -                | <sub>b</sub> 102 | <sub>a</sub> 9   | <sub>a</sub> 3   | .31             | .03   | .00   |
| F                           | Erodium cicutarium (a)    | -                | <sub>a</sub> 28  | <sub>b</sub> 185 | <sub>c</sub> 364 | .73             | 13.87 | 42.31 |
| F                           | Gilia sp. (a)             | -                | <sub>a</sub> 3   | <sub>a</sub> -   | <sub>b</sub> 12  | .00             | -     | .03   |
| F                           | Lactuca serriola          | -                | -                | 3                | -                | -               | .03   | -     |
| F                           | Lupinus sp. (a)           | -                | <sub>a</sub> -   | <sub>a</sub> -   | <sub>b</sub> 13  | -               | -     | .51   |
| F                           | Lychnis drummondii        | <sub>a</sub> -   | <sub>b</sub> 8   | <sub>a</sub> -   | <sub>a</sub> -   | .05             | -     | -     |
| F                           | Microsteris gracilis (a)  | -                | <sub>b</sub> 154 | <sub>a</sub> 8   | <sub>a</sub> -   | .64             | .02   | -     |
| F                           | Navarretia intertexta (a) | -                | -                | 3                | 4                | -               | .01   | .01   |

| T<br>y<br>p<br>e          | Species                      |                |                 |                 |                 | Average Cover % |       |       |
|---------------------------|------------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-------|-------|
|                           |                              | '92            | '98             | '03             | '08             | '98             | '03   | '08   |
| F                         | Nyctaginaceae                | -              | -               | -               | 2               | -               | -     | .15   |
| F                         | Oenothera sp.                | -              | -               | -               | 1               | -               | -     | .00   |
| F                         | Plantago patagonica (a)      | -              | <sub>a</sub> 28 | <sub>a</sub> 29 | <sub>b</sub> 60 | .13             | .21   | .33   |
| F                         | Ranunculus testiculatus (a)  | -              | -               | -               | 3               | -               | -     | .00   |
| F                         | Sisymbrium altissimum (a)    | -              | <sub>a</sub> -  | <sub>b</sub> 20 | <sub>a</sub> 3  | -               | 1.46  | .07   |
| F                         | Sphaeralcea grossulariifolia | <sub>a</sub> 4 | <sub>a</sub> 3  | <sub>b</sub> 60 | <sub>b</sub> 54 | .00             | .97   | 2.52  |
| Total for Annual Forbs    |                              | 0              | 322             | 273             | 470             | 1.83            | 15.64 | 43.33 |
| Total for Perennial Forbs |                              | 4              | 22              | 66              | 61              | 0.08            | 1.01  | 2.74  |
| Total for Forbs           |                              | 4              | 344             | 339             | 531             | 1.92            | 16.65 | 46.08 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 46

| T<br>y<br>p<br>e | Species                            | Strip Frequency |     |     | Average Cover % |       |      |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|-------|------|
|                  |                                    | '98             | '03 | '08 | '98             | '03   | '08  |
| B                | Artemisia tridentata vaseyana      | 26              | 6   | 0   | 4.31            | .03   | -    |
| B                | Chrysothamnus nauseosus hololeucus | 0               | 0   | 0   | .15             | -     | -    |
| B                | Cowania mexicana stansburiana      | 12              | 1   | 0   | 1.52            | .00   | -    |
| B                | Ephedra viridis                    | 1               | 0   | 0   | .63             | -     | -    |
| B                | Gutierrezia microrcephala          | 69              | 86  | 17  | 6.17            | 11.85 | .40  |
| B                | Juniperus osteosperma              | 7               | 0   | 0   | 2.75            | -     | -    |
| B                | Kochia prostrata                   | 0               | 10  | 16  | -               | .34   | .40  |
| B                | Opuntia sp.                        | 3               | 0   | 0   | .00             | -     | -    |
| B                | Prunus fasciculata                 | 5               | 5   | 4   | .00             | .39   | .66  |
| B                | Purshia tridentata                 | 3               | 1   | 0   | 1.48            | .15   | -    |
| Total for Browse |                                    | 126             | 109 | 37  | 17.03           | 12.76 | 1.46 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 46

| Species                       | Percent Cover |       |      |
|-------------------------------|---------------|-------|------|
|                               | '98           | '03   | '08  |
| Cowania mexicana stansburiana | .80           | -     | -    |
| Gutierrezia microrcephala     | -             | 14.85 | .53  |
| Juniperus osteosperma         | 3.20          | -     | -    |
| Kochia prostrata              | -             | .60   | .91  |
| Pinus monophylla              | .20           | -     | -    |
| Prunus fasciculata            | -             | .83   | 1.06 |

BASIC COVER --

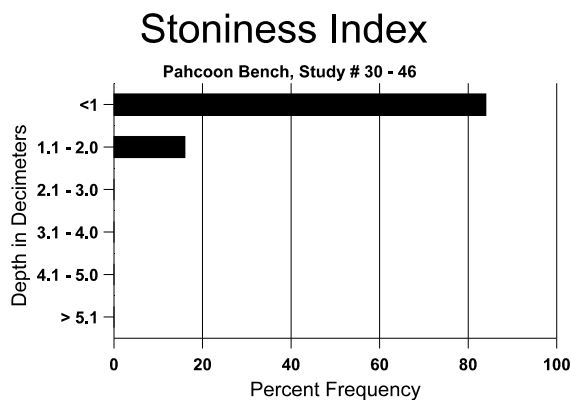
Management unit 30 , Study no: 46

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 0               | 5.50  | 53.28 | 48.50 | 51.93 |
| Rock        | 0               | 7.25  | 10.22 | 11.40 | 10.77 |
| Pavement    | 0               | 8.50  | 9.86  | 7.26  | 8.51  |
| Litter      | 0               | 70.50 | 55.49 | 31.16 | 27.81 |
| Cryptogams  | 0               | 0     | 1.21  | .03   | .05   |
| Bare Ground | 11.75           | 8.25  | 7.42  | 13.06 | 12.21 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 46, Study Name: Pahcoon Bench

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam  |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand | %silt | %clay |     |       |       |      |
| 10.3                         | 50.4 (14.4)     | 7.0 | 48.0  | 33.4  | 18.6  | 2.6 | 12.6  | 108.8 | 0.8  |



PELLET GROUP DATA --

Management unit 30 , Study no: 46

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 34                | 10  | 7   |
| Elk    | -                 | -   | 2   |
| Deer   | 33                | 20  | 29  |
| Cattle | 3                 | 2   | 4   |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| -                      | -       | -       |
| 19 (47)                | 25 (63) | 7 (18)  |
| 13 (32)                | 8 (20)  | 27 (66) |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 46

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>4866</b>                           | 733                                      | 3333  | 1533   | -        | -    | 0           | 0       | 0          | -       | 0            | 25/19                     |
| 92                                   | <b>3398</b>                           | 6933                                     | -     | 3199   | 199      | -    | 0           | 0       | 6          | -       | 0            | 28/28                     |
| 98                                   | <b>800</b>                            | -  | 20    | 660    | 120      | 280  | 20          | 0       | 15         | 3       | 3            | 28/36                     |
| 03                                   | <b>120</b>                            | 20                                       | 80    | 40     | -        | -    | 0           | 17      | 0          | -       | 0            | 17/15                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 77/17                     |
| <i>Cowania mexicana stansburiana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 28/28                     |
| 92                                   | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 57/44                     |
| 98                                   | <b>260</b>                            | 100                                      | -     | 240    | 20       | 20   | 31          | 15      | 8          | -       | 0            | 61/52                     |
| 03                                   | <b>20</b>                             | -  | -     | -      | 20       | 580  | 0           | 0       | 100        | -       | 0            | 26/23                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | 30/38                     |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 25/48                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/19                     |
| <i>Gutierrezia microrcephala</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                   | <b>466</b>                            | -  | -     | 466    | -        | -    | 0           | 0       | 0          | -       | 0            | 13/11                     |
| 92                                   | <b>3932</b>                           | 7933                                     | 199   | 3733   | -        | -    | 0           | 0       | 0          | -       | 0            | 14/15                     |
| 98                                   | <b>7360</b>                           | 80                                       | 160   | 7120   | 80       | 80   | 0           | 0       | 1          | 1       | 1            | 9/12                      |
| 03                                   | <b>17600</b>                          | 80                                       | 1980  | 15180  | 440      | 1020 | 0           | 0       | 3          | 1       | 1            | 12/13                     |
| 08                                   | <b>1340</b>                           | -  | 160   | 1120   | 60       | 120  | 0           | 1       | 4          | 1       | 3            | 9/10                      |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Juniperus osteosperma</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | 66                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 66                                    | -  | 66    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 140                                   | 20                                       | 80    | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | 40   | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Kochia prostrata</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 260                                   | 40                                       | 80    | 180    | -        | -    | 0           | 0       | -          | -       | 0            | 10/15                     |
| 08                           | 1080                                  | -  | 600   | 480    | -        | -    | 6           | 6       | -          | -       | 0            | 10/16                     |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 60                                    | -  | 20    | 40     | -        | -    | 0           | 0       | -          | -       | 0            | 8/20                      |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/18                      |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 10/27                     |
| <b>Prunus fasciculata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                           | 100                                   | -  | 20    | 60     | 20       | -    | 0           | 0       | 20         | 20      | 20           | 51/72                     |
| 03                           | 100                                   | -  | -     | 100    | -        | -    | 20          | 0       | 0          | -       | 20           | 39/56                     |
| 08                           | 80                                    | -  | -     | 20     | 60       | -    | 0           | 0       | 75         | -       | 0            | 28/38                     |
| <b>Purshia glandulosa</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 265                                   | -  | 199   | 66     | -        | -    | 25          | 0       | -          | -       | 0            | 32/44                     |
| 92                           | 266                                   | -  | 266   | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                           | 465                                   | 66                                       | 66    | 399    | -        | -    | 29          | 0       | 0          | -       | 0            | 34/50                     |
| 98                           | 60                                    | 60                                       | -     | 60     | -        | -    | 33          | 67      | 0          | -       | 0            | 47/71                     |
| 03                           | 20                                    | -  | -     | -      | 20       | -    | 100         | 0       | 100        | -       | 0            | 44/38                     |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Quercus turbinella</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | 20                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Yucca baccata baccata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | <b>133</b>                            | -  | -     | 133    | -        | -    | 50          | 0       | -          | -       | 0            | 7/10                      |
| 92                           | <b>199</b>                            | -  | 199   | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |



Trend Study 30-52-08

Study site name: Northwest of Enterprise.

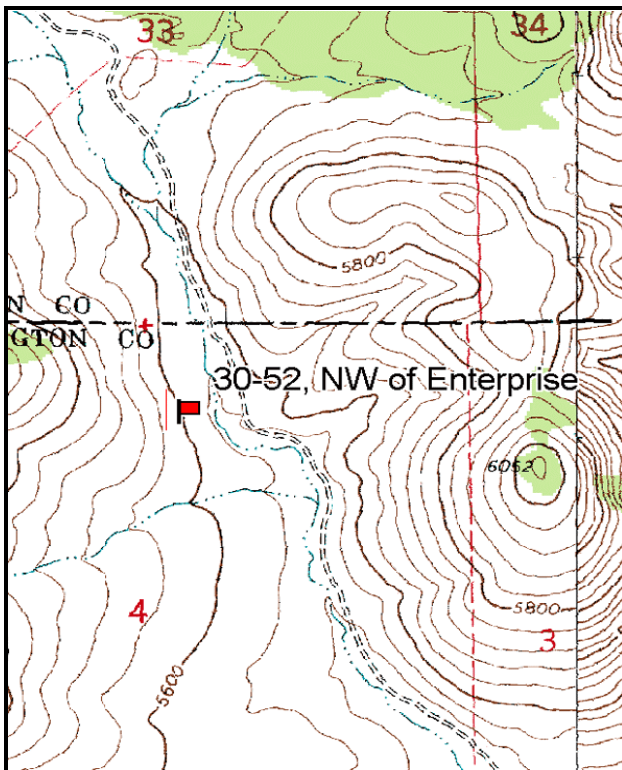
Vegetation type: Burn-Seeding.

Compass bearing: frequency baseline 245 degrees magnetic. (Line 2-4, 289°M)

Frequency belt placement: line 1 (8 & 94ft), line 2 (37ft), line 3 (51ft), line 4 (63ft).

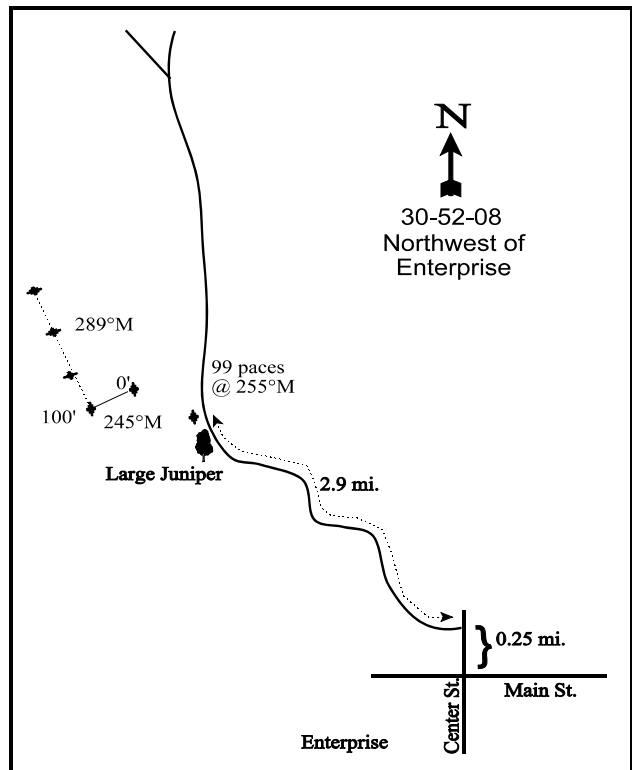
LOCATION DESCRIPTION

Starting from the town of Enterprise, turn north on 2<sup>nd</sup> West and pass over a bridge. From the bridge, drive 0.6 miles to just past 375 West and turn right on Old Modena Road right before the fire hydrant. From there, travel 2.3 miles. Stop where the road makes a turn to the north. On the left side of the road, before the bend, are a few junipers. Past the junipers is a witness post on the left side of the road. From the witness post the 0-foot baseline stake is 99 paces at 260 degrees magnetic, marked with browse tag #223.. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map Name: Hebron

Township 37S, Range 17W, Section 4



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 256166 E, 4165270 N

## DISCUSSION

### Northwest of Enterprise - Trend Study No. 30-52

#### Study Information

This trend study is located on critical deer winter range northwest of the town of Enterprise [elevation: 5,600 feet (1,707 m), slope: 25%, aspect: northeast]. The vegetation type is Wyoming big sagebrush-grass. Little sign of deer was noted in 1992. Pellet group data from 1998 estimated 40 deer and 2 cow days use/acre (99 ddu/ha and 5 cdu/ha). The site burned prior to the 2003 reading which eliminated all the browse in the entire area. The lower, flatter terrain was chained after seed was flown on. Deer still use the area and pellet group data from 2003 estimated 23 deer days use/acre (56 ddu/ha). Cattle had used the site sometime in 2002 at an estimated 12 days use/acre (30 cdu/ha) but had not yet used the site in 2003. The 2008 pellet group data estimated 8 deer days use/acre (20 ddu/ha) and 17 cow days use/acre (43 cdu/ha).

#### Soil

Soils are moderately deep but rocky on the surface and within the profile. Effective rooting depth is estimated at about 19 inches. Rock and erosion pavement are abundant on the surface, making up nearly 40% cover in 2003. The upper part of the site is very rocky as soil has moved down slope. There are signs of past erosion in the form of soil pedestalling and terracing of the slope, but current litter and vegetation cover seem to be sufficient to hold the soil in place. The soil erosion condition was classified as stable in 2008.

#### Browse

The key browse species prior to the fire was Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). The sight supported an over mature stand of sagebrush, which has steadily declined in density from 6,733 plants/acre in 1982 to 2,660 by 1998. Utilization was moderate to heavy in 1982 and 1992, but more light to moderate in 1998. Decadence increased from 23% in 1982 to 48% in 1998. Vigor was good that year, yet reproduction was poor with dead plants nearly as numerous as mature plants (1,180 live vs 1,160 dead plants/acre). The wildfire prior to the 2003 reading eliminated all of the sagebrush in the area.

Cliffrose (*Cowania mexicana stansburiana*) provided some additional forage with an estimated 380 plants/acre in 1998. It had received moderate to heavy use, yet vigor was normal and reproduction was good. The only other browse species of significance was broom snakeweed (*Gutierrezia sarothrae*). Juniper trees (*Juniperus osteosperma*) were scattered throughout the site. Point-quarter data from 1998 estimated 20 trees/acre with an average basal diameter of 8 inches. Overhead canopy cover averaged 8%. Wildfire eliminated nearly all of the shrubs on the site. Burned juniper trees on the more level terrain were chained and seeded. The only shrubs left in 2003 were a few resprouting ephedra (*Ephedra viridis*), some broom snakeweed, and a good stand of seeded prostrate kochia (*Kochia prostrata*) which numbered 3,200 plants/acre in 2003. That has since increased to 17,580 plants/acre in 2008. Some kochia was moderately and heavily browsed in 2003 and 2008.

#### Herbaceous Understory

Perennial grasses were abundant and diverse with mutton bluegrass (*Poa fendleriana*) and Sandberg bluegrass (*P. secunda*) being the most common grass species prior to the fire. Annual cheatgrass (*Bromus tectorum*) was also present, providing 17% of the grass cover in 1998. Forbs were fairly diverse, yet no species was common. The 12 annual and perennial forbs encountered in 1998 provided less than 1% total cover. The most common species included deervetch (*Lotus plebius*), longleaf phlox (*Phlox longifolia*), and a milkvetch

(*Astragalus sp.*). In 2003, the herbaceous composition was dominated by perennial grasses, but western wheatgrass (*Agropyron smithii*) and galleta (*Hilaria jamesii*) provided most of the grass cover (75%). Sandberg bluegrass was also common in 2003. Annual cheatgrass was present but not nearly as abundant as it was in 1998. Forbs were still lacking and produced only about 1% total cover in 2003. By 2008, cheatgrass had taken over, representing 74% of grass cover and 67% of total vegetation cover, and the nested frequency of cheatgrass increased five-fold. Perennial grasses still provide 8% cover with western wheatgrass and galleta. Gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*) was the only fairly common species in 2003. Deervetch was the most common forb in 2008 but provided less than 1% cover.

#### 1992 TREND ASSESSMENT

The key browse species, Wyoming big sagebrush, has no recruitment, density has declined by 42%, and decadence has increased. On the positive side, vigor has improved. Broom snakeweed had declined in density by 34%. Overall, the browse trend is down. Quadrat frequencies for grasses are down slightly, while forbs have increased. Combined, summed quadrat frequencies of forbs and grasses have remained constant since the previous reading.

browse - down (-2)                      grasses - slightly down (-1)                      forbs - stable (0)

#### 1998 TREND ASSESSMENT

Trend for browse is slightly down. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Wyoming big sagebrush decadence has remained high (48%), and reproduction is not sufficient to maintain the population. Cliffrose is found on the site in small numbers. Cliffrose reproduction is good. Trend for the herbaceous understory is up for perennial grasses, but stable for forbs which only make up only 4% of the herbaceous cover. Sum of nested frequency for perennial grasses has increased dramatically with a significant increase in the frequency of mutton and Sandberg bluegrass.

Winter range condition (DCI) - fair-good (46) low potential scale  
browse - slightly down (-1)                      grasses - up (+2)                      forbs - stable (0)

#### 2003 TREND ASSESSMENT

This site burned prior to the 2003 reading which eliminated all of the sagebrush on this site. Trend for browse is down due to the elimination of Wyoming big sagebrush and cliffrose from the site. A good stand of seeded prostrate kochia has established at an estimated density of 3,100 plants/acre. Some of these plants displayed moderate to heavy use in 2003. Trend for the grasses is down due to a decline in the sum of nested frequency for perennial grasses. Perennial grasses still dominate the composition with western wheatgrass, galleta, and Sandberg bluegrass providing most of the grass cover. Some seeded crested wheatgrass has established on the site. Trend for forbs is stable. Forbs are still lacking with only gooseberryleaf globemallow being fairly common.

Winter range condition (DCI) - poor-fair (26) low potential scale  
browse - down (-2)                      grasses - down (-2)                      forbs - stable (0)

2008 TREND ASSESSMENT

Browse trend is up, recovering from a fire. Kochia is now the dominant browse species representing 98% of browse cover and 14% of total cover. Kochia density has increased 467% to 17,580 plants/acre with no decadence. Broom snakeweed is the only other browse species on the site but occurs at low levels, 160 plants/acre. The herbaceous understory has become dominated once again by cheatgrass which now accounts for 74% of all grass cover and 67% of all vegetation cover with a significant increase in nested frequency. Perennial grass nested frequency declined from 379 to 334 (a 12% decrease) while cover declined 26%. Blue grama and western wheatgrass still account for 88% of perennial cover. Forbs still occur at a low frequency and provide little cover but have increased somewhat from 2003. Deer vetch is the principal perennial species although it occurs at low levels.

Winter range condition (DCI) - very poor (4) low potential scale

browse - up (+2)

grasses - down (-2)

forbs - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 52

| T<br>y<br>p<br>e            | Species                   |                  |                  |                   |                  | Average Cover % |       |       |
|-----------------------------|---------------------------|------------------|------------------|-------------------|------------------|-----------------|-------|-------|
|                             |                           | '92              | '98              | '03               | '08              | '98             | '03   | '08   |
| G                           | Agropyron cristatum       | a <sup>-</sup>   | a <sup>-</sup>   | b <sup>18</sup>   | b <sup>15</sup>  | -               | .27   | .38   |
| G                           | Agropyron smithii         | ab <sup>68</sup> | a <sup>44</sup>  | bc <sup>91</sup>  | c <sup>118</sup> | .55             | 3.40  | 3.11  |
| G                           | Agropyron spicatum        | -                | -                | 3                 | -                | -               | .15   | -     |
| G                           | Bromus tectorum (a)       | -                | b <sup>261</sup> | a <sup>56</sup>   | c <sup>358</sup> | 3.09            | .16   | 24.34 |
| G                           | Hilaria jamesii           | a <sup>55</sup>  | ab <sup>81</sup> | bc <sup>124</sup> | c <sup>148</sup> | 1.78            | 5.25  | 4.22  |
| G                           | Koeleria cristata         | 2                | 2                | -                 | -                | .03             | -     | -     |
| G                           | Oryzopsis hymenoides      | 11               | 1                | 6                 | 3                | .00             | .16   | .15   |
| G                           | Poa fendleriana           | b <sup>60</sup>  | c <sup>101</sup> | a <sup>-</sup>    | a <sup>-</sup>   | 5.88            | -     | -     |
| G                           | Poa secunda               | a <sup>41</sup>  | c <sup>215</sup> | b <sup>132</sup>  | a <sup>29</sup>  | 5.57            | 2.00  | .31   |
| G                           | Sitanion hystrix          | b <sup>54</sup>  | b <sup>54</sup>  | a <sup>5</sup>    | a <sup>21</sup>  | .92             | .03   | .15   |
| G                           | Unknown grass - perennial | 3                | -                | -                 | -                | -               | -     | -     |
| G                           | Vulpia octoflora (a)      | -                | c <sup>67</sup>  | b <sup>12</sup>   | a <sup>-</sup>   | .30             | .02   | -     |
| Total for Annual Grasses    |                           | 0                | 328              | 68                | 358              | 3.40            | 0.18  | 24.34 |
| Total for Perennial Grasses |                           | 294              | 498              | 379               | 334              | 14.76           | 11.28 | 8.34  |
| Total for Grasses           |                           | 294              | 826              | 447               | 692              | 18.17           | 11.46 | 32.68 |
| F                           | Allium sp.                | -                | -                | 8                 | -                | -               | .01   | -     |
| F                           | Antennaria rosea          | -                | 3                | -                 | -                | .03             | -     | -     |
| F                           | Astragalus sp.            | 5                | 11               | -                 | 2                | .19             | -     | .00   |
| F                           | Calochortus nuttallii     | a <sup>3</sup>   | ab <sup>16</sup> | ab <sup>9</sup>   | b <sup>17</sup>  | .03             | .02   | .05   |
| F                           | Cirsium sp.               | -                | -                | -                 | 3                | -               | -     | .01   |
| F                           | Collinsia parviflora (a)  | -                | b <sup>18</sup>  | a <sup>-</sup>    | b <sup>26</sup>  | .04             | -     | .06   |

| Type                      | Species                             |                  |                 |                 |                  | Average Cover % |      |      |
|---------------------------|-------------------------------------|------------------|-----------------|-----------------|------------------|-----------------|------|------|
|                           |                                     | '92              | '98             | '03             | '08              | '98             | '03  | '08  |
| F                         | <i>Crepis acuminata</i>             | -                | -               | 2               | 2                | -               | .03  | .03  |
| F                         | <i>Cymopterus</i> sp.               | -                | 6               | 1               | 4                | .07             | .03  | .06  |
| F                         | <i>Draba</i> sp. (a)                | -                | <sub>b</sub> 20 | <sub>a</sub> -  | <sub>a</sub> -   | .05             | -    | -    |
| F                         | <i>Erigeron pumilus</i>             | -                | 1               | -               | 1                | .03             | -    | .00  |
| F                         | <i>Eriogonum umbellatum</i>         | 2                | -               | -               | -                | -               | -    | -    |
| F                         | <i>Helianthus annuus</i> (a)        | -                | -               | 2               | 4                | -               | .00  | .01  |
| F                         | <i>Lappula occidentalis</i> (a)     | -                | -               | -               | 3                | -               | -    | .00  |
| F                         | <i>Lactuca serriola</i>             | -                | -               | -               | 1                | -               | -    | .00  |
| F                         | <i>Lithospermum</i> sp.             | -                | -               | -               | -                | -               | .00  | -    |
| F                         | <i>Lotus plebeius</i>               | <sub>c</sub> 94  | <sub>b</sub> 39 | <sub>a</sub> 1  | <sub>ab</sub> 24 | .18             | .00  | .91  |
| F                         | <i>Lupinus</i> sp. (a)              | -                | -               | -               | 4                | -               | -    | .01  |
| F                         | <i>Machaeranthera canescens</i>     | 3                | -               | -               | -                | -               | -    | -    |
| F                         | <i>Microsteris gracilis</i> (a)     | -                | <sub>b</sub> 25 | <sub>a</sub> -  | <sub>b</sub> 23  | .05             | -    | .06  |
| F                         | <i>Phlox longifolia</i>             | <sub>ab</sub> 15 | <sub>b</sub> 32 | <sub>a</sub> 13 | <sub>a</sub> 1   | .11             | .08  | .00  |
| F                         | <i>Plantago patagonica</i> (a)      | -                | 4               | -               | -                | .01             | -    | -    |
| F                         | <i>Sisymbrium altissimum</i> (a)    | -                | 2               | -               | 8                | .00             | -    | .05  |
| F                         | <i>Sphaeralcea grossulariifolia</i> | <sub>a</sub> -   | <sub>a</sub> -  | <sub>c</sub> 34 | <sub>b</sub> 9   | -               | .71  | .03  |
| F                         | <i>Tragopogon dubius</i>            | -                | -               | -               | 4                | -               | -    | .06  |
| F                         | <i>Trifolium</i> sp.                | -                | -               | -               | 1                | -               | -    | .03  |
| F                         | Unknown forb-annual (a)             | -                | -               | 2               | -                | -               | .03  | -    |
| Total for Annual Forbs    |                                     | 0                | 69              | 4               | 68               | 0.16            | 0.04 | 0.20 |
| Total for Perennial Forbs |                                     | 122              | 108             | 68              | 69               | 0.65            | 0.90 | 1.21 |
| Total for Forbs           |                                     | 122              | 177             | 72              | 137              | 0.81            | 0.94 | 1.42 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 52

| Type             | Species                              | Strip Frequency |     |     | Average Cover % |      |      |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|------|------|
|                  |                                      | '98             | '03 | '08 | '98             | '03  | '08  |
| B                | Amelanchier utahensis                | 1               | 0   | 0   | .00             | -    | -    |
| B                | Artemisia tridentata<br>wyomingensis | 76              | 0   | 0   | 9.16            | -    | -    |
| B                | Chrysothamnus nauseosus              | 0               | 0   | 0   | .38             | -    | -    |
| B                | Chrysothamnus viscidiflorus          | 14              | 0   | 0   | .51             | -    | -    |
| B                | Cowania mexicana<br>stansburiana     | 12              | 0   | 0   | .49             | -    | -    |
| B                | Ephedra viridis                      | 0               | 1   | 0   | -               | .00  | -    |
| B                | Gutierrezia sarothrae                | 54              | 46  | 7   | 1.14            | .65  | .05  |
| B                | Juniperus osteosperma                | 2               | 0   | 0   | 5.09            | -    | -    |
| B                | Kochia prostrata                     | 0               | 36  | 54  | -               | .98  | 2.33 |
| B                | Polygala subspinosa                  | 0               | 0   | 2   | -               | -    | .00  |
| B                | Purshia tridentata                   | 1               | 0   | 0   | .00             | -    | -    |
| Total for Browse |                                      | 160             | 83  | 63  | 16.79           | 1.64 | 2.38 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 52

| Species               | Percent Cover |      |      |
|-----------------------|---------------|------|------|
|                       | '98           | '03  | '08  |
| Gutierrezia sarothrae | -             | .35  | .01  |
| Juniperus osteosperma | 8.39          | -    | -    |
| Kochia prostrata      | -             | 2.13 | 1.70 |

BASIC COVER --

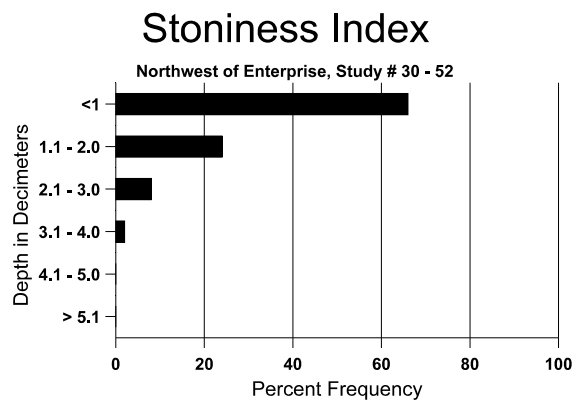
Management unit 30 , Study no: 52

| Cover Type  | Average Cover % |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|
|             | '82             | '92   | '98   | '03   | '08   |
| Vegetation  | 1.50            | 4.25  | 38.27 | 14.06 | 39.98 |
| Rock        | 20.25           | 30.50 | 36.20 | 35.83 | 31.52 |
| Pavement    | 6.25            | 10.75 | 6.67  | 3.94  | 1.70  |
| Litter      | 56.75           | 45.75 | 38.02 | 38.18 | 45.84 |
| Cryptogams  | 2.25            | .75   | 2.40  | .03   | .16   |
| Bare Ground | 13.00           | 7.50  | 13.41 | 16.97 | 2.40  |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 52, Study Name: Northwest of Enterprise

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 4.8                          | 48.0 (17.7)     | 6.6 | 32.6   | 45.2   | 22.2   | 2.7 | 25.9  | 732.8 | 0.5  |



PELLET GROUP DATA --

Management unit 30 , Study no: 52

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 10                | 18  | 44  |
| Horse  | 1                 | -   | -   |
| Deer   | 16                | 12  | 12  |
| Cattle | -                 | 4   | 14  |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| -                      | -       | -       |
| -                      | -       | -       |
| 40 (99)                | 23 (56) | 12 (20) |
| 2 (5)                  | 12 (30) | 17 (43) |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 52

|                       |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|-----------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Amelanchier utahensis |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                    | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                    | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                    | 20                                    | -  | -     | -      | 20       | -    | 0           | 0       | 100        | -       | 0            | -/-                       |
| 03                    | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                    | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata wyomingensis</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>6731</b>                           | -  | 599   | 4599   | 1533     | -    | 33          | 23      | 23         | 7       | 24           | 22/23                     |
| 92                                       | <b>3931</b>                           | -  | 199   | 1799   | 1933     | -    | 61          | 14      | 49         | -       | 2            | 24/24                     |
| 98                                       | <b>2660</b>                           | 40                                       | 200   | 1180   | 1280     | 1160 | 23          | 0       | 48         | 20      | 20           | 19/28                     |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 18/21                     |
| <i>Chrysothamnus viscidiflorus</i>       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 4/7                       |
| 92                                       | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | 0          | -       | 0            | 11/14                     |
| 98                                       | <b>800</b>                            | -  | 220   | 560    | 20       | -    | 0           | 0       | 3          | -       | 0            | 11/18                     |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Cowania mexicana stansburiana</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                                       | <b>133</b>                            | -  | 133   | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>380</b>                            | 80                                       | 120   | 260    | -        | -    | 26          | 47      | -          | -       | 0            | 31/25                     |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>133</b>                            | -  | -     | 133    | -        | -    | 50          | 0       | 0          | -       | 0            | 11/6                      |
| 92                                       | <b>199</b>                            | -  | 199   | -      | -        | -    | 33          | 0       | 0          | -       | 0            | -/-                       |
| 98                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 32/51                     |
| 03                                       | <b>40</b>                             | -  | 20    | -      | 20       | -    | 0           | 100     | 50         | -       | 0            | 17/12                     |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 8/13                      |
| <i>Gutierrezia sarothrae</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>8265</b>                           | -  | 533   | 6599   | 1133     | -    | 0           | 0       | 14         | 2       | 6            | 8/11                      |
| 92                                       | <b>5466</b>                           | 66                                       | -     | 5466   | -        | -    | 0           | 0       | 0          | -       | 0            | 11/10                     |
| 98                                       | <b>4060</b>                           | 80                                       | 540   | 3380   | 140      | 40   | 0           | 0       | 3          | 2       | 2            | 6/8                       |
| 03                                       | <b>1740</b>                           | 20                                       | 380   | 680    | 680      | 640  | 5           | 5       | 39         | 26      | 28           | 4/7                       |
| 08                                       | <b>160</b>                            | 340                                      | -     | 120    | 40       | -    | 0           | 0       | 25         | -       | 0            | 7/9                       |
| <i>Juniperus osteosperma</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                                       | <b>66</b>                             | -  | -     | 66     | -        | -    | 0           | 0       | -          | -       | 0            | 67/131                    |
| 92                                       | <b>0</b>                              | 66                                       | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                                       | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |



|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Kochia prostrata</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 3100                                  | -  | 1040  | 2060   | -        | -    | 27          | 4       | -          | -       | 0            | 8/11                      |
| 08                           | 17580                                 | 1600                                     | 3520  | 14060  | -        | -    | 42          | 24      | -          | -       | 0            | 6/7                       |
| <b>Leptodactylon pungens</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/5                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/20                      |
| <b>Polygala subspinosa</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 40                                    | -  | -     | 40     | -        | -    | 50          | 0       | -          | -       | 0            | 3/5                       |
| <b>Purshia tridentata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 82                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                           | 20                                    | -  | -     | 20     | -        | -    | 100         | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/13                      |

Trend Study 30-54-08

Study site name: Bullion Canyon.

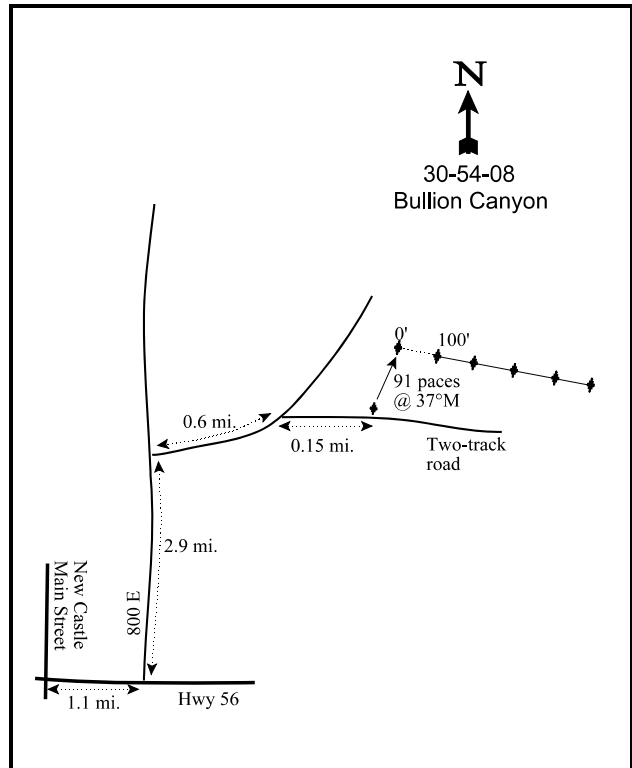
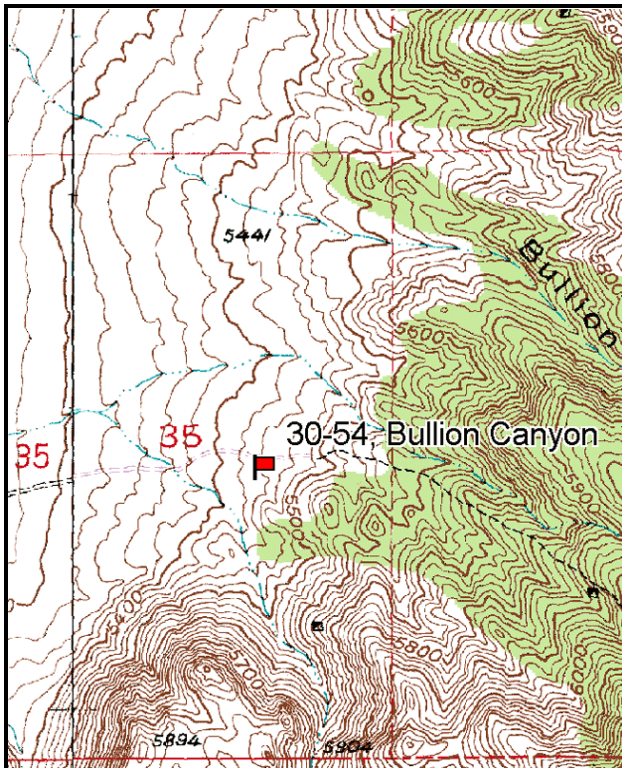
Vegetation type: Wyoming Big Sagebrush.

Compass bearing : frequency baseline 97 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Starting at the intersection of Hwy 56 and Main street in New Castle, head east on Hwy 56 1.1 miles to 800 E. Turn left (north) onto 800 E. and drive 2.9 miles to a right turn (0.3 miles past a gate). Go 0.6 miles to a fork. Take the faint two-track road to the right and go 0.15 miles to a witness post on the left side of the road. The 0-foot stake is 91 paces at 37 degrees magnetic from the witness post. The 0-foot stake is marked by browse tag #493. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map name: Silver Peak

Diagrammatic Sketch

Township 35S, Range 15W, Section 35

GPS: NAD 83, UTM 12S 280060 E, 4176993 N

## DISCUSSION

### Bullion Canyon - Trend Study No. 30-54

#### Study Information

This trend study is located near the mouth of Bullion Canyon [elevation 5,400 feet (1,646 m), slope: 5%-10%, aspect: west]. It was established in 1998 and samples a sagebrush-grass vegetation type within a scattered population of juniper trees. Agricultural fields are located in the valley bottom about one and a half miles to the west. Pellet group data from 1998 estimated light deer use at 23 deer days use/acre (57 ddu/ha). Some of the deer pellet groups were recent and bedding sites were present under several highlined juniper trees. A few old cattle pats were also encountered along with some horse sign. Pellet group data from 2003 estimated a higher level of use at 50 deer days use/acre (124 ddu/ha). Pellet group data from 2008 estimated 62 deer days use/acre (154 ddu/ha) and 4 cow days use /acre (9 cdu/ha).

#### Soil

Soil on the site is deep with an effective rooting depth estimated at 19 inches. Rock and gravel are abundant on the surface and within the profile. Soil texture is a loam which is neutral in reaction (pH 7.0). Phosphorus has a low availability for plant growth and development at only 6.4 ppm (Tiedemann and Lopez 2004). Protective ground cover consists mostly of rock and pavement cover and sagebrush crowns. The relative combined vegetation and litter cover has been moderate at 38% - 40% since 1998. Relative bare ground cover has been low at 14% - 18% since 1998. There are some active gullies in the area. The upper hillside is terraced with some localized erosion occurring, but it does not appear to be excessive. The soil erosion condition class was determined to be slight in 2003 and 2008 due to pedestaling of plants, flow patterns, and soil movement.

#### Browse

The key browse species consist of a combination of black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). These species appear to be hybridizing with many shrubs displaying phenotypes of both black and Wyoming big sagebrush. All sagebrush has been classified as Wyoming big sagebrush. The population density of sagebrush was estimated at 6,420 plants/acre in 1998. Use was moderate, vigor was normal on most plants, and decadence was low at 17%. Young recruitment was good with 13% of the population consisting of young plants. Data from 2003 show a 18% decline in sagebrush density. Use was classified as moderate to heavy. Due to drought, average vigor has declined and the number of decadent plants increased from 17% in 1998 to 54% in 2003. Young recruitment is fair but not nearly enough to replace decadent/dying plants. In 2008, sagebrush density was estimated at 4,880 plants/acre, a 7% decrease, while decadent plants decreased from 54% to 42% since 2003. Recruitment also decreased from 320 young/acre to 40 young/acre.

Other preferred species found on the site in small numbers include fourwing saltbush (*Atriplex canescens*), green ephedra (*Ephedra viridis*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Fourwing is scattered over the site, although it occurs in a dense patch near the baseline. Use was moderate and vigor was poor on one-third of the plants sampled in 1998. Fourwing decadence was also high at 43%. All plants sampled in 2003 were classified as decadent. By 2008, although density had decreased 25% to 60 plants/acre no plants were classified as decadent and seedlings were sampled for the first time. The green ephedra appeared to be fair better in 2003. They showed heavy use in 1998 and moderate to heavy use in 2003. Density increased

31% in 2003 to 840 plants/acre. Average vigor is still poor on nearly one-third of the population although the number of decadent plants declined to only 19%. The density of ephedra remained similar in 2008, but decadence and plants displaying poor vigor increased.

Increaser shrubs include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus stenophyllus*) and broom snakeweed (*Gutierrezia sarothrae*). Snakeweed was the most abundant increaser in 1998 with an estimated density of 1,360 plants/acre. By 2008, snakeweed density had increased to 5,320 plants/acre after decreasing to 560 plants/acre in 2003. Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) trees are scattered over the site. Point-quarter data from 1998 estimated 21 pinyon and 96 juniper trees/acre. Average basal diameter was 1.6 inches for pinyon and 1.9 inches for juniper. Many of the larger, older trees appeared to be highlined. Tree density has slowly increased. Point-quarter data from 2003 estimated 29 pinyon and 157 juniper trees/acre. Average diameter has remained similar (1.7 inches for pinyon and 1.7 inches for juniper). Point-quarter data for 2008 estimated 25 pinyon and 164 juniper trees/acre with average diameters of 2.0 and 3.1 inches, respectively.

#### Herbaceous Understory

The herbaceous understory is poor. Grasses were dominated by the annual cheatgrass (*Bromus tectorum*) which provided 76% of the herbaceous cover in 1998. With drought, cover of cheatgrass declined and provided only 1% of the total grass cover in 2003. Perennial species are not abundant with only the warm season grass, galleta (*Hilaria jamesii*), occurring more than occasionally. Perennial grasses have maintained cover and had a 21% increase in nested frequency in 2008. Cheatgrass increased significantly in nested frequency from 2003 to 2008, but provides only 0.5% cover. Forbs are diverse, but produced 1% or less cover in all sample years. The most common forb species are thistle (*Cirsium sp.*) and Desert Indian paintbrush (*Castilleja chromsa*).

#### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - fair (42) low potential scale

#### 2003 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is down likely due to drought. Density has declined by 18% since 1998, poor vigor has increased, and the number of decadent plants has increased from 17% to 54% of the population. In addition, 53% of the decadent plants sampled were classified as dying (>50% crown death), which amounts to 1,500 plants/acre. No seedlings were sampled in 2003 and young plants accounted for only 6% of the population. The less abundant fourwing saltbush also displayed downward trends. Trend for the grasses is down slightly. Sum of nested frequency for perennial grasses declined slightly, although average cover of perennials has remained similar to 2003 levels. Drought conditions likely contributed to a significant decline in nested frequency of the annual, cheatgrass. Cover of cheatgrass also declined from 13% in 1998 to less than one tenth of one percent in 2003. All perennial grasses declined in nested frequency but only Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Sitanion hystrix*) declined significantly. Trend for forbs is stable. Perennial forbs remain rare yet sum of nested frequency has remained similar to 1998.

winter range condition (DCI) - poor-fair (26) low potential scale

browse - down (-2)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is stable. Wyoming big sage brush density is 4,880 plants/acre (down 7%) while decadence has decreased from 54% in 2003 to 42%. Recruitment of young sagebrush plants was low at 1% of the population.. Fourwing saltbush density has decreased 25% to 60 plants/acre but none were classified as decadent (down from 100% in 2003). Trend for the grasses is slightly up. The herbaceous understory has seen a small return of cheatgrass with a significant increase in nested frequency, but at 0.5% cover is nowhere near 1998 levels. Perennial grass species sum of nested frequency has increased 20%. The sum of nested frequency of perennial forbs has remained similar to 2003, but cover of perennial forbs has nearly doubled.

winter range condition (DCI) - poor-fair (26) low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 54

| Type                        | Species                           | Nested Frequency |                 |                  | Average Cover % |      |      |
|-----------------------------|-----------------------------------|------------------|-----------------|------------------|-----------------|------|------|
|                             |                                   | '98              | '03             | '08              | '98             | '03  | '08  |
| G                           | Aristida purpurea                 | 1                | 5               | 4                | .03             | .01  | .07  |
| G                           | Bouteloua gracilis                | a-               | a-              | b <sup>19</sup>  | -               | -    | .30  |
| G                           | Bromus tectorum (a)               | c <sup>404</sup> | a <sup>12</sup> | b <sup>144</sup> | 12.57           | .02  | .52  |
| G                           | Carex sp.                         | 1                | -               | -                | .00             | -    | -    |
| G                           | Hilaria jamesii                   | 112              | 96              | 98               | 2.07            | 2.59 | 2.49 |
| G                           | Oryzopsis hymenoides              | 46               | 29              | 25               | .95             | .52  | .41  |
| G                           | Poa secunda                       | 22               | 7               | 12               | .46             | .05  | .06  |
| G                           | Sitanion hystrix                  | b <sup>40</sup>  | a <sup>2</sup>  | a <sup>6</sup>   | .38             | .01  | .01  |
| G                           | Stipa comata                      | a-               | a-              | b <sup>4</sup>   | -               | .00  | .07  |
| G                           | Vulpia octoflora (a)              | 2                | -               | 6                | .00             | -    | .02  |
| Total for Annual Grasses    |                                   | 406              | 12              | 150              | 12.57           | 0.02 | 0.54 |
| Total for Perennial Grasses |                                   | 222              | 139             | 168              | 3.91            | 3.19 | 3.43 |
| Total for Grasses           |                                   | 628              | 151             | 318              | 16.48           | 3.22 | 3.98 |
| F                           | Allium sp.                        | 2                | -               | 1                | .00             | -    | .00  |
| F                           | Arabis sp.                        | 4                | 2               | -                | .00             | .01  | -    |
| F                           | Astragalus sp.                    | 5                | -               | 4                | .01             | -    | .01  |
| F                           | Brickellia oblongifolia linifolia | -                | -               | 5                | -               | -    | .06  |
| F                           | Castilleja chromosa               | ab <sup>8</sup>  | a-              | b <sup>12</sup>  | .09             | -    | .30  |
| F                           | Calochortus flexuosus             | a <sup>5</sup>   | b <sup>29</sup> | b <sup>22</sup>  | .01             | .09  | .08  |
| F                           | Cirsium sp.                       | 8                | -               | 2                | .04             | -    | .15  |
| F                           | Cryptantha sp.                    | b <sup>15</sup>  | a-              | b <sup>11</sup>  | .03             | -    | .05  |
| F                           | Cymopterus sp.                    | b <sup>17</sup>  | c <sup>28</sup> | a-               | .07             | .07  | -    |
| F                           | Delphinium nuttallianum           | -                | 6               | 1                | -               | .04  | .00  |

| Type                      | Species                      | Nested Frequency |                         |                 | Average Cover % |                |      |
|---------------------------|------------------------------|------------------|-------------------------|-----------------|-----------------|----------------|------|
|                           |                              | '98              | '03                     | '08             | '98             | '03            | '08  |
|                           |                              | F                | Descurainia pinnata (a) | <sub>b</sub> 13 | <sub>a</sub> -  | <sub>a</sub> 2 | .06  |
| F                         | Draba sp. (a)                | <sub>b</sub> 24  | <sub>a</sub> -          | <sub>a</sub> 2  | .11             | -              | .01  |
| F                         | Eriogonum sp.                | 8                | 11                      | -               | .06             | .02            | -    |
| F                         | Eriogonum ovalifolium        | <sub>a</sub> -   | <sub>a</sub> -          | <sub>b</sub> 15 | -               | -              | .05  |
| F                         | Gilia sp. (a)                | <sub>a</sub> 10  | <sub>a</sub> 4          | <sub>b</sub> 39 | .06             | .00            | .12  |
| F                         | Lappula occidentalis (a)     | -                | -                       | 7               | -               | -              | .02  |
| F                         | Lithospermum sp.             | -                | 5                       | -               | -               | .18            | -    |
| F                         | Lomatium sp.                 | <sub>a</sub> -   | <sub>a</sub> -          | <sub>b</sub> 25 | -               | -              | .09  |
| F                         | Penstemon sp.                | 2                | -                       | 3               | .01             | -              | .03  |
| F                         | Phlox longifolia             | 48               | 45                      | 38              | .23             | .10            | .11  |
| F                         | Senecio multilobatus         | 1                | -                       | -               | .03             | -              | .03  |
| F                         | Sphaeralcea grossulariifolia | -                | -                       | 1               | -               | -              | .03  |
| F                         | Streptanthus cordatus        | 11               | 8                       | 3               | .08             | .02            | .03  |
| Total for Annual Forbs    |                              | 47               | 4                       | 50              | 0.23            | 0.00           | 0.15 |
| Total for Perennial Forbs |                              | 134              | 134                     | 143             | 0.68            | 0.54           | 1.03 |
| Total for Forbs           |                              | 181              | 138                     | 193             | 0.91            | 0.55           | 1.19 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 54

| Type             | Species                                  | Strip Frequency |                                   |     | Average Cover % |       |       |
|------------------|--|-----------------|-----------------------------------|-----|-----------------|-------|-------|
|                  |  | '98             | '03                               | '08 | '98             | '03   | '08   |
|                  |  | B               | Artemisia tridentata wyomingensis | 92  | 92              | 87    | 19.54 |
| B                | Atriplex canescens                       | 6               | 4                                 | 2   | .97             | .21   | .63   |
| B                | Chrysothamnus viscidiflorus stenophyllus | 32              | 19                                | 26  | .98             | .07   | .23   |
| B                | Ephedra viridis                          | 7               | 11                                | 11  | .45             | .17   | .10   |
| B                | Gutierrezia sarothrae                    | 18              | 14                                | 48  | .49             | .13   | 1.25  |
| B                | Juniperus osteosperma                    | 7               | 6                                 | 6   | 1.44            | 3.44  | 4.34  |
| B                | Opuntia sp.                              | 4               | 9                                 | 7   | .00             | .03   | .15   |
| B                | Pediocactus simpsonii                    | 3               | 4                                 | 1   | .00             | .00   | .00   |
| B                | Pinus monophylla                         | 0               | 0                                 | 1   | -               | .03   | .03   |
| B                | Sclerocactus sp.                         | 1               | 4                                 | 5   | .00             | .00   | .00   |
| Total for Browse |  | 170             | 163                               | 194 | 23.89           | 16.66 | 16.87 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 54

| Species                                  | Percent Cover |      |      |
|--|---------------|------|------|
|  | '98           | '03  | '08  |
| Artemisia tridentata wyomingensis        | -             | 7.80 | 9.86 |
| Atriplex canescens                       | -             | .20  | .85  |
| Chrysothamnus viscidiflorus stenophyllus | -             | .15  | .18  |
| Ephedra viridis                          | -             | .05  | .15  |
| Gutierrezia sarothrae                    | -             | -    | .81  |
| Juniperus osteosperma                    | 3.40          | 2.90 | 4.69 |
| Opuntia sp.                              | -             | .16  | .03  |
| Sclerocactus sp.                         | -             | .03  | .03  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 54

| Species                           | Average leader growth (in) |     |
|-----------------------------------|----------------------------|-----|
|                                   | '03                        | '08 |
| Artemisia tridentata wyomingensis | 1.0                        | 0.8 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 54

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 96             | 157 | 164 |
| Pinus monophylla      | -              | 29  | 25  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 1.9                   | 1.7 | 3.1 |
| -                     | 1.7 | 2.0 |

BASIC COVER --

Management unit 30 , Study no: 54

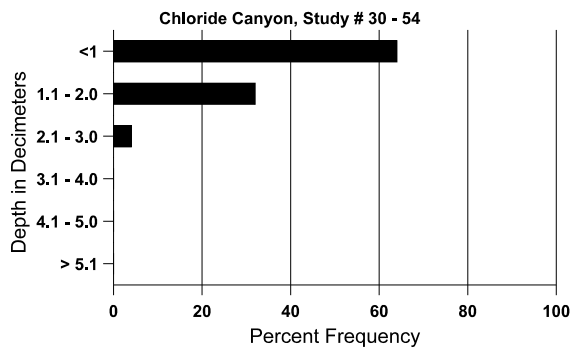
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 33.48           | 21.92 | 21.14 |
| Rock        | 14.30           | 16.04 | 14.76 |
| Pavement    | 33.29           | 35.88 | 36.98 |
| Litter      | 12.42           | 20.07 | 24.34 |
| Cryptogams  | .63             | .31   | .50   |
| Bare Ground | 20.05           | 15.18 | 16.81 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 54, Study Name: Chloride Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 19.0                         | 45.6 (18.3)     | 7.0 | 46.0   | 29.4   | 24.6   | 1.7 | 6.4   | 160.0 | 0.6  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 54

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 9                 | 5   | 62  |
| Deer   | 24                | 18  | 32  |
| Cattle | -                 | 1   | 2   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| 23 (57)                | 50 (124) | 62 (154) |
| 2 (5)                  | -        | 4 (9)    |

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 54

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia tridentata wyomingensis</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                       | <b>6420</b>                           | 120                                      | 860   | 4460   | 1100     | 560  | 60          | 9       | 17         | 10      | 10           | 12/22                     |
| 03                                       | <b>5260</b>                           | -  | 320   | 2120   | 2820     | 1480 | 31          | 16      | 54         | 29      | 32           | 9/19                      |
| 08                                       | <b>4880</b>                           | 120                                      | 40    | 2780   | 2060     | 1000 | 30          | 11      | 42         | 31      | 31           | 11/21                     |
| <b>Atriplex canescens</b>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                       | <b>140</b>                            | -  | -     | 80     | 60       | -    | 86          | 0       | 43         | 29      | 29           | 21/27                     |
| 03                                       | <b>80</b>                             | -  | -     | -      | 80       | -    | 0           | 75      | 100        | 75      | 75           | 19/37                     |
| 08                                       | <b>60</b>                             | 20                                       | -     | 60     | -        | -    | 33          | 0       | 0          | -       | 0            | 22/38                     |



|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year  | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus nauseosus</b>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/18                      |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Chrysothamnus viscidiflorus stenophyllus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 960                                   | 60                                       | 60    | 820    | 80       | -    | 2           | 0       | 8          | 4       | 6            | 10/13                     |
| 03  | 480                                   | -  | 60    | 120    | 300      | 20   | 8           | 0       | 63         | 38      | 38           | 6/9                       |
| 08  | 660                                   | 60                                       | 60    | 340    | 260      | 20   | 12          | 12      | 39         | 24      | 24           | 7/10                      |
| <b>Ephedra viridis</b>                          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 580                                   | -  | 20    | 360    | 200      | 20   | 14          | 83      | 34         | 31      | 31           | 16/16                     |
| 03  | 840                                   | -  | 480   | 200    | 160      | 40   | 12          | 24      | 19         | 12      | 26           | 10/14                     |
| 08  | 760                                   | 120                                      | 120   | 300    | 340      | 80   | 0           | 89      | 45         | 37      | 37           | 15/19                     |
| <b>Grayia spinosa</b>                           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 31/41                     |
| <b>Gutierrezia sarothrae</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 1360                                  | 20                                       | 420   | 920    | 20       | 20   | 0           | 0       | 1          | 1       | 1            | 6/6                       |
| 03  | 560                                   | -  | -     | 520    | 40       | 260  | 0           | 0       | 7          | 4       | 7            | 5/7                       |
| 08  | 5320                                  | 100                                      | 680   | 4400   | 240      | 60   | .37         | 0       | 5          | 1       | 2            | 5/6                       |
| <b>Juniperus osteosperma</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 140                                   | 20                                       | 120   | 20     | -        | 40   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 120                                   | -  | 40    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 120                                   | -  | 40    | 80     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 80                                    | -  | -     | 40     | 40       | 20   | 0           | 0       | 50         | -       | 0            | 4/7                       |
| 03  | 180                                   | -  | -     | 120    | 60       | -    | 0           | 0       | 33         | 22      | 33           | 5/16                      |
| 08  | 160                                   | -  | 40    | 60     | 60       | 20   | 0           | 0       | 38         | 25      | 38           | 5/16                      |
| <b>Pediocactus simpsonii</b>                    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 60                                    | -  | -     | 60     | -        | 20   | 0           | 0       | 0          | -       | 0            | 3/3                       |
| 03  | 80                                    | -  | -     | 60     | 20       | -    | 0           | 0       | 25         | 25      | 25           | 2/2                       |
| 08  | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 1/2                       |
| <b>Pinus monophylla</b>                         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | 20                                    | 20                                       | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                     |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| Polygala subspinosa |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 5/9                       |
| Sclerocactus sp.    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                  | <b>80</b>                             | -  | -     | 80     | -        | -    | 0           | 0       | -          | -       | 0            | 3/2                       |
| 08                  | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 4/3                       |

Trend Study 30-55-08

Study site name: Quichapa Canyon

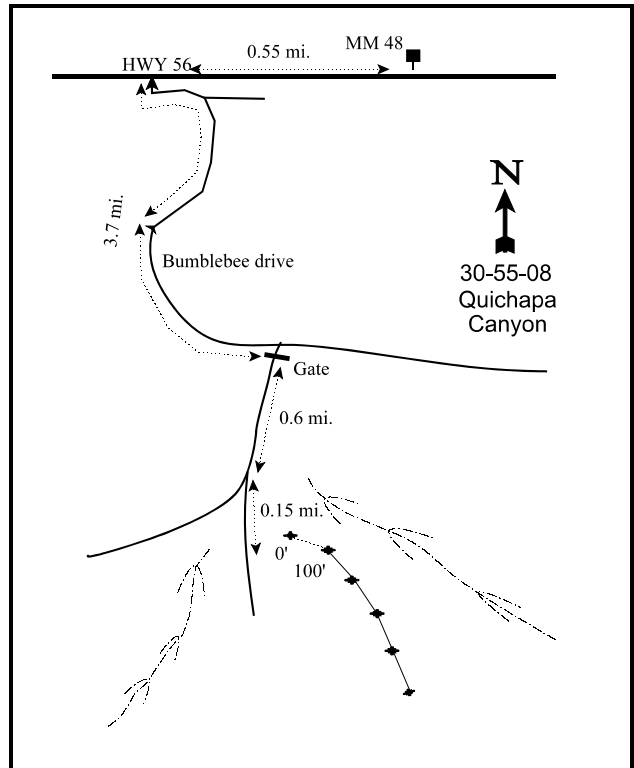
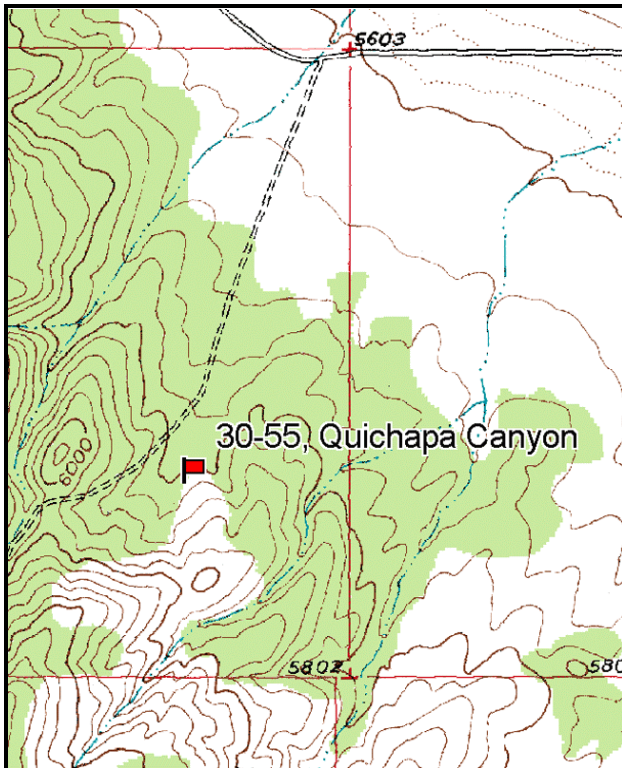
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 103 degrees magnetic. (lines 2-3, 142°M, line 4, 156°M, line 5, 153°M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 4 on 1ft.

LOCATION DESCRIPTION

From Highway 56, drive to mile marker 48 and continue east 0.55 miles to Bumble Bee Dr., a road on the right (south). Travel 3.7 miles south to a gate on the right. Proceed through the gate and drive 0.6 miles to a fork. Take the left fork for 0.15 miles to the witness post on the left side of the road. The 0-foot stake is 5 paces away at 77 degrees magnetic. The study is marked by half high fenceposts. The 0-foot stake is marked by browse tag # 498.



Map name: Kannarraville

Diagrammatic Sketch

Township 37S, Range 12W, Section 7

GPS: NAD 83, UTM 12S 302302 E, 4162874 N

## DISCUSSION

### Quichapa Canyon - Trend Study No. 30-55

#### Study Information

This trend study was established in 1998 to monitor deer winter range on the northeast side of the Pine Valley unit [elevation: 5,800 feet (1,768 m), slope: 20%, aspect: northwest]. The site is a mountain brush type with a Utah juniper (*Juniperus osteosperma*) overstory. Water is available about one-quarter of a mile to the northeast in a stream. The area receives use by deer, sheep, and some cattle. Pellet group data taken from the site in 1998 estimated 41 deer days use/acre (101 ddu/ha). Several deer were seen near the site during study establishment and fresh pellet groups were also observed. Sheep had also recently used the site in 1998 and a sheep camp was located one-half mile to the northeast. Some cow sign was also observed in low numbers. Pellet group data from 2003 estimated 33 deer days use/acre (83 ddu/ha). Only 1 cattle pat was encountered in 2003. Pellet group data from 2008 estimated 1 elk day use/acre (3 edu/ha), 38 deer days use/acre (93 ddu/ha) and 16 cow days use/acre (40 cdu/ha).

#### Soil

Soil at the site is moderately deep with an effective rooting depth of just over 14 inches. It has a sandy loam texture with clay concentrated in lower horizons. Rock and pavement are common on the surface and within the profile. Some erosion appears to be occurring due to poor protective ground cover combined with the steep terrain. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

Utah juniper is abundant on the site and slowly increasing. Smaller numbers of pinyon pine (*Pinus edulis*) are also found. Point-quarter data from 2003 estimated 196 juniper and 32 pinyon trees/acre. Average basal diameter was 4.9 inches for juniper and 2.8 inches for pinyon. These trees provided 37% of the browse cover in 2003 with a line-intercept canopy cover value of 14%. By 2008, these estimates were 88 juniper and 39 pinyon trees/acre with diameters of 4 and 1 inches, respectively. Drought conditions in 2003 caused several trees to have brown leaves. Key understory species consist of Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata vaseyana*), and antelope bitterbrush (*Purshia tridentata*). Serviceberry provided 26% of the browse cover in 1998, 30% in 2003 and 15% in 2008. Density was estimated at 1,240 plants/acre in 1998, 1,780 plants/acre in 2003 and 1,020 plants/acre in 2008. Mature plants average nearly 4 feet in height. They have been moderate to heavily utilized and decadence has been moderately high at 44% in 1998, 34% in 2003, and 37% in 2008. Recruitment of young plants has been good in all readings.

Mountain big sagebrush provides 38% of the shrub cover with an estimated density of around 4,820 plants/acre in 2008. Use of the sagebrush has been mostly light to moderate. Vigor is normal on most plants and decadence increased from 25% in 1998 to 50% in 2003 before falling to 16% in 2008. Bitterbrush occurs in small numbers of about 220 plants/acre. It displays very heavy hedging with most individuals sampled being classified as partly unavailable due to hedging. There is no sign of reproduction, and decadence was only 13% in 1998, increasing to 38% in 2003, then to 55% in 2008. There are also small numbers of black sagebrush (*Artemisia nova*), true mountain mahogany (*Cercocarpus montanus*), and Gambel oak (*Quercus gambelii*) which provide some additional forage.

### Herbaceous Understory

The herbaceous understory is very poor. Cheatgrass (*Bromus tectorum*) is the most common species as it provided 72% of the grass cover and 66% of the total herbaceous cover in 1998. Drought conditions likely caused a significant decline in the nested frequency of cheatgrass in 2003 with a corresponding drop in cover from 7% in 1998 to less than 1% in 2003. Cheatgrass rebounded in 2008 with a significant increase in nested frequency and a large increase in cover. Bottlebrush squirreltail (*Sitanion hystrix*) is the only common perennial grass on the site with several other perennial species occurring less frequently. Forbs are diverse with 19 species encountered in 1998. However, none are very abundant with all of these forbs combining to produce less than 1% cover in 1998 and 2008, and only 2% cover in 2003.

### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - very poor (27) mid-level potential scale

### 2003 TREND ASSESSMENT

Trend for browse is mixed. Trend for serviceberry is stable. Serviceberry vigor remained similar and the number of decadent plants declined slightly to 34%. Serviceberry seedlings are fairly abundant and young plants account for 42% of the population. Trend for sagebrush and bitterbrush are down. Density of mountain big sagebrush declined slightly since 1998, more plants display poor vigor, and one-half the population is now decadent. No seedlings or young were encountered in 2003. Bitterbrush is still being extremely heavily hedged. This is due primarily to its limited numbers (260 plants/acre). Vigor remains normal but the number of decadent plants has increased from 13% to 38%. Due to the high level of use, no flowering was occurring even though annual leader growth was good averaging 2 inches. Taking all of this into consideration, the overall browse trend is considered slightly down. Trend for the herbaceous understory is stable but poor. Sum of nested frequency for perennial grasses remained stable yet nested frequency of cheatgrass declined significantly. Average cover of cheatgrass declined from 7% in 1998 to less than 1% in 2003. Nested frequency of bottlebrush squirreltail also declined, but other perennial grass species increased. Several sites on the unit also show a decline of bottlebrush squirreltail during this drought period. The forb composition remains poor with few perennial forbs found on the site more than occasionally. Annual forbs are more abundant.

winter range condition (DCI) - very poor (30) mid-level potential scale

browse - slightly down (-1)

grass - stable (0)

forb - stable (0)

### 2008 TREND ASSESSMENT

Trend for browse is slightly up. Serviceberry density has declined 43% to 1,020 plants/acre while recruitment has dropped from 740 young/acre to 380 young/acre and the number of seedlings has decreased from 220/acre to 60/acre. Decadence has remained steady at 37%. Mountain big sagebrush has increased in density from 1,880 plants/acre to 4,820 plants/acre and decadence has decreased from 50% to 16%. Recruitment has improved from no young in 2003 to 1,980 young/acre and 4,640 seedlings/acre. Individuals displaying poor vigor has also fallen (22% in 2003 to 7%). Bitterbrush has decreased in density 15% (220 plants/acre), plants displaying poor vigor has increased to 45%, and decadence is at 55%. In the herbaceous understory, perennial grasses have doubled in cover and seen a 49% increase in sum of nested frequency. Cheatgrass has increased 57% in nested frequency and nearly tripled in cover. Bottlebrush squirreltail is the predominant perennial species and had a significant increase in nested frequency. Trend for forbs is up. The sum of nested frequency

of perennial forbs increased 21%, but the sum of nested frequency of annual forbs decreased markedly. Cover of perennial forbs increased slightly, but cover of annual forbs decreased from 2% in 2003 to 0.1%.

winter range condition (DCI) - poor (40) mid-level potential scale

browse - slightly up (+1)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 55

| Type                        | Species                  | Nested Frequency |      |      | Average Cover % |      |      |
|-----------------------------|--------------------------|------------------|------|------|-----------------|------|------|
|                             |                          | '98              | '03  | '08  | '98             | '03  | '08  |
| G                           | Bromus tectorum (a)      | c371             | a150 | b235 | 7.05            | .87  | 2.36 |
| G                           | Hilaria jamesii          | a-               | b14  | a-   | -               | .22  | -    |
| G                           | Oryzopsis hymenoides     | 8                | 11   | 11   | .21             | .10  | .19  |
| G                           | Poa bulbosa              | 2                | -    | -    | .00             | -    | -    |
| G                           | Poa fendleriana          | 31               | 44   | 38   | .68             | .20  | .69  |
| G                           | Poa secunda              | a3               | a2   | b29  | .03             | .00  | .09  |
| G                           | Sitanion hystrix         | ab79             | a51  | b104 | 1.86            | .66  | 1.66 |
| G                           | Vulpia octoflora (a)     | 4                | -    | -    | .01             | -    | -    |
| Total for Annual Grasses    |                          | 375              | 150  | 235  | 7.06            | 0.87 | 2.36 |
| Total for Perennial Grasses |                          | 123              | 122  | 182  | 2.80            | 1.20 | 2.65 |
| Total for Grasses           |                          | 498              | 272  | 417  | 9.86            | 2.07 | 5.01 |
| F                           | Agoseris glauca          | 6                | 5    | 7    | .01             | .01  | .07  |
| F                           | Alyssum alyssoides (a)   | -                | -    | 2    | -               | -    | .00  |
| F                           | Allium sp.               | 2                | -    | -    | .00             | -    | -    |
| F                           | Arabis sp.               | -                | 8    | 7    | -               | .07  | .01  |
| F                           | Astragalus convallarius  | 2                | -    | -    | .15             | -    | -    |
| F                           | Astragalus sp.           | 8                | 2    | 2    | .02             | .00  | .03  |
| F                           | Brodiaea pulchella       | a-               | a-   | b10  | -               | -    | .02  |
| F                           | Castilleja chromosa      | 3                | -    | -    | .00             | -    | -    |
| F                           | Calochortus nuttallii    | 4                | 2    | 10   | .01             | .01  | .03  |
| F                           | Chaenactis douglasii     | 9                | -    | 5    | .02             | -    | .01  |
| F                           | Comandra pallida         | -                | 10   | -    | -               | .06  | -    |
| F                           | Collinsia parviflora (a) | b61              | c208 | a6   | .15             | 1.25 | .01  |
| F                           | Cymopterus sp.           | -                | 2    | 6    | .00             | .00  | .01  |
| F                           | Descurainia pinnata (a)  | a3               | b30  | a-   | .01             | .21  | -    |
| F                           | Draba sp. (a)            | b13              | a1   | ab2  | .03             | .00  | .01  |
| F                           | Gilia sp. (a)            | a-               | b55  | a1   | -               | .30  | .00  |
| F                           | Lappula occidentalis (a) | -                | -    | 5    | -               | -    | .00  |

| Type                      | Species                      | Nested Frequency |                  |                 | Average Cover % |      |      |
|---------------------------|------------------------------|------------------|------------------|-----------------|-----------------|------|------|
|                           |                              | '98              | '03              | '08             | '98             | '03  | '08  |
|                           |                              | F                | Lomatium sp.     | 3               | 1               | -    | .00  |
| F                         | Microsteris gracilis (a)     | <sub>b</sub> 73  | <sub>b</sub> 100 | <sub>a</sub> 11 | .17             | .28  | .02  |
| F                         | Orobanche fasciculata        | 2                | -                | 3               | .00             | -    | .03  |
| F                         | Penstemon sp.                | 2                | -                | -               | .00             | -    | -    |
| F                         | Phlox longifolia             | 19               | 24               | 16              | .05             | .08  | .04  |
| F                         | Polygonum douglasii (a)      | <sub>a</sub> -   | <sub>a</sub> 5   | <sub>b</sub> 19 | -               | .01  | .04  |
| F                         | Sphaeralcea grossulariifolia | -                | 2                | -               | -               | .00  | -    |
| F                         | Streptanthus cordatus        | -                | 1                | 4               | -               | .03  | .01  |
| F                         | Stellaria jamesiana          | 1                | -                | -               | .03             | -    | -    |
| F                         | Trifolium sp.                | 18               | 8                | 16              | .03             | .02  | .10  |
| F                         | Vicia americana              | -                | -                | 1               | -               | -    | .00  |
| F                         | Zigadenus paniculatus        | <sub>a</sub> 3   | <sub>a</sub> -   | <sub>b</sub> 14 | .03             | -    | .04  |
| Total for Annual Forbs    |                              | 150              | 399              | 46              | 0.36            | 2.08 | 0.10 |
| Total for Perennial Forbs |                              | 82               | 65               | 101             | 0.39            | 0.31 | 0.42 |
| Total for Forbs           |                              | 232              | 464              | 147             | 0.76            | 2.39 | 0.53 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 55

| Type             | Species                       | Strip Frequency |                       |     | Average Cover % |       |       |
|------------------|-------------------------------|-----------------|-----------------------|-----|-----------------|-------|-------|
|                  |                               | '98             | '03                   | '08 | '98             | '03   | '08   |
|                  |                               | B               | Amelanchier utahensis | 37  | 34              | 29    | 5.16  |
| B                | Artemisia nova                | 4               | 0                     | 0   | 2.02            | -     | -     |
| B                | Artemisia tridentata vaseyana | 68              | 59                    | 68  | 3.82            | 3.53  | 6.19  |
| B                | Juniperus osteosperma         | 8               | 8                     | 12  | 7.06            | 6.21  | 6.94  |
| B                | Opuntia sp.                   | 1               | 3                     | 3   | .00             | .00   | .00   |
| B                | Pinus edulis                  | 2               | 0                     | 3   | .15             | -     | .00   |
| B                | Pinus monophylla              | 0               | 2                     | 0   | -               | .63   | -     |
| B                | Purshia tridentata            | 11              | 6                     | 6   | 1.41            | 1.31  | .41   |
| B                | Quercus gambelii              | 5               | 5                     | 7   | .03             | .06   | .21   |
| Total for Browse |                               | 136             | 117                   | 128 | 19.68           | 16.73 | 16.22 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 55

| Species                       | Percent Cover |       |       |
|-------------------------------|---------------|-------|-------|
|                               | '98           | '03   | '08   |
| Amelanchier utahensis         | -             | 4.26  | 3.11  |
| Artemisia tridentata vaseyana | -             | 6.44  | 9.93  |
| Juniperus osteosperma         | 10.19         | 13.50 | 13.48 |
| Opuntia sp.                   | -             | -     | .26   |
| Pinus monophylla              | -             | .51   | -     |
| Purshia tridentata            | -             | .48   | .56   |
| Quercus gambelii              | 1.00          | .51   | 1.13  |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 55

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 2.0                        | 1.1 |
| Artemisia tridentata vaseyana | 1.0                        | 1.4 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 55

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 163            | 196 | 88  |
| Pinus edulis          | 23             | 32  | 39  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 6.4                   | 4.9 | 4.0 |
| 7.2                   | 2.8 | 1.0 |

BASIC COVER --

Management unit 30 , Study no: 55

| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 30.07           | 25.30 | 19.97 |
| Rock        | 11.87           | 13.54 | 12.31 |
| Pavement    | 17.17           | 22.48 | 22.31 |
| Litter      | 39.04           | 32.59 | 44.25 |
| Cryptogams  | .22             | .05   | .08   |
| Bare Ground | 27.82           | 20.30 | 18.71 |

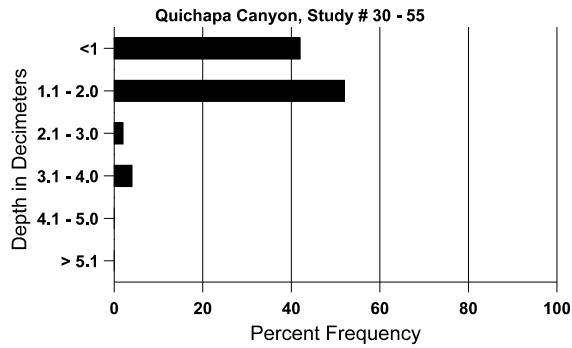


SOIL ANALYSIS DATA --

Management unit 30, Study no: 55, Study Name: Quichapa Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | loam   |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|--------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand | % silt | % clay |     |       |       |      |
| 14.3                         | 54.8<br>(14.2)  | 6.5 | 36.6   | 38.7   | 24.7   | 3.7 | 14.1  | 492.8 | 0.6  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 55

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | 2                 | -   | 7   |
| Rabbit | 30                | 19  | 84  |
| Elk    | -                 | -   | 1   |
| Deer   | 35                | 23  | 42  |
| Cattle | -                 | -   | 1   |

| Days use per acre (ha) |         |         |
|------------------------|---------|---------|
| '98                    | '03     | '08     |
| 6 (15)                 | -       | 16 (40) |
| -                      | -       | -       |
| -                      | -       | 1 (3)   |
| 41 (101)               | 33 (83) | 38 (93) |
| -                      | -       | -       |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 55

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Amelanchier utahensis</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>1240</b>                           | 400                                      | 260   | 440    | 540      | 240  | 27          | 52      | 44         | 26      | 26           | 45/42                     |
| 03                                   | <b>1780</b>                           | 220                                      | 740   | 440    | 600      | 300  | 22          | 25      | 34         | 20      | 20           | 35/34                     |
| 08                                   | <b>1020</b>                           | 60                                       | 380   | 260    | 380      | 160  | 12          | 14      | 37         | 16      | 18           | 39/40                     |
| <i>Artemisia nova</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>80</b>                             | -  | -     | -      | 80       | 160  | 0           | 0       | 100        | 75      | 75           | 8/17                      |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>2100</b>                           | 80                                       | 240   | 1400   | 460      | 480  | 17          | .95     | 22         | 6       | 6            | 21/28                     |
| 03                                   | <b>1880</b>                           | -  | -     | 940    | 940      | 920  | 40          | 3       | 50         | 22      | 22           | 22/26                     |
| 08                                   | <b>4820</b>                           | 4640                                     | 1980  | 2060   | 780      | 740  | 9           | 1       | 16         | 7       | 7            | 20/25                     |
| <i>Cercocarpus montanus</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 44/52                     |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Gutierrezia sarothrae</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 8/9                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Juniperus osteosperma</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>160</b>                            | 20                                       | 100   | 60     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>160</b>                            | -  | 60    | 100    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>260</b>                            | 80                                       | 160   | 100    | -        | -    | 0           | 0       | -          | -       | 8            | -/-                       |
| <i>Opuntia sp.</i>                   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/12                      |
| 03                                   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 4/15                      |
| 08                                   | <b>60</b>                             | -  | -     | 60     | -        | -    | 0           | 0       | -          | -       | 0            | 6/11                      |
| <i>Pinus edulis</i>                  |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>60</b>                             | 20                                       | 60    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>60</b>                             | -  | 40    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |  |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|--|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |  |
| <b>Pinus monophylla</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 98                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 03                        | <b>40</b>                             | -  | 40    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| 08                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |  |
| <b>Purshia tridentata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 98                        | <b>300</b>                            | -  | -     | 260    | 40       | 20   | 0           | 93      | 13         | 13      | 13           | 20/34                     |  |
| 03                        | <b>260</b>                            | -  | -     | 160    | 100      | 100  | 23          | 69      | 38         | -       | 0            | 14/29                     |  |
| 08                        | <b>220</b>                            | -  | -     | 100    | 120      | 60   | 0           | 91      | 55         | 45      | 45           | 12/21                     |  |
| <b>Quercus gambelii</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |  |
| 98                        | <b>160</b>                            | 20                                       | 120   | 40     | -        | -    | 0           | 13      | -          | -       | 13           | 31/30                     |  |
| 03                        | <b>200</b>                            | -  | 160   | 40     | -        | -    | 0           | 20      | -          | -       | 0            | 46/37                     |  |
| 08                        | <b>760</b>                            | -  | 560   | 200    | -        | -    | 5           | 0       | -          | -       | 3            | 40/38                     |  |

Trend Study 30-56-08

Study site name: Woolsey Reseed.

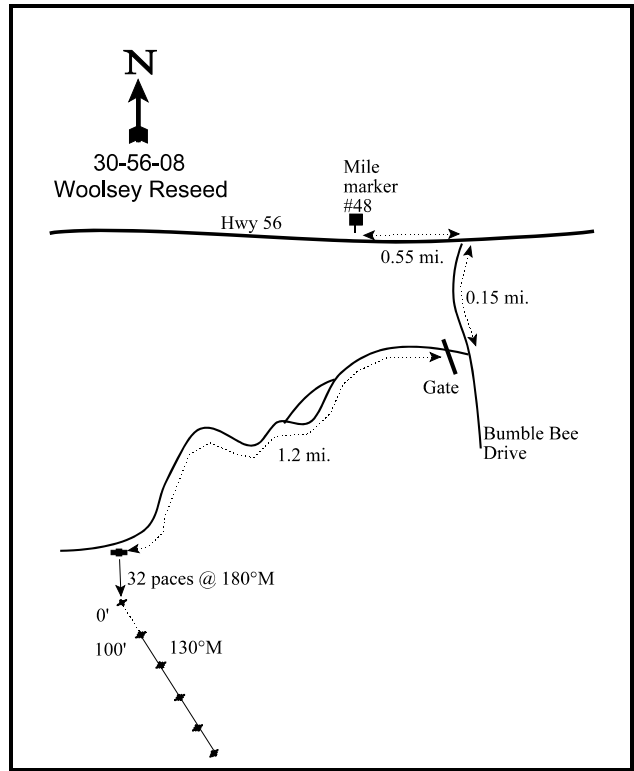
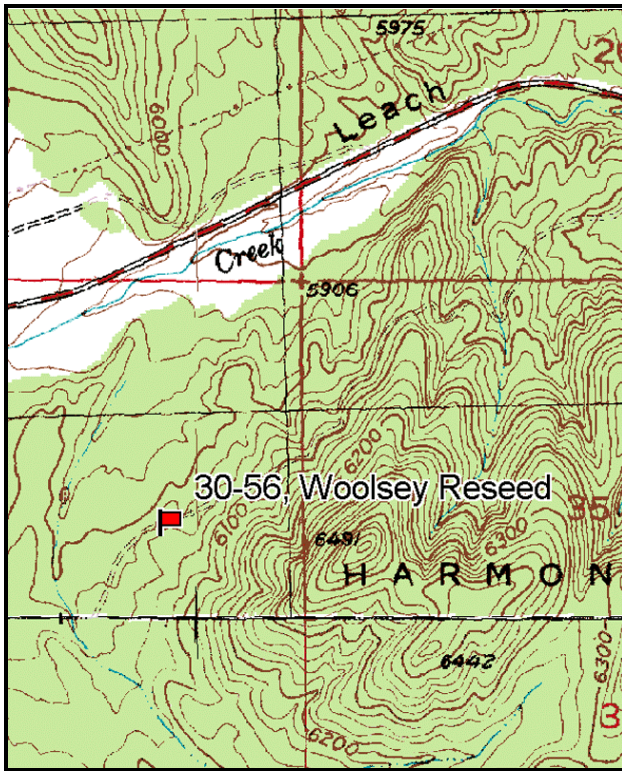
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 130 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From mile marker 48 on Highway 56 go east 0.55 miles to Bumblebee drive. Turn right (south) and travel 0.15 miles crossing a bridge to a right turn. Take this turn, go thru a gate, and proceed 1.2 miles to a witness post in a chaining. From the witness post the 0-foot stake is 32 paces directly south. The 0-foot stake is marked by browse tag # 95. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map Name: Desert Mound

Diagrammatic Sketch

Township 36S, Range 13W, Section 34

GPS: NAD 83, UTM 12S 297607 E, 4166888 N

## DISCUSSION

### Woolsey Seeding - Trend Study No. 30-56

#### Study Information

This trend study was established in 1998. It is located on the Woolsey seeding and samples a chained and seeded pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) site that is considered important deer winter range [elevation: 6,000 feet; slope: 10%-15%; northwest aspect]. The land is administered by the BLM and was treated by lop and scatter between 2003 and 2008. Deer are thought to concentrate on the chaining during the winter and cattle also graze the area during the spring and summer. Pellet group data estimated 37 deer days use/acre in 1998 and 44 in 2003 (91 and 109 ddu/ha, respectively). Cattle use was estimated at 55 cow days use/acre in 1998 and 26 in 2003 (136 and 65cdu/ha, respectively). Pellet data from 2008 estimated 3 elk days use/acre (8 edu/ha), 41 deer days use/acre (101 ddu/ha), 9 cow days use/acre (22 cdu/ha), and 3 sheep days use/acre (8 sdu/ha). Escape cover for deer is abundant in the form of large serviceberry on the site and unchained pinyon and juniper trees about 500 feet to the east.

#### Soil

Soil on the site is moderately deep, and rocky on the surface and through the profile. Effective rooting depth is estimated at 16 inches. Soil texture is a clay loam which is neutral in reaction (pH 7.0). Phosphorus is low at only 6.1 ppm and may limit plant growth and development (Tiedemann and Lopez 2004). Erosion is not a problem on the site due to the abundant protective ground cover consisting primarily of herbaceous vegetation and old chaining litter. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

The site supports low densities of several preferred browse species including Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), dwarf rabbitbrush (*Chrysothamnus depressus*), rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), cliffrose (*Cowania mexicana* ssp. *stansburiana*), antelope bitterbrush (*Purshia tridentata*), and curlleaf and true mountain mahogany (*Cercocarpus ledifolius* and *C. montanus*). The most abundant of these is rubber rabbitbrush which numbered about 300 plants/acre in 1998 and 2003 then declined to 200 plants/acre in 2008. Most of the other preferred shrubs were not adequately sampled because they occur in such limited numbers. Cliffrose and bitterbrush were heavily hedged with serviceberry moderately utilized during both readings. True mountain mahogany and curlleaf mountain mahogany were also heavily hedged during both readings. Young pinyon and juniper trees were released by the chaining. These are young trees in the 4 to 6 foot class, not killed by the chaining. They were fairly abundant. Point-quarter data from 2003 estimated 63 Utah juniper and 41 pinyon trees/acre while in 2008 only 20 juniper and 18 pinyon trees occurred per acre after the lop and scatter treatment. Pinyon and juniper provided nearly 4% cover which accounted for 53% of the shrub cover in 1998, and a line-intercept canopy cover of 6% for juniper and 1.25% for pinyon, over a twofold increase since 1998. After the treatment in 2008, pinyon and juniper provided no quadrat or line-intercept cover.

#### Herbaceous Understory

Seeded grasses dominate the site. Crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), and Russian wildrye (*Elymus junceus*) are abundant and provided 96% of grass cover in 1998, 99% in 2003, and 98% in 2008. Three native perennial grasses are also present in small numbers as is the annual cheatgrass (*Bromus tectorum*). The forb component is diverse with 15 and 17 species

encountered in 1998 and 2003, respectively. However, all species occur rarely and all perennial forbs combined produced less than 1% cover during all readings.

#### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - very poor-poor (33) mid-level potential scale

#### 2003 TREND ASSESSMENT

Trend for browse is stable although the browse component is limited, browse accounts for 16% of vegetation cover. There are several preferred species which occur in very small numbers and are heavily hedged. All species, serviceberry, mountain big sagebrush, curleaf mahogany, rubber rabbitbrush, cliffrose, and bitterbrush, displayed normal vigor even with the heavy use. Trend for the herbaceous understory is down. Sum of nested frequency for perennial grasses declined by 37% since 1998. There was some difficulty differentiating crested and intermediate wheatgrass in 2003 due to late flowering. However, the combined nested frequency value for these grasses declined 34%. Nested frequency of the only other seeded grass, Russian wildrye, also declined significantly. Average cover of perennial grasses declined more than two-fold from 27% to 11%. Forbs remain diverse but all species are rare in their occurrence. Nested frequency of perennial forbs also declined although total cover of forbs remained similar to 1998 levels due to an increase in annual forb cover.

winter range condition (DCI) - very poor (26) mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - stable (0)

#### 2008 TREND ASSESSMENT

Browse trend is stable. Serviceberry density has increased 50% to 60 plants/acre with no decadence, and recruitment of young plants is good at 33% of the population. Mountain big sagebrush density is constant at 20 plants/acre. Low rabbitbrush is on a downward trend as density has decreased 60% to 40 plants/acre since 2003 and no recruitment was noted. Trend for the grasses is up. The herbaceous understory has improved greatly due to a three-fold increase in perennial grass cover to 39%, and a 22% increase in the sum of nested frequency. Cheatgrass is increasing on the site, but still accounts for less than 1% of cover. The trend for forbs is stable, but forbs are rare on the site. The sum of nested frequency of perennial forbs is similar to 2003, though cover of perennial forbs has decreased to less than 0.5%.

winter range condition (DCI) - very poor (32) mid-level potential scale

browse - stable (0)

grass - up (+2)

forb - stable (0)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 56

| Type                        | Species                            | Nested Frequency  |                  |                  | Average Cover % |       |       |
|-----------------------------|------------------------------------|-------------------|------------------|------------------|-----------------|-------|-------|
|                             |                                    | '98               | '03              | '08              | '98             | '03   | '08   |
| G                           | <i>Agropyron cristatum</i>         | <sub>ab</sub> 190 | <sub>b</sub> 262 | <sub>a</sub> 186 | 8.09            | 8.57  | 16.59 |
| G                           | <i>Agropyron intermedium</i>       | <sub>b</sub> 287  | <sub>a</sub> 54  | <sub>a</sub> 51  | 13.56           | 1.39  | 2.34  |
| G                           | <i>Bromus inermis</i>              | -                 | -                | 1                | -               | -     | .00   |
| G                           | <i>Bromus tectorum</i> (a)         | <sub>b</sub> 75   | <sub>a</sub> 14  | <sub>b</sub> 85  | .75             | .04   | .34   |
| G                           | <i>Elymus junceus</i>              | <sub>b</sub> 110  | <sub>a</sub> 57  | <sub>c</sub> 204 | 4.10            | 1.38  | 19.44 |
| G                           | <i>Oryzopsis hymenoides</i>        | -                 | -                | 6                | .03             | .00   | .15   |
| G                           | <i>Poa secunda</i>                 | 4                 | 2                | 2                | .01             | .03   | .00   |
| G                           | <i>Sitanion hystrix</i>            | <sub>ab</sub> 3   | <sub>a</sub> -   | <sub>b</sub> 7   | .15             | -     | .36   |
| Total for Annual Grasses    |                                    | 75                | 14               | 85               | 0.75            | 0.04  | 0.34  |
| Total for Perennial Grasses |                                    | 594               | 375              | 457              | 25.96           | 11.39 | 38.92 |
| Total for Grasses           |                                    | 669               | 389              | 542              | 26.71           | 11.43 | 39.26 |
| F                           | <i>Astragalus</i> sp.              | 5                 | 1                | 6                | .09             | .00   | .03   |
| F                           | <i>Collinsia parviflora</i> (a)    | -                 | -                | 2                | -               | -     | .00   |
| F                           | <i>Cryptantha</i> sp.              | <sub>a</sub> -    | <sub>ab</sub> 4  | <sub>b</sub> 10  | -               | .03   | .05   |
| F                           | <i>Cymopterus</i> sp.              | 7                 | 8                | -                | .09             | .04   | -     |
| F                           | <i>Dalea flavescens</i>            | 5                 | -                | 2                | .30             | -     | .00   |
| F                           | <i>Descurainia pinnata</i> (a)     | <sub>a</sub> 5    | <sub>b</sub> 22  | <sub>a</sub> -   | .01             | .14   | -     |
| F                           | <i>Draba</i> sp. (a)               | <sub>b</sub> 11   | <sub>c</sub> 27  | <sub>a</sub> -   | .03             | .16   | -     |
| F                           | <i>Eriogonum shockleyi</i>         | -                 | -                | -                | -               | -     | .00   |
| F                           | <i>Eriogonum umbellatum</i>        | 3                 | 2                | -                | .03             | .03   | -     |
| F                           | <i>Lappula occidentalis</i> (a)    | 3                 | 15               | 3                | .01             | .20   | .01   |
| F                           | <i>Lesquerella</i> sp.             | 4                 | 3                | 6                | .07             | .01   | .01   |
| F                           | <i>Lotus utahensis</i>             | 2                 | -                | 2                | .03             | -     | .00   |
| F                           | <i>Lupinus argenteus</i>           | 3                 | -                | -                | .00             | -     | -     |
| F                           | <i>Microsteris gracilis</i> (a)    | <sub>b</sub> 21   | <sub>ab</sub> 8  | <sub>a</sub> 3   | .05             | .02   | .01   |
| F                           | <i>Pedicularis centranthera</i>    | -                 | 6                | 5                | -               | .44   | .18   |
| F                           | <i>Penstemon</i> sp.               | 4                 | 4                | 2                | .00             | .01   | .00   |
| F                           | <i>Petradoria pumila</i>           | 9                 | 4                | -                | .18             | .01   | .00   |
| F                           | <i>Phlox hoodii</i>                | 5                 | 4                | 1                | .04             | .01   | .00   |
| F                           | <i>Phlox longifolia</i>            | -                 | 1                | -                | -               | .00   | -     |
| F                           | <i>Polygonum douglasii</i> (a)     | -                 | 6                | 9                | -               | .01   | .02   |
| F                           | <i>Ranunculus testiculatus</i> (a) | -                 | 1                | 35               | -               | .00   | .10   |
| F                           | <i>Streptanthus cordatus</i>       | 2                 | 13               | 8                | .01             | .03   | .04   |
| Total for Annual Forbs      |                                    | 40                | 79               | 52               | 0.10            | 0.54  | 0.14  |

| T<br>y<br>p<br>e | Species                   | Nested Frequency |     |     | Average Cover % |      |      |
|------------------|---------------------------|------------------|-----|-----|-----------------|------|------|
|                  |                           | '98              | '03 | '08 | '98             | '03  | '08  |
|                  | Total for Perennial Forbs | 49               | 50  | 42  | 0.85            | 0.64 | 0.34 |
|                  | Total for Forbs           | 89               | 129 | 94  | 0.96            | 1.19 | 0.49 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 56

| T<br>y<br>p<br>e | Species                            | Strip Frequency |     |     | Average Cover % |      |      |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|------|------|
|                  |                                    | '98             | '03 | '08 | '98             | '03  | '08  |
| B                | Amelanchier utahensis              | 2               | 1   | 2   | .85             | .98  | .98  |
| B                | Artemisia tridentata vaseyana      | 1               | 1   | 1   | .00             | .00  | .03  |
| B                | Cercocarpus montanus               | 1               | 1   | 1   | .00             | .00  | .00  |
| B                | Chrysothamnus depressus            | 18              | 4   | 2   | .55             | .00  | .03  |
| B                | Chrysothamnus nauseosus hololeucus | 8               | 6   | 7   | 1.56            | .45  | .64  |
| B                | Chrysothamnus viscidiflorus        | 0               | 0   | 0   | -               | -    | .15  |
| B                | Cowania mexicana stansburiana      | 0               | 3   | 2   | -               | .00  | .15  |
| B                | Eriogonum microthecum              | 3               | 3   | 10  | .03             | .01  | .04  |
| B                | Gutierrezia sarothrae              | 20              | 20  | 41  | .45             | .26  | .81  |
| B                | Juniperus osteosperma              | 4               | 4   | 0   | 1.94            | 5.10 | .00  |
| B                | Opuntia sp.                        | 0               | 1   | 0   | -               | .00  | -    |
| B                | Pinus edulis                       | 3               | 1   | 0   | 1.97            | .18  | -    |
| B                | Purshia tridentata                 | 0               | 0   | 0   | .03             | -    | -    |
| B                | Ribes sp.                          | 1               | 0   | 0   | .00             | -    | -    |
|                  | Total for Browse                   | 61              | 45  | 66  | 7.40            | 6.98 | 2.83 |



CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 56

| Species                            | Percent Cover |      |     |
|------------------------------------|---------------|------|-----|
|                                    | '98           | '03  | '08 |
| Amelanchier utahensis              | -             | .81  | .98 |
| Artemisia tridentata vaseyana      | -             | -    | .11 |
| Chrysothamnus nauseosus hololeucus | -             | .16  | -   |
| Cowania mexicana stansburiana      | -             | .08  | .20 |
| Gutierrezia sarothrae              | -             | .50  | .68 |
| Juniperus osteosperma              | .60           | 6.15 | -   |
| Pinus edulis                       | 2.20          | 1.26 | -   |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 56

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Amelanchier utahensis         | 1.6                        | 1.4 |
| Cowania mexicana stansburiana | 1.8                        | 0.5 |
| Purshia tridentata            | 0.9                        | 0.9 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 56

| Species               | Trees per Acre |     |     |
|-----------------------|----------------|-----|-----|
|                       | '98            | '03 | '08 |
| Juniperus osteosperma | 59             | 63  | 20  |
| Pinus edulis          | 28             | 41  | 18  |

| Average diameter (in) |     |     |
|-----------------------|-----|-----|
| '98                   | '03 | '08 |
| 2.0                   | 3.4 | 1.8 |
| 2.0                   | 2.3 | -   |

BASIC COVER --

Management unit 30 , Study no: 56

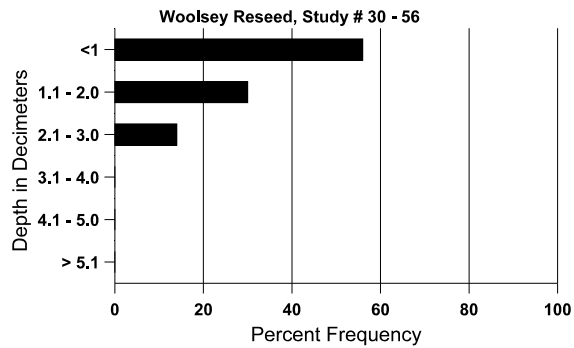
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 39.56           | 20.13 | 42.75 |
| Rock        | 5.94            | 8.19  | 5.01  |
| Pavement    | 9.63            | 19.89 | 15.67 |
| Litter      | 52.22           | 47.84 | 46.15 |
| Cryptogams  | .24             | .04   | .43   |
| Bare Ground | 18.28           | 10.11 | 7.16  |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 56, Study Name: Woolsey Reseed

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand    | % silt | % clay |     |       |       |      |
| 16.1                         | 51.6 (16.3)     | 7.0 | 38.0      | 25.4   | 36.6   | 3.5 | 6.1   | 118.4 | 0.7  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 56

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Sheep  | -                 | -   | 1   |
| Rabbit | 25                | 23  | 90  |
| Deer   | 24                | 30  | 39  |
| Cattle | 11                | 8   | 4   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | 3 (8.3)  |
| -                      | -        | -        |
| 36 (89)                | 44 (109) | 41 (101) |
| 54 (133)               | 26 (64)  | 9 (22)   |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 56

|   |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y   | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Amelanchier utahensis</b>              |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>40</b>                             | -  | -     | 40     | -        | -    | 100         | 0       | -          | -       | 0            | 37/51                     |
| 03  | <b>40</b>                             | 20                                       | 20    | 20     | -        | -    | 50          | 0       | -          | -       | 0            | 58/70                     |
| 08  | <b>60</b>                             | 60                                       | 20    | 40     | -        | -    | 33          | 33      | -          | -       | 0            | 72/93                     |
| <b>Artemisia tridentata vaseyana</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | -          | -       | 0            | 8/-                       |
| 08  | <b>20</b>                             | 80                                       | -     | 20     | -        | 20   | 0           | 0       | -          | -       | 0            | 14/15                     |
| <b>Cercocarpus ledifolius</b>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 35/47                     |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 34/53                     |
| <b>Cercocarpus montanus</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 100     | 0          | -       | 0            | 50/54                     |
| 03  | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 100     | 100        | -       | 0            | 64/60                     |
| 08  | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 100     | 100        | 100     | 100          | 38/44                     |
| <b>Chrysothamnus depressus</b>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>620</b>                            | 20                                       | 100   | 520    | -        | -    | 0           | 0       | -          | -       | 0            | 4/6                       |
| 03  | <b>100</b>                            | -  | 20    | 80     | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| 08  | <b>40</b>                             | -  | -     | 40     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Chrysothamnus nauseosus hololeucus</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>300</b>                            | -  | 40    | 180    | 80       | -    | 40          | 0       | 27         | 13      | 13           | 34/43                     |
| 03  | <b>320</b>                            | -  | -     | 300    | 20       | 60   | 6           | 0       | 6          | -       | 0            | 30/38                     |
| 08  | <b>200</b>                            | -  | 40    | 100    | 60       | 80   | 30          | 20      | 30         | 30      | 30           | 30/32                     |
| <b>Chrysothamnus viscidiflorus</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08  | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 9/14                      |
| <b>Cowania mexicana stansburiana</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98  | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | 0          | -       | 0            | 62/66                     |
| 03  | <b>60</b>                             | -  | -     | 40     | 20       | -    | 0           | 33      | 33         | -       | 0            | 54/56                     |
| 08  | <b>40</b>                             | -  | 20    | 20     | -        | -    | 0           | 50      | 0          | -       | 0            | 73/58                     |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Eriogonum microthecum</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 60                                    | -  | 20    | 40     | -        | -    | 0           | 0       | 0          | -       | 0            | 4/11                      |
| 03                           | 80                                    | -  | -     | 60     | 20       | -    | 100         | 0       | 25         | -       | 0            | 1/2                       |
| 08                           | 220                                   | 40                                       | -     | 220    | -        | -    | 18          | 0       | 0          | -       | 0            | 3/4                       |
| <i>Gutierrezia sarothrae</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 1180                                  | 80                                       | 60    | 1120   | -        | 20   | 0           | 0       | 0          | -       | 0            | 7/10                      |
| 03                           | 1260                                  | 640                                      | 40    | 1180   | 40       | 40   | 0           | 0       | 3          | 2       | 2            | 5/6                       |
| 08                           | 1920                                  | 2020                                     | 220   | 1060   | 640      | 100  | 1           | 2       | 33         | 8       | 8            | 6/9                       |
| <i>Juniperus osteosperma</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 100                                   | 40                                       | 40    | 60     | -        | 60   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 100                                   | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | 60                                       | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Opuntia sp.</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 4/5                       |
| <i>Pediocactus simpsonii</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| <i>Pinus edulis</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 60                                    | -  | 40    | 20     | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Purshia tridentata</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 33/70                     |
| 03                           | 0                                     | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | 27/37                     |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 27/34                     |
| <i>Ribes sp.</i>             |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 80                                    | -  | -     | 80     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Sclerocactus sp.</i>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 3/7                       |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-57-08

Study site name: Summit Spring.

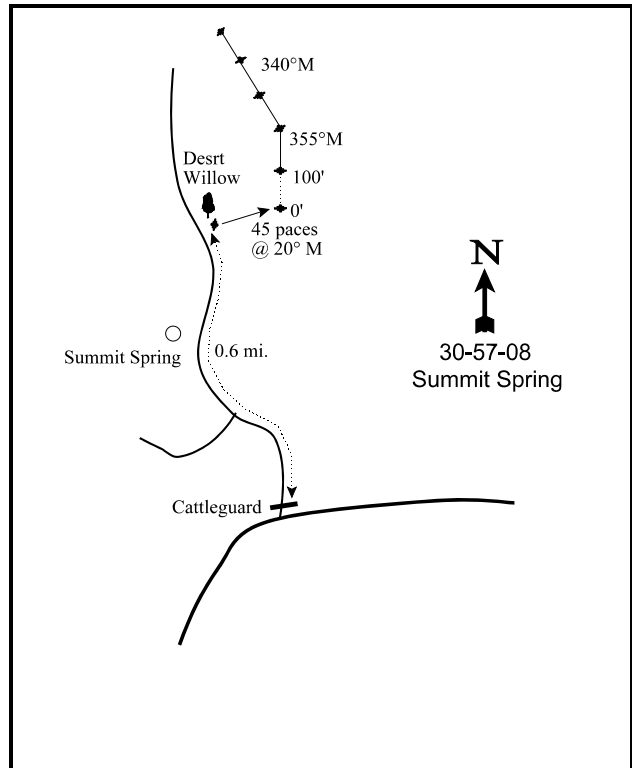
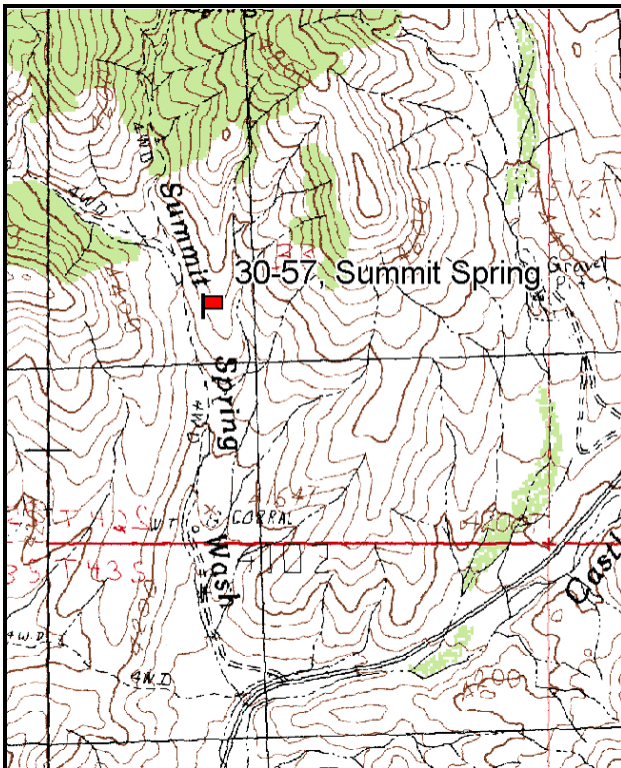
Vegetation type: Black Brush.

Compass bearing: frequency baseline 355 degrees magnetic. (lines 3-5, 340° M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From Utah Hill Summit, drive 2.9 miles to the Lytle Ranch turnoff, just south of Castle Cliff. Proceed northeast for approximately 1.5 miles to a dirt road on the left (north) that leads to Summit Spring. From the highway, go 0.3 miles to a cattle watering trough and corral. Continue 0.3 miles further to a desert willow on the right (east) side of the road. The 0-foot stake is 45 paces at 20 degrees magnetic from the desert willow. The 0-foot stake has browse tag #494 attached. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map Name Jarvis Peak

Diagrammatic Sketch

Township 42S, Range 18W, Section 33

GPS: NAD 83, UTM 12S 244800 E, 4108320 N

## DISCUSSION

### Summit Spring - Trend Study No. 30-57

#### Study Information

This trend study was established in 1998, and was placed about one-half mile south of Summit Spring [elevation: 4,300 feet (1,311 m), slope: 25%-35%, aspect: west]. The study samples winter range on the southwest side of the Pine Valley unit, and the transect samples a desert shrub community. This area burned in the 2005 Westside Complex fire and was aerially seeded that winter. This removed quite a bit of browse cover. The area is grazed by cattle, and cattle were present near the site during study site establishment on June 2<sup>nd</sup> of 1998 and during the 2003 reading on May 20th. A cattle watering trough, which is apparently fed by a pipe from nearby Summit Spring, is found about one-quarter of a mile to the south. Pellet group data estimated a high level of deer use at 61 days use/acre (151 ddu/ha) in 1998 and 76 days use/acre (187 ddu/ha) in 2003. Cow use was estimated at 4 days use/acre (10 cdu/ha) in 1998 and 7 days use/acre (18 cdu/ha) in 2003. Pellet group data from 2008 estimated 44 deer days use/acre (109 ddu/ha) and 1 cow day use/acre (2 cdu/ha). Cattle use is higher on the more level areas and along the ridge top.

#### Soil

Soil on the site is relatively shallow and very rocky. Effective rooting depth is estimated at nearly 14 inches. Soil texture is a sandy loam which is neutral in reaction (pH 6.9). Relative combined vegetation and litter cover has ranged from 49%-55%, and relative combined rock and pavement cover has ranged from 40%-43% since 1998. Relative bare ground cover has increased from around 5% in 1998 and 2003 to 10% in 2008. Some erosion is apparent due to the steep slope, but is localized and the soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

The fire in 2004 removed much of the browse component on this site. Prior to the fire, the site supported 12 shrub species, including the preferred browse species Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and green ephedra (*Ephedra viridis*). Blackbrush (*Coleogyne ramosissima*), slenderbush eriogonum (*Eriogonum microthecum*), and desert peachbush (*Prunus fasciculata*) also provide browse forage. In 2003, cliffrose provided 27% of the browse cover with an estimated density of about 230 plants/acre. Mature plants were large, averaging about 4 feet in height with a crown diameter of over 5 feet. They displayed light to moderate use and good vigor in 1998 with much heavier use in 2003. In 2008, after the fire, cliffrose cover and density had dropped to 1% and 20 plants/acre. Vigor was poor on all plants in 2008 and the entire population was comprised of young plants.

Green ephedra density was estimated at 680 plants/acre in 1998, 500 plants/acre in 2003 and no plants in 2008, after the fire. Blackbrush occurred at a low density of about 200 plants/acre in 2003 but were not found in 2008. They were lightly browsed in 1998 but more heavily utilized in 2003. In 2003 Desert peachbush was found at relatively low densities (180 plants/acre), and contributed 25% of the browse cover. This increased in 2008 to 240 plants/acre and 64% of browse cover. They also displayed light use in 1998, with heavier use in 2003 and 2008. Decadence increased from 0% in 1998 to 33% in 2003 and fell back to 0% in 2008. Recruitment of young plants comprised 25% of the population.

Undesirable shrubs found on the site include threadleaf snakeweed (*Gutierrezia microcephala*), Mojave desertrose or turpentine bush (*Haplopappus laricifolius*), and Datil yucca or banana yucca (*Yucca baccata* ssp. *baccata*). Snakeweed was the most abundant with a density of 1,720 plants/acre in 1998. Drought has caused a 80% drop in density to 340 plants/acre in 2003. After the fire, the density decreased further to 160 plants/acre in 2008. Turpentine bush has remained more stable in density. Narrowleaf goldenweed (*Haplopappus linearifolius*) has also been effected by drought. It declined 74% in density in 2003 from 780 to 200 plants/acre, with no plants sampled in 2008, after the fire.

Herbaceous Understory

The herbaceous understory is very poor and depleted. Cheatgrass (*Bromus tectorum*) totally dominated understory with 99% of the grass cover and 79% of the herbaceous cover in 1998. No perennial grasses were sampled on the site in 1998, however, some Indian ricegrass was observed growing under the protection of shrubs. A few Sandberg bluegrass plants were encountered in 2003. The grass component was even worse in 2008 with grasses providing only 2% of the total vegetation cover. However, cheatgrass nested frequency decreased significantly from 2003 to 2008, and cheatgrass cover decreased from 13% to just over 1%. Perennial grasses are still rare and provide minimal cover. The forb component is also poor with storksbill (*Erodium cicutarium*) providing 97% of the forb cover and 81% of vegetation cover in 2008. Other forbs are rare and only a few perennial species were found. Perennial grass and forb cover combined, provide less than one-half of 1% cover. The only dependable forage source for deer or cattle on this site comes from the shrubs, although cheatgrass and storksbill can be utilized in the spring and fall under the right conditions.

Seed Mix - Westside Complex

| <b>Seeded Species</b> | <b>lbs./acre</b> |
|-----------------------|------------------|
| Pubescent             | 2.50             |
| Hycrest Wheatgrass    | 2.50             |
| Indian Ricegrass      | 0.50             |
| Sideoats Grama        | 0.50             |
| Galleta               | 0.25             |
| Thickspike            | 0.50             |
| Sand Dropseed         | 0.25             |
| Lewis Flax            | 0.50             |
| Small Burnet          | 0.50             |
| Alfalfa               | 0.50             |
| Yellow                | 0.50             |
| Bee Plant             | 0.10             |
| Fourwing Saltbush     | 0.10             |
| Winterfat             | 0.25             |
| Blanket Flower        | 0.10             |
| Forage Kochia         | 1.00             |

1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - poor (14) low potential scale

2003 TREND ASSESSMENT

Preferred shrubs, cliffrose, blackbrush, and green ephedra, show heavier use compared to 1998. Vigor has remained good on most plants. The exception is cliffrose where the number of decadent plants has increased but is not of concern for this species as it commonly goes into and out of periods of decadence. Reproduction is poor this year, yet it is not a problem for a long-lived species. The small population of desert peachbush has remained stable in density even though decadence increased from 0% to 33%. One positive aspect of the browse trend is the 80% decline in snakeweed. Trend for the herbaceous understory is stable yet very depleted. The herbaceous understory is still totally dominated by annuals, primarily cheatgrass and storksbill. Cheatgrass has declined significantly in nested frequency and average cover declined from 22% to 13%. However, cheatgrass still accounts for 92% of the grass cover. Storksbill increased significantly in nested frequency and it provides 75% of the total forb cover. There are very few perennial grasses or forbs on the site except for some Sandberg bluegrass (*Poa secunda*) that was encountered in 2003. Due to the lack of perennial herbaceous plants, livestock and wildlife are dependent on shrubs for most of their forage needs.

winter range condition (DCI) - very poor-poor (11) low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2008 TREND ASSESSMENT

Browse trend is down, due to the fire Cliffrose has decreased in density 92% to 20 plants/acre all of which are young and in poor vigor. Ephedra and blackbrush were not sampled on the site in 2008. Desert peachbush has increased 33% to 240 plants/acre with no decadence.

Herbaceous understory is very poor. Cheatgrass accounts for 73% of grass cover but has decreased greatly in frequency and cover. No other grass species contribute much, but due to the decrease in cheatgrass trend is slightly up. Forbs are dominated by storksbill which accounts for 95% of forbs and 81% of vegetation cover which is great for ground cover but is still an annual species.

winter range condition (DCI) - very poor (0) low potential scale

browse - down (-2)

grass - slightly up (+1)

forb - slightly down (0)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 57

| T<br>y<br>p<br>e | Species              | Nested Frequency |                  |                  | Average Cover % |       |      |
|------------------|----------------------|------------------|------------------|------------------|-----------------|-------|------|
|                  |                      | '98              | '03              | '08              | '98             | '03   | '08  |
| G                | Aristida purpurea    | -                | -                | 2                | -               | -     | .00  |
| G                | Bromus rubens (a)    | <sub>a</sub> -   | <sub>c</sub> 90  | <sub>b</sub> 33  | -               | .73   | .26  |
| G                | Bromus tectorum (a)  | <sub>c</sub> 432 | <sub>b</sub> 375 | <sub>a</sub> 220 | 21.97           | 12.97 | 1.44 |
| G                | Oryzopsis hymenoides | -                | -                | -                | .00             | -     | -    |
| G                | Poa secunda          | <sub>a</sub> -   | <sub>b</sub> 17  | <sub>a</sub> 5   | -               | .24   | .01  |



| Type                        | Species                   | Nested Frequency |                        |      | Average Cover % |       |       |
|-----------------------------|---------------------------|------------------|------------------------|------|-----------------|-------|-------|
|                             |                           | '98              | '03                    | '08  | '98             | '03   | '08   |
|                             |                           | G                | Sporobolus cryptandrus | a-   | a-              | b12   | -     |
| G                           | Stipa lettermani          | -                | -                      | 4    | -               | -     | .03   |
| G                           | Vulpia octoflora (a)      | a4               | b28                    | b32  | .00             | .18   | .14   |
| Total for Annual Grasses    |                           | 436              | 493                    | 285  | 21.98           | 13.89 | 1.84  |
| Total for Perennial Grasses |                           | 0                | 17                     | 23   | 0.00            | 0.24  | 0.12  |
| Total for Grasses           |                           | 436              | 510                    | 308  | 21.98           | 14.13 | 1.96  |
| F                           | Aster sp.                 | 6                | -                      | -    | .04             | -     | -     |
| F                           | Astragalus sp.            | a-               | a-                     | b10  | -               | -     | .02   |
| F                           | Compositae                | -                | 2                      | -    | -               | .00   | -     |
| F                           | Cryptantha sp.(a)         | -                | -                      | 3    | -               | -     | .00   |
| F                           | Cryptantha sp.            | 3                | -                      | 4    | .00             | -     | .15   |
| F                           | Descurainia pinnata (a)   | a-               | b14                    | a1   | -               | .06   | .00   |
| F                           | Draba sp. (a)             | 8                | 7                      | 6    | .04             | .04   | .01   |
| F                           | Erodium cicutarium (a)    | a164             | b234                   | c430 | 5.59            | 5.94  | 27.18 |
| F                           | Eriogonum sp.             | -                | 4                      | 2    | -               | .15   | .00   |
| F                           | Eriophyllum wallacei      | -                | 5                      | -    | -               | .03   | -     |
| F                           | Euphorbia sp.             | -                | -                      | 5    | -               | -     | .15   |
| F                           | Galium sp.                | -                | 3                      | -    | -               | .03   | -     |
| F                           | Gilia sp. (a)             | a-               | b50                    | b31  | -               | .30   | .09   |
| F                           | Lappula occidentalis (a)  | a-               | b25                    | b3   | -               | .16   | .00   |
| F                           | Lygodesmia sp.            | -                | -                      | 3    | -               | -     | .15   |
| F                           | Microsteris gracilis (a)  | 2                | -                      | -    | .00             | -     | -     |
| F                           | Navarretia intertexta (a) | a-               | b41                    | b45  | -               | .52   | .18   |
| F                           | Oenothera sp.             | -                | 1                      | -    | -               | .03   | -     |
| F                           | Plantago patagonica (a)   | a10              | b47                    | b32  | .05             | .16   | .13   |
| F                           | Salvia columbariae        | 5                | -                      | -    | .19             | -     | -     |
| F                           | Sedum lanceolatum         | a-               | b17                    | a-   | -               | .26   | -     |
| F                           | Unknown forb-annual (a)   | a-               | b33                    | a-   | -               | .22   | -     |
| Total for Annual Forbs      |                           | 184              | 451                    | 551  | 5.68            | 7.42  | 27.61 |
| Total for Perennial Forbs   |                           | 14               | 32                     | 24   | 0.23            | 0.52  | 0.48  |
| Total for Forbs             |                           | 198              | 483                    | 575  | 5.92            | 7.94  | 28.10 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 57

| T<br>y<br>p<br>e | Species                              | Strip Frequency |     |     | Average Cover % |       |      |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|-------|------|
|                  |                                      | '98             | '03 | '08 | '98             | '03   | '08  |
| B                | <i>Cowania mexicana stansburiana</i> | 8               | 8   | 1   | 5.73            | 4.96  | .03  |
| B                | <i>Coleogyne ramosissima</i>         | 11              | 8   | 0   | -               | 2.01  | -    |
| B                | <i>Echinocereus engelmannii</i>      | 1               | 1   | 1   | .03             | -     | .03  |
| B                | <i>Ephedra viridis</i>               | 17              | 14  | 0   | .65             | 1.97  | -    |
| B                | <i>Eriogonum microthecum</i>         | 0               | 0   | 0   | .03             | -     | -    |
| B                | <i>Gutierrezia microrcephala</i>     | 45              | 14  | 6   | 3.47            | .31   | .15  |
| B                | <i>Haplopappus linearifolius</i>     | 25              | 8   | 0   | 4.05            | .12   | -    |
| B                | <i>Opuntia sp.</i>                   | 1               | 1   | 1   | .00             | .15   | .01  |
| B                | <i>Prunus fasciculata</i>            | 5               | 9   | 10  | 4.85            | 5.05  | 2.14 |
| B                | <i>Thamnosma montana</i>             | 21              | 18  | 1   | .50             | 1.10  | -    |
| B                | <i>Yucca baccata baccata</i>         | 12              | 15  | 12  | 2.24            | 2.42  | 1.04 |
| Total for Browse |                                      | 146             | 96  | 32  | 21.59           | 18.13 | 3.41 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 57

| Species                              | Percent Cover |      |
|--------------------------------------|---------------|------|
|                                      | '03           | '08  |
| <i>Cowania mexicana stansburiana</i> | 4.58          | .20  |
| <i>Coleogyne ramosissima</i>         | 1.64          | -    |
| <i>Ephedra viridis</i>               | 1.56          | -    |
| <i>Gutierrezia microrcephala</i>     | .20           | .30  |
| <i>Haplopappus linearifolius</i>     | 1.08          | -    |
| <i>Prunus fasciculata</i>            | 4.88          | 2.26 |
| <i>Thamnosma montana</i>             | 2.84          | -    |
| <i>Yucca baccata baccata</i>         | 2.83          | .70  |

BASIC COVER --

Management unit 30 , Study no: 57

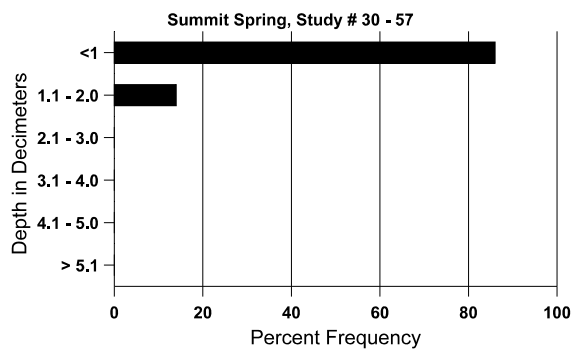
| Cover Type  | Average Cover % |       |       |
|-------------|-----------------|-------|-------|
|             | '98             | '03   | '08   |
| Vegetation  | 45.40           | 36.82 | 31.62 |
| Rock        | 19.40           | 18.57 | 18.63 |
| Pavement    | 34.65           | 32.18 | 25.23 |
| Litter      | 27.13           | 24.01 | 21.71 |
| Cryptogams  | 0               | .06   | 0     |
| Bare Ground | 6.44            | 6.24  | 11.21 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 57, Study Name: Summit Spring

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 13.9                         | 64.0<br>(15.9)  | 6.9 | 66.0       | 21.4  | 12.6  | 0.7 | 10.4  | 83.2  | 0.5  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 57

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 5                 | 3   | 4   |
| Elk    | -                 | -   | 2   |
| Deer   | 28                | 27  | 46  |
| Cattle | 1                 | 6   | 1   |

| Days use per acre (ha) |          |          |
|------------------------|----------|----------|
| '98                    | '03      | '08      |
| -                      | -        | -        |
| -                      | -        | -        |
| 61 (151)               | 76 (187) | 44 (109) |
| 4 (10)                 | 7 (18)   | 1 (2)    |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 57

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Cowania mexicana stansburiana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>220</b>                            | -  | 20    | 200    | -        | -    | 36          | 0       | 0          | -       | 0            | 47/64                     |
| 03                                   | <b>240</b>                            | -  | -     | 180    | 60       | -    | 0           | 92      | 25         | -       | 8            | 55/77                     |
| 08                                   | <b>20</b>                             | -  | 20    | -      | -        | -    | 0           | 0       | 0          | -       | 100          | 13/24                     |
| <i>Coleogyne ramosissima</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>240</b>                            | 80                                       | -     | 240    | -        | 20   | 8           | 0       | -          | -       | 0            | 27/46                     |
| 03                                   | <b>180</b>                            | -  | -     | 180    | -        | 40   | 89          | 11      | -          | -       | 0            | 32/49                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Echinocereus engelmannii</i>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 11/9                      |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 15/16                     |
| 08                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 100          | 6/7                       |
| <i>Ephedra viridis</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>680</b>                            | -  | 200   | 420    | 60       | -    | 29          | 0       | 9          | 6       | 6            | 21/29                     |
| 03                                   | <b>500</b>                            | -  | 20    | 440    | 40       | -    | 24          | 4       | 8          | 8       | 8            | 19/29                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 14/15                     |
| <i>Eriogonum microthecum</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | 18/27                     |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Grayia spinosa</i>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | 18/22                     |
| <i>Gutierrezia microrcephala</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>1740</b>                           | 100                                      | 140   | 1340   | 260      | 420  | 0           | 0       | 15         | 11      | 11           | 16/19                     |
| 03                                   | <b>340</b>                            | 120                                      | 20    | 80     | 240      | 1000 | 0           | 0       | 71         | 53      | 53           | 15/15                     |
| 08                                   | <b>160</b>                            | -  | 80    | 80     | -        | 20   | 0           | 0       | 0          | -       | 0            | 12/12                     |
| <i>Haplopappus linearifolius</i>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                                   | <b>780</b>                            | 20                                       | 100   | 460    | 220      | 180  | 0           | 0       | 28         | 5       | 5            | 22/31                     |
| 03                                   | <b>200</b>                            | 40                                       | -     | 100    | 100      | 600  | 0           | 0       | 50         | 30      | 40           | 21/27                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | 9/11                      |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Opuntia echinocarpa</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 23/15                     |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 20                                    | -  | 20    | -      | -        | 20   | 0           | 0       | -          | -       | 0            | 11/12                     |
| 03                           | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 12/11                     |
| 08                           | 20                                    | 20                                       | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/12                      |
| <b>Prunus fasciculata</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 180                                   | 40                                       | -     | 180    | -        | 20   | 11          | 0       | 0          | -       | 0            | 45/67                     |
| 03                           | 180                                   | -  | -     | 120    | 60       | -    | 11          | 22      | 33         | 11      | 11           | 48/70                     |
| 08                           | 240                                   | -  | 60    | 180    | -        | 20   | 0           | 33      | 0          | -       | 8            | 26/40                     |
| <b>Thamnosma montana</b>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 480                                   | 20                                       | 40    | 420    | 20       | 20   | 13          | 0       | 4          | -       | 4            | 16/34                     |
| 03                           | 400                                   | -  | -     | 340    | 60       | 40   | 0           | 0       | 15         | 10      | 15           | 17/33                     |
| 08                           | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | 0          | -       | 0            | 11/21                     |
| <b>Yucca baccata baccata</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 98                           | 740                                   | -  | -     | 640    | 100      | 80   | 0           | 0       | 14         | 8       | 8            | 31/39                     |
| 03                           | 800                                   | -  | -     | 800    | -        | -    | 0           | 0       | 0          | -       | 0            | 30/39                     |
| 08                           | 420                                   | -  | -     | 400    | 20       | 40   | 0           | 29      | 5          | -       | 33           | 23/30                     |

Trend Study 30-58-08

Study site name: Spirit Creek South Burned.

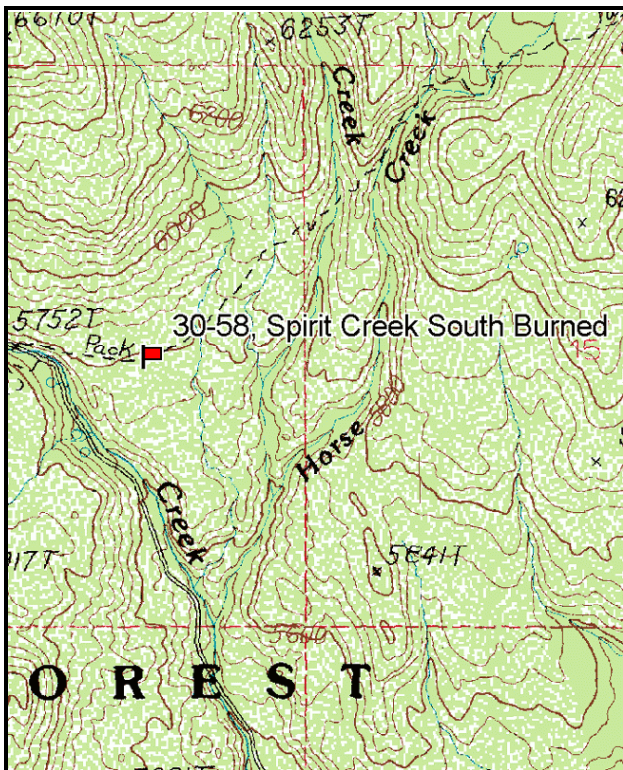
Vegetation type: Burn-seeding.

Compass bearing: frequency baseline 111 degrees magnetic. (Line 2, 94°M, line 3 &4, 15°M)

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft). No rebar.

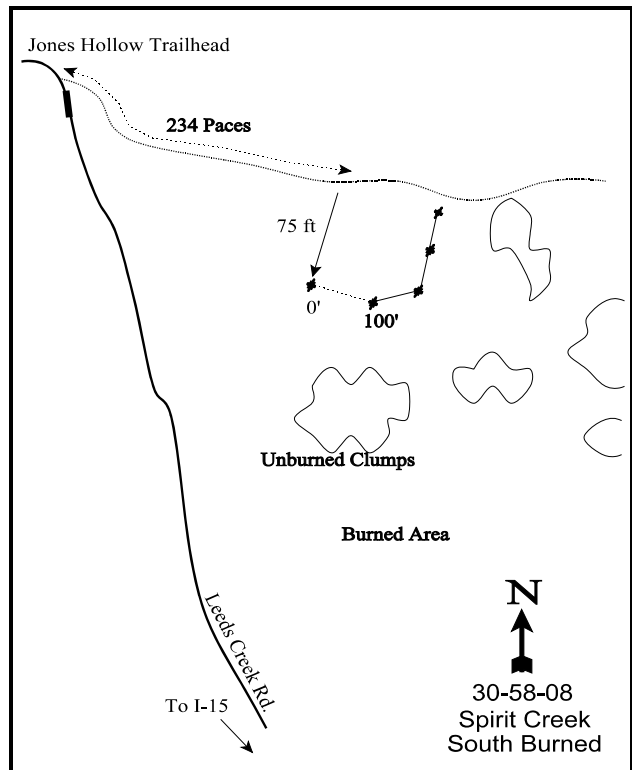
LOCATION DESCRIPTION

Traveling south on I-15 from Cedar City, take the first Leeds exit #23 (If traveling north, there is no off ramp at exit #23 take exit #22 and the frontage road to exit #23). Travel northwest on the Leeds Creek Road for 3.25 miles. Stay to the right at the fork and proceed about 4.0 miles towards the Oak Grove campground. Stop just past a bridge at the Jones Hollow (Blake-Harmony) trail head. Hike 234 paces up the trail to a 4-foot tall green fence post 75 feet southwest (212°M) of the trail. This is the 0-foot baseline stake. All stakes are 4 foot tall green fence posts.



Map Name: Signal Peak

Township 40S, Range 14W, Section 16



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 284967 E, 4131911 N

## DISCUSSION

### Spirit Creek South - Trend Study No. 30-58

#### Study Information

The Spirit Creek South Burn trend site consists of a nearly level grass meadow surrounded by Gambel oak (*Quercus gambelii*) and shrub-live oak (*Q. turbenella*) [elevation 5,800 feet (1,768 m), slope: 4-5%, aspect: southeast]. The site, which was previously a mountain big sagebrush (*Artemisia tridentata* ssp. *vaeyana*) flat, was burned in June of 1986 and seeded in early July by the Dixie National Forest. The area is important fawning habitat for mule deer which is evidenced by the abundant pellet groups in 1992. Pellet group data from 1998 also estimated a high level of use at 76 deer days use/acre (188 ddu/ha). Some of the deer pellet groups were fresh when the study was read in 1998 on June 4<sup>th</sup>. Deer use was much lighter in 2003 with just 17 days use/acre estimated (43 ddu/ha). Pellet group data from 2008 estimated very light use by elk at 1 elk day use/acre (2 edu/ha) and very heavy use by deer at 162 deer days use/acre (400 ddu/ha). No cattle grazing occurs in this area.

#### Soil

Soil is a deep sandy loam with little rock on the surface or within the profile. Effective rooting depth is estimated at over 27 inches. The soil is slightly acidic in reactivity (pH 6.1). Due to the flat topography, erosion is not a problem, even with high amounts of bare ground occurring after the fire. The study was established September 16, 1986, about 3 months after the fire. At that time, basal vegetation cover was less than one percent. Bare ground covered 94% of the ground surface, while litter cover left after the fire, averaged only 6%. The site was read again in September of 1987. Basal vegetation cover increased to 10%, litter increased to 16%, conversely bare ground declined to 74%. Some soil movement was noticed, yet it was not significant. During the 1992 reading, soil conditions continued to improve. Basal vegetation cover averaged 23%, while bare ground continued to decline significantly. Relative combined vegetation and litter cover has been high at 83%-88% since 1998, and relative bare ground cover has ranged from 12%-16% since 1998. The soil erosion condition was classified as stable in 2003 and 2008.

#### Browse

The site previously was dominated by mountain big sagebrush. Burned sagebrush stumps counted during the 1986 reading indicated a pre-burn density of approximately 7,100 plants/acre. The only browse left on the site in 1986 consisted of re-sprouting Gambel oak, which numbered 3,533 stems/acre. By 1987, there were an estimated 433 sagebrush seedlings/acre on the site. Desert ceanothus (*Ceanothus greggii*) and broom snakeweed (*Gutierrezia sarothrae*) seedlings also appeared in small numbers. Oak increased along the frequency baseline, but declined to 633 young plants/acre on the density plots. During the 1992 reading, there were an estimated 166 plants/acre of sagebrush, 19% of which were classified as decadent. All other sagebrush consisted of seedlings and young. Gambel oak continued to increase on the frequency belts, but disappeared in the density plots. Broom snakeweed occurred in small numbers. During the 1998 reading, the original 100 foot frequency baseline was extended another 300 feet in order to better sample the small meadow. Density of sagebrush increased to 340 plants/acre with no seedlings sampled. Young plants were also rare at only 60 plants/acre. Dead sagebrush listed in the table consisted of old burned stems. Utilization of the sagebrush was mostly light with some moderate use. Vigor was good on all except decadent sagebrush. Density of Gambel oak increased due to the larger sample as it grows in vigorous scattered clones. Mature plants average nearly 4 feet in height. Sagebrush density declined slightly in 2003, but mature plants were

healthy and vigorous with excellent leader growth. Gambel oak increased in stems/acre due to an abundance of young sprouts. Utilization of browse in all years has been light. In 2008, there was an improvement in sagebrush with an increase in density to 340 plants/acre with good vigor and low decadence. There were some seedlings encountered, but no young sagebrush plants were sampled. Decadence was as 12%. Gambel oak was similar to 2003 readings at 2,620 plants/acre with good recruitment, low decadence, and good vigor.

#### Herbaceous Understory

The site is now dominated by seeded grasses and alfalfa (*Medicago sativa*). However, during the 1986 reading, no seeded species had established. Bottlebrush squirreltail (*Sitanion hystrix*) and mutton bluegrass (*Poa fendleriana*) were the only perennial grasses encountered. Forbs consisted of a few early seral species. By 1987, seeded grasses became well established with crested and intermediate wheatgrass (*Agropyron cristatum* and *A. intermedium*) being the most common. Seeded forbs, yellow sweetclover (*Melilotus officinalis*) and alfalfa, also became well established along with several invasive weedy species. Crested and intermediate wheatgrass continued to dominate the site in 1992 with quadrat frequencies of 91% and 92% respectively. Smooth brome (*Bromus inermis*) was also fairly abundant. Two species, orchard grass (*Dactylis glomerata*) and mutton bluegrass, were not encountered in 1992. During the 1998 reading, intermediate wheatgrass was by far the most abundant species. It provided 58% of the grass cover and had a cover value of 23%. Crested wheatgrass and smooth brome were the only other common perennial species as they accounted for 24% and 11% of the grass cover, respectively. Annual cheatgrass (*Bromus tectorum*) was also encountered in 1998. Cheatgrass is found in the interspace between bunch grasses, yet it is not abundant. In 2008, the herbaceous understory was stable with good perennial grass cover. Cheatgrass cover decreased in 2008 representing less than 1% of vegetation cover.

The forb composition is diverse but only a few species are abundant. Seeded forbs have all disappeared with the exception of alfalfa and a few yellow sweet clover. During the 1998 reading, alfalfa accounted for 82% of the forb cover. Forb diversity and abundance is likely hindered by the abundance of aggressive exotic grasses seeded onto the site. Annual forbs declined in 2008 due to a loss of slender phlox (*Microsteris gracilis*) which was still the most frequent forb. Alfalfa provided 57% of forb cover but only 2% of total vegetation cover.

#### 1992 TREND ASSESSMENT

Browse are not abundant on the site, but some sagebrush has become reestablished and oak has resprouted. Overall, the browse trend is down when compared to the pre-burn conditions, but has improved since the fire. Further improvements in the browse composition may be hindered by the dominance of seeded exotic grasses. The herbaceous understory has improved significantly since the burn. From 1986 to 1987, both grass and forb sum of nested frequencies increased significantly. Sum of nested frequency for crested wheatgrass and intermediate wheatgrass, and smooth brome continued to increase between 1987 and 1992. Other seeded and native grasses declined or disappeared from the site. Forb nested frequencies declined during the same interval. The only common forbs left on the site are a *Euphorbia* sp. and alfalfa. Combined nested frequencies of grasses and forbs have not increased since 1987. Overall, herbaceous understory has improved between 1986 and 1987 and is stable between 1987 and 1992.

browse - up (+2)

grass - up (+2)

forb - down (-2)



### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in the density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big sagebrush plants displaying poor vigor have increased to 18% of the population, but are still low in number. Decadence of sagebrush has remained similar to 1992, and recruitment of young sagebrush plants is good at 18% of the population. Trend for grasses is slightly up with a significant increase in the nested frequency of intermediate wheatgrass and smooth brome. The trend for forbs is slightly up, but is in poor condition. The sum of nested frequency for perennial forbs has declined slightly. The most abundant forb, alfalfa, has remained similar in nested frequency, however.

winter range condition (DCI) - good (71) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (0)

### 2003 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush, is stable. Density of mature plants has remained similar to 1998 but the number of young plants has declined. Mature sagebrush sampled in 2003 were very vigorous and annual leader growth averaged 2.6 inches by June 3<sup>rd</sup>. Gambel oakbrush, which occurs in scattered clones, has remained stable. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses has declined, while the sum of nested frequency of perennial forbs has increased. Nested frequency of the three primary perennial grasses has declined significantly, but they are still abundant. Average cover of perennial grasses declined from 37% in 1998 to 20%, likely due to drought conditions. Nested frequency of alfalfa increased significantly, but average cover declined from 7% to 3%. Slender phlox increased significantly and provided 68% of the total forb cover in 2003. The dominant forb, alfalfa, doubled in nested frequency, but cover decreased to 3.4%.

winter range condition (DCI) - poor (40) Mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - up (+2)

### 2008 TREND ASSESSMENT

Trend for browse is slightly up as cover has increased and density has remained similar on important browse species. Mountain big sagebrush has increased in density 33% to 340 plants/acre with 12% decadence. Recruitment of young is poor with no young plants sampled. Gambel oak density remained similar and decadence is low at 15%. Trend for the grasses is stable. Perennial and annual grasses have remained similar in sum of nested frequency and cover. Intermediate wheatgrass and smooth brome account for 88% of grass cover. Trend for forbs is down. Alfalfa shows a decline in nested frequency and cover.

winter range condition (DCI) - fair (60) Mid-level potential scale

browse - slightly up (+1)

grass - stable (0)

forb - down (-2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 58

| T<br>y<br>p<br>e            | Species                          | Nested Frequency      |                       |                       |                        |                        |                       | Average Cover % |       |       |
|-----------------------------|----------------------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|-----------------------|-----------------|-------|-------|
|                             |                                  | '86                   | '87                   | '92                   | '98                    | '03                    | '08                   | '98             | '03   | '08   |
| G                           | <i>Agropyron cristatum</i>       | a <sup>-</sup><br>187 | d <sup>-</sup><br>223 | d <sup>-</sup><br>203 | c <sup>-</sup><br>129  | b <sup>-</sup><br>55   | 9.51                  | 6.75            | 2.17  |       |
| G                           | <i>Agropyron intermedium</i>     | a <sup>-</sup><br>163 | d <sup>-</sup><br>268 | d <sup>-</sup><br>299 | bc <sup>-</sup><br>215 | cd <sup>-</sup><br>235 | 22.76                 | 9.99            | 13.18 |       |
| G                           | <i>Bromus inermis</i>            | a <sup>-</sup><br>33  | b <sup>-</sup><br>62  | d <sup>-</sup><br>166 | c <sup>-</sup><br>112  | d <sup>-</sup><br>157  | 4.42                  | 3.32            | 6.51  |       |
| G                           | <i>Bromus tectorum</i> (a)       | -                     | -                     | -                     | b <sup>-</sup><br>197  | a <sup>-</sup><br>45   | a <sup>-</sup><br>58  | 1.82            | .53   | .20   |
| G                           | <i>Dactylis glomerata</i>        | a <sup>-</sup><br>19  | a <sup>-</sup><br>2   | a <sup>-</sup><br>5   | a <sup>-</sup><br>1    | a <sup>-</sup><br>1    | -                     | -               | -     |       |
| G                           | <i>Festuca ovina</i>             | a <sup>-</sup><br>15  | a <sup>-</sup><br>2   | a <sup>-</sup><br>5   | a <sup>-</sup><br>1    | a <sup>-</sup><br>1    | .18                   | -               | -     |       |
| G                           | <i>Poa fendleriana</i>           | a <sup>-</sup><br>2   | b <sup>-</sup><br>14  | a <sup>-</sup><br>2   | a <sup>-</sup><br>2    | a <sup>-</sup><br>1    | .15                   | -               | .00   |       |
| G                           | <i>Poa pratensis</i>             | -                     | -                     | -                     | -                      | -                      | 3                     | .00             | -     | .15   |
| G                           | <i>Sitanion hystrix</i>          | ab <sup>-</sup><br>5  | b <sup>-</sup><br>10  | ab <sup>-</sup><br>2  | ab <sup>-</sup><br>1   | ab <sup>-</sup><br>1   | a <sup>-</sup><br>1   | .03             | .00   | -     |
| G                           | <i>Vulpia octoflora</i> (a)      | -                     | -                     | -                     | ab <sup>-</sup><br>36  | ab <sup>-</sup><br>60  | a <sup>-</sup><br>11  | .40             | 1.25  | .03   |
| Total for Annual Grasses    |                                  | 0                     | 0                     | 0                     | 233                    | 105                    | 69                    | 2.22            | 1.78  | 0.23  |
| Total for Perennial Grasses |                                  | 7                     | 441                   | 557                   | 676                    | 457                    | 451                   | 37.07           | 20.07 | 22.02 |
| Total for Grasses           |                                  | 7                     | 441                   | 557                   | 909                    | 562                    | 520                   | 39.30           | 21.86 | 22.25 |
| F                           | <i>Agoseris glauca</i>           | -                     | -                     | -                     | 9                      | -                      | -                     | .04             | -     | -     |
| F                           | <i>Alyssum alyssoides</i> (a)    | -                     | -                     | -                     | a <sup>-</sup><br>1    | a <sup>-</sup><br>1    | b <sup>-</sup><br>16  | -               | -     | .42   |
| F                           | <i>Camelina microcarpa</i> (a)   | -                     | -                     | -                     | -                      | 1                      | -                     | -               | .00   | -     |
| F                           | <i>Calochortus nuttallii</i>     | -                     | -                     | -                     | -                      | 3                      | -                     | -               | .01   | -     |
| F                           | <i>Chenopodium</i> sp. (a)       | 3                     | -                     | 2                     | -                      | 2                      | -                     | -               | .00   | -     |
| F                           | <i>Crepis acuminata</i>          | -                     | -                     | 1                     | -                      | -                      | -                     | -               | -     | -     |
| F                           | <i>Cymopterus</i> sp.            | -                     | -                     | -                     | 5                      | 6                      | 3                     | .02             | .01   | .01   |
| F                           | <i>Draba</i> sp. (a)             | -                     | -                     | -                     | b <sup>-</sup><br>22   | c <sup>-</sup><br>41   | a <sup>-</sup><br>1   | .09             | .19   | .00   |
| F                           | <i>Dracocephalum parviflorum</i> | -                     | -                     | -                     | -                      | 1                      | -                     | -               | .03   | -     |
| F                           | <i>Erodium cicutarium</i> (a)    | -                     | -                     | -                     | -                      | 2                      | -                     | -               | .07   | -     |
| F                           | <i>Erigeron</i> sp.              | -                     | -                     | 3                     | -                      | -                      | -                     | -               | -     | -     |
| F                           | <i>Euphorbia</i> sp.             | 17                    | 16                    | 23                    | 9                      | 27                     | 16                    | .06             | .56   | .09   |
| F                           | <i>Gilia</i> sp. (a)             | -                     | -                     | -                     | a <sup>-</sup><br>1    | c <sup>-</sup><br>47   | b <sup>-</sup><br>9   | -               | .55   | .02   |
| F                           | <i>Lotus utahensis</i>           | 6                     | 12                    | 6                     | 6                      | 3                      | 11                    | .33             | .01   | .57   |
| F                           | <i>Melilotus officinalis</i>     | a <sup>-</sup><br>24  | a <sup>-</sup><br>2   | a <sup>-</sup><br>5   | a <sup>-</sup><br>6    | a <sup>-</sup><br>1    | a <sup>-</sup><br>1   | -               | .01   | -     |
| F                           | <i>Medicago sativa</i>           | a <sup>-</sup><br>88  | bc <sup>-</sup><br>41 | b <sup>-</sup><br>40  | cd <sup>-</sup><br>82  | bc <sup>-</sup><br>53  | 7.13                  | 3.40            | 2.28  |       |
| F                           | <i>Microsteris gracilis</i> (a)  | -                     | -                     | -                     | b <sup>-</sup><br>183  | c <sup>-</sup><br>254  | a <sup>-</sup><br>120 | 1.00            | 10.71 | .39   |
| F                           | <i>Nicotiana attenuata</i> (a)   | -                     | b <sup>-</sup><br>39  | a <sup>-</sup><br>1   | a <sup>-</sup><br>1    | a <sup>-</sup><br>1    | a <sup>-</sup><br>1   | -               | -     | -     |
| F                           | <i>Penstemon leonardi</i>        | -                     | 2                     | -                     | -                      | -                      | -                     | -               | -     | -     |
| F                           | <i>Physalis</i> sp.              | -                     | 5                     | -                     | -                      | -                      | -                     | -               | -     | -     |
| F                           | <i>Sanguisorba minor</i>         | -                     | 2                     | -                     | -                      | -                      | -                     | -               | -     | -     |

| Type                      | Species                             | Nested Frequency |                |     |     |                 |                 | Average Cover % |       |      |
|---------------------------|-------------------------------------|------------------|----------------|-----|-----|-----------------|-----------------|-----------------|-------|------|
|                           |                                     | '86              | '87            | '92 | '98 | '03             | '08             | '98             | '03   | '08  |
| F                         | <i>Sphaeralcea grossulariifolia</i> | a-               | a <sup>3</sup> | a-  | a-  | b <sup>18</sup> | ab <sup>8</sup> | -               | .09   | .21  |
| F                         | <i>Tragopogon dubius</i>            | -                | -              | -   | -   | 3               | -               | -               | .00   | -    |
| F                         | Unknown forb-perennial              | -                | -              | 6   | -   | -               | -               | -               | -     | -    |
| Total for Annual Forbs    |                                     | 3                | 39             | 2   | 205 | 347             | 146             | 1.09            | 11.55 | 0.84 |
| Total for Perennial Forbs |                                     | 23               | 152            | 80  | 69  | 149             | 91              | 7.59            | 4.14  | 3.17 |
| Total for Forbs           |                                     | 26               | 191            | 82  | 274 | 496             | 237             | 8.69            | 15.69 | 4.02 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 58

| Type             | Species                              | Strip Frequency |     |     | Average Cover % |      |      |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|------|------|
|                  |                                      | '98             | '03 | '08 | '98             | '03  | '08  |
| B                | <i>Arctostaphylos patula</i>         | 2               | 1   | 1   | .03             | .15  | .63  |
| B                | <i>Artemisia tridentata vaseyana</i> | 13              | 11  | 14  | .45             | 1.04 | 1.10 |
| B                | <i>Gutierrezia sarothrae</i>         | 3               | 1   | 0   | .15             | .00  | -    |
| B                | <i>Opuntia sp.</i>                   | 2               | 0   | 0   | .30             | -    | -    |
| B                | <i>Quercus gambelii</i>              | 27              | 27  | 24  | 5.15            | 1.98 | 4.49 |
| B                | <i>Quercus turbinella</i>            | 4               | 1   | 2   | .03             | .18  | .15  |
| Total for Browse |                                      | 51              | 41  | 41  | 6.11            | 3.35 | 6.37 |

#### CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 58

| Species                              | Percent Cover |      |      |
|--------------------------------------|---------------|------|------|
|                                      | '98           | '03  | '08  |
| <i>Arctostaphylos patula</i>         | -             | .36  | .75  |
| <i>Artemisia tridentata vaseyana</i> | -             | 1.93 | 3.91 |
| <i>Quercus gambelii</i>              | 1.20          | 4.43 | 7.23 |

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 58

| Species                              | Average leader growth (in) |     |
|--------------------------------------|----------------------------|-----|
|                                      | '03                        | '08 |
| <i>Artemisia tridentata vaseyana</i> | 2.6                        | 1.4 |

BASIC COVER --

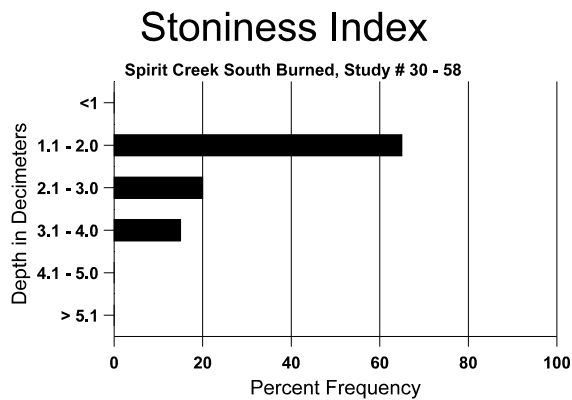
Management unit 30 , Study no: 58

| Cover Type  | Average Cover % |       |       |       |       |       |
|-------------|-----------------|-------|-------|-------|-------|-------|
|             | '86             | '87   | '92   | '98   | '03   | '08   |
| Vegetation  | .25             | 9.75  | 22.50 | 55.70 | 43.92 | 31.24 |
| Rock        | 0               | 0     | 0     | .02   | 0     | 0     |
| Pavement    | 0               | .25   | .75   | .51   | .24   | .39   |
| Litter      | 5.50            | 15.75 | 48.50 | 68.34 | 58.87 | 64.88 |
| Cryptogams  | 0               | 0     | 0     | .46   | .17   | .44   |
| Bare Ground | 94.25           | 74.25 | 28.25 | 18.20 | 13.81 | 18.42 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 58, Study Name: Spirit Creek South Burned

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand      | %silt | %clay |     |       |       |      |
| 27.4                         | 42.8<br>(17.7)  | 6.1 | 64.0       | 21.4  | 14.6  | 1.8 | 15.2  | 176.0 | 0.7  |



PELLET GROUP DATA --

Management unit 30 , Study no: 58

| Type   | Quadrat Frequency |     |     |
|--------|-------------------|-----|-----|
|        | '98               | '03 | '08 |
| Rabbit | 1                 | 8   | 65  |
| Elk    | -                 | -   | -   |
| Deer   | 55                | 30  | 25  |

| Days use per acre (ha) |         |           |
|------------------------|---------|-----------|
| '98                    | '03     | '08       |
| -                      | -       | -         |
| -                      | -       | 1 (2)     |
| 76 (188)               | 17 (43) | 162 (400) |

BROWSE CHARACTERISTICS --  
 Management unit 30 , Study no: 58

|                                      |  | Age class distribution (plants per acre) |       |        |          |      | Utilization   |            |               |            |                    |                                    |
|--------------------------------------|--|--|-------|--------|----------|------|---------------|------------|---------------|------------|--------------------|------------------------------------|
| Y<br>e<br>a<br>r                     | Plants per<br>Acre<br>(excluding<br>seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | %<br>moderate | %<br>heavy | %<br>decadent | %<br>dying | %<br>poor<br>vigor | Average<br>Height<br>Crown<br>(in) |
| <i>Amelanchier utahensis</i>         |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 86                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 87                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 92                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 98                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 03                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 08                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | 35/48                              |
| <i>Arctostaphylos patula</i>         |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 86                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 87                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 92                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 98                                   | 40   | -  | -     | 40     | -        | 20   | 50            | 0          | -             | -          | 0                  | 14/19                              |
| 03                                   | 20   | -  | -     | 20     | -        | -    | 0             | 0          | -             | -          | 0                  | 30/55                              |
| 08                                   | 20   | -  | -     | 20     | -        | 20   | 0             | 0          | -             | -          | 0                  | 39/52                              |
| <i>Artemisia tridentata vaseyana</i> |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 86                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | 0             | -          | 0                  | -/-                                |
| 87                                   | 0  | 433                                      | -     | -      | -        | -    | 0             | 0          | 0             | -          | 0                  | -/-                                |
| 92                                   | 166  | 33                                       | 133   | -      | 33       | -    | 20            | 20         | 20            | -          | 0                  | -/-                                |
| 98                                   | 340  | -  | 60    | 200    | 80       | 1880 | 18            | 0          | 24            | 18         | 18                 | 17/24                              |
| 03                                   | 280  | -  | -     | 280    | -        | 80   | 0             | 0          | 0             | -          | 0                  | 31/38                              |
| 08                                   | 340  | 380                                      | -     | 300    | 40       | 80   | 6             | 6          | 12            | -          | 0                  | 37/51                              |
| <i>Ceanothus greggii</i>             |  |  |       |        |          |      |               |            |               |            |                    |                                    |
| 86                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 87                                   | 0  | 133                                      | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 92                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 98                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | -/-                                |
| 03                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | 52/69                              |
| 08                                   | 0  | -  | -     | -      | -        | -    | 0             | 0          | -             | -          | 0                  | 35/58                              |

|                                  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|----------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                             | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Chrysothamnus parryi</b>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 87                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/15                      |
| <b>Eriodictyon angustifolium</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 87                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 13/13                     |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Gutierrezia sarothrae</b>     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 87                               | 366                                   | -  | 33    | 333    | -        | -    | 0           | 0       | -          | -       | 9            | 9/7                       |
| 92                               | 266                                   | -  | 133   | 133    | -        | -    | 0           | 0       | -          | -       | 0            | 10/15                     |
| 98                               | 120                                   | -  | -     | 120    | -        | -    | 0           | 0       | -          | -       | 0            | 6/12                      |
| 03                               | 20                                    | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 6/6                       |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/9                       |
| <b>Opuntia sp.</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 87                               | 66                                    | -  | 66    | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 33                                    | -  | -     | 33     | -        | -    | 0           | 0       | -          | -       | 100          | 6/9                       |
| 98                               | 40                                    | -  | -     | 40     | -        | -    | 100         | 0       | -          | -       | 100          | 8/22                      |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/11                     |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 12/20                     |
| <b>Purshia tridentata</b>        |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 87                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 92                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 98                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 03                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 25/40                     |
| 08                               | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 26/80                     |

|                           |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|---------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                      | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Quercus gambelii</b>   |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                        | <b>0</b>                              | 3533                                     | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 87                        | <b>633</b>                            | -  | 633   | -      | -        | -    | 5           | 0       | 0          | -       | 0            | -/-                       |
| 92                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                        | <b>2000</b>                           | 60                                       | 600   | 1240   | 160      | 660  | 5           | 0       | 8          | -       | 0            | 45/48                     |
| 03                        | <b>2740</b>                           | 60                                       | 1120  | 1060   | 560      | 3080 | 3           | 0       | 20         | 1       | 1            | 44/24                     |
| 08                        | <b>2620</b>                           | 40                                       | 460   | 1760   | 400      | 3860 | 6           | 5       | 15         | 6       | 8            | 74/41                     |
| <b>Quercus turbinella</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 86                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 87                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 92                        | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| 98                        | <b>80</b>                             | -  | 20    | 20     | 40       | 20   | 0           | 0       | 50         | 50      | 50           | 50/59                     |
| 03                        | <b>20</b>                             | 20                                       | -     | -      | 20       | 40   | 0           | 0       | 100        | 100     | 100          | 51/46                     |
| 08                        | <b>40</b>                             | -  | -     | -      | 40       | 40   | 0           | 50      | 100        | 50      | 50           | 74/82                     |

Trend Study 30-61-08

Study site name: Tobin Bench.

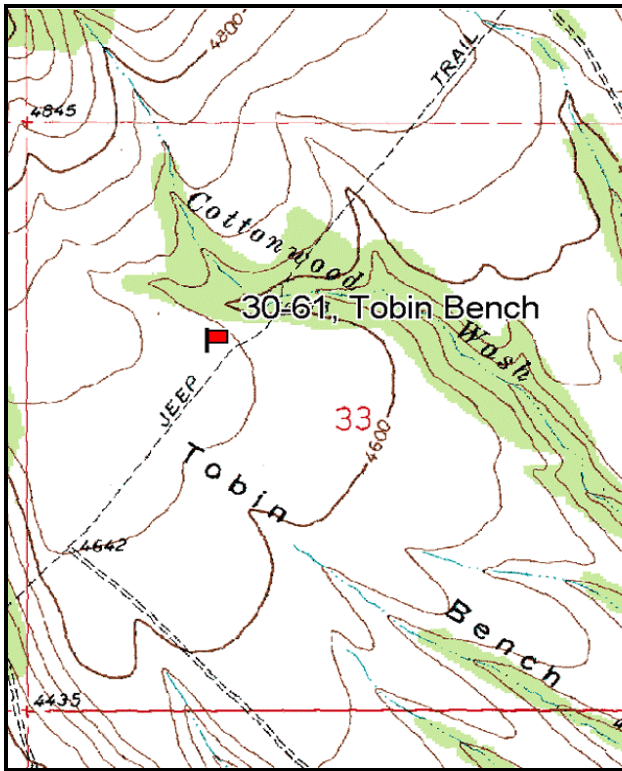
Vegetation type: Cliffrose-sagebrush.

Compass bearing: frequency baseline 272 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

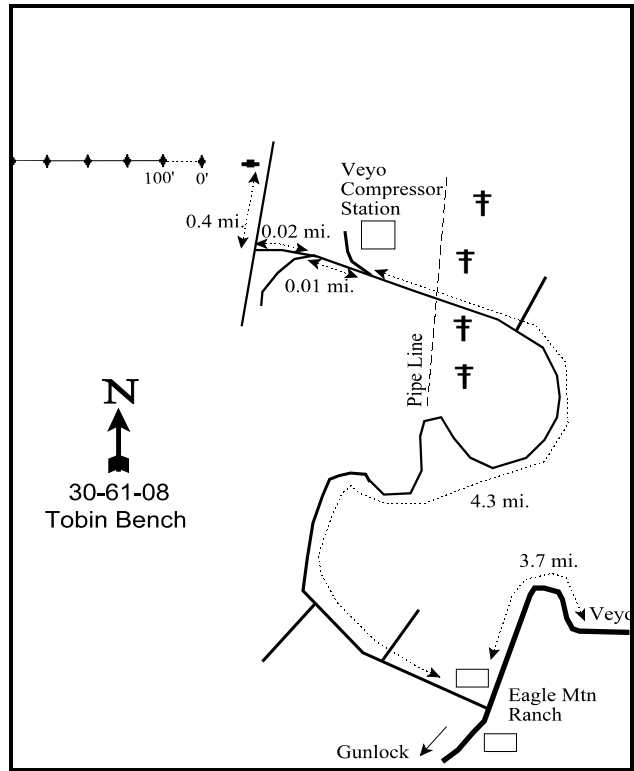
LOCATION DESCRIPTION

From Veyo, drive west on Center St. for 5.7 miles to a road on the right (north) side of the road. The Eagle Mountain Ranch will be on the left side of the road at this turn. Drive on this oiled road for 4.3 miles to Veyo Compressor Station and a fork in the road. Take the left fork for 0.01 miles to another fork. Stay right and drive 0.02 miles to an intersection and a wire gate. Turn right and drive 0.4 miles on an old powerline road to the witness post on the left side of the road. The 0-foot stake is 7 paces at 306 degrees magnetic from the witness post. The baseline runs approximately west. The study is marked by green steel "T" fence posts approximately 12 to 14 inches in height with browse tag number 244.



Map Name: Gunlock

Township 39S, Range 17W, Section 33



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 255113 E, 4137729 N



## DISCUSSION

### Tobin Bench - Trend Study No. 30-61

#### Study Information

This study was established in 2003 and sampled a cliffrose/sagebrush winter range near the blackbrush ecotone, prior to the site burning between 2003 and 2008 [elevation: 4,650 (1,417 m), slope: 3%, aspect: east]. The area is now dominated by annuals. The site likely burned as part of the 2006 Bull Complex Fire, which was aerially seeded. The transect is located west of the town of Veyo, and about one and a half miles east of the Grapevine Spring trend study. This area receives heavy winter deer use and experienced severe sagebrush die-off in 2003, likely due to drought. Pellet group data from 2003 estimated heavy deer use at 225 deer days use/acre (555 ddu/ha). Pellet group data from 2008 estimated 1 elk day use/acre (3 edu/ha) and 42 deer days use/acre (103 ddu/ha). Prior to the fire, the local DWR biologist estimated that 1,000 deer routinely used this area from October through March.

#### Soils

Soil at the site is deep with an effective rooting depth estimated at a little over 17 inches. Texture is a sandy clay loam, and reactivity is neutral (pH 7.1). There is some rock and pavement on the surface and abundant litter mostly from dead sagebrush plants. Relative combined vegetation and litter cover was moderate at 55%-62% since 2003, and relative combined rock and pavement cover was 16%-17% since 2003. Bare ground is found in the shrub interspace with soil pedestalling around shrubs. Relative bare ground cover was 22%-28% since 2003. There are some signs of erosion on the site but it is limited by the gentle terrain. The soil erosion condition was classified stable in 2003 and 2008.

#### Browse

Prior to the fire, this area supported a moderately dense stand of low elevation mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) possibly hybridized with Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Intermixed with the sagebrush is a population of moderately tall Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) plants/acre. This area has experienced severe drought in the past. Precipitation data from the town of Veyo show several of the years prior to 2008 have below normal annual precipitation, especially 2002, which was only 37% of normal. In addition, spring precipitation (April to June) has been drier than normal for the past 4 years. The spring of 2002 was exceptionally dry at only 5% of normal (Utah climate summaries 2008). This dry period is likely the cause of a major sagebrush die-off on Tobin Bench. In 2003, shrub density data estimated 4,340 dead sagebrush plants/acre with another 600 plants/acre of decadent plants. Only about 20 plants/acre are mature plants with normal vigor. Utilization of the surviving plants was moderate to heavy. There were no seedlings or young encountered. After the fire, there were no mountain big sagebrush plants sampled in 2008.

The cliffrose population was healthy and vigorous when sampled in 2003. The 2003 density estimate was 500 plants/acre with 4% young and 53% decadence. There was a 40% decrease in 2008 to 300 plants/acre with no decadence and 13% young. Mature plants average nearly 5 feet in height, making some plants partly unavailable to browsing. Vigor is normal on most plants but half of the population was classified as decadent in 2003. Reproduction is minimal but cliffrose is a long-lived species. The only other shrubs on the site consist of some oakbrush (*Quercus turbinella*) and three species of cactus (*Opuntia* sp. and *Sclerocactus* spp.).

Herbaceous Understory

The 2003 herbaceous understory was very poor. Perennial grasses were rare and represented by a few intermediate wheatgrass (*Agropyron intermedium*) and bottlebrush squirreltail (*Sitanion hystrix*) plants. Forbs were somewhat more abundant but only four species were encountered. A euphorbia sp. and weakstem mariposa lily (*Calochortus flexuosus*) were the only common species. Total grass and forb cover averaged less than 4% in 2003. Cheatgrass (*Bromus tectorum*) was sampled for the first time in 2008, although infrequently. Forbs increased greatly in 2008, but were dominated by storksbill (*Erodium cicutarium*) and tumbled mustard (*Sisymbrium altissimum*).

Seed Mix - Bull Complex Fire

| Seeded Species     | lbs./acre |
|--------------------|-----------|
| Pubescent          | 3.0       |
| Hycrest Wheatgrass | 1.0       |
| Sideoats Grama     | 2.0       |
| Smooth Brome       | 1.0       |
| Small Burnett      | 1.0       |
| Alfalfa            | 1.0       |
| Palmer Penstemon   | 0.1       |
| Yellow Sweetclover | 0.5       |
| Prostrate Kochia   | 1.0       |

2003 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - very poor (20) mid-level potential scale

2008 TREND ASSESSMENT

Trend for browse is down. Mountain big sagebrush was completely lost, and cliffrose has declined in density from 500 to 300 plants/acre. Cliffrose cover has decreased from 7% to 1%. Perennial grasses are stable but very poor, though cheatgrass has entered the system. Perennial forb sum of nested frequency increased 87%, though the annual species, storksbill, was the dominant forb on the site. Storksbill was not sampled in 2003. Storksbill accounted for 74% of herbaceous cover and 72% of vegetation cover.

winter range condition (DCI) - very poor (7) mid-level potential scale

browse - down (-2)                      grass - stable (0)                      forb -stable (0)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 61

| Type | Species               | Nested Frequency |     | Average Cover % |     |
|------|-----------------------|------------------|-----|-----------------|-----|
|      |                       | '03              | '08 | '03             | '08 |
| G    | Agropyron cristatum   | -                | 2   | -               | .00 |
| G    | Agropyron intermedium | 2                | -   | .03             | -   |
| G    | Bromus tectorum (a)   | -                | 6   | -               | .02 |

| Type                        | Species                             | Nested Frequency |                  | Average Cover % |       |
|-----------------------------|-------------------------------------|------------------|------------------|-----------------|-------|
|                             |                                     | '03              | '08              | '03             | '08   |
| G                           | <i>Sitanion hystrix</i>             | 7                | 7                | .01             | .04   |
| G                           | <i>Vulpia octoflora</i> (a)         | -                | 4                | -               | .01   |
| Total for Annual Grasses    |                                     | 0                | 10               | 0               | 0.02  |
| Total for Perennial Grasses |                                     | 9                | 9                | 0.04            | 0.04  |
| Total for Grasses           |                                     | 9                | 19               | 0.04            | 0.07  |
| F                           | <i>Alyssum desertorum</i> (a)       | -                | 1                | -               | .03   |
| F                           | <i>Aster</i> sp.                    | 1                | -                | .00             | -     |
| F                           | <i>Calochortus flexuosus</i>        | 37               | 13               | .37             | .08   |
| F                           | <i>Chenopodium fremontii</i> (a)    | -                | 6                | -               | .01   |
| F                           | <i>Descurainia pinnata</i> (a)      | <sub>a</sub> -   | <sub>b</sub> 85  | -               | 1.25  |
| F                           | <i>Erodium cicutarium</i> (a)       | <sub>a</sub> -   | <sub>b</sub> 298 | -               | 35.71 |
| F                           | <i>Eriogonum umbellatum</i>         | <sub>a</sub> -   | <sub>b</sub> 19  | -               | 1.92  |
| F                           | <i>Euphorbia</i> sp.                | <sub>a</sub> 46  | <sub>b</sub> 121 | 2.89            | .62   |
| F                           | <i>Lappula occidentalis</i> (a)     | <sub>a</sub> -   | <sub>b</sub> 34  | -               | .57   |
| F                           | <i>Navarretia intertexta</i> (a)    | <sub>a</sub> 2   | <sub>b</sub> 104 | .03             | .52   |
| F                           | <i>Salsola iberica</i> (a)          | <sub>a</sub> -   | <sub>b</sub> 67  | -               | .13   |
| F                           | <i>Sisymbrium altissimum</i> (a)    | <sub>a</sub> -   | <sub>b</sub> 104 | -               | 7.53  |
| F                           | <i>Sphaeralcea grossulariifolia</i> | -                | 4                | -               | .11   |
| Total for Annual Forbs      |                                     | 2                | 699              | 0.03            | 45.76 |
| Total for Perennial Forbs   |                                     | 84               | 157              | 3.27            | 2.73  |
| Total for Forbs             |                                     | 86               | 856              | 3.30            | 48.50 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 61

| Type             | Species                              | Strip Frequency |     | Average Cover % |      |
|------------------|--------------------------------------|-----------------|-----|-----------------|------|
|                  |                                      | '03             | '08 | '03             | '08  |
| B                | <i>Artemisia tridentata vaseyana</i> | 24              | 0   | 6.11            | -    |
| B                | <i>Cowania mexicana stansburiana</i> | 25              | 15  | 7.29            | 1.12 |
| B                | <i>Gutierrezia sarothrae</i>         | 0               | 8   | -               | .15  |
| B                | <i>Kochia prostrata</i>              | 0               | 2   | -               | .03  |
| B                | <i>Quercus turbinella</i>            | 2               | 2   | .53             | .00  |
| Total for Browse |                                      | 51              | 27  | 13.94           | 1.30 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 61

| Species                       | Percent Cover |      |
|-------------------------------|---------------|------|
|                               | '03           | '08  |
| Artemisia tridentata vaseyana | .93           | -    |
| Cowania mexicana stansburiana | 7.88          | 1.33 |
| Quercus turbinella            | 1.36          | -    |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 61

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Cowania mexicana stansburiana | 2.5                        | 2.9 |

BASIC COVER --

Management unit 30 , Study no: 61

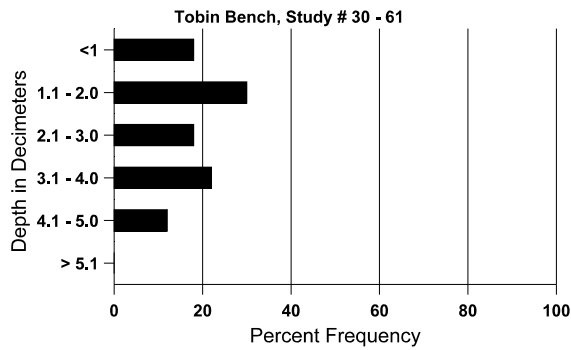
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 17.18           | 49.00 |
| Rock        | 7.96            | 11.91 |
| Pavement    | 9.61            | 7.57  |
| Litter      | 50.40           | 13.06 |
| Cryptogams  | .09             | .01   |
| Bare Ground | 23.35           | 31.44 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 61, Study Name: Tobin Bench

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy clay loam |       |       | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------------|-------|-------|-----|-------|-------|------|
|                              |                 |     | %sand           | %silt | %clay |     |       |       |      |
| 17.2                         | 72.8 (16.6)     | 7.1 | 58.6            | 14.7  | 26.7  | 1.3 | 10.3  | 486.4 | 0.6  |

## Stoniness Index



### PELLET GROUP DATA --

Management unit 30 , Study no: 61

| Type   | Quadrat Frequency |     | Days use per acre (ha) |          |
|--------|-------------------|-----|------------------------|----------|
|        | '03               | '08 | '03                    | '08      |
| Rabbit | 7                 | 36  | -                      | -        |
| Elk    | -                 | -   | -                      | 1 (3)    |
| Deer   | 50                | 40  | 225 (555)              | 42 (103) |

### BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 61

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>620</b>                            | -  | -     | 20     | 600      | 4340 | 32          | 16      | 97         | 74      | 74           | 31/41                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Cowania mexicana stansburiana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>500</b>                            | 20                                       | 20    | 220    | 260      | 20   | 24          | 48      | 52         | 8       | 8            | 57/67                     |
| 08                                   | <b>300</b>                            | 20                                       | 40    | 260    | -        | -    | 0           | 7       | 0          | -       | 80           | 16/21                     |
| <i>Coryphantha vivipara</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/5                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 30/34                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 10/7                      |

|                              |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                         | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Gutierrezia sarothrae</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 200                                   | -  | -     | 200    | -        | -    | 0           | 0       | -          | -       | 0            | 10/9                      |
| <i>Kochia prostrata</i>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                           | 40                                    | -  | 20    | 20     | -        | -    | 0           | 0       | -          | -       | 0            | 9/6                       |
| <i>Opuntia sp.</i>           |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 13/26                     |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Quercus turbinella</i>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                           | 240                                   | -  | -     | 240    | -        | 40   | 0           | 0       | -          | -       | 0            | 52/44                     |
| 08                           | 220                                   | -  | -     | 220    | -        | -    | 0           | 0       | -          | -       | 100          | 19/16                     |
| <i>Sclerocactus sp.</i>      |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 11/11                     |
| 08                           | 0                                     | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |

Trend Study 30-62-08

Study site name: North Hills.

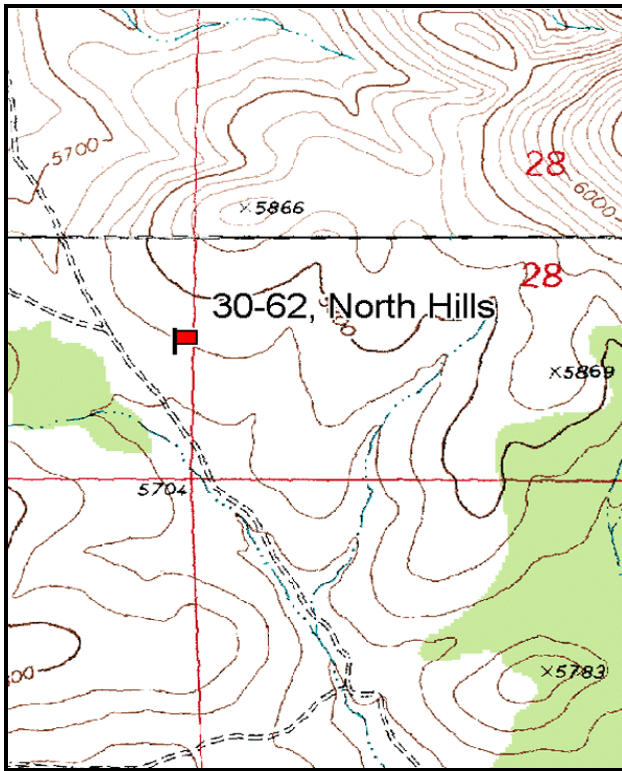
Vegetation type: Cliffrose-sagebrush.

Compass bearing: frequency baseline 0 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

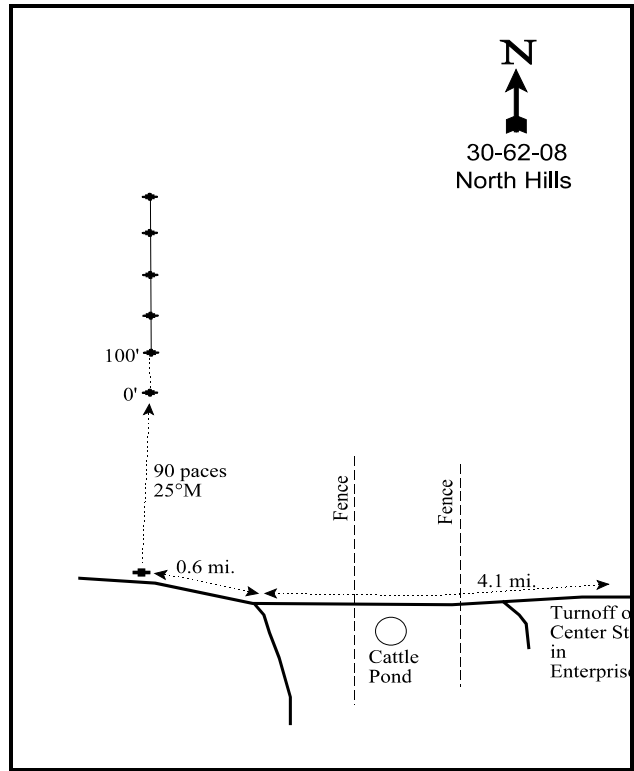
LOCATION DESCRIPTION

Starting from the town of Enterprise, turn north on 2<sup>nd</sup> West and pass over a bridge. From the bridge, drive 0.6 miles to just past 375 West and turn right on Old Modena Rd right before a fire hydrant On Old Modena Rd., travel 4.1 miles passing study 30-52 and a couple of fences to a fork on the left. Continue straight on the road for another 0.6 miles to the witness post on the right side of the road. The 0-foot stake is 90 paces at 25 degrees magnetic. The 0-foot stake is marked by browse tag # 434. The study is marked by green steel "T" fence posts approximately 12 to 14 inches in height.



Map Name: Hebron

Township 36S, Range 17W, Section 28



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 255292 E, 4167606 N

## DISCUSSION

### North Hills - Trend Study No. 30-62

#### Study Information

This study was established in 2003, and is located about five miles northwest of the town of Enterprise [elevation: 5,800 feet (1,768 m), slope: 11%, aspect: southwest]. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) winter range. Pellet group transect data estimated deer use to be light in 2003 (25 deer days use/acre:63 ddu/ha), and moderate in 2008 (41 ddu/acre:101 ddu/ha). There was a lot of horse use noted, but only one horse pellet group was sampled in 2008.

#### Soil

Soil is moderately shallow with effective rooting depth averaging just over 13 inches. Deeper soil depth measurements were limited by rock and a calcium carbonate layer which started at about 9 inches in depth. This layer does not appear to be a barrier to roots however. Soil texture is a clay loam and reactivity is neutral (pH of 7.1). There is little unprotected bare ground exposed with a relative bare ground cover of 6%-11% in 2003 and 2008. The soil erosion condition class was rated as stable in 2003 and 2008.

#### Browse

The site supports a moderate stand of mountain big sagebrush with a few scattered Stansbury cliffrose. Sagebrush density has increased slightly from 2003 to 4,580 plants/acre in 2008. Sagebrush plants have had normal vigor, but the number of decadent plants was high at 46% in both 2003 and 2008. Recruitment of young sagebrush plants has been poor with no young plants sampled in 2008. Use of sagebrush was light to moderate in 2003 and 2008.

Cliffrose density is low but increased slightly from 2003 to 140 plants/acre in 2008. These are large tree-like plants averaging nearly 6 feet in height. Use was heavy on available plants in both sample years. Vigor was normal in 2003, but the proportion of plants displaying poor vigor increased in 2008. The number of decadent plants was also low in 2003, but increased markedly in 2008.

The site had also supported a very small number of heavily hedged antelope bitterbrush (*Purshia tridentata*) in 2003, but no bitterbrush plants were sampled in 2008. Broom snakeweed (*Gutierrezia sarothrae*) increased in density from 2003 to 2008, but decreased in line-intercept cover.

#### Herbaceous Understory

The herbaceous understory is poor. There were six species of perennial and two species of annual grasses sampled on the site. The annual, cheatgrass (*Bromus tectorum*), provided from 65%-67% of the total grass cover during the two sample years. The most common perennial grasses include galleta (*Hilaria jamesii*) and bottlebrush squirreltail (*Sitanion hystrix*). Several forbs were found on the site but most are rare in their occurrence. Total forb cover totaled less than 1% in both sample years.

#### 2003 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - very poor (21) Mid-level potential scale



## 2008 TREND ASSESSMENT

The trend for browse is slightly up, but the community could be considered at risk due to the high decadence of the primary browse species, mountain big sagebrush and Stansbury cliffrose, and because of the dominance of cheatgrass in the understory. Density of sagebrush increased by 26% from 3,380 plants/acre in 2003 to 4,580 plants/acre in 2008. Sagebrush vigor has remained normal, but decadence has been high at 46% in both sample years. Recruitment of sagebrush has declined with no young plants being sampled in 2008. Cliffrose density increased 43% from 80 plants/acre in 2003 to 140 plants/acre. The proportion of cliffrose plants displaying poor vigor increased to 29%, and decadence increased to 57%. The density of the increaser species, broom snakeweed, increased 39% from 2,480 plants/acre in 2003 to 4,060 plants/acre, but the line-intercept cover and average size of mature plants decreased slightly. The trend for grasses is slightly down, but, as mentioned above, is dominated by cheatgrass. The sum of nested frequency of perennial grasses increased, but so did the sum of nested frequency of annual grasses. Galleta, mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail, and cheatgrass all increased significantly in nested frequency from 2003. Cheatgrass cover increased from 19% of the total vegetative cover in 2003 to 31%. Trend for forbs is stable, but forbs are rare. There was an increase in the sum of nested frequency of perennial forbs, but cover of perennial forbs decreased.

winter range condition (DCI) - very poor (28) Mid-level potential scale

browse - slightly up (+1)

grass - slightly down (-1)

forb - stable (0)

### HERBACEOUS TRENDS --

Management unit 30 , Study no: 62

| T<br>y<br>p<br>e            | Species                         | Nested<br>Frequency |                  | Average<br>Cover % |       |
|-----------------------------|---------------------------------|---------------------|------------------|--------------------|-------|
|                             |                                 | '03                 | '08              | '03                | '08   |
| G                           | <i>Bromus japonicus</i> (a)     | 1                   | -                | .00                | -     |
| G                           | <i>Bromus tectorum</i> (a)      | <sub>a</sub> 174    | <sub>b</sub> 389 | 4.39               | 12.34 |
| G                           | <i>Hilaria jamesii</i>          | <sub>a</sub> 81     | <sub>b</sub> 121 | 1.36               | 4.38  |
| G                           | <i>Oryzopsis hymenoides</i>     | 11                  | 1                | .19                | .00   |
| G                           | <i>Poa fendleriana</i>          | <sub>a</sub> 5      | <sub>b</sub> 23  | .04                | .41   |
| G                           | <i>Poa secunda</i>              | 14                  | 7                | .11                | .10   |
| G                           | <i>Sitanion hystrix</i>         | 49                  | 47               | .29                | 1.09  |
| G                           | <i>Vulpia octoflora</i> (a)     | <sub>b</sub> 86     | <sub>a</sub> 61  | .32                | .13   |
| Total for Annual Grasses    |                                 | 261                 | 450              | 4.72               | 12.47 |
| Total for Perennial Grasses |                                 | 160                 | 199              | 2.01               | 5.99  |
| Total for Grasses           |                                 | 421                 | 649              | 6.73               | 18.46 |
| F                           | <i>Astragalus</i> sp.           | -                   | 3                | -                  | .01   |
| F                           | <i>Brodiaea pulchella</i>       | <sub>a</sub> -      | <sub>b</sub> 26  | -                  | .06   |
| F                           | <i>Calochortus nuttallii</i>    | 12                  | 6                | .02                | .01   |
| F                           | Compositae                      | 5                   | 12               | .21                | .03   |
| F                           | <i>Collinsia parviflora</i> (a) | <sub>a</sub> -      | <sub>b</sub> 43  | -                  | .11   |

| T<br>y<br>p<br>e          | Species                      | Nested<br>Frequency |                 | Average<br>Cover % |      |
|---------------------------|------------------------------|---------------------|-----------------|--------------------|------|
|                           |                              | '03                 | '08             | '03                | '08  |
| F                         | Descurainia pinnata (a)      | -                   | 2               | -                  | .00  |
| F                         | Draba sp. (a)                | <sub>a</sub> 5      | <sub>b</sub> 27 | .01                | .06  |
| F                         | Gilia sp. (a)                | 25                  | 14              | .13                | .03  |
| F                         | Lupinus argenteus            | 3                   | -               | .01                | -    |
| F                         | Lupinus sp. (a)              | <sub>a</sub> -      | <sub>b</sub> 19 | -                  | .05  |
| F                         | Mentzelia sp.                | <sub>a</sub> -      | <sub>b</sub> 16 | -                  | .03  |
| F                         | Microsteris gracilis (a)     | 2                   | 27              | .01                | .06  |
| F                         | Microseris lindeyi           | -                   | 1               | -                  | .00  |
| F                         | Navarretia intertexta (a)    | 32                  | 40              | .19                | .10  |
| F                         | Phlox longifolia             | 2                   | -               | .00                | -    |
| F                         | Sphaeralcea grossulariifolia | 4                   | 5               | .04                | .01  |
| Total for Annual Forbs    |                              | 64                  | 172             | 0.35               | 0.43 |
| Total for Perennial Forbs |                              | 26                  | 69              | 0.29               | 0.16 |
| Total for Forbs           |                              | 90                  | 241             | 0.64               | 0.60 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 62

| T<br>y<br>p<br>e | Species                          | Strip<br>Frequency |     | Average<br>Cover % |       |
|------------------|----------------------------------|--------------------|-----|--------------------|-------|
|                  |                                  | '03                | '08 | '03                | '08   |
| B                | Artemisia tridentata vaseyana    | 83                 | 73  | 13.61              | 17.47 |
| B                | Cowania mexicana<br>stansburiana | 4                  | 6   | .30                | 1.66  |
| B                | Coryphantha vivipara             | 1                  | 0   | .00                | -     |
| B                | Gutierrezia sarothrae            | 37                 | 46  | 1.56               | 1.27  |
| B                | Purshia tridentata               | 1                  | 0   | .63                | -     |
| Total for Browse |                                  | 126                | 125 | 16.11              | 20.42 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 62

| Species                       | Percent Cover |       |
|-------------------------------|---------------|-------|
|                               | '03           | '08   |
| Artemisia tridentata vaseyana | 16.11         | 17.88 |
| Cowania mexicana stansburiana | .58           | .90   |
| Gutierrezia sarothrae         | 1.56          | .73   |
| Purshia tridentata            | .33           | -     |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 62

| Species                       | Average leader growth (in) |     |
|-------------------------------|----------------------------|-----|
|                               | '03                        | '08 |
| Artemisia tridentata vaseyana | 4.2                        | 0.9 |
| Cowania mexicana stansburiana | 1.2                        | 0.6 |

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 62

| Species               | Trees per Acre |     |
|-----------------------|----------------|-----|
|                       | '03            | '08 |
| Juniperus osteosperma | <18            | 19  |

| Average diameter (in) |     |
|-----------------------|-----|
| '03                   | '08 |
| -                     | 6.4 |

BASIC COVER --

Management unit 30 , Study no: 62

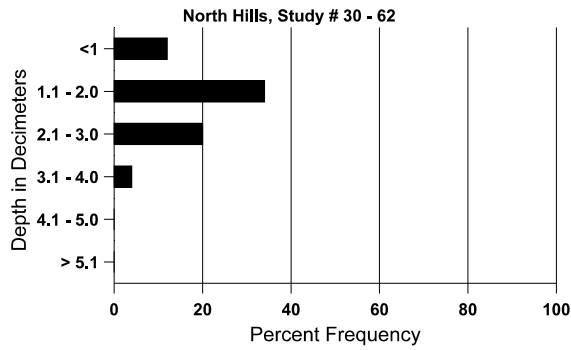
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 28.15           | 38.67 |
| Rock        | 19.44           | 21.10 |
| Pavement    | 12.29           | 11.91 |
| Litter      | 36.87           | 39.17 |
| Cryptogams  | .07             | .43   |
| Bare Ground | 11.86           | 7.59  |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 62, Study Name: North Hills

| Effective rooting depth (in) | Temp °F (depth) | pH  | clay loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|-----------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand    | % silt | % clay |     |       |       |      |
| 13.2                         | 71.4<br>(14.0)  | 7.1 | 34.6      | 36.7   | 28.7   | 1.2 | 5.1   | 422.4 | 0.4  |

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 62

| Type   | Quadrat Frequency |     |
|--------|-------------------|-----|
|        | '03               | '08 |
| Rabbit | 31                | 70  |
| Horse  | -                 | 2   |
| Elk    | -                 | 1   |
| Deer   | 19                | 36  |
| Cattle | -                 | 2   |

| Days use per acre (ha) |          |
|------------------------|----------|
| '03                    | '08      |
| -                      | -        |
| -                      | 1 (1)    |
| -                      | -        |
| 25 (63)                | 41 (101) |
| -                      | -        |

BROWSE CHARACTERISTICS --  
Management unit 30 , Study no: 62

|                                      |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y                                    | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia tridentata vaseyana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>3380</b>                           | 20                                       | 40    | 1780   | 1560     | 1240 | 22          | 8       | 46         | 20      | 20           | 23/31                     |
| 08                                   | <b>2740</b>                           | 80                                       | -     | 1640   | 1100     | 980  | 21          | 4       | 40         | 16      | 16           | 24/38                     |
| <i>Chrysothamnus parryi</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 6/15                      |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Cowania mexicana stansburiana</i> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>80</b>                             | 20                                       | 20    | 60     | -        | 20   | 25          | 75      | 0          | -       | 0            | 57/50                     |
| 08                                   | <b>140</b>                            | 20                                       | -     | 60     | 80       | -    | 0           | 71      | 57         | 29      | 29           | 70/67                     |
| <i>Coryphantha vivipara</i>          |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <i>Ephedra viridis</i>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 27/45                     |
| <i>Gutierrezia sarothrae</i>         |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>2480</b>                           | 40                                       | 40    | 2320   | 120      | 580  | 0           | 0       | 5          | .80     | .80          | 8/10                      |
| 08                                   | <b>4060</b>                           | 1980                                     | 100   | 3760   | 200      | 420  | .49         | 0       | 5          | 2       | 2            | 5/6                       |
| <i>Purshia tridentata</i>            |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>20</b>                             | -  | -     | -      | 20       | -    | 0           | 100     | 100        | 100     | 100          | 10/21                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | 0          | -       | 0            | -/-                       |
| <i>Yucca sp.</i>                     |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 28/35                     |
| 08                                   | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 28/30                     |

Trend Study 30-63-08

Study site name: Holt Canyon.

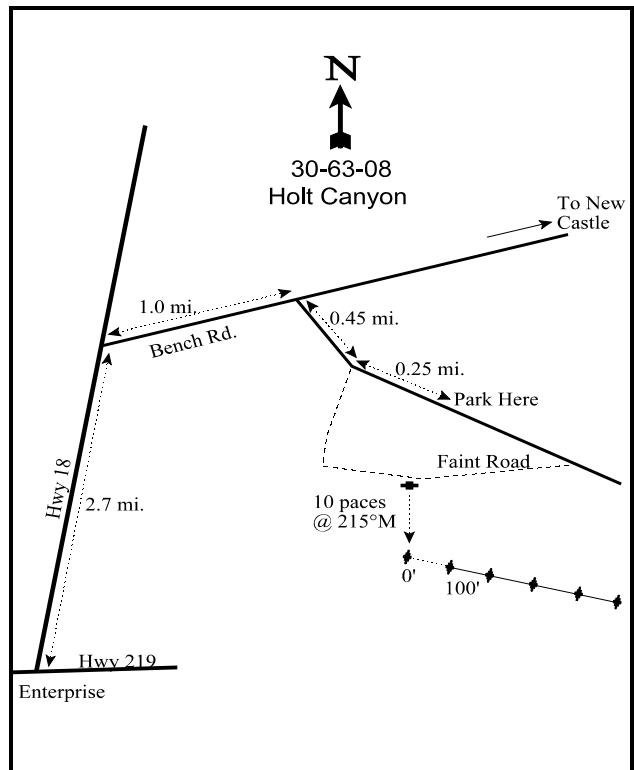
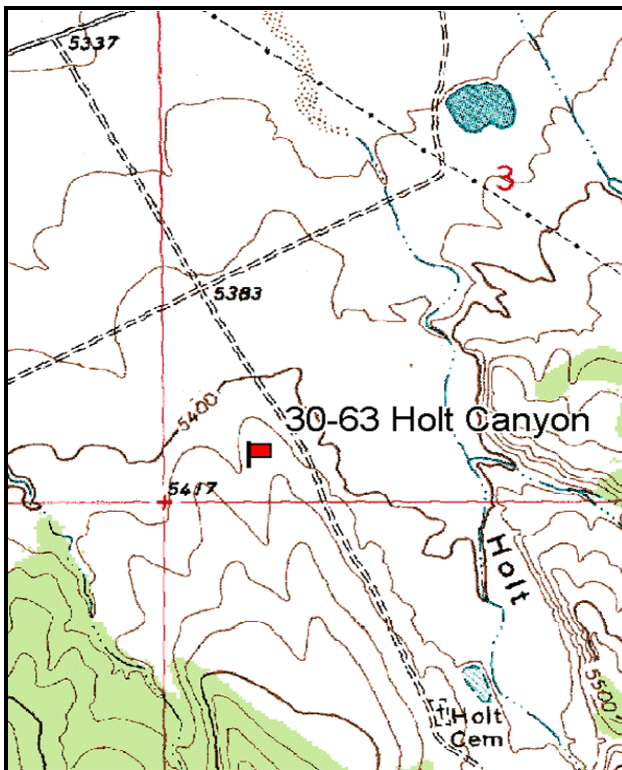
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 149 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From Enterprise, drive east on Highway 18 for 2.7 miles to Bench Rd. Turn RIGHT and drive approximately 1.0 mile to Holt Canyon Road, there is a sign. Drive on Holt Canyon Rd. for 0.45 miles to an intersection. Continue straight for 0.25 miles and park. Walk up the hill to the west and look for a full high witness post next to a faint road. From the witness post, the 0-foot stake is 10 paces at 215 degrees magnetic. The 0-foot stake is marked by browse tag #142. The study is marked by green steel "T" fence posts approximately 12 to 14 inches in height.



Map Name: Enterprise

Diagrammatic Sketch

Township 37S, Range 16W, Section 3

GPS: NAD 83, UTM 12S 266848 E, 4163765 N

## DISCUSSION

### Holt Canyon - Trend Study No. 30-63

#### Study Information

This study is located about seven miles south of the town of Newcastle [elevation: 5,400 feet (1,646 m), slope: 11%-14%, aspect southwest]. The study was established in 2003 in a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community type. The site is located on a Wyoming big sagebrush winter range at the mouth of Holt Canyon. This area has received little to no livestock use for many years. It does receive some use by wintering deer and pellet group data taken on the site estimated light deer use in 2003 and 2008 (11 deer days use/acre:26 ddu/ha and 13 ddu/acre:31 ddu/ha, respectively).

#### Soil

Soil at the site is relatively shallow with an effective rooting depth estimated at 11 inches. The soil surface is gravelly with larger rocks scattered on the surface and throughout the profile. Parent material is basalt. Soil texture is a sandy loam and reactivity is neutral (pH of 7.2). Shrub interspaces are mostly bare of herbaceous vegetation but the soil surface is armored by pavement and the amount of exposed bare ground is low. Relative bare ground cover was only 9%-10% in 2003 and 2008. The erosion condition class was rated as stable in 2003, and slight in 2008 due to flow patterns, pedestalling of plants, and surface litter movement.

#### Browse

The site supports a fairly dense stand for a Wyoming big sagebrush site with around 3,000 plants/acre in 2003 and 2008, and line-intercept cover estimate of around 20% for the same years. Sagebrush vigor was mostly normal in 2003, but plants displaying poor vigor increased to 30% in 2008. The number of decadent sagebrush plants has been high at 54%-60% in 2003 and 2008. Utilization was mostly light to moderate in both 2003 and 2008. Annual leader growth has been good, averaging 1.7 inches in 2003 and 1.1 inches in 2008. Young recruitment has been marginal to poor with only 100 young plants/acre estimated in 2003, and no young plants sampled in 2008. The only other shrubs encountered on the site included a few cactus (*Opuntia* spp.), spiny polygala (*Polygala subspinosa* ssp. *subspinosa*), and an occasional antelope bitterbrush (*Purshia tridentata*).

#### Herbaceous Understory

The herbaceous understory is poor with a total grass cover of only 5%-8% over the sample years, and most of that comes from annual species. The dominant species is cheatgrass (*Bromus tectorum*), which accounted for 23% of the total grass cover in 2003, and 79% in 2008. Galleta (*Hilaria jamesii*) accounted for 56% of the total grass cover in 2003, but declined to only 4% in 2008. The perennial grasses purple three-awn (*Aristida purpurea*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*), as well as the annual sixweeks fescue (*Vulpia octoflora*), are also found on the site in small numbers. Perennial forbs are rare. Total forb cover averaged around 2% in 2003, and less than 1% in 2008. Annual forbs, Gilia (*Gilia* sp.) and wooly navarretia (*Navarretia intertexta*), are the only common species.

#### 2003 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (48) Low potential scale

## 2008 TREND ASSESSMENT

Trend for browse is stable, but should be considered at risk due to high decadence in the sagebrush population and the dominance of cheatgrass in the understory. Wyoming big sagebrush is the only common browse species on the site. Sagebrush density has declined slightly from 3080 plants/acre in 2003 to 2880 plants/acre. The proportion of plants displaying poor vigor increased from 16% in 2003 to 30%. Decadence is high and increased slightly from 54% in 2003 to 60%. Recruitment is poor with a decline in the number of young plants from 26% in 2003 to no young plants sampled in 2008. The trend for grasses is down. There was little change in the sum of nested frequency of perennial grasses from 2003, but the sum of nested frequency of annual grasses increased three-fold from 2003. As stated above, cheatgrass dominates the herbaceous understory, and increased significantly in nested frequency from 2003. Cover of cheatgrass increased from 23% of the total grass cover in 2003 to 79%. The annual, sixweeks fescue, also increased significantly in nested frequency. There was a slight change in the composition of the perennial grasses with a significant decrease in the nested frequency of galleta, but a significant increase in the nested frequency of Indian ricegrass. The trend for forbs is slightly up, but forbs are very rare on the site. The sum of nested frequency of perennial forbs nearly doubled from 2003, though cover of perennial forbs is still less than 1%. There was a significant increase in the nested frequency of sego lily (*Calochortus nuttallii*), and the number of perennial species sampled increased from six species in 2003 to ten species. Cover of annual forb species declined from around 2% in 2003 to just 0.25%.

winter range condition (DCI) - poor (18) Low potential scale

browse - stable (0)

grass - down (-2)

forb - slightly up (+1)

## HERBACEOUS TRENDS --

Management unit 30 , Study no: 63

| T<br>y<br>p<br>e            | Species                         | Nested<br>Frequency |                  | Average<br>Cover % |      |
|-----------------------------|---------------------------------|---------------------|------------------|--------------------|------|
|                             |                                 | '03                 | '08              | '03                | '08  |
| G                           | <i>Aristida purpurea</i>        | 22                  | 18               | .52                | .13  |
| G                           | <i>Bromus tectorum</i> (a)      | <sub>a</sub> 128    | <sub>b</sub> 382 | 1.05               | 6.47 |
| G                           | <i>Hilaria jamesii</i>          | <sub>b</sub> 86     | <sub>a</sub> 44  | 2.54               | .35  |
| G                           | <i>Oryzopsis hymenoides</i>     | <sub>a</sub> 9      | <sub>b</sub> 19  | .04                | .46  |
| G                           | <i>Poa secunda</i>              | -                   | 3                | -                  | .03  |
| G                           | <i>Sitanion hystrix</i>         | 30                  | 68               | .33                | .53  |
| G                           | <i>Vulpia octoflora</i> (a)     | <sub>a</sub> 4      | <sub>b</sub> 27  | .00                | .20  |
| Total for Annual Grasses    |                                 | 132                 | 409              | 1.06               | 6.67 |
| Total for Perennial Grasses |                                 | 147                 | 152              | 3.45               | 1.51 |
| Total for Grasses           |                                 | 279                 | 561              | 4.51               | 8.19 |
| F                           | <i>Alyssum alyssoides</i> (a)   | -                   | 2                | -                  | .01  |
| F                           | <i>Astragalus</i> sp.           | -                   | 6                | -                  | .01  |
| F                           | <i>Castilleja linariaefolia</i> | -                   | 4                | -                  | .01  |
| F                           | <i>Calochortus nuttallii</i>    | <sub>a</sub> 8      | <sub>b</sub> 22  | .02                | .09  |



| T<br>y<br>p<br>e          | Species                    | Nested<br>Frequency |                | Average<br>Cover % |      |
|---------------------------|----------------------------|---------------------|----------------|--------------------|------|
|                           |                            | '03                 | '08            | '03                | '08  |
| F                         | Cryptantha sp.(a)          | -                   | 15             | -                  | .03  |
| F                         | Cymopterus sp.             | 10                  | 2              | .04                | .01  |
| F                         | Epilobium brachycarpum (a) | -                   | 3              | -                  | .00  |
| F                         | Eriogonum sp.              | -                   | 4              | -                  | .00  |
| F                         | Eriogonum ovalifolium      | -                   | 4              | -                  | .01  |
| F                         | Euphorbia sp.              | 5                   | 4              | .03                | .01  |
| F                         | Gilia sp. (a)              | <sub>b</sub> 66     | <sub>a</sub> 9 | .68                | .02  |
| F                         | Leucelene ericoides        | 5                   | 5              | .15                | .38  |
| F                         | Navarretia intertexta (a)  | 88                  | 89             | .84                | .17  |
| F                         | Penstemon sp.              | 1                   | -              | .03                | -    |
| F                         | Phlox longifolia           | 1                   | 4              | .00                | .01  |
| F                         | Sedum lanceolatum          | -                   | 3              | -                  | .00  |
| F                         | Sisymbrium altissimum (a)  | -                   | 5              | -                  | .01  |
| Total for Annual Forbs    |                            | 154                 | 123            | 1.52               | 0.25 |
| Total for Perennial Forbs |                            | 30                  | 58             | 0.28               | 0.55 |
| Total for Forbs           |                            | 184                 | 181            | 1.81               | 0.81 |

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 63

| T<br>y<br>p<br>e | Species                              | Strip<br>Frequency |     | Average<br>Cover % |       |
|------------------|--------------------------------------|--------------------|-----|--------------------|-------|
|                  |                                      | '03                | '08 | '03                | '08   |
| B                | Amelanchier utahensis                | 0                  | 0   | .38                | -     |
| B                | Artemisia tridentata<br>wyomingensis | 81                 | 84  | 22.93              | 17.67 |
| B                | Opuntia sp.                          | 1                  | 0   | .38                | -     |
| B                | Polygala subspinoso<br>subspinoso    | 5                  | 0   | .06                | .01   |
| Total for Browse |                                      | 87                 | 84  | 23.75              | 17.68 |

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 63

| Species                           | Percent Cover |       |
|-----------------------------------|---------------|-------|
|                                   | '03           | '08   |
| Artemisia tridentata wyomingensis | 18.48         | 22.64 |
| Opuntia sp.                       | .61           | -     |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 63

| Species                           | Average leader growth (in) |     |
|-----------------------------------|----------------------------|-----|
|                                   | '03                        | '08 |
| Artemisia tridentata wyomingensis | 1.7                        | 1.1 |

BASIC COVER --

Management unit 30 , Study no: 63

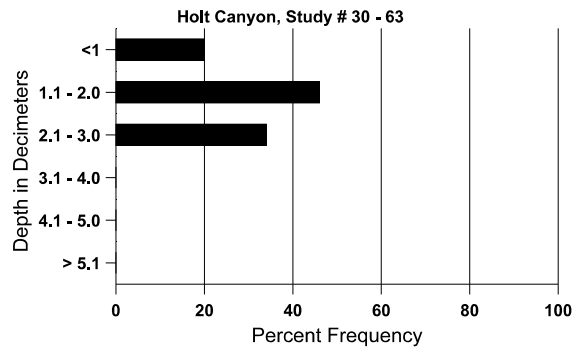
| Cover Type  | Average Cover % |       |
|-------------|-----------------|-------|
|             | '03             | '08   |
| Vegetation  | 31.81           | 25.13 |
| Rock        | 4.84            | 4.49  |
| Pavement    | 24.13           | 21.15 |
| Litter      | 41.40           | 54.59 |
| Cryptogams  | .18             | 1.11  |
| Bare Ground | 11.53           | 10.15 |

SOIL ANALYSIS DATA --

Management unit 30, Study no: 63, Study Name: Holt Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH  | sandy loam |        |        | %OM | PPM P | PPM K | ds/m |
|------------------------------|-----------------|-----|------------|--------|--------|-----|-------|-------|------|
|                              |                 |     | % sand     | % silt | % clay |     |       |       |      |
| 11.0                         | 70.4 (11.2)     | 7.2 | 64.6       | 18.7   | 16.7   | 1.2 | 4.9   | 451.2 | 0.5  |

## Stoniness Index



### PELLET GROUP DATA --

Management unit 30 , Study no: 63

| Type   | Quadrat Frequency |     | Days use per acre (ha) |         |
|--------|-------------------|-----|------------------------|---------|
|        | '03               | '08 | '03                    | '08     |
| Rabbit | 26                | 87  | -                      | -       |
| Deer   | 8                 | 11  | 11 (26)                | 13 (31) |
| Cattle | -                 | -   | -                      | 2 (4)   |

### BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 63

|  |                                       | Age class distribution (plants per acre) |       |        |          |      | Utilization |         |            |         |              |                           |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year                                     | Plants per Acre (excluding seedlings) | Seedling                                 | Young | Mature | Decadent | Dead | % moderate  | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <b>Artemisia tridentata wyomingensis</b> |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                       | <b>3080</b>                           | -  | 100   | 1320   | 1660     | 980  | 33          | 3       | 54         | 16      | 16           | 28/37                     |
| 08                                       | <b>2880</b>                           | 20                                       | -     | 1160   | 1720     | 1160 | 17          | 8       | 60         | 24      | 30           | 28/39                     |
| <b>Opuntia echinocarpa</b>               |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | 20   | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Opuntia sp.</b>                       |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                       | <b>20</b>                             | -  | -     | 20     | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | -/-                       |
| <b>Polygala subspinoso subspinoso</b>    |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                       | <b>100</b>                            | -  | -     | 100    | -        | -    | 0           | 0       | -          | -       | 0            | 3/5                       |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 5/4                       |
| <b>Purshia tridentata</b>                |                                       |  |       |        |          |      |             |         |            |         |              |                           |
| 03                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 48/65                     |
| 08                                       | <b>0</b>                              | -  | -     | -      | -        | -    | 0           | 0       | -          | -       | 0            | 36/45                     |

## SUMMARY

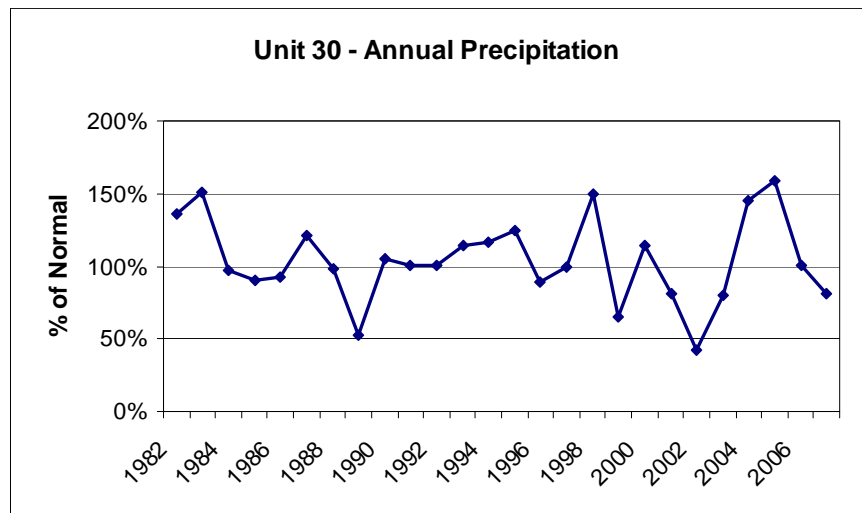
### WILDLIFE MANAGEMENT 30 - PINE VALLEY

#### Community Types

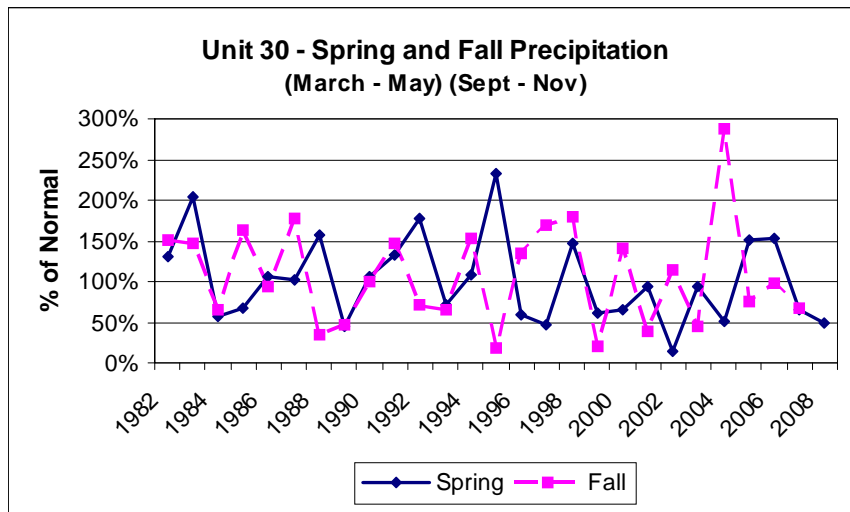
Twenty one trend studies were sampled in 2008. Six studies sampled higher elevation summer and summer/transitional range (30-5, 30-26, 30-35, 30-41, 30-45, and 30-58). Six studies sampled winter range in mountain brush communities (30-3, 30-38, 30-42, 30-55, 30-61, and 30-62). Three studies sampled Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities (30-29, 30-54, and 30-63). Three studies sampled chained and seeded singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) communities (30-13, 30-40, and 30-56). Three studies sampled burns that had been seeded (30-46 and 30-52). One study sampled a black sagebrush (*Artemisia nova*) community (30-57).

#### Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Cedar City FAA Airport, New Harmony, Gunlock Powerhouse, Veyo Powerhouse, and Enterprise weatherstations (Figures 1 and 2). The units annual precipitation was below 75% of normal (drought conditions) in 1989, 1999, and 2002 (Figure 1). Spring precipitation for the unit was below 75% of normal in 1984, 1985, 1993, 1996, 1999, 2000, and 2007, near or below 50% of normal in 1989, 1997, 2004, and 2008, and near 15% of normal in 2002 (Figure 2). Fall precipitation was near or below 75% of normal in 1984, 1992, 1993, 2005, and 2007, near or below 50% in 1988, 1989, and 2003, and near or below 20% of normal in 1995 and 1999, (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).



**Figure 1.** Annual precipitation data for unit 30. Precipitation data were collected at the Cedar City FAA Airport, New Harmony, Gunlock Powerhouse, Veyo Powerhouse, and Enterprise weather stations (Utah Climate Summaries 2008)



**Figure 2.** Annual spring (March-May) and Fall (Sept.-Nov.) precipitation for unit 30. Precipitation data were collected at the Cedar City FAA Airport, New Harmony, Gunlock Powerhouse, Veyo Powerhouse, and Enterprise weather stations (Utah Climate Summaries 2008).

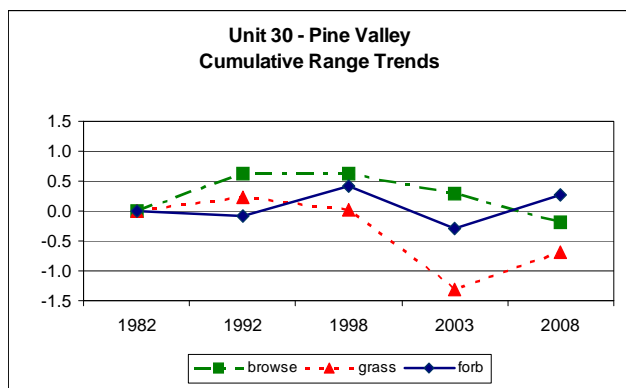


Figure 3. Cumulative range trends for unit 30.

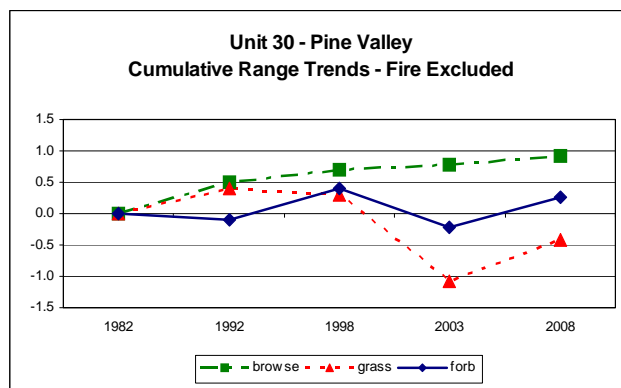


Figure 4. Cumulative range trends for unit 30, excluding sites that burned in wildfires.

### Browse

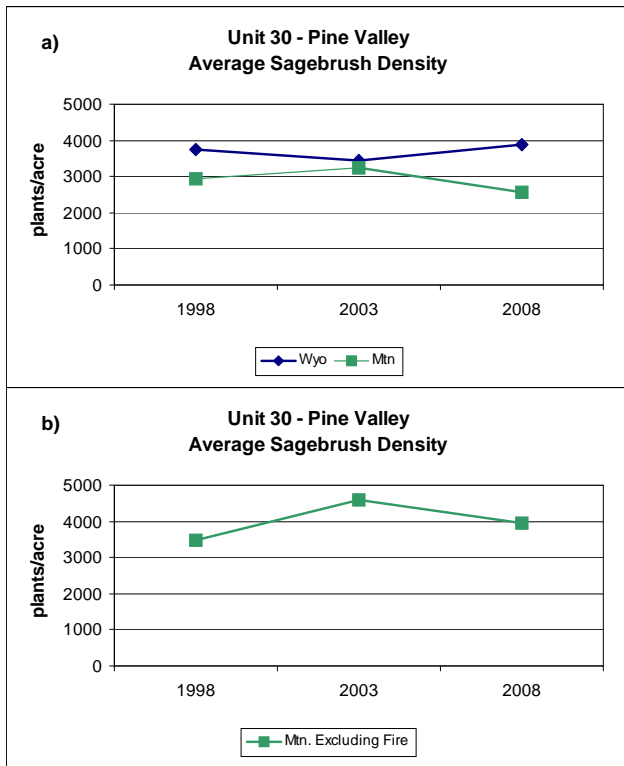
Six study sites have burned in wildfires since sampling began (30-38, 30-42, 30-45, 30-46, 30-57, and 30-61). Most of the fires occurred between the 2003 and 2008 sample periods (For further detail, refer to the discussion section). Because of this, the average trends for the unit and for individual species are reported for all sites and for sites excluding sites that burned. The average browse trend for all sites increased slightly from 1982 to 1992, remained fairly constant to 1998, then steadily decreased in 2003 and 2008 (Figure 3). The average browse trend excluding sites that burned increased steadily from 1992 to 1998, then increased more slowly through 2008 (Figure 4).

Wyoming big sagebrush was sampled at the Southwest of Newcastle (30-29), Telegraph Draw (30-40), Northwest of Enterprise (30-52), Bullion Canyon (30-54), Quichapa Canyon (30-55), and Holt Canyon (30-63) study sites, none of which burned. Average density of Wyoming big sagebrush has remained similar at between about 3,500 plants/acre to about 4,000 plants/acre from 1998 to 2008 (Figure 5a). The average cover of Wyoming big sagebrush decreased slightly from about 12% in 1998 to 9% in 2008 (Figure 6a). Average decadence of Wyoming big sagebrush increased markedly from 16% in 1998 to 44% in 2003, and decreased slightly to 34% in 2008 (Figure 7a).

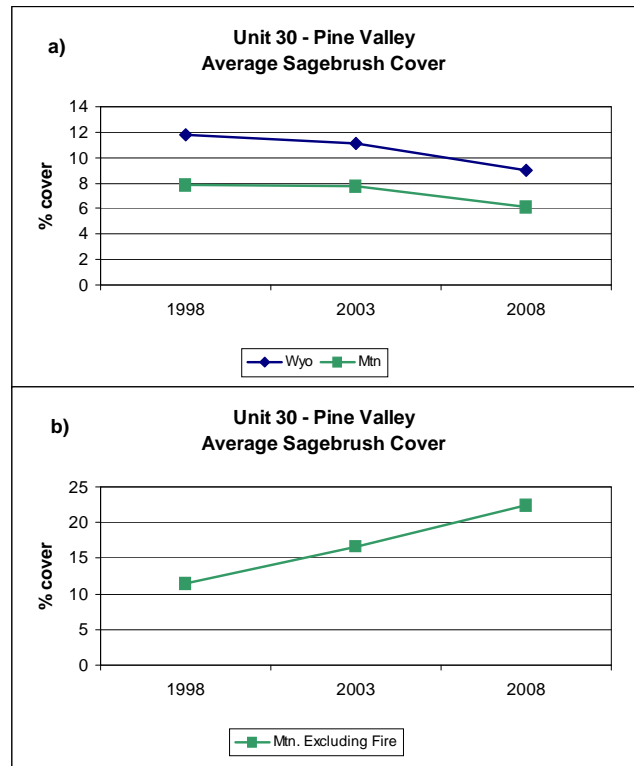
Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was sampled in the Upper Broad Hollow (30-3), Harmony Mountain Summit (30-5), Black Ridge (30-13), Grassy Flat Ridge (30-26), Deep Canyon (30-35), Wide Canyon (30-38), Joe Spring (30-41), Grapevine Spring (30-42), Flat Top Mountain (30-45), Pahcoon bench (30-46), Woolsey Reseed (30-56), Spirit Creek South Burn (30-58), Tobin Bench (30-61), and North Hills (30-62) study sites, five of which have burned. Average density of mountain big sagebrush on all sites sampled was fairly constant at around 3,000 plants/acre in 1998 and 2003, but decreased to around 2,500 plants/acre in 2008 (Figure 5a). Trends for density were similar if sites that burned were excluded (Figure 5b).

The cover of mountain big sagebrush on all sites decreased slightly from around 8% in 1998 and 2003 to 6% in 2008 (Figure 6a). If the sites that burned are excluded, cover increased steadily from 12% in 1998 to 22% in 2008 (Figure 6b). Decadence in mountain big sagebrush on all sites increased from 12% in 1998 to 26% in 2003, then decreased to 14% in 2008 (Figure 7a). Trends for decadence were similar if sites that burned were excluded, but at lower percentages (Figure 7b).

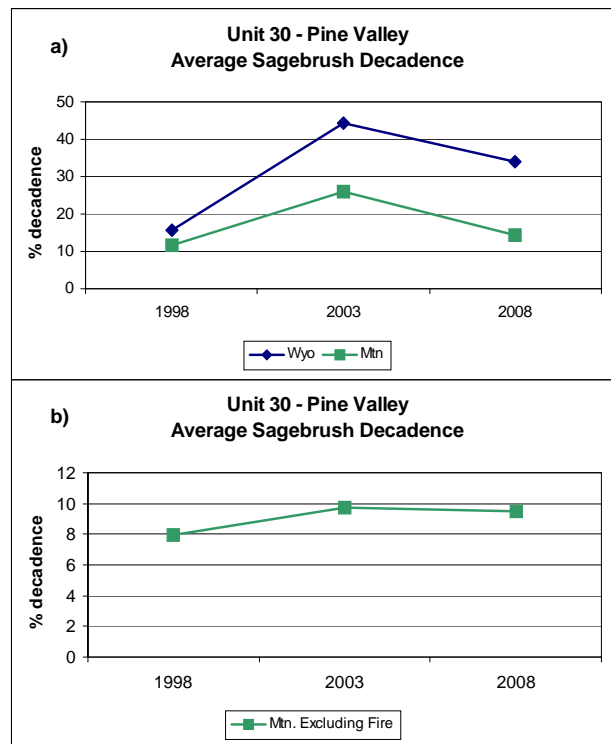
Black sagebrush (*Artemisia nova*) was sampled in two studies, Upper Broad Hollow (30-3) and Quichapa Canyon (30-55), at very low densities. Blackbrush (*Coleogyne ramosissima*) was sampled in one study,



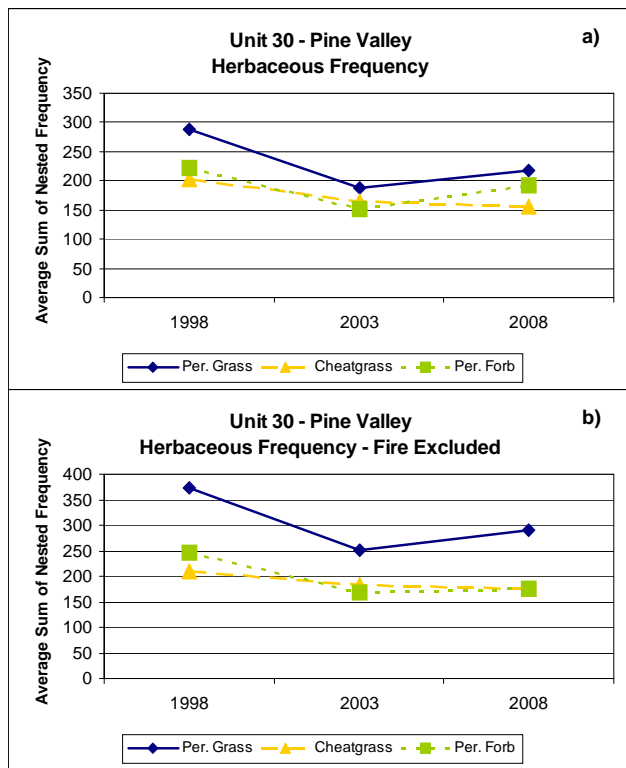
**Figure 5.** a) Average density of Wyoming big (Wyo) and mountain big (Mtn) sagebrush for all sites in unit 30. b) Average density of mountain big sagebrush for unit 30, with sites that burned excluded.



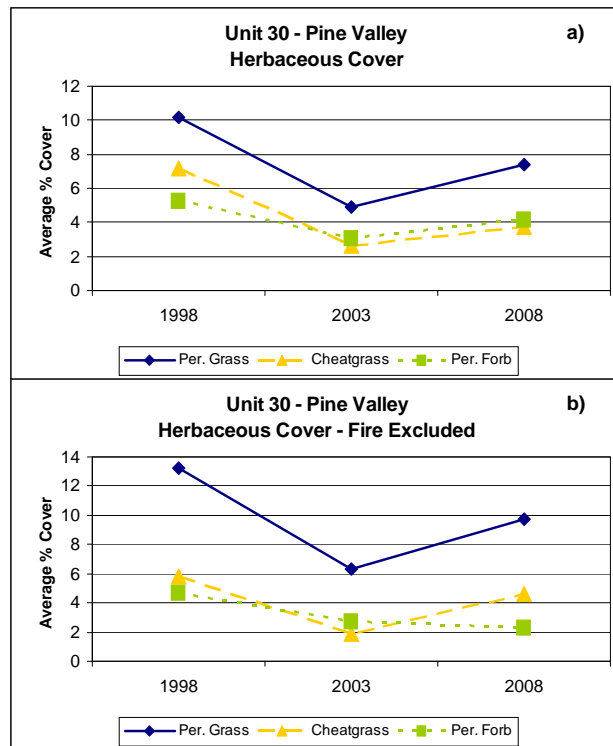
**Figure 6.** a) Average cover of Wyoming big (Wyo) and mountain big (Mtn) sagebrush for all sites in unit 30. b) Average density of mountain big sagebrush for unit 30, with sites that burned excluded.



**Figure 7.** a) Average decadence of Wyoming big (Wyo) and mountain big (Mtn) sagebrush for all sites in unit 30. b) Average decadence of mountain big sagebrush for unit 30, with sites that burned excluded.



**Figure 8.** a) Average sum of nested frequency of perennial grass, cheatgrass, and perennial forbs for all sites in unit 30. b) Average sum of nested frequency of perennial grass, cheatgrass and perennial forbs in unit 30, with sites that burned in wildfires excluded.



**Figure 9.** Average cover of perennial grass, cheatgrass, and perennial forbs for all sites in unit 30. b) Average cover of perennial grass, cheatgrass, and perennial forbs in unit 30, with sites that burned in wildfires excluded.

Summit Spring (30-57). Summary statistics were not calculated for these species. For more information on trends for these species refer to the discussion section of the individual sites.

### Grass

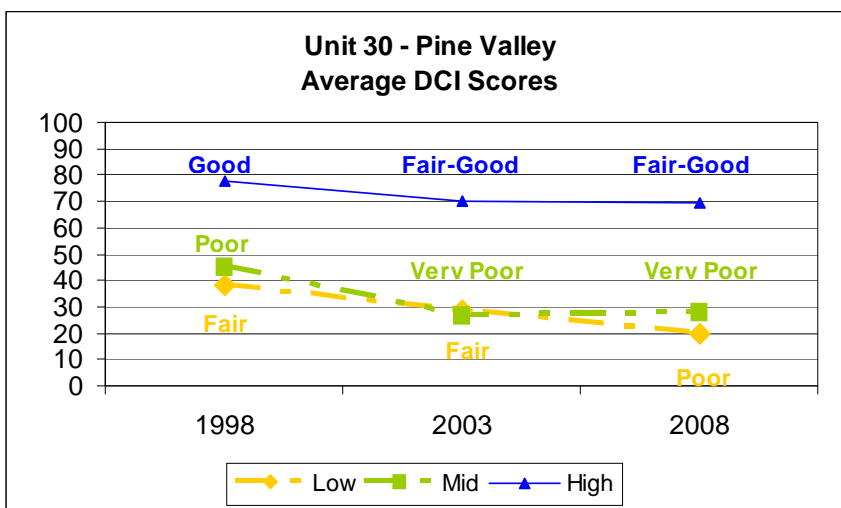
The cumulative grass trend was similar for all sites and when sites that burned were excluded. The cumulative grass trend increased slightly from 1982 to 1992, stayed relatively stable to 1998, declined sharply in 2003, then increased in 2008 (Figure 3 and Figure 4). The average sum of nested frequency of perennial grasses and cover had a similar trend. The sum of nested frequency of perennial grasses decreased by 35% from 1998 to 2003, and increased by 16% in 2008 (Figure 8a). The average cover of perennial grasses decreased from 10% in 1998 to 5% in 2003, and increased slightly to 7% in 2008 (Figure 9a). There was a large decrease in both frequency and cover of cheatgrass (*Bromus tectorum*) between the 1998 and 2003 sample years, then both frequency and cover of cheatgrass stayed fairly constant in 2008 (Figure 8a and Figure 9a).

### Forb

The cumulative forb trend of all sites was similar from 1982 to 1998, then decreased markedly in 2003 before increasing slightly in 2008 (Figure 3). The cumulative forb trend for forbs with sites that burned excluded was similar except that forbs did not increase much between 2003 and 2008. The trends of the average sum of nested frequency of perennial forbs and perennial forb cover were similar whether or not sites that burned were included. The sum of nested frequency of perennial forbs and cover both declined from 1998 to 2003, then increased again in 2008 (Figure 8a and Figure 9a).

Desirable Components Index

Six studies in this herd unit were considered to be in the low potential scale for the Desirable Components Index (DCI): Southwest of New Castle (30-29), Telegraph Draw (30-40), Northwest of Enterprise (30-52), Bullion Canyon (30-54), Summit Spring (30-57), and Holt Canyon (30-63). The average DCI rating for the low potential scale was fair (33) in 1998 and 2003, and decreased to poor-fair (24) in 2008 (Figure 10). When the low potential study that burned (30-57) was excluded, the average DCI rating increased to 44 in 1998, 32 in 2003, and decreasing further to 24 in 2008. The trend of the DCI rating remained similar, however. This increase in the overall average DCI rating for each sample year is due to the poorer quality of the Summit Spring study before it burned. Nine studies considered to be in the mid-level potential scale for the DCI: Black Ridge (30-13), Wide Canyon (30-38), Joe Spring (30-41), Grapevine Spring (30-42), Pahcoon Bench (30-46), Quichapa Canyon (30-55), Woolsey Reseed (30-56), Tobin Bench (30-61), and North Hills (30-62). The average DCI rating for mid-level potential scale was very poor-poor (35) in 1998, decreasing to very poor (25 and 24) in 2003 and 2008, respectively (Figure 10). When the mid-level potential sites that burned (30-38, 30-42, 30-46, 30-57, and 30-61) were excluded, the average DCI rating increased to 50 in 1998, 35 in 2003, and 39 in 2008. The trend for the average DCI of the mid-potential scale site improved slightly between the 2003 and 2008 sample years when sites that burned were excluded. One site was considered to be in the high potential scale for the DCI: Upper Broad Hollow (30-3). The DCI for this site was good (68 to 70) for all the sample years (Figure 10). The six remaining studies are considered to be summer range and do not meet the criteria for a DCI rating.



**Figure 10.** Unit 30, average Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which are low, mid-level, and high. Studies considered to be on summer range do not meet the criteria for a DCI rating and are not included.



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