UTAH BIG GAME RANGE TREND STUDIES 1998 Volume 2

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REPORT FOR FEDERAL AID PROJECT W-135-R-19

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME
RANGE TREND STUDIES
1998 Volume 2

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Performance Report for Federal Aid Project W-135-R-19

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TABLE OF CONTENTS

Page

PROGRAM NARRATIVE iii
REMARKS v
MAP OF UTAH HERD UNITS vi
RANGE TREND STUDY METHODS vii
REPORT FORMAT. xviii

Page

Wildlife Management Unit 20 (62C) Southwest Desert 1
20-01 Upper Indian Peak
20-02 Lower Indian Peak
20-03 Mountain Home Reseed
20-05 Upper Hamblin Valley
20-06 Wah Wah Pass

Wildlife Management Unit 22 (49,56) Beaver . 44
22-01 Deer Flat
22-02 Piute Reservoir
22-03 Oak Basin
22-04 Wades Canyon
22-05 Bone Hollow
22-06 Beaver Table
22-07 Sheep Rock
22-08 Muley Point
22-09 Rocks Reseeding
22-10 Doubleup Hollow
22-11 “B” Hill
22-12 Big Cedar Cove
22-13 Minersville Reservoir
22-14 Antelope Mountain
22-15 Fremont Wash

Wildlife Management Unit 29 (51) Zion 172
29-01 Wilson Ranch
29-02 Smith’s Mesa
29-03 North Hills

Wildlife Management Unit 30 (50A & B) Pine Valley, West Pine Valley, Commanche 197
30-03 Upper Broad Hollow
30-05 Harmony Mountain Summit
30-09 Upper Lime Spring
30-12 Pintura Bench
30-13 Black Ridge
30-18 Grants Ranch Trail
30-24 Paradise
30-26 Grassy Flat Ridge
30-29 Southwest of New Castle
30-35 Deep Canyon
30-37 Truman Bench
30-38 Wide Canyon
30-40 Telegraph Draw
30-41 Joe Spring
30-42 Grapevine Spring

Page

30-45 Flat Top Mountain
30-46 Pahcoon Bench
30-47 Lost Peak
30-52 Northwest of Enterprise
30-53 Sevy Hollow
30-54 Chloride Canyon
30-55 Quichapa Canyon
30-56 Woolsey Reseed
30-57 Summit Spring
30-58 Spirit Creek South Burned
30-59 Upper Horse Creek
30-60 Jones Hollow 1

Discontinued Trend Studies Unit 30 (50A). . . 451
50A-02 Comanche Creek Ditch
50A-10 Upper Bumblebee Spring
50A-16 Upper Leeds Creek
50A-19 Big Water Reservoir
50A-21 Upper Comanche Canyon
50B-03 New Castle Reservoir
50B-07 Swett Hills
50B-08 Oak Spring
50B-09 Whiterocks Reservoir
50B-11 West of Long Point
50B-13 Atchinson Mountain
50B-16 West Valley
50B-07c Motoqua
50B-12c Rattlesnake Spring
50B-14c Pinnacles

Wildlife Management Unit 27R and 29R Special Studies (Kanab Exclosures) 480
27R-01 John R. Flat Total Exclosure
27R-02 John R. Flat Livestock Exclosure
27R-03 John R. Flat Outside
27R-04 Nephi Pasture Total Exclosure
27R-05 Nephi Pasture Livestock Exclosure
27-07 Nephi Pasture Outside
27R-08 Five Mile Mountain Outside
27R-09 Five Mile Mountain Exclosure
27R-10 Cockscomb Exclosure
27R-11 Cockscomb Outside
29R-01 Elephant Gap Total Exclosure
29R-02 Elephant Gap Livestock Exclosure
29R-03 Elephant Gap Outside

References 580

PROGRAM NARRATIVE

State: UTAH Project Number: W-135-R
Project Title: Statewide Big Game Range Trend Studies

Problem and Need: The ability to monitor vegetation composition changes (range trend) on key big game areas is an important part of a big game management program. The health and vigor of big game populations are closely associated with the quality and quantity of forage in key areas. Key areas are defined as those areas "where deer or other big game have demonstrated a definite pattern of use during normal climatic conditions over a long period." This project will emphasize deer and elk habitat although monitoring efforts may include other big game species as needed. Winter ranges for both deer and elk will comprise the bulk of the trend studies, although there are certain herd units where summer range is the portion of the unit that limits carrying capacity. Most of the key areas are located on public lands (BLM, USFS or State Lands) that are impacted by livestock grazing programs. Most of these programs are summarized in allotment management plans (USFS) or resource management plans (BLM) which are used to direct the management of a variety of resources on public lands (rangelands, watersheds, energy and minerals, recreational opportunities, etc.). This project was initiated to direct the attention of local interagency committees on the proper management of key big game areas throughout the state. The Division adopted monitoring guidelines established by the Utah State Interagency Committee (staff level biologists from BLM, USFS and DWR) which assures that data collected by DWR is compatible with that collected by both federal agencies. This limits the amount of duplication involved in monitoring certain key areas where either BLM, USFS or DWR may have overlapping responsibilities or concerns about range trend.

Objectives:

1. Continue to monitor range trend in all key areas within a DWR administrative region annually. This could also include requests for any area of the state that has need of current range trend information because of special habitat needs or concerns regarding big game and livestock interactions.

2. Classify every trend study site according to ecological site and identify habitat objectives based on site potential.

3. Prepare an annual report which will include herd unit descriptions, trend study narratives and herd unit evaluations for all herd units in a region annually.

4. Foster cooperative efforts among interagency personnel with respect to trend study site selection, sharing trend data, development of trend monitoring procedures and data analysis, and the identification of management objectives for study sites.

5. Monitor vegetation in wildlife habitat improvement projects.

6. Use the information generated by this project to inform local interagency committees of key habitat areas that are declining in value for big game.

7. Propose management strategies that are designed to correct habitat limitations in key areas.

Expected Results and Benefits:

Every five years the trend studies in each of the five regions will be reread and the status of the vegetation in key areas of each herd unit will be evaluated. The local interagency committee will be able to use the information to determine if key areas are declining in habitat value and if so, to recommend adjustments in management programs that would help restore big game habitat.

REMARKS

The work completed during the 1998 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southern Region. Trend studies surveyed in these management units were established in 1982, 1985, and 1987 with rereads in 1991, 1992, and 1998. Some new sites were established in 1998 as well.

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

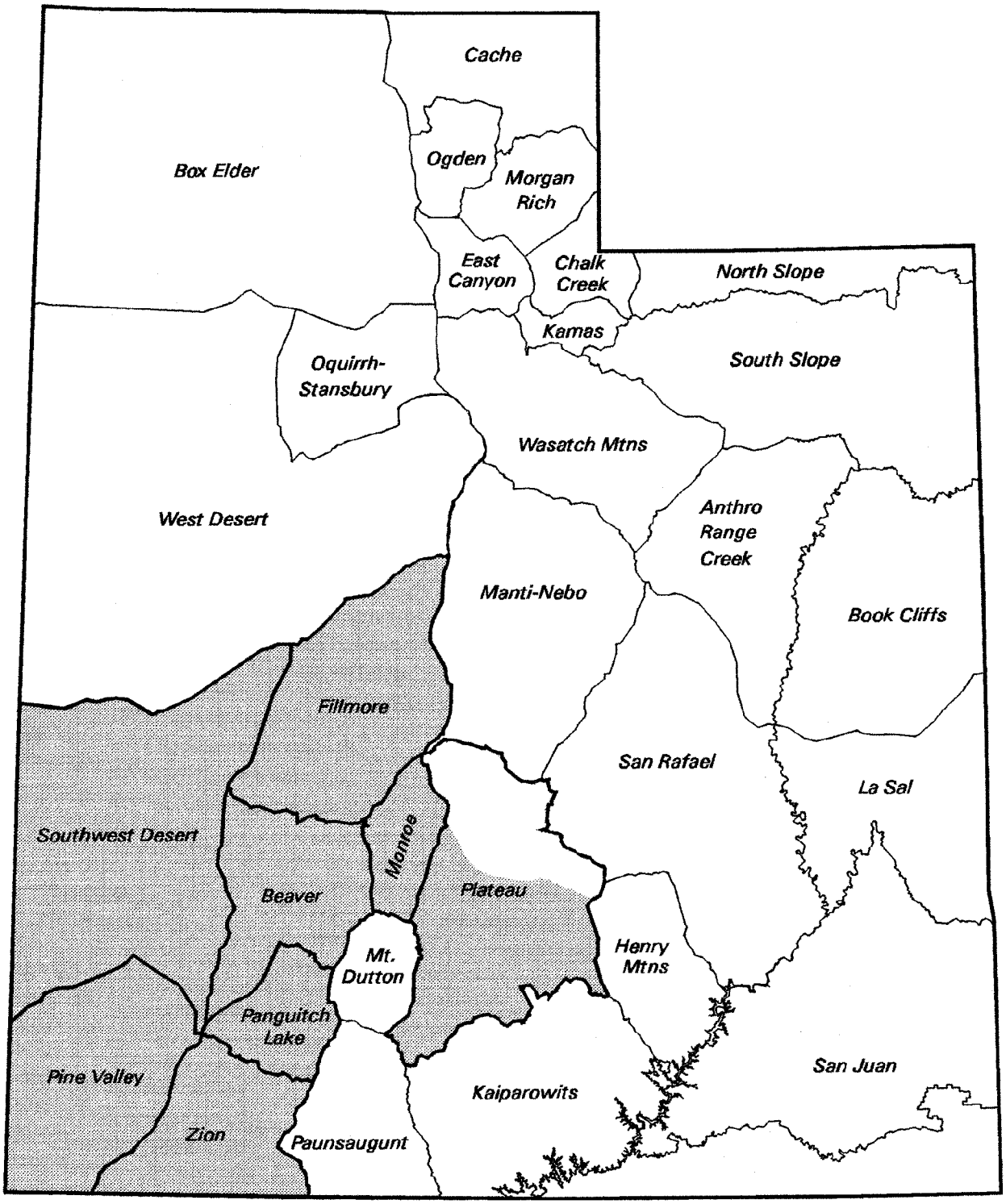
Dixie National Forest
- Cedar City Ranger District
- Escalante Range District
- Pine Valley Ranger District
- Powell Ranger District
- Teasdale Ranger District

Fish Lake National Forest
- Beaver Ranger District
- Fillmore Ranger District
- Richfield Ranger District

Bureau of Land Management
- Beaver River Resource Area
- Dixie Resource Area
- Escalante Resource Area
- Kanab Resource Area
- Warm Spring Resource Area

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

Utah Management Units Surveyed in 1998



UDAF GIS March, 1999

RANGE TREND STUDY METHODS

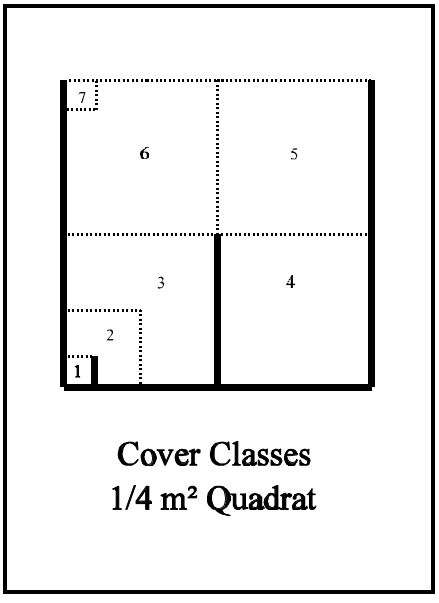
Trend monitoring studies depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or "key" areas within distinct plant communities on big game ranges. These "key" areas should be 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 critical habitat as agreed upon by DWR, BLM, and USFS personnel. Often, the 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 the transects proper identification.

Vegetative composition

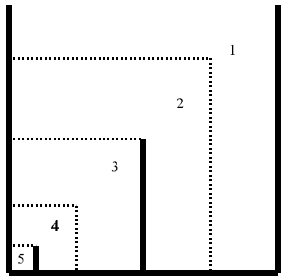
Determining vegetational characteristics for each "key" area is determined by setting up 5 consecutive 100 ft base line transects in the area of interest. This 500 ft line is the baseline and one, 100 ft belt is placed perpendicular to each 100 ft section of the base line at random foot marks and centered on the 50 ft mark. A 1/4 m^2 quadrat is centered every 5 feet along the same side of the belt. 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 species occurring within a quadrat, including annual species.

Currently, cover is determined using a slightly modified Daubenmire (1959) cover class method. The seven cover class are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, 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.

Canopy cover of shrubs or trees above eye level 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.



Nested frequency values for the quadrat range from 1-5 according to which area or which sub-quadrat the plant species 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.



Nested Frequency
1/4 m^2 Quadrat

Higher nested frequency scores represent a higher abundance for that plant species. 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 (Mosley and others 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. Quadrat frequency is used to give another quantitative, but less sensitive measure to help corroborate the trends being illustrated by the sum of nested frequency values.

Nested frequency, quadrat frequency, and average percent cover data for individual grass and forb species are summarized in the "Vegetative 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 classes. ([1]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 the amount of use by placing shrubs in Form Classes 1 through 9.

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 by Vigor Classes 1-4.

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 possible sample of 50 plants per species depending on their respective densities. Tree density is determined by the point-center quarter method centered on each end of the 5, 100 ft base lines. This allows sampling trees on a much larger scale. The strip method, used to estimate shrub density, can in most cases effectively inventory seedling and young tree densities.

A more accurate method of determining shrub frequency is being used in this and all subsequent reports. It was found that nested and quadrat frequency of shrubs in previous reports did not usually reflect accurate trends in shrub populations with low numbers. Each 1/100 acre shrub strip is divided into 20, 5 foot segments. Presence or absence is now determined in these strip segments to give a more accurate measure of shrub frequency. This larger sample will better reflect changing trends in the shrub populations. This data along with shrub cover is recorded in the browse trends table. For example, if a species was rooted in 25 of the shrub 100 strips, strip frequency for this species would be 25%.

TREND DETERMINATION

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

1) changes in density or number of plants/acre
2) proportion of decadent plants and percentage of decadent plants that are dying
3) biotic potential or proportion of seedlings in population
4) proportion of young plants in population
5) proportion of individuals heavily browsed
6) proportion of plants in poor vigor
7) changes in height and crown diameter measurements
8) changes in browse composition
9) strip frequency values

Trends in herbaceous plants as a group or as a single “key” species can be determined by comparing the sum of nested and quadrat 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 α=.10. Ground cover parameters are analyzed and compared in the discussions of the reread studies. Trends for soil are determined by comparing these basic ground cover measurements and cover composition (herbs vs shrubs) between years as well as comparing photos and observer observations between readings. 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 “vegetative trends” table summarizes average cover, quadrat frequency, and nested frequency data for individual grass and forb species. The table contains all the grass species found on site 23-1. Readings prior to mid-1992 include only nested and quadrat 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 have a combined total cover of 11.39%. In 1985, *Agropyron spicatum* had a sum of nested frequency value of 227. In 1991, the sum of nested frequency value did not change and is still 227. By 1998, sum of nested frequency declined to 183. The subscript letters indicate that the sum of nested frequency value between 1985 and 1991 were not statistically different. Although, the 1998 sum of

nested frequency for *A. spicatum* shows a significant decrease compared to 1985 and 1991. Quadrat frequency showed a slight increase from 1985 to 1991 and then a marked decrease in 1998. Cover was estimated at 7.78% for *A. spicatum* in 1998. Trend for this grass is down due to a significant decline in nested frequency.

In 1985, perennial grasses had a sum of nested frequency value of 265. This value has steadily increased to 313 in 1991 and 344 in 1998. The summed value of 344 for 1998 was derived by subtracting the annual grass value (*Bromus tectorum*) from the total value of 386. These changes would indicate a slightly upward overall trend for perennial grasses on this site. The forb trend can be determined in a similar manner. The herbaceous understory trend is determined using both the grass and forb trends. For example, total herbaceous cover is 12.23% (grass total cover + forb total cover) with grass providing the bulk of the cover. Therefore, when determining herbaceous trend, the grass proportion should be weighted more heavily then the forb proportion.

HERBACEOUS TRENDS --
Herd unit 23 , Study no: 1

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron spicatum	$_{b}$227	$_{b}$220	$_{a}$183	79	84	68	7.78
G	Bromus tectorum (a)	-	-	42	-	-	14	.43
G	Oryzopsis hymenoides	4	12	12	2	4	4	.17
G	Poa fendleriana	$_{a}$6	$_{b}$36	$_{b}$49	3	16	21	.98
G	Poa secunda	$_{a}$3	$_{b}$18	$_{c}$94	1	10	40	2.00
G	Sitanion hystrix	$_{b}$25	$_{ab}$20	$_{a}$6	13	9	3	.01
Total Annual Grasses		0	0	42	0	0	14	.43
Total Perennial Grasses		265	313	344	98	123	136	10.96
Total for Grasses		265	313	386	98	123	150	11.39
F	Agoseris glauca	-	10	1	-	5	1	.00
F	Arabis spp.	$_{a}$-	$_{b}$18	$_{a}$1	-	9	1	.00
F	Astragalus convallarius	$_{a}$2	$_{a}$4	$_{b}$6	1	1	6	.15
F	Calochortus nuttallii	$_{ab}$4	$_{b}$8	$_{a}$-	2	4	-	-
F	Collinsia parviflora (a)	-	-	3	-	-	1	.00
F	Crepis acuminata	-	6	7	-	2	2	.06
F	Eriogonum racemosum	-	-	4	-	-	1	.03
F	Eriogonum umbellatum	-	1	9	-	1	5	.16
F	Phlox austromontana	-	6	4	-	3	2	.16
F	Phlox longifolia	$_{a}$8	$_{b}$27	$_{a}$16	4	14	6	.20
Total Annual Forbs		0	0	3	0	0	1	.00
Total Perennial Forbs		14	80	48	0	0	24	.78
Total for Forbs		14	80	51	7	39	25	.78

Values with different subscript letters are significantly different at " .10 (annuals excluded)
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 had a strip frequency of 40 out of a possible 100. Cover is determined using the $1/4m^2$ quadrat and estimating the percent of the quadrat covered below eye level (~6 feet). In this case, mountain big sagebrush cover is estimated to be 2.54%.

BROWSE TRENDS --
Herd unit 23 , Study no: 1

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	35	2.24
B	Artemisia tridentata vaseyana	40	2.54
B	Chrysothamnus depressus	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	.15
B	Gutierrezia sarothrae	2	-
B	Juniperus osteosperma	4	5.51
B	Opuntia spp.	1	.15
B	Pinus edulis	4	5.99
B	Purshia tridentata	18	3.20
Total for Browse		106	19.79

To more accurately estimate overhead canopy cover for trees, the line intercept method is used along each 100' belt. This data is reported in the canopy cover table which follows. For example, *Juniperus osteosperma* has an estimated average cover of 7%.

CANOPY COVER --
Herd unit 23 , Study no: 1

Species	Percent Cover '98
Juniperus osteosperma	7
Pinus edulis	3

The basic cover table summarizes nested frequency and 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 projected vegetational cover (30.04). Therefore, comparisons can be made for all cover measurements except for general vegetation cover which now examines projected foliar cover rather than just basal cover.

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

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	274	2.00	5.75	30.04
Rock	216	6.00	5.25	11.18
Pavement	279	30.50	24.25	26.32
Litter	381	46.50	46.50	42.49
Cryptogams	46	5.00	3.00	.93
Bare Ground	254	10.00	15.25	21.42

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., 64.4°F), with the average depth (in inches) as the lower measurement (12.7). Chemical and textural characteristics are also listed and were determined by laboratory analysis of a composite sample taken near each of the 5 baseline starting stakes.

SOIL ANALYSIS DATA --
Herd Unit 23, Study # 01, Study Name: Bear Ridge

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.2	64.4 (12.7)	7.3	40.0	33.4	26.6	3.4	9.0	57.6	.5

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

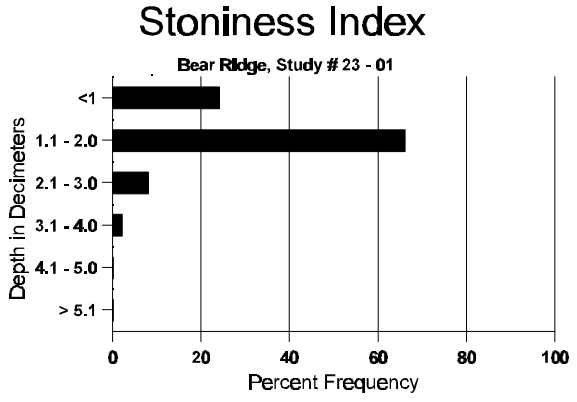
Ultra acid	<3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	>9.1

Percent organic matter (%OM) refers to the amount of organic matter in the top 12 inches of soil. Parts per million of phosphorus and potassium are also included. Values for phosphorus and potassium less than 10 ppm and 70 ppm respectively may be limiting to vegetation growth.

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 help become more aware of how rock is distributed throughout the upper soil profile, a stoniness index is determined for each of the sites. Depth to the nearest rock is estimated at the first 10 feet (at one-foot intervals) of 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.



The pellet group frequency table summarizes the quadrat frequency of wildlife and livestock droppings found on the site. This data was not included in reports done prior to mid-1992. For example in 1998, rabbit pellet

groups were found in 25% of the quadrats placed on study 23-1, indicating the relative amount of rabbit use. With future readings, this data can help characterize changes in wildlife use patterns on the site.

PELLET GROUP FREQUENCY --
Herd unit 23 , Study no: 1

Type	Quadrat Frequency '98
Rabbit	25
Elk	4
Deer	36

It was determined additional information on pellet-groups was needed. Therefore, a larger sample distributed over a larger area is now read in conjunction with the vegetative transects. The pellet-group transect has a minimum of 50, 100ft^2 circular plots which are placed through the area. These are usually two parallel transects of 25 plots on each side of the vegetative trend transect. 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. If more precision is required, the transect is marked permanently and the pellet groups within the circular plots are removed or marked.

On the following page is a section of a browse table which summarizes characteristics of shrubs on study 23-1. Total plants/acre for Mountain big sagebrush, excluding seedlings (S) and dead (X) was 1,400 in 1985, 1,065 in 1991, and 1,100 in 1998. Seedlings are excluded from the population estimate because with summer drought, they may all die by late fall causing great fluctuations in population estimates from year to year. Since mid-1992, a larger shrub sample is used to better characterize the shrub populations. Therefore, changes in density may not necessarily indicate changes in trend, especially those populations that characteristically are clumped and/or have discontinuous distributions. Earlier smaller sample sizes could easily either over estimate or under estimate shrub populations. Other characteristics like percent decadency, vigor, percent heavy hedging, biotic potential, etc. should be given more weight in determining shrub trend when comparing years where sample sizes are different.

The following data on mountain big sagebrush shows the proportion of decadent shrubs (abbreviated as Dec: in the table) in the population has steadily increased from 53% in 1985 to 63% in 1991 and to 67% by 1998. More seedlings were encountered in 1985 and 1991, with slight fluctuations in the numbers of young plants. The percentage of plants displaying poor vigor has increased from 14% in 1985 to 38% in 1991 and is estimated at 40% in 1998. This percentage is determined by dividing the number of shrubs in vigor classes 3 and 4 by the total number of shrubs sampled (yearly totals for each grouping; Y, M, and D). The proportion of shrubs displaying heavy hedging declined from 24% in 1985 to 6% in 1991 and only 2% by 1998. This is determined by dividing the number of shrubs in form classes 3, 6 and 9 by the total number of shrubs sampled (total column). The proportion of shrubs displaying moderate use has fluctuated from 67% in 1985, down to 19% in 1991, and up to 56% in 1998. This is determined by dividing the number of shrubs in form classes 2 and 5 by the total number of shrubs sampled. The dead to live ratio is 2:1. This ratio is determined by dividing the number of dead plants by the number of live plants. The average height of sagebrush (mature plants) and crown diameter has fluctuated from 13" x 15" to 12" x 13" and finally 15" x 23". Considering all these factors, trend for sagebrush in 1998 is slightly downward due to increased poor vigor and increased percent decadency. Also the number of dead plants encountered is more than double the number of live plants inventoried. An additional statistic to look at is the proportion of plants classified as dying in the decadent age class. For example, 60% of the decadent plants were reported as dying in 1991 and 41% of the decadent plants were reported as dying in 1998. This number is determined by dividing the number of plants in vigor class 4 by the total number of plants in the decadent age class. Both the dead to live ratio and the

percentage of dying plants in the decadent age class indicate there has been a large shrub dieoff in the past and this might continue into the future.

BROWSE CHARACTERISTICS --
Herd unit 23, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	91	-	-	-	1	-	-	4	-	-	5	-	-	-	333			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	-	2	1	-	-	-	-	-	-	3	-	-	-	200			3
	91	4	-	-	1	-	-	-	-	-	5	-	-	-	333			5
	98	2	-	-	3	-	-	-	-	-	5	-	-	-	100			5
M	85	1	4	1	-	-	-	-	-	-	4	-	2	-	400	13	15	6
	91	-	-	1	-	-	-	-	-	-	1	-	-	-	66	12	13	1
	98	2	9	1	1	-	-	-	-	-	12	-	1	-	260	15	23	13
D	85	1	8	3	-	-	-	-	-	-	11	-	1	-	800			12
	91	5	3	-	2	-	-	-	-	-	4	-	-	6	666			10
	98	14	22	-	1	-	-	-	-	-	16	-	6	15	740			37
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	2300			115

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	67%	24%	14%	-24%
'91	19%	06%	38%	+ 3%
'98	56%	02%	40%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1400	Dec:	57%
	'91	1065		63%
	'98	1100		67%

Management background information, photographs, and knowledgeable plant identification add to the data base for each site. Management and background information for each site is obtained from the administering agency. Permanently located photographs are taken; a general view down line and a close-up picture of a quadrat from each belt are used to further characterize individual sites. Correct plant identification is critical for a complete and accurate site analysis. Species identification mostly follows "A Utah Flora" (Welsh et al. 1987). 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.

Sometimes information is requested for the production of shrubs and/or herbaceous species. These methods are described in a Interagency Technical Reference on Sampling Vegetation Attributes ([2]U.S. Department of Interior Bureau of Land Management 1996). The standard double weight sampling method is used for determining shrub production. This requires the establishment of a weight reference unit for each shrub species occurring in the area being sampled. Weights for 10 mature shrubs are determined for each species. Then this average weight is used with the population estimates to help estimate production by species on a per acre basis. When estimates for herbaceous species are needed, the same method is utilized except that three clipped quadrats are correlated to the herbaceous plant cover values.

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[2]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 herd 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.

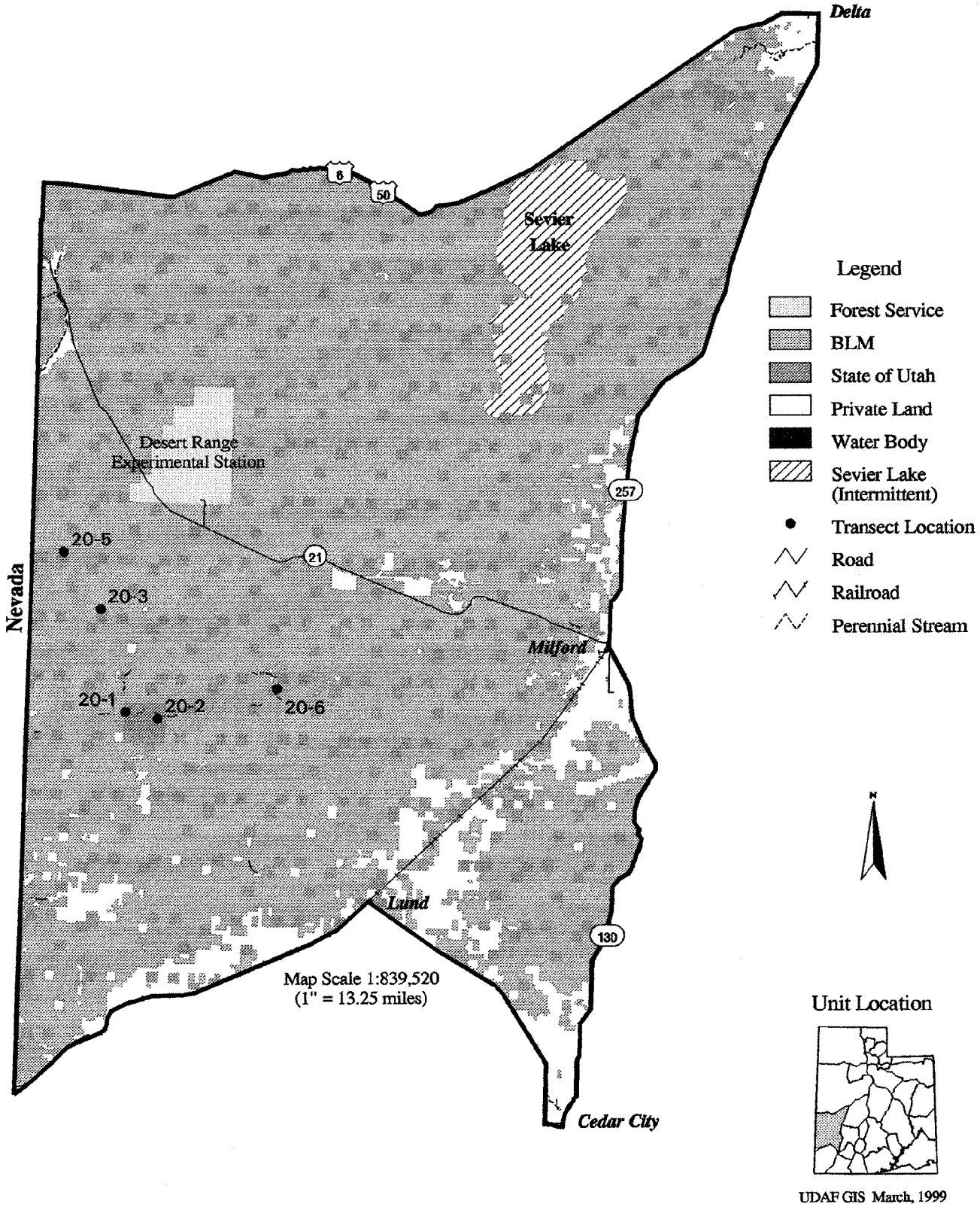
The name of the site and directions for locating the site are given on the location page. Due to many changes in management unit boundaries, trend studies have been renumbered. The previous trend study number is found in parenthesis following the trend study number currently being used. Also included on this page are the range 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, 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 change is indicated in the herbaceous trends table.

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 20



WILDLIFE MANAGEMENT UNIT 20 (62C) - SOUTHWEST DESERT

Boundary Description

> **Beaver, Iron and Millard counties** - Boundary begins at Highway US-50(6) and the Utah-Nevada state line; then east along US-50(6) to Highway SR-257; then south of SR-257 to Highway SR-21; then south on SR-21 to Highway SR-130; then south on SR-130 to Interstate 15; then south on I-15 to Highway SR-56; then west on SR-56 to the Lund Highway; then northwest along this highway to the Union Pacific railroad tracks at Lund; then south along this railway to the Utah-Nevada state line; then north along this state line to US-50(6) and beginning point.

Management Unit Description

The West Desert-South unit covers a large arid area along the Nevada border, although much of this is cold-desert valley bottoms and is not suitable habitat for mule deer. The Wah Wah, Needle, and San Francisco ranges provide approximately 937,449 acres of summer range for deer. However, most is lower quality summer range consisting of mountain brush types. There is little quality summer range due to the lack of aspen on these mountains. Winter range is estimated at 251,382 acres. Summer range for elk is estimated at only 68,239 acres with 123,046 acres of winter range. (Evans el al. 1998). All three mountains run north and south with their drainages flowing to the east and west. With similar steep and rugged topography, the upper areas are quite susceptible to erosion of unprotected soils from high intensity summer storms. Gentle rolling slopes, foothills, and benches dominate below 7,500 feet. The elevation on the unit ranges from 4,700 feet at the hardpan in Wah Wah Valley to 9,790 feet at Indian Peak.

Most of the unit is administered by the BLM (>80%). The DWR manages the 10,240 acre Indian Peak Wildlife Management area and private interests control 5% of the deer and elk summer range and 4% and 8% of the deer and elk winter range. By far, the most prominent land use is livestock grazing. Cattle are grazed year-round in some areas and particularly the valley bottoms in winter. Additionally, pinyon nuts and Christmas trees are harvested and sold commercially. Mule deer are the dominant big game species, along with a small but increasing herd of elk which is to be managed to achieve a population of 975 wintering animals. Pronghorn antelope are common in the valleys, while feral horses are present and overly abundant in localized areas north of Indian Peaks on the Needle Range.

The big game range was inventoried by Coles and Pederson (1970) in 1969. The whole area is considered only marginal deer habitat due to the lack of good summer range. The vegetal composition of nearly all of the area classified as deer range is typical of winter ranges throughout the state. Of the four vegetation types, Coles and Pederson (1970) recognized juniper-pinyon (*Pinus monophylla*) as the most prevalent, covering 74% of the deer range. Sagebrush was second, covering 19% of the range. The browse-shrub type and seeded areas cover respectively 4% and 3% of the range. The browse-shrub type is the most productive and in the most demand by both livestock and deer. Despite a scarcity of forbs which makes it poor summer range, most deer use the browse-shrub type extensively year-round. Rehabilitation projects, covering 21,882 acres of former pinyon-juniper range, have increased overall production. This has been due mostly to the establishment of healthy stands of seeded perennial grasses. Livestock and elk populations have benefited most from these seeded areas. Deer may also have benefited, but to a lesser extent due to the limited success of forb and browse establishment. The best seedings for deer have been in the Indian Peaks area where bitterbrush is common.

Herd Unit Management Objectives

The West Desert was all considered to be one herd unit prior to 1971 when it was split into three subunits (62A, 62B and 62C). Deer numbers and thus harvests have always been relatively low in these units. Either sex hunts were conducted in 20 (62C) between 1951 and 1973 with a maximum harvest of 617 deer in 1972.

The average harvest for the buck only hunts between 1974 and 1984 was 133, with a low of 50 in 1975, and a high of 197 in 1984 (Jense et al 1985). Harvests have declined between 1991 and 1995 from 261 in 1991 to only 55 by 1995. To get a better idea of what kind of trend is taking place on this herd unit, a regression of deer harvest since 1950 is best to help explain the trend. This type of analysis indicates a continued downward trend that is 37% lower than what took place in 1950 (Jense et al. 1991). Poor fawning and summering areas contribute to typically low fawn production (usually well below 70 fawns/100 does) which inhibits the rate of increase. Fawn/doe ratios were estimated at only 14 in 1986-87 and 45 in 1988-89 (Jense et al. 1991). This increased to 51 by 1991-92, but dropped to 33 fawns/100 does in 1992-93 (Evans et al. 1996). These low counts are reflective of the downward trend in deer populations for Utah's western desert areas.

Current population objectives for deer are to reach a target winter population of 4,000. More recently, only 2,500 deer were estimated in the post season counts of 1996. The herd composition is to be maintained with a post season buck to doe ratio of 15:100, with 30% of the bucks being 3 point or larger. Overall deer numbers on this unit are significantly below recent averages and greatly below historic highs and averages (Evans et al. 1996). Elk objectives are to achieve a population of 975 wintering animals with a minimum post season bull to cow ratio of 16:100. At least 8 of these bulls are to be 2 ½ years old or older. The bull harvest objective is to maintain a bull harvest of 90% to 100% mature bulls with an average age of at least 5 years.

Competition between feral horses, livestock, and big game for the herbaceous vegetation around seeps, springs, and creeks is a problem. Because the forbs and succulent grasses typical of the summer diet of mule deer and elk are scarce throughout the range, the limited riparian areas where they do occur are vital. Unfortunately, livestock and feral horses also prefer these areas and use them extensively. Feral horses are especially detrimental because of their tendency to trample vegetation and compact soils resulting in reduced forage production and erosion problems. Many of these riparian areas should be fenced to alleviate some of these problems. Chaining and seeding of closed juniper-pinyon stands at higher elevations would enhance the area for elk and could have limited benefits for deer.

Study Site Description

Because of unit 20's (62C) limitations as big game range, it had been given a low priority and only two permanent trend monitoring studies were established in 1985. These studies were both on DWR lands in the Indian Peak area. Due to increasing competition with deer, elk, and wild horses, three additional trend studies were established in 1998. These include: Mountain Home Seeding, Upper Hamblin Valley, and Wah Wah Pass.

Trend Study 20-1-98

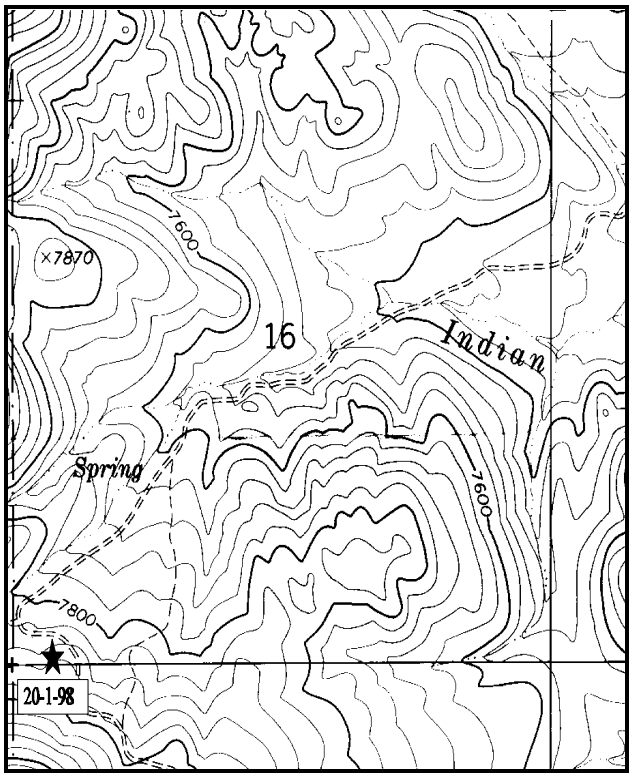
Study site name: Upper Indian Peak . Range type: Mixed Mountain Brush .

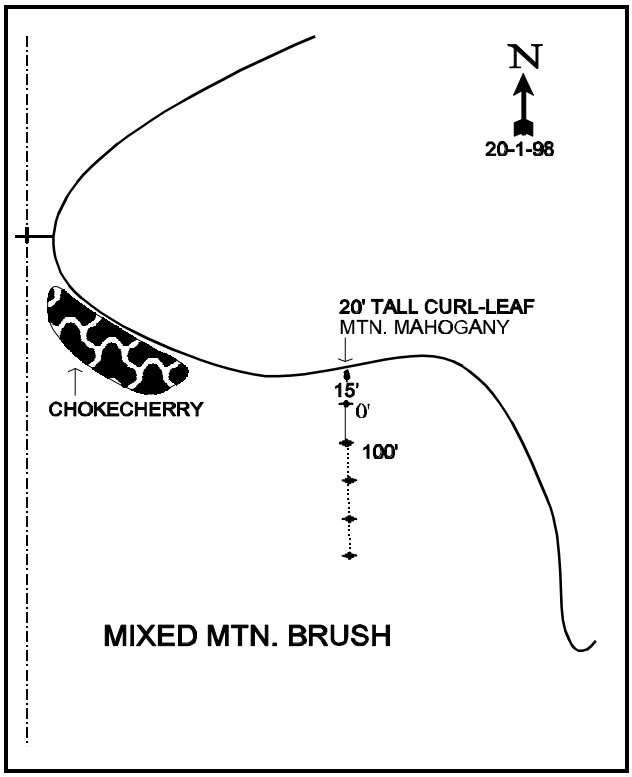
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Indian Peaks state cabin travel west 0.4 miles to a fork. Turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curlleaf mahogany on the west side of the road and the witness post. It is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany. The study is marked by two to three foot tall steel rebar.





Map Name: Buckhorn Spring, Utah

Diagrammatic Sketch

Township 29S , Range 18W , Section 16

UTM 4240550.888 N, 248680.399 E

DISCUSSION

Trend Study No. 20-1 (62C-1)

The Upper Indian Peak range trend study samples an area of mixed mountain brush, north east of Indian Peak. This limited browse-shrub range type is important to the resident deer and elk herds. The site has an elevation of 7,900 feet with a northerly aspect and slope varies from 20% to 30%. It is used year-round except when there is deep snow. There is ample, although low quality, winter range within the pinyon-juniper belt. Water can be limiting on these dry mountains, but there are several springs and a small perennial stream within one-quarter mile of this site.

Deer, elk, trespass cattle, and feral horses are found in the area. Pellet group data from 1991 estimate 14 deer and 13 elk days use/hectare. The allotment has been closed to livestock grazing since 1978. However, cattle continue to trespass onto DWR land. Pellet group data from 1998 estimate 8 deer, 26 elk, and 4 cow days use/acre. Most of the elk pellet groups were older, but some were recent and several elk were seen in the area while driving to the site. Some of the deer pellet groups were also recent.

The soil varies in depth because of the rocky subsurface horizons. Effective rooting depth (see methods) averages just over 15 inches. The rock fragments are loose, showing moderate downslope movement of rocks and soil which causes pedestaling on the uphill side of shrubs and terracing of trails parallel to the slope. Vegetation and litter provide excellent ground cover on some of the area.

A variety of browse species comprise the vegetative community. The most conspicuous plants are both valuable and palatable forage species. These include: true mountain mahogany, Utah serviceberry, and mountain big sagebrush. Other important species include: curlleaf mountain mahogany, slenderbush eriogonum, and mountain snowberry. All the browse species with the exception of mountain big sagebrush declined in numbers between 1985 and 1991. A much larger sample was taken in 1998. The changes in density between 1991 and 1998 are largely due to change in sample size. The larger sample size gives more accurate population estimates for shrubs species which typically have distributions that are discontinuous and/or clumped. Mountain big sagebrush is currently (‘98) the most abundant shrub on the site. It provides 46% of the browse cover with a cover value of 16%. Utah serviceberry accounts for 24% of the browse cover, while true mountain mahogany provides an additional 15%. Preferred browse species displayed mostly light use in 1985, increasing to moderate and heavy use by 1991 and 1998. Vigor is generally good and populations appear to be stable.

The herbaceous understory is abundant and diverse. Perennial grasses provide 13% cover with 7 species being classified. The only abundant grass is mutton bluegrass which makes up 91% of the grass cover. Current utilization of the grasses are light. A variety of forbs were found growing in close proximity to the shrubs, although there were very few in the interspaces. This could be due to soil condition, moisture availability or providing protection from grazing animals. Many valuable forage species are present which are very important in providing succulent summer forage. Some of the more common forbs include: Indian paintbrush, Eaton fleabane, tapertip hawksbeard, dusty penstemon, and desert phlox. Paintbrush was heavily utilized in 1991 and 1998.

1985 APPARENT TREND ASSESSMENT

Signs indicate some soil movement, although erosion is not a serious problem. The increasing vegetative and litter cover will help stabilize the soil and may also aid the establishment of forbs. Density of desirable browse species appears to be increasing. Cattle grazing should be closely regulated to ensure they do not further damage the water sources and over utilize the vegetation in riparian areas which appear to be critical big game habitat.

1991 TREND ASSESSMENT

The soil trend appears slightly down with no severe erosion problems occurring on the site. Vegetation and litter cover have increased slightly, but percent bare ground has increased from 12% to 20% since 1985. The key browse species show decreases in population densities and slight increases in decadent plants, with the exception of sagebrush which makes up half of the preferred browse. However, there are still good numbers of young and seedlings so the trend appears stable. Grass trend is slightly up and the forb trend is up due to a large increase in nested frequency values.

TREND ASSESSMENT
soil - slightly down
browse - stable
herbaceous understory - improving

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground declined but litter cover also declined. Some erosion is occurring but it is minimal. Trend for the key browse species, serviceberry, mountain big sagebrush, and true mountain mahogany is stable with changes in population densities primarily related to the much larger sample used in 1998. These shrubs show similar use compared to 1991, vigor is generally good and percent decadence low. Current reproduction appears adequate to maintain these populations. Trend for the herbaceous understory is mixed. Trend for perennial grasses is stable, but sum of nested frequency of perennial forbs has declined dramatically. Some of the difference would be due to the larger sample. The original 100 ft frequency baseline was placed in an area with heavier cover of herbaceous plants. The new baseline is 400 feet long and stretches further up the hill where there is larger bare shrub interspaces and less forbs. The largest decline in nested frequency for forbs comes from Indian paintbrush, Eaton fleabane, longleaf and desert phlox. With this in mind, trend is considered stable.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 20 , Study no: 1

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'85	'91	'98	'85	'91	'98	'98
G	Agropyron spicatum	a 10	b 38	ab 23	7	17	9	.26
G	Koeleria cristata	1	-	6	1	-	2	.06
G	Leucopoa kingii	-	-	2	-	-	2	.01
G	Poa fendleriana	267	267	265	94	97	94	11.69
G	Poa secunda	a -	ab 4	b 17	-	3	7	.55
G	Sitanion hystrix	-	-	1	-	-	1	.06
G	Stipa comata	-	-	3	-	-	1	.15
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		278	309	317	102	117	116	12.78

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
Total for Grasses		278	309	317	102	117	116	12.78
F	Achillea millefolium	1	-	3	1	-	1	.00
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$14	-	-	7	.04
F	Allium spp.	$_{a}$-	$_{a}$-	$_{b}$18	-	-	9	.09
F	Antennaria rosea	-	2	-	-	1	-	-
F	Androsace septentrionalis (a)	-	-	5	-	-	3	.01
F	Arabis drummondi	4	6	2	3	3	2	.01
F	Astragalus mollissimus	33	20	18	15	12	8	.14
F	Astragalus utahensis	$_{a}$-	$_{a}$-	$_{b}$7	-	-	4	.33
F	Balsamorhiza hookeri	$_{a}$-	$_{a}$-	$_{b}$35	-	-	15	.57
F	Balsamorhiza sagittata	1	3	1	1	1	1	.03
F	Castilleja angustifolia	$_{a}$62	$_{b}$113	$_{a}$66	34	52	28	1.40
F	Calochortus nuttallii	1	-	5	1	-	3	.04
F	Collinsia parviflora (a)	-	-	12	-	-	6	.05
F	Crepis acuminata	$_{a}$32	$_{b}$66	$_{a}$39	17	37	20	.29
F	Cymopterus spp.	$_{a}$-	$_{a}$-	$_{b}$25	-	-	11	.32
F	Delphinium nuttallianum	-	-	2	-	-	1	.00
F	Erigeron eatonii	$_{b}$162	$_{b}$153	$_{a}$112	66	66	52	2.01
F	Erigeron pumilus	3	5	3	1	3	1	.00
F	Eriogonum racemosum	41	35	24	18	17	12	.22
F	Eriogonum umbellatum	27	40	46	13	20	19	.95
F	Fritillaria atropurpurea	$_{a}$-	$_{a}$-	$_{b}$13	-	-	6	.05
F	Galium multiflorum	3	3	6	3	1	3	.18
F	Lappula occidentalis (a)	-	-	3	-	-	1	.00
F	Lomatium spp.	$_{a}$-	$_{a}$-	$_{b}$38	-	-	17	.47
F	Lupinus argenteus	$_{b}$42	$_{ab}$38	$_{a}$20	23	20	11	.92
F	Lygodesmia spinosa	-	4	-	-	3	-	-
F	Microsteris gracilis (a)	-	-	3	-	-	1	.00
F	Penstemon bridgesii	7	17	4	4	8	2	.15
F	Penstemon comarrhenus	21	22	20	9	10	12	1.24
F	Phlox austromontana	$_{b}$163	$_{c}$197	$_{a}$91	61	70	31	4.61
F	Phlox longifolia	$_{b}$69	$_{b}$86	$_{a}$33	32	38	16	.15
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{b}$15	-	-	7	.13
F	Streptanthus cordatus	4	2	7	2	1	3	.01
F	Unknown forb-perennial	5	-	-	3	-	-	-
Total for Annual Forbs		0	0	23	0	0	11	0.08
Total for Perennial Forbs		681	812	667	307	363	302	14.46
Total for Forbs		681	812	690	307	363	313	14.54

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)
BROWSE TRENDS --

Herd unit 20 , Study no: 1

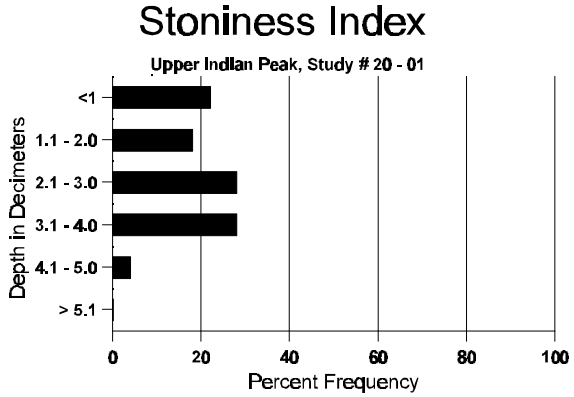
Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Amelanchier utahensis	30	8.40
B	Artemisia tridentata vaseyana	87	15.96
B	Cercocarpus ledifolius	4	.39
B	Cercocarpus montanus	30	5.22
B	Chrysothamnus viscidiflorus stenophyllus	22	.91
B	Cowania mexicana stansburiana	1	-
B	Eriogonum microthecum	30	.79
B	Opuntia erinacea	19	.22
B	Pinus monophylla	2	-
B	Purshia tridentata	3	.68
B	Symphoricarpos oreophilus	35	1.87
B	Tetradymia canescens	5	.18
Total for Browse		267	34.66

BASIC COVER --
Herd unit 20 , Study no: 1

Cover Type	Nested Frequency ‘98	Average Cover % '85	'91	'98
Vegetation	347	12.50	14.50	49.77
Rock	175	1.00	1.75	4.53
Pavement	320	36.25	22.00	33.65
Litter	381	38.75	42.00	34.09
Cryptogams	17	0	0	.08
Bare Ground	211	11.50	19.75	8.10

SOIL ANALYSIS DATA --
Herd Unit 20, Study # 01, Study Name: Upper Indian Peak

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.3	36.2 (15.4)	7.3	62.0	21.1	16.9	2.2	9.3	112.0	.4



PELLET GROUP FREQUENCY --
Herd unit 20 , Study no: 1

Type	Quadrat Frequency '98
Rabbit	19
Elk	19
Deer	14
Cattle	3

BROWSE CHARACTERISTICS --
Herd unit 20 , Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	1	-	-	5	-	-	6	-	-	-	400			6
	98	-	-	-	3	-	-	-	-	-	3	-	-	-	60			3
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	12	1	-	2	-	-	1	-	-	16	-	-	-	320			16
M	85	16	-	-	-	-	-	-	-	-	16	-	-	-	1066	27	23	16
	91	3	-	-	-	-	-	-	-	-	3	-	-	-	200	33	35	3
	98	9	11	3	5	-	-	-	-	-	28	-	-	-	560	42	46	28
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-63%
'91	17%	00%	00%	+56%
'98	27%	09%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1066	Dec:	0%
	'91	399		17%
	'98	900		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	18	-	-	-	-	-	-	-	-	18	-	-	-	1200			18
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840			42
Y	85	59	2	-	-	-	-	-	-	-	59	-	2	-	4066			61
	91	3	7	2	2	-	-	1	-	-	13	-	2	-	1000			15
	98	42	6	1	3	-	-	-	-	-	52	-	-	-	1040			52
M	85	74	27	3	-	-	-	-	-	-	104	-	-	-	6933	8	13	104
	91	8	62	37	4	4	2	1	-	1	115	1	3	-	7933	8	18	119
	98	107	92	42	3	-	-	2	-	-	246	-	-	-	4920	15	23	246
D	85	1	3	1	-	-	-	-	-	-	5	-	-	-	333			5
	91	10	11	12	3	3	-	1	-	-	26	-	1	13	2666			40
	98	21	18	1	2	1	-	1	-	-	35	-	-	9	880			44
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	19%	02%	01%	+ 2%
'91	50%	31%	11%	-41%
'98	34%	13%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	11332	Dec:		3%
'91	11599			23%
'98	6840			13%

Cercocarpus ledifolius																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	2	-	-	-	1	-	-	-	3	-	-	-	60	76	59	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	40%	20%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		-
'91	0			-
'98	100			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
S	85	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	91	3	-	-	2	-	-	-	-	-	5	-	-	-	333			5
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	4	2	-	1	-	-	-	-	-	7	-	-	-	140			7
M	85	10	8	-	-	-	-	-	-	-	18	-	-	-	1200	30	12	18
	91	1	6	6	-	-	-	-	-	-	13	-	-	-	866	31	37	13
	98	3	13	9	2	-	-	-	-	-	27	-	-	-	540	43	52	27
D	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	1	-	-	-	-	-	-	-	-	-	-	1	66			1
	98	1	2	-	-	-	-	-	-	-	2	-	1	-	60			3
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	36%	00%	00%	-23%
'91	41%	35%	06%	-35%
'98	46%	24%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	1466	Dec:		5%
'91	1132			6%
'98	740			8%

Chrysothamnus viscidiflorus stenophyllus																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	85	9	-	-	-	-	-	-	-	-	9	-	-	-	600	8	6	9
	91	1	1	-	-	-	-	-	-	-	2	-	-	-	133	9	11	2
	98	21	3	-	2	-	-	-	-	-	26	-	-	-	520	10	14	26
D	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	5	1	-	-	-	-	-	-	-	6	-	-	-	120			6
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-62%
'91	20%	00%	00%	+54%
'98	11%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	866	Dec:		8%
'91	332			20%
'98	720			17%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum microthecum																		
S	85	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	91	11	-	-	-	-	-	-	-	-	11	-	-	-	733			11
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	85	26	-	-	-	-	-	-	-	-	24	-	2	-	1733			26
	91	21	1	-	7	3	-	1	-	-	33	-	-	-	2200			33
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	85	119	-	-	-	-	-	-	-	-	117	-	2	-	7933	6	4	119
	91	44	6	1	9	-	-	3	-	-	60	-	3	-	4200	7	7	63
	98	42	-	1	2	-	-	-	-	-	45	-	-	-	900	7	10	45
D	85	13	-	-	-	-	-	-	-	-	12	-	1	-	866			13
	91	9	-	-	-	1	-	1	-	-	7	-	1	3	733			11
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	03%	-32%
'91	10%	.93%	07%	-86%
'98	00%	02%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	10532	Dec:		8%
'91	7133			10%
'98	1000			4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia erinacea																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	17	-	-	-	-	-	-	-	-	17	-	-	-	1133			17
	91	6	-	-	2	-	-	3	-	-	10	-	1	-	733			11
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	85	34	-	-	-	-	-	-	-	-	33	-	1	-	2266	5	8	34
	91	14	-	-	3	-	-	-	-	-	12	-	3	2	1133	4	6	17
	98	10	-	-	-	-	-	-	-	-	7	-	3	-	200	4	9	10
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	6	-	-	5	-	-	-	-	-	7	-	1	3	733			11
	98	4	-	-	-	-	-	-	-	-	3	-	-	1	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	02%	-24%
'91	00%	00%	26%	-83%
'98	00%	00%	18%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	3399	Dec:		0%
'91	2599			28%
'98	440			18%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus monophylla																		
Y	85	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-75%
'91	00%	00%	00%	- 9%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	266	Dec:	-
	'91	66		-
	'98	60		-

Purshia tridentata																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	1	-	-	-	-	-	-	3	-	-	-	60	11	53	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	- 9%
'98	00%	33%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	66		-
	'98	60		-

Symphoricarpos oreophilus																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
Y	85	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	91	5	2	-	1	-	-	-	-	-	8	-	-	-	533			8
	98	7	-	-	8	-	-	4	-	-	19	1	-	-	400			20
M	85	9	-	-	-	-	-	-	-	-	9	-	-	-	600	10	9	9
	91	-	-	-	1	-	-	4	-	-	5	-	-	-	333	12	22	5
	98	34	-	-	8	2	-	7	-	-	51	-	-	-	1020	12	22	51

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-32%
'91	15%	00%	00%	+39%
'98	03%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1266	Dec:	-
	'91	866		-
	'98	1420		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	5	-	-	-	-	-	-	-	-	5	-	-	-	333	10	6	5
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	-	-	-	1	-	-	4	-	-	-	80	12	13	4
D	85	3	-	-	-	-	-	-	-	-	2	-	1	-	200			3
	91	3	-	-	1	-	-	-	-	-	1	-	-	3	266			4
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	13%	-25%
'91	00%	00%	50%	-75%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	533	Dec:	38%
	'91	399		67%
	'98	100		20%

Trend Study 20-2-98

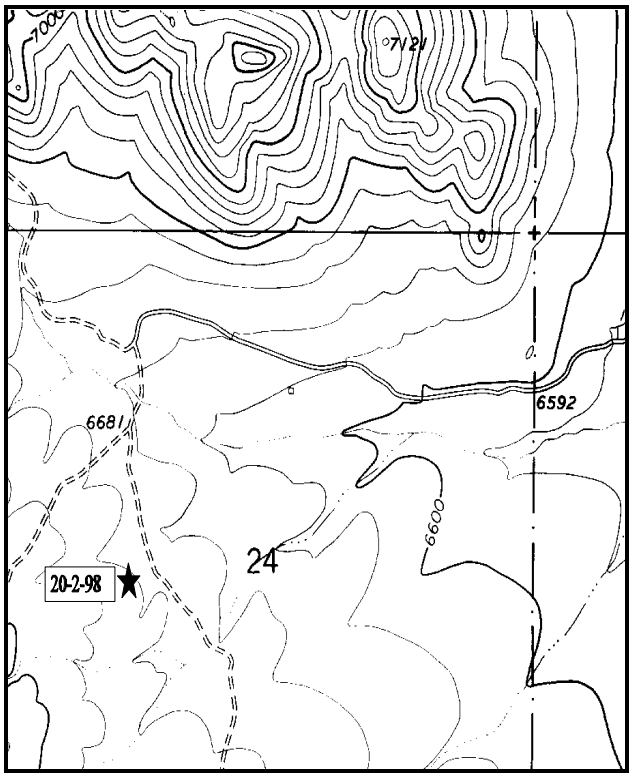
Study site name: Lower Indian Peak . Range type: Chained, Cabled, Seeded P-J.

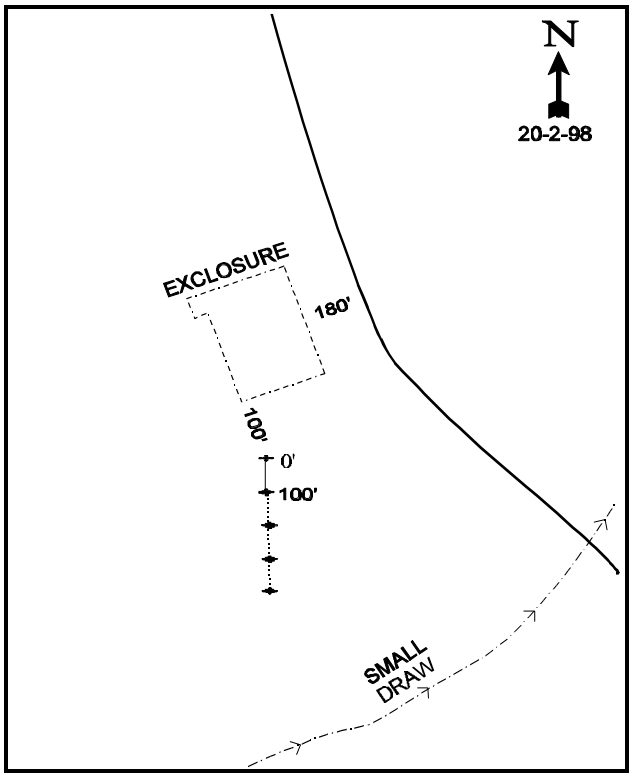
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft).

LOCATION DESCRIPTION

From the Indian Peaks state cabin travel 0.4 miles west to a fork, turn left. Turn left and cross the stream. Continue 0.1 miles and turn left at the fork. Go 0.30 miles to an exclosure which is about 180 feet off the right side of the road. The frequency baseline starts 100 feet south (in line with the fence) of the southwest corner of the exclosure. The 0-foot baseline stake is a rebar with browse tag #7076 attached.





Map Name: Buckhorn Spring, Utah

Diagrammatic Sketch

Township 29S , Range 18S , Section 24

UTM 4239423.151 N, 253743.292 E

DISCUSSION

Trend Study No. 20-2 (62C-2)

The Lower Indian Peak study is located on a chained and seeded section of DWR land. One hundred acres were treated in 1959 by chaining and drilling with a mixture of grasses, forbs, and browse species. The area is now dominated by perennial grasses with scattered sagebrush and pinyon-juniper. The terrain is gently sloping with a generally eastern aspect. Deer use in this open area appears light. Pellet group counts in 1991 estimate only 2 deer and 3 elk days use/acre. Pellet group data from 1998 estimate 7 deer, 16 elk and 6 trespass cow days use/acre. Rabbit sign was found in half of the pellet group plots and in 25% of the quadrats indicating a relatively high level of use.

The soil is moderately shallow and rocky with an effective rooting depth (see methods) estimated at 14 inches. Depth is variable however, with shallow rooted black sagebrush over most of the site and the deeper rooted mountain big sagebrush found in certain areas. Soil texture is a sandy loam with a slightly acid pH (6.4). Many large rocks are found on the surface. Along with this and erosion pavement, rock covers a large proportion of the surface. Buildup of litter is limited to old pinyon-juniper slash. Some erosion does occur, but it is insignificant at this time.

Key browse species include black sagebrush and mountain big sagebrush. There are also small numbers of bitterbrush and green ephedra which provide some additional preferred forage. Mountain sagebrush and black sagebrush are present in relatively low numbers. Mountain big sagebrush was found in the frequency belts but not in the density plots in 1985 and 1991. They were large plants which had been lightly to moderately browsed. Black sagebrush was estimated at 1,333 plants/acre in 1985 increasing slightly to 1,533 by 1991. Use was light to moderate. A much larger sample was used in 1998. Density of black sagebrush remained similar and mountain big sagebrush numbered 500 plants/acre. Currently, mountain big sagebrush contributes 35% of the browse cover, while black sagebrush makes up 18% of the browse cover. Together they contribute 53% of the browse cover. Both displayed light to moderate use, good vigor, and low decadence.

Bitterbrush was not sampled in 1985 or 1991, but individuals found in the area had been heavily hedged. A small number were picked up in the larger sample used in 1998. All displayed extremely heavy use. The most abundant shrub on the site in 1985 was the undesirable increaser species, broom snakeweed with a density of 3,732 plants/acre. Numbers dropped significantly by 1991 to 1,732 plants/acre. During the 1998 reading, only 180 plants/acre were estimated. Stickyleaf low rabbitbrush was encountered in small numbers in 1991, which appears to have been misidentified as broom snakeweed in 1985.

Young pinyon are scattered throughout the area and may begin to have more of an influence on the surrounding vegetation. Data from 1991 estimated 60 singleleaf pinyon pine trees/acre, 75% of which are 4 to 8 feet in height. The other 25% were over eight feet in height. There were an estimated 18 Rocky Mountain juniper trees per acre, 29% were in the 4 to 8 foot class and 58% are over eight feet tall. No seedling pinyon or juniper were encountered. Point quarter data from 1998 estimate 78 pinyon and 22 juniper trees/acre. Average basal diameter is 4.2 inches for pinyon and 4.8 inches for juniper. Five percent of the juniper trees sampled were chained over trees that were still alive. Most pinyon and juniper trees were in the 6 to 8 foot size class. Pinyon and juniper are dominant in the surrounding area, making the rehabilitated areas very valuable to wintering big game.

Grasses provide most of the ground cover on this site and are evenly dispersed plants. The most abundant grasses are seeded species; crested wheatgrass, intermediate wheatgrass, and smooth brome which currently ('98) account for 76% of the grass cover. Also common is the annual cheatgrass which provides 14% of the grass cover. The area was heavily utilized by trespassing cattle in the past. They concentrated on the treated sites, resulting in depressed vigor of the grasses. Some trespass grazing still occurs but at a much lower rate.

Forbs are still scarce, and those found are not especially valuable species. The nine species encountered in 1998 produced just over ½ of 1% cover. The only common species was desert phlox.

1985 APPARENT TREND ASSESSMENT

The vegetative and soil trends were both effected by the pinyon-juniper rehabilitation work. Soil erosion is continuing at a slow rate. The lack of litter and vegetative cover on much of the area perpetuates this erosion. Vegetative trend may be up for a while on grasses and sagebrush. Christmas tree sales and firewood cutting should be encouraged to reduce the encroachment of pinyon and juniper and prolong the longevity of the seeding. Closer regulation of cattle grazing is also important.

1991 TREND ASSESSMENT

The soil trend is slightly down. Erosion from high intensity summer thunder storms was noticeable, but doesn't appear to be a major problem. Basal vegetative cover dropped by over 50% and bare ground increased by 28%. The browse trend is stable. Density has increased slightly for black sagebrush and there are reduced numbers of broom snakeweed. Use is heavier on the black sagebrush however, and reproduction is poor. Pinyon and juniper trees number approximately 78 trees per acre, most of which are in the 4 to 8 foot height class. None were classified as seedlings. Follow up treatment on these trees should be considered to encourage increases in the browse and herbaceous vegetation. The grass trend is stable with similar sum of nested frequency values between readings. Forbs are not numerous enough to be of importance on this site.

TREND ASSESSMENT
soil - slightly down
browse - stable
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil is stable. There is some slight improvements in protective ground cover values, although not enough to warrant an upward trend. Trend for the key browse, mountain big sagebrush and black sagebrush, appears stable. The slight decline in density for black sagebrush appears to be caused by the larger sample used in 1998. Utilization is slightly lighter, vigor good, and decadence low at only 5%. Density of the increaser/invader broom snakeweed continues to decline with only 180 plants/acre currently estimated. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses. Nested frequency of intermediate wheatgrass and smooth brome have declined significantly. Forbs occur at similar low frequencies.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 20 , Study no: 2

Type	Species	Nested Frequency '85	Nested Frequency '91	Nested Frequency '98	Quadrat Frequency '85	Quadrat Frequency '91	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	256	241	230	88	91	81	12.79
G	Agropyron dasystachyum	16	2	1	5	1	1	.00
G	Agropyron intermedium	$_{a}$32	$_{b}$86	$_{a}$28	13	32	12	1.25
G	Aristida purpurea	$_{a}$18	$_{b}$37	$_{a}$7	10	15	3	.06
G	Bouteloua gracilis	$_{a}$-	$_{b}$19	$_{a}$1	-	10	1	.00
G	Bromus inermis	25	19	46	10	9	16	1.26
G	Bromus tectorum (a)	-	-	184	-	-	70	2.86
G	Elymus junceus	$_{b}$87	$_{a}$18	$_{a}$9	36	9	4	.05
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$23	-	-	8	.29
G	Poa fendleriana	-	-	7	-	-	3	.21
G	Poa secunda	$_{a}$-	$_{a}$-	$_{b}$20	-	-	7	.25
G	Sitanion hystrix	19	6	11	7	2	5	.72
G	Stipa comata	-	-	3	-	-	2	.04
Total for Annual Grasses		0	0	184	0	0	70	2.86
Total for Perennial Grasses		453	428	386	169	169	143	16.96
Total for Grasses		453	428	570	169	169	213	19.83
F	Astragalus cibarius	2	3	-	1	1	-	-
F	Cymopterus spp.	-	-	2	-	-	1	.00
F	Draba spp. (a)	-	-	36	-	-	16	.13
F	Erigeron pumilus	$_{b}$8	$_{a}$-	$_{a}$3	5	-	1	.03
F	Gilia spp. (a)	-	-	19	-	-	10	.05
F	Lappula occidentalis (a)	-	-	1	-	-	1	.00
F	Leucelene ericoides	$_{a}$-	$_{b}$15	$_{a}$2	-	7	1	.00
F	Penstemon palmeri	-	3	-	-	1	-	-
F	Phlox austromontana	4	7	10	3	4	6	.37
F	Senecio multilobatus	-	-	1	-	-	1	.00
F	Sphaeralcea coccinea	3	-	2	2	-	2	.01
F	Unknown forb-perennial	2	1	-	2	1	-	-
Total for Annual Forbs		0	0	56	0	0	27	0.18
Total for Perennial Forbs		19	29	20	13	14	12	0.42
Total for Forbs		19	29	76	13	14	39	0.60

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 20 , Study no: 2

Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Artemisia nova	30	1.95
B	Artemisia tridentata vaseyana	21	3.90
B	Chrysothamnus parryi howardi	4	.15
B	Chrysothamnus viscidiflorus viscidiflorus	2	.38
B	Echinocereus spp.	1	-
B	Ephedra viridis	2	.15
B	Gutierrezia sarothrae	7	.03
B	Juniperus osteosperma	4	3.90
B	Opuntia spp.	1	-
B	Opuntia whipplei	1	.00
B	Pinus monophylla	0	.00
B	Purshia tridentata	2	.53
B	Sclerocactus	1	.03
Total for Browse		76	11.03

CANOPY COVER --
Herd unit 20 , Study no: 2

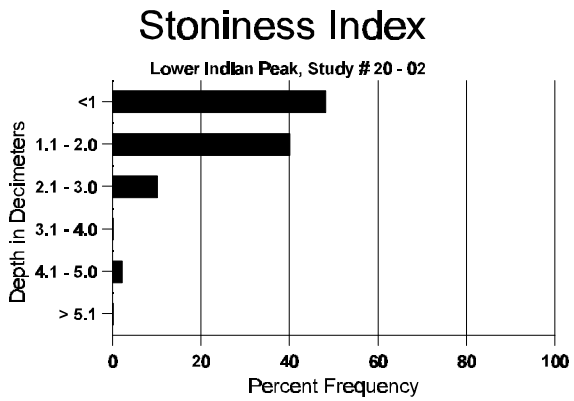
Species	Percent Cover ‘98
Juniperus osteosperma	3

BASIC COVER --
Herd unit 20 , Study no: 2

Cover Type	Nested Frequency ‘98	Average Cover %		
		'85	'91	'98
Vegetation	329	8.75	4.00	34.35
Rock	210	14.25	22.00	13.17
Pavement	252	23.25	16.25	10.75
Litter	387	36.00	32.50	37.12
Cryptogams	65	0	.25	1.24
Bare Ground	275	17.75	25.00	21.53

SOIL ANALYSIS DATA --
Herd Unit 20, Study # 02, Study Name: Lower Indian Peak

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.9	42.0 (15.7)	6.4	64.0	17.4	18.6	2.1	12.7	99.2	.6



PELLET GROUP FREQUENCY --
Herd unit 20 , Study no: 2

Type	Quadrat Frequency '98
Rabbit	25
Elk	8
Deer	3

BROWSE CHARACTERISTICS --
Herd unit 20 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	85	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	91	2	3	1	-	1	-	2	-	-	9	-	-	-	600			9
	98	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	85	8	3	-	-	-	-	-	-	-	11	-	-	-	733	11	13	11
	91	5	6	2	1	-	-	-	-	-	14	-	-	-	933	9	16	14
	98	35	13	1	-	-	-	-	-	-	49	-	-	-	980	9	22	49
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	15%	00%	00%	+13%
'91	43%	13%	00%	-14%
'98	20%	02%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1333	Dec:	0%
	'91	1533		0%
	'98	1320		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	13	4	1	-	-	-	-	-	-	18	-	-	-	360	21	34	18
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	1	-	-	-	-	-	5	-	-	1	120			6
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	16%	04%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		0%
'91	0			0%
'98	500			24%

Chrysothamnus parryi howardi																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	9	1
	91	-	1	-	-	-	-	-	-	-	1	-	-	-	66	20	22	1
	98	1	2	-	-	-	-	-	-	-	3	-	-	-	60	19	23	3
D	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	2	-	-	1	-	-	-	-	-	-	-	-	3	200			3
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	25%	00%	75%	-62%
'98	40%	00%	40%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	266	Dec:		75%
'91	266			75%
'98	100			40%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	1	-	-	-	-	-	-	1	-	-	-	66	7	22	1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	13	23	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	50%	50%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	132		-
	'98	40		-

Echinocereus spp.																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	12	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Ephedra viridis																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	27	39	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	50%	00%	50%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	85	34	-	-	-	-	-	-	-	-	34	-	-	-	2266			34
	91	43	-	-	1	-	-	2	-	-	46	-	-	-	3066			46
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	85	19	-	-	-	-	-	-	-	-	19	-	-	-	1266			19
	91	21	-	-	-	-	-	-	-	-	21	-	-	-	1400			21
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	30	1	-	-	-	-	-	-	-	31	-	-	-	2066	6	7	31
	91	4	-	-	-	-	-	-	-	-	4	-	-	-	266	5	6	4
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	5	7	5
D	85	4	2	-	-	-	-	-	-	-	6	-	-	-	400			6
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	4	-	-	-	-	-	-	-	-	-	-	-	4	80			4
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	05%	00%	00%	-54%
'91	00%	00%	00%	-90%
'98	00%	00%	44%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	3732	Dec:	11%
	'91	1732		4%
	'98	180		44%

Juniperus osteosperma																		
M	85	-	-	-	1	-	-	-	-	-	1	-	-	-	66	69	83	1
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66	138	91	1
	98	2	-	-	1	-	-	1	-	-	4	-	-	-	80	-	-	4
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	+18%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	80		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	2	4	1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	0%
	'91	66		100%
	'98	20		0%

Opuntia whipplei																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	11	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Pinus monophylla																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	0		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	1	-	-	-	1	-	-	-	20	21	60	1
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	1	-	-	-	-	-	-	-	-	1	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	100%	50%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		0%
'91	0			0%
'98	40			50%

Sclerocactus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	2	3	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	20		-

Trend Study 20-3-98

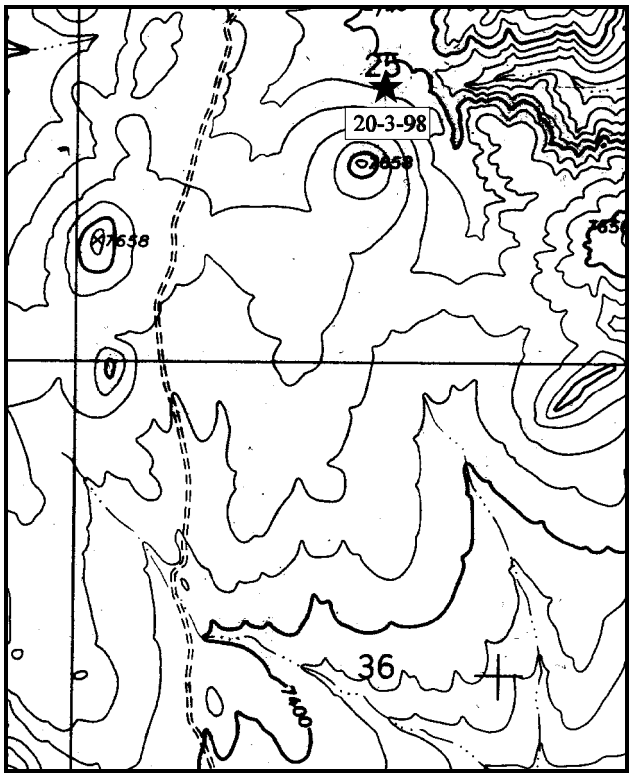
Study site name: Mountain Home Seeding . Range type: Burn

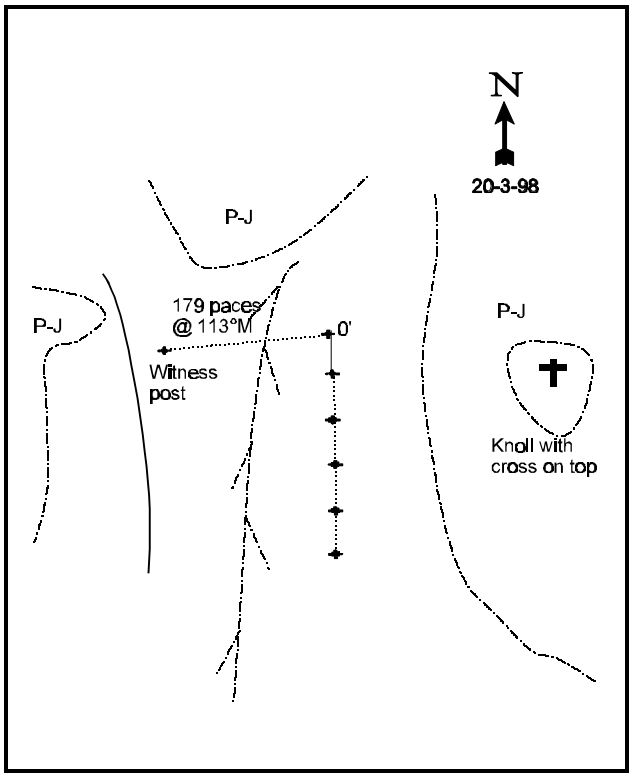
Compass bearing: frequency baseline 180 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the Indian Peaks cabin drive to the main Pine Valley Road. Turn left (north) and drive about 2 miles to a fork which is labeled with a sign saying "Hamblin Valley Road 15 miles." Drive west on this road avoiding side roads about 12 miles to a four-way intersection. The sign reads "Lopers Spring 6.0 miles" to the north. Turn right (north) and drive 6.0 miles to a witness post on the right side of the road. (You will pass another 4 way intersection at about 3.7 miles.) The 0-foot stake is 170 paces from the witness post at 113° magnetic.





Map Name: Lopers Spring , Utah

Diagrammatic Sketch

Township 27S , Range 19W , Section 25

UTM 4257365.708 N, 244882.593 E

DISCUSSION

Trend Study No. 20-3

The Mountain Home Seeding is a new trend study established in 1998 on a burned and chained pinyon-juniper area. It has a west, northwest aspect with a gentle slope which varies from 3% to 7%. Elevation is about 7,400 feet. This treatment area is used heavily by wild horses and moderately by elk. The site is available most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site baseline. Pellet group data from the site estimate 55 horse, 27 elk, and 7 deer days use/acre. Some of the elk sign was recent with the study site being read on June 9th, 1998.

Soil at the site is moderately shallow with an effective rooting depth (see methods) of just over 12 inches. Soil texture is a sandy loam with a slightly acid pH (6.3). Rock and gravel sized pavement is common on the surface and throughout the profile. There is some localized soil movement occurring on the site, although it does not appear to be a problem at this time.

A few mountain big sagebrush and resprouting rabbitbrush were encountered, with most shrubs being eliminated by the fire. None of the shrubs appeared to be utilized. Dead pinyon and juniper stumps numbered approximately 80/acre.

The site is dominated by seeded grasses, primarily crested wheatgrass, which provides 84% of the grass cover. Smooth brome and intermediate wheatgrass are also fairly common. All grasses combined produce 30% cover. Forbs are fairly diverse, but not abundant with 12 species producing less than 1% cover. The most common forb is the seeded alfalfa which provides 35% of the forb cover. This forb appeared to be heavily utilized.

1998 APPARENT TREND ASSESSMENT

The soil appears to have been stabilized by the treatment. Herbaceous cover is abundant and well dispersed. There are few shrubs on the site. Establishment of a significant shrub population will take many years in the thick herbaceous cover unless they are inter-seeded. Seeded perennial grasses are well established and should remain so as long as the site is not severely overgrazed. However, the composition is poor with crested wheatgrass dominating the site. Forbs are also limited.

HERBACEOUS TRENDS --
Herd unit 20 , Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	352	97	25.30
G	Agropyron intermedium	34	13	.90
G	Aristida purpurea	5	1	.15
G	Bromus inermis	115	48	3.25
G	Bromus tectorum (a)	84	27	.65
G	Sitanion hystrix	3	2	.03
Total for Annual Grasses		84	27	0.64
Total for Perennial Grasses		509	161	29.64

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
Total for Grasses		593	188	30.29
F	Astragalus spp.	1	1	.00
F	Collinsia parviflora (a)	11	6	.03
F	Cymopterus spp.	34	13	.11
F	Descurainia pinnata (a)	2	1	.03
F	Gilia spp. (a)	25	12	.08
F	Lappula occidentalis (a)	5	2	.01
F	Lupinus argenteus	3	1	.00
F	Lygodesmia spinosa	1	1	.03
F	Medicago sativa	7	6	.22
F	Microsteris gracilis (a)	24	11	.05
F	Phlox longifolia	1	1	.00
F	Sphaeralcea coccinea	2	1	.03
Total for Annual Forbs		67	32	0.21
Total for Perennial Forbs		49	24	0.41
Total for Forbs		116	56	0.62

BROWSE TRENDS --
Herd unit 20 , Study no: 3

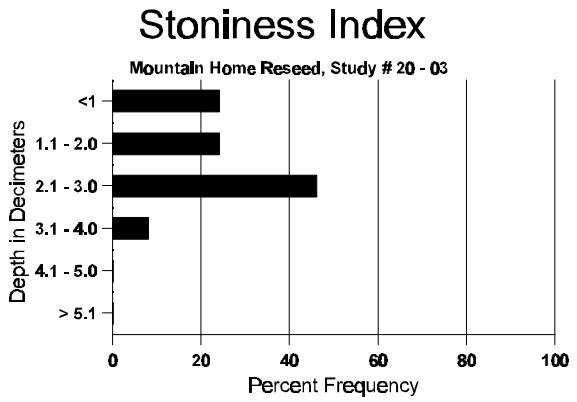
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	0	-
B	Chrysothamnus parryi howardi	0	.38
B	Juniperus osteosperma	0	-
B	Pinus monophylla	0	-
Total for Browse		0	0.38

BASIC COVER --
Herd unit 20 , Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	409	35.65
Rock	301	13.67
Pavement	417	23.51
Litter	493	42.54
Cryptogams	10	.04
Bare Ground	353	15.58

SOIL ANALYSIS DATA --
Herd Unit 20, Study # 03, Study Name: Mountain Home Reseed

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.2	37.0 (13.4)	6.3	70.0	15.1	14.9	2.1	21.5	163.2	.6



PELLET GROUP FREQUENCY --
Herd unit 20 , Study no: 3

Type	Quadrat Frequency '98
Rabbit	5
Horse	30
Elk	27
Deer	14

BROWSE CHARACTERISTICS --
Herd unit 20 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1 2 3 4 5 6 7 8 9	Vigor Class 1 2 3 4	Plants Per Acre	Average (inches) Ht. Cr.	Total
Artemisia tridentata vaseyana						
M	98	- - - - - - - - -	- - - -	0	30 40	0
% Plants Showing '98		Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change	
Total Plants/Acre (excluding Dead & Seedlings)			'98	0	Dec:	-
Chrysothamnus parryi howardi						
M	98	- - - - - - - - -	- - - -	0	35 48	0
% Plants Showing '98		Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change	
Total Plants/Acre (excluding Dead & Seedlings)			'98	0	Dec:	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%						%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Pinus monophylla																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%						%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

Trend Study 20-5-98

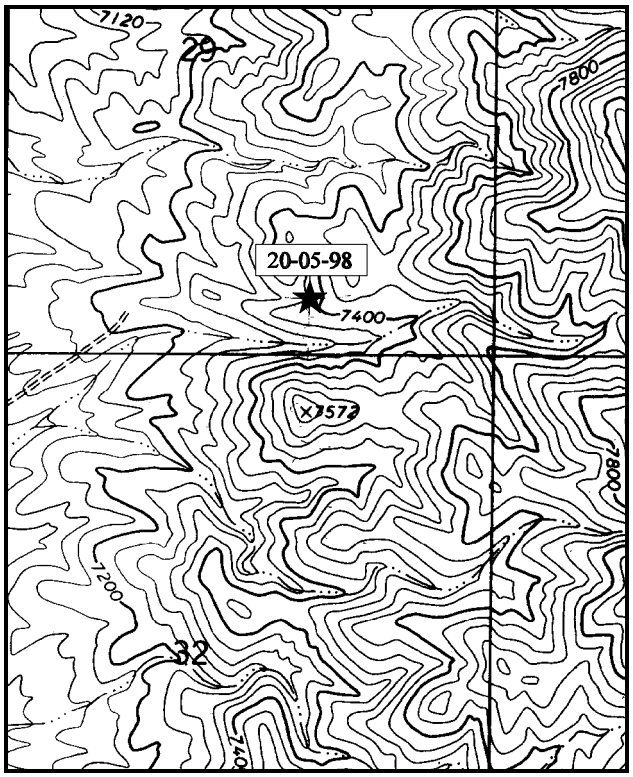
Study site name: Upper Hamblin Valley Range type: Mountain Brush

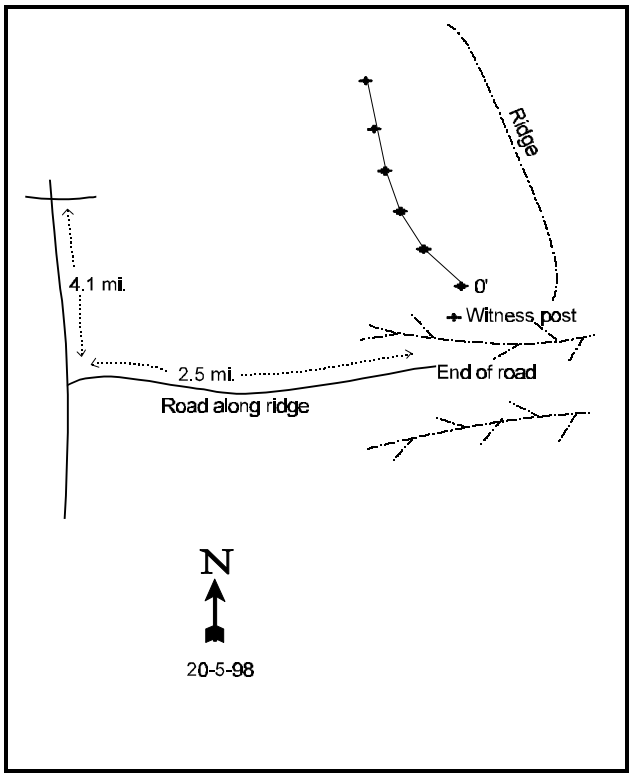
Compass bearing: frequency baseline 320 M degrees. Line 2 335 °M, line 3 340°M, line 4-5 356°M.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Indian Peaks cabin go north and west over the Pine Valley Pass Road to Hamblin Valley Road. This intersection has a cattle corral and trailer to the west. From this intersection drive north 17.8 miles to another intersection. Turn right and drive 4.1 miles to a road on the left. Turn left and drive up the road along the ridge 2.5 miles to where the road ends. The site is on the ridge across the gully to the northeast. The witness post is by the 0-foot stake and can be seen across the wash from the end of the road.





Map Name: Mountain Home Pass , Utah

Diagrammatic Sketch

Township 26S , Range 19W , Section 29

UTM 4266736.217 N, 239163.960 E

DISCUSSION

Trend Study No. 20-5

The "Upper Hamblin Valley" trend study is a new site which samples important winter range in the upper Hamblin Valley. It samples a narrow ridge with a southwest facing slope (22%) and an elevation of approximately 7,600 feet. The area supports a singleleaf pinyon pine and Utah juniper overstory with an understory of highly preferred curlleaf mountain mahogany. The site is used heavily by elk and wild horses. Sign of horses is evident all over the area including several stud piles along the road to the site. A mare with a colt was seen during study site establishment on June 9th. Pellet group data estimate approximately 21 elk, 9 deer, and 7 horse days/acre. Elk sign appeared fairly recent, while most horse sign appeared to be a few months old. Horses have obviously been heavily utilizing the area, however our pellet group transect does not appear to accurately estimate their impact.

Soil on the site is shallow and very rocky on the surface and within the profile. Effective rooting depth (see methods) is estimated at 13 inches. Soil texture is a loam with a neutral pH (7.0). Phosphorus appears to be limiting at just 4.5 ppm when 10 ppm is considered to be a minimal value for normal plant development. There is evidence of soil movement in the open spaces between trees and shrubs, and soil pedestaling is also evident. The wash near the site shows signs of recent activity. Vegetative cover on the site comes almost entirely from trees and shrubs. Herbaceous vegetation, which is more effective at protecting soil, is depleted.

The site supports a variety of browse species. Preferred forage species include: curlleaf mountain mahogany, black sagebrush, green ephedra, and snowberry. Mahogany accounts for 45% of the browse cover with a population of 420 plants/acre. Average mature plants are nearly 4 feet in height with a crown diameter of nearly 5 feet. They exhibit some characteristics of littleleaf mountain mahogany (*Cercocarpus intricatus*) due to their characteristically narrow leaf forms. They are most likely hybrid forms between curlleaf and littleleaf mahogany which occurs often in this area. Utilization is heavy, with 90% of the plants displaying heavy use. Sixty-seven percent of the mature curlleaf were classified as largely unavailable due to hedging. Even with this high level of use, the population has a fairly well balanced age structure which displays good vigor and low percent decadence at 14%.

Black sagebrush is the most abundant shrub on the site with an estimated population of 700, relatively small statured plants/acre. Use is mostly light. Green ephedra occurs in limited numbers. Use of this shrub is moderate to heavy. Most of the ephedra seen along the road to the site had been heavily hedged by what appeared to be mostly wild horses. A small population of snowberry on the site shows moderate use with heavy use reported on some individuals. The preferred species contribute 62% of the total browse cover.

An overstory of mostly singleleaf pinyon pine trees provides 33% of the browse cover. Point quarter data estimate 82 pinyon and 13 juniper trees/acre. Average basal diameter is 7 inches for pinyon and 10 inches for juniper. Overhead canopy cover is variable, but averages 10% over the study site. As canopy cover for pinyon-juniper communities reaches 10%, this usually will depress the production of the understory by as much as 40%.

The herbaceous understory is deficient and composed mostly of low value species. Of the four perennial grasses found on the site, only bluebunch wheatgrass is relatively abundant. However, all grasses combined produce just over 2% total cover. Forbs are diverse with 16 species encountered. The only common species are the low value rock goldenrod, heath aster, and an annual draba.

1998 APPARENT TREND ASSESSMENT

Soil condition is poor. Sheet erosion appears to be occurring in the bare shrub and tree interspaces. Rock and pavement cover are high and provide 56% cover. This would indicate moderate soil loss in previous years. Herbaceous vegetation and litter cover are poor, leaving the soil poorly protected. Trend will not improve until more herbaceous vegetation becomes established on the site. Trend for browse appears stable. Utilization is extremely high, yet not unusual for curlleaf mountain mahogany. Even so, the population displays good vigor, low decadency, and a balanced age structure. Continued heavy use could eventually have a negative impact however. Other preferred shrubs, green ephedra and snowberry, also appear stable. The herbaceous understory is depleted and composition is dominated by mostly poor value forbs. The trend will not improve in the future unless more preferred perennial grasses and forbs become established.

HERBACEOUS TRENDS --
Herd unit 20 , Study no: 5

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron spicatum	87	39	1.29
G	Bromus tectorum (a)	17	7	.06
G	Oryzopsis hymenoides	10	7	.06
G	Poa secunda	58	23	.78
G	Sitanion hystrix	4	2	.06
Total for Annual Grasses		17	7	0.06
Total for Perennial Grasses		159	71	2.20
Total for Grasses		176	78	2.25
F	Arabis spp.	2	2	.01
F	Arenaria spp.	31	13	.19
F	Cryptantha spp.	30	12	.45
F	Cymopterus spp.	10	3	.07
F	Delphinium nuttallianum	1	1	.00
F	Descurainia pinnata (a)	3	1	.00
F	Draba spp. (a)	193	60	1.47
F	Epilobium paniculatum (a)	3	2	.01
F	Erigeron eatonii	12	6	.08
F	Gilia spp. (a)	10	6	.03
F	Leucelene ericoides	69	28	.68
F	Lomatium spp.	31	13	.22
F	Oenothera spp.	5	3	.16
F	Petradoria pumila	150	57	4.73
F	Physaria chambersii	11	5	.07
F	Senecio multilobatus	3	1	.00
Total for Annual Forbs		209	69	1.51

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
Total for Perennial Forbs		350	141	6.63
Total for Forbs		559	210	8.15

BROWSE TRENDS --
Herd unit 20 , Study no: 5

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	18	.76
B	Cercocarpus ledifolius	18	7.16
B	Ephedra viridis	7	1.08
B	Gutierrezia sarothrae	3	.03
B	Pinus monophylla	6	5.34
B	Sclerocactus	2	.00
B	Symphoricarpos oreophilus	10	1.62
Total for Browse		64	16.05

CANOPY COVER --
Herd unit 20 , Study no: 5

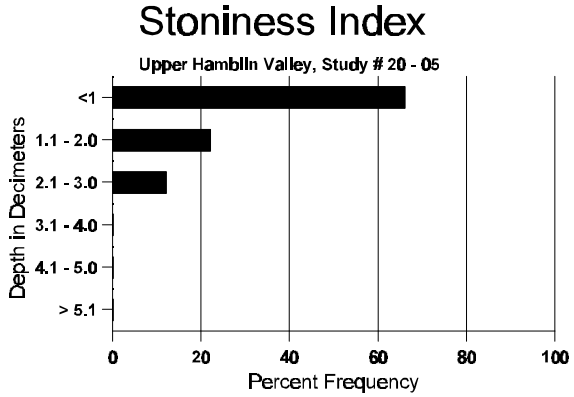
Species	Percent Cover '98
Pinus monophylla	10

BASIC COVER --
Herd unit 20 , Study no: 5

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	348	24.20
Rock	402	27.03
Pavement	420	28.82
Litter	430	30.17
Cryptogams	98	1.11
Bare Ground	315	14.01

SOIL ANALYSIS DATA --
Herd Unit 20, Study # 05, Study Name: Upper Hamblin Valley

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.0	34.4 (15.5)	7.0	44.0	35.4	20.6	3.5	4.5	64.0	.8



PELLET GROUP FREQUENCY --
Herd unit 20 , Study no: 5

Type	Quadrat Frequency '98
Rabbit	2
Horse	3
Elk	8
Deer	2

BROWSE CHARACTERISTICS --
Herd unit 20 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	4	1	-	-	-	-	-	-	-	5	-	-	-	100			5
M	98	25	-	-	-	-	-	-	-	-	25	-	-	-	500	9	19	25
D	98	5	-	-	-	-	-	-	-	-	4	-	-	1	100			5
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	03%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	700	Dec:	14%

Cercocarpus ledifolius																		
S	98	-	-	-	-	-	-	-	-	1	1	-	-	-	20			1
Y	98	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	-	-	2	-	-	11	-	-	3	16	-	-	-	320	41	58	16
D	98	-	-	2	-	-	1	-	-	-	2	-	-	1	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	05%	90%	05%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	420	Dec:	14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra viridis																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	1	2	1	-	-	-	-	-	-	4	-	-	-	80	28	43	4
D	98	-	-	1	2	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98				Moderate Use 25%			Heavy Use 25%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		38%
Gutierrezia sarothrae																		
M	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	4	6	5
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		100	Dec:		-
Pinus monophylla																		
S	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	1	-	-	-	-	-	3	-	-	4	-	-	-	80	-	-	4
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		120	Dec:		-
Sclerocactus																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	2	3	2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Symphoricarpos oreophilus																		
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	5	4	1	-	-	-	-	-	-	10	-	-	-	200	23	34	10
% Plants Showing '98				Moderate Use 31%			Heavy Use 08%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		260	Dec:		-

Trend Study 20-6-98

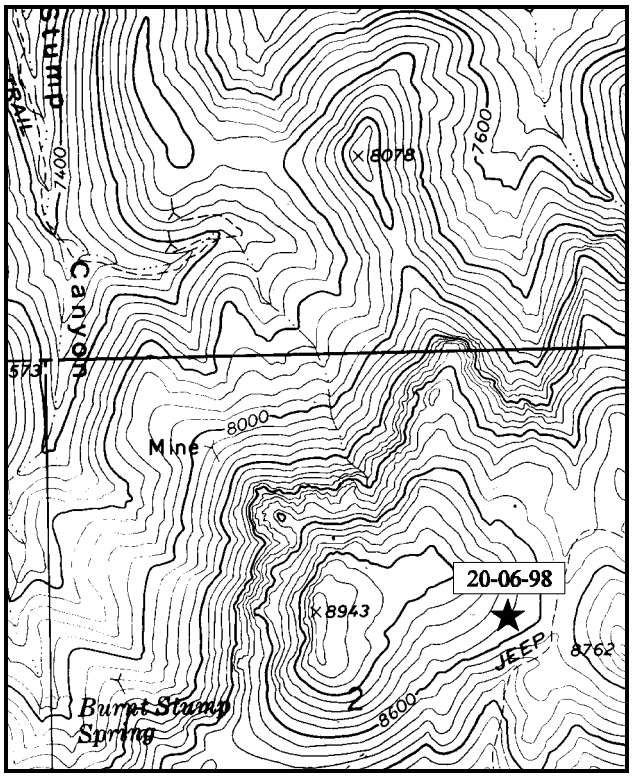
Study site name: Wah Wah Pass . Range type: Curlleaf Mtn Mahogany

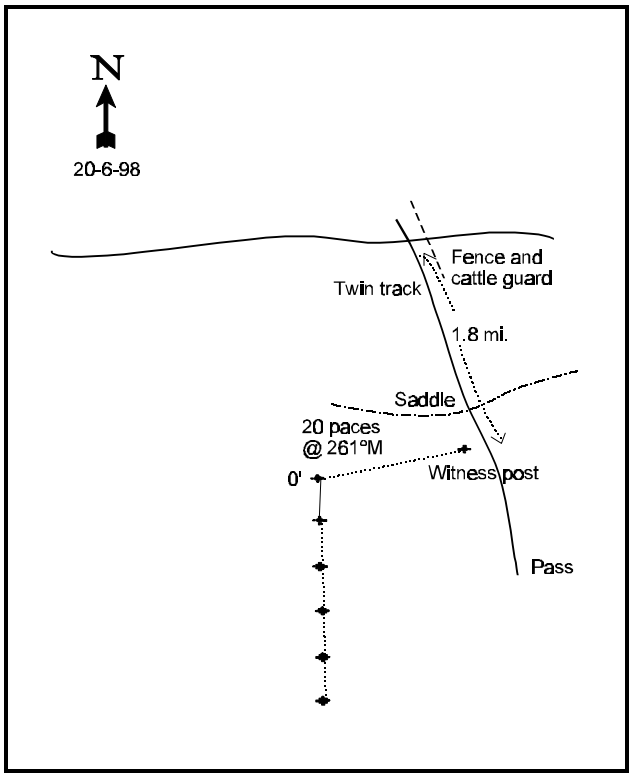
Compass bearing: frequency baseline 184 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the Indian Peaks cabin turnoff from the Pine Valley Road, go north 3.5 miles thru an "S" turn in the road and crossing a gully to a fork. Turn right and travel east 1.45 miles to a cattle guard. Continue about 7.1 miles up the canyon to the pass. Turn right before a fence and another cattle guard on a twin track. Travel south about 1.8 miles to a saddle and a witness post on the right side of the road. From the post the 0-foot stake is 20 paces at a bearing of 261 degrees magnetic.





Map Name: Lamerdorf Peak , Utah Diagrammatic Sketch

Township 29S , Range 19W , Section 2 UTM 4244243.384 N, 272488.273 E

DISCUSSION

Trend Study No. 20-6

The Wah Wah Pass trend study was established in 1998 to monitor wildlife use on the Wah Wah Mountains. There were no trend studies previously established on these mountains because of low deer numbers, The study site was placed on the only area here significant deer use could be found. It samples a saddle which supports a curlleaf mountain mahogany type with a sagebrush and snowberry understory. Slope is a gentle 5% to 10%. Aspect is northeast at an elevation of approximately 8,600 feet. The area is used by cattle, wild horses, and deer. Cattle were observed on the site during establishment of the study on June 18, 1998. They were using many of the taller curlleaf mahogany for shade. Three wild horses were also seen near the site. Pellet group transect data estimate 18 cow, 11 deer and 5 horse days use/acre. Most of the cow and horse use is concentrated near the beginning of the baseline which borders an open meadow area. Deer use was more prevalent further down the baseline, where mahogany density is higher. Cattle have already heavily utilized the available grasses on the site. The area is considered high elevation winter range for deer, which is likely used year round with mild weather conditions.

Soil on the site is moderately deep with an effective rooting depth (see methods) of just over 15 inches. Texture is a clay loam with a neutral pH (6.8). Soil parent material is limestone. Phosphorus appears to be limiting to plant development with just 2.6 ppm, when 10 ppm is considered a minimal value for normal plant development. The soil is fairly rocky with pavement and rock concentrated on the surface in open interspaces. However, vegetation and litter cover are abundant and erosion does not currently appear to be a problem.

The site supports a variety of browse species, but the most prominent is curlleaf mountain mahogany which provides 52% of the browse cover. Its population density is estimated at 1,440 plants/acre. Thirty percent of the mature plants are tree-like growth forms which are unavailable to browsing due to height. Overhead canopy cover of mahogany is variable but averages 51% over the whole site. Available mahogany display moderate to heavy use. The stand is healthy with good vigor, low decadence, and exceptionally good reproduction. Open areas between trees support mountain big sagebrush. Density is estimated at 2,180 plants/acre. These plants appear unutilized. There is also a good population of mountain snowberry under the mahogany. Density is estimated at 5,000 plants/acre. They appear lightly utilized with a few individual plants displaying moderate use. Vigor is good and percent decadence low at only 6%.

Singleleaf pinyon pine and white fir are found on the site in small numbers. Point quarter data estimate 22 pinyon and 11 white fir trees/acre. Average basal diameter is 5 inches for pinyon and 6 inches for white fir.

The herbaceous understory is depleted. Only 3 grasses were encountered on the site and they produce only 2% total cover. Forbs are diverse with 25 species being sampled. There are several preferred species present, but no single species produces more than 1% cover and all forbs combined produce only just over 6% cover. The most common forbs include: pale agoseris, thistle, lousewort, and twinpod.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable due to the abundant vegetation and litter cover, combined with the gentle terrain. The key browse species, curlleaf mountain mahogany, appear to be slowly increasing with many of the mature plants becoming unavailable to browsing due to height. Seedlings are abundant and young plants comprise 36% of the population. The herbaceous understory is poor. Grasses are lacking. Forbs are diverse with several preferred species present. Abundance could be better however, as 25 forb species produce only about 6% total cover. Herbaceous production may be somewhat suppressed by the overstory of mahogany (51% canopy cover), although it appears that grazing animals currently have a greater negative impact.

HERBACEOUS TRENDS --
Herd unit 20 , Study no: 6

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron spicatum	7	2	.03
G	Oryzopsis hymenoides	3	2	.01
G	Poa fendleriana	65	24	2.16
Total for Annual Grasses		0	0	0
Total for Perennial Grasses		75	28	2.21
Total for Grasses		75	28	2.21
F	Agoseris glauca	37	12	.73
F	Balsamorhiza hookeri	7	4	.60
F	Balsamorhiza sagittata	2	1	.15
F	Calochortus nuttallii	11	6	.05
F	Chaenactis douglasii	9	4	.21
F	Cirsium spp.	43	17	.70
F	Cryptantha spp.	5	1	.03
F	Cymopterus spp.	1	1	.00
F	Erigeron eatonii	3	1	.00
F	Erigeron spp.	30	11	.40
F	Eriogonum spp.	3	1	.15
F	Ipomopsis aggregata	6	3	.04
F	Lappula occidentalis (a)	14	5	.08
F	Linum lewisii	9	4	.23
F	Lupinus argenteus	18	9	.43
F	Machaeranthera canescens	2	1	.03
F	Mertensia arizonica leonardi	3	1	.15
F	Medicago sativa	4	1	.38
F	Pedicularis centranthera	21	9	.70
F	Penstemon comarrhenus	13	6	.28
F	Penstemon pachyphyllus	13	6	.10
F	Petradoria pumila	14	5	.37
F	Physaria chambersii	19	10	.58
F	Senecio multilobatus	6	3	.06
F	Taraxacum officinale	3	2	.03
Total for Annual Forbs		14	5	0.07
Total for Perennial Forbs		282	119	6.47
Total for Forbs		296	124	6.55

BROWSE TRENDS --
Herd unit 20 , Study no: 6

Type	Species	Strip Frequency '98	Average Cover % '98
B	Abies concolor	-	.15
B	Artemisia nova	-	.38
B	Artemisia tridentata vaseyana	40	6.02
B	Cercocarpus ledifolius	39	27.11
B	Chrysothamnus viscidiflorus viscidiflorus	22	1.19
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	-	.38
B	Mahonia repens	18	2.09
B	Opuntia spp.	0	-
B	Pinus monophylla	2	.00
B	Ribes cereum cereum	1	.63
B	Symphoricarpos oreophilus	54	14.33
Total for Browse		176	52.30

CANOPY COVER --
Herd unit 20 , Study no: 6

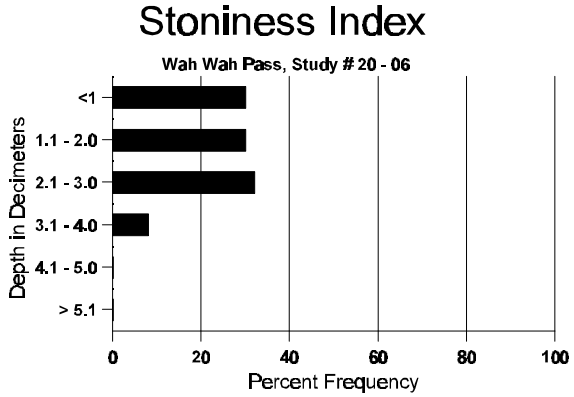
Species	Percent Cover '98
Abies concolor	2
Cercocarpus ledifolius	51
Pinus monophylla	3

BASIC COVER --
Herd unit 20 , Study no: 6

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	310	49.24
Rock	142	7.25
Pavement	168	8.96
Litter	494	74.97
Cryptogams	1	.00
Bare Ground	154	7.97

SOIL ANALYSIS DATA --
Herd Unit 20, Study # 06, Study Name: Wah Wah Pass

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.2	35.8 (16.6)	6.8	29.6	34.8	35.6	4.9	2.6	195.2	.7



PELLET GROUP FREQUENCY --
Herd unit 20 , Study no: 6

Type	Quadrat Frequency '98
Rabbit	9
Horse	2
Deer	9
Cattle	8

BROWSE CHARACTERISTICS --
Herd unit 20 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	98	7	-	-	4	-	-	-	-	-	11	-	-	-	220			11
Y	98	15	-	-	2	-	-	2	-	-	19	-	-	-	380			19
M	98	56	-	-	6	-	-	-	-	-	62	-	-	-	1240	11	20	62
D	98	25	-	-	3	-	-	-	-	-	17	-	-	11	560			28
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 10%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				2180	Dec:		26%
Cercocarpus ledifolius																		
S	98	195	-	-	3	-	-	-	-	-	198	-	-	-	3960			198
Y	98	6	15	1	2	1	1	-	-	-	26	-	-	-	520			26
M	98	24	5	1	-	1	-	-	13	-	44	-	-	-	880	68	102	44
D	98	1	1	-	-	-	-	-	-	-	1	-	-	1	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing '98		Moderate Use 32%			Heavy Use 04%			Poor Vigor 01%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				1440	Dec:		3%

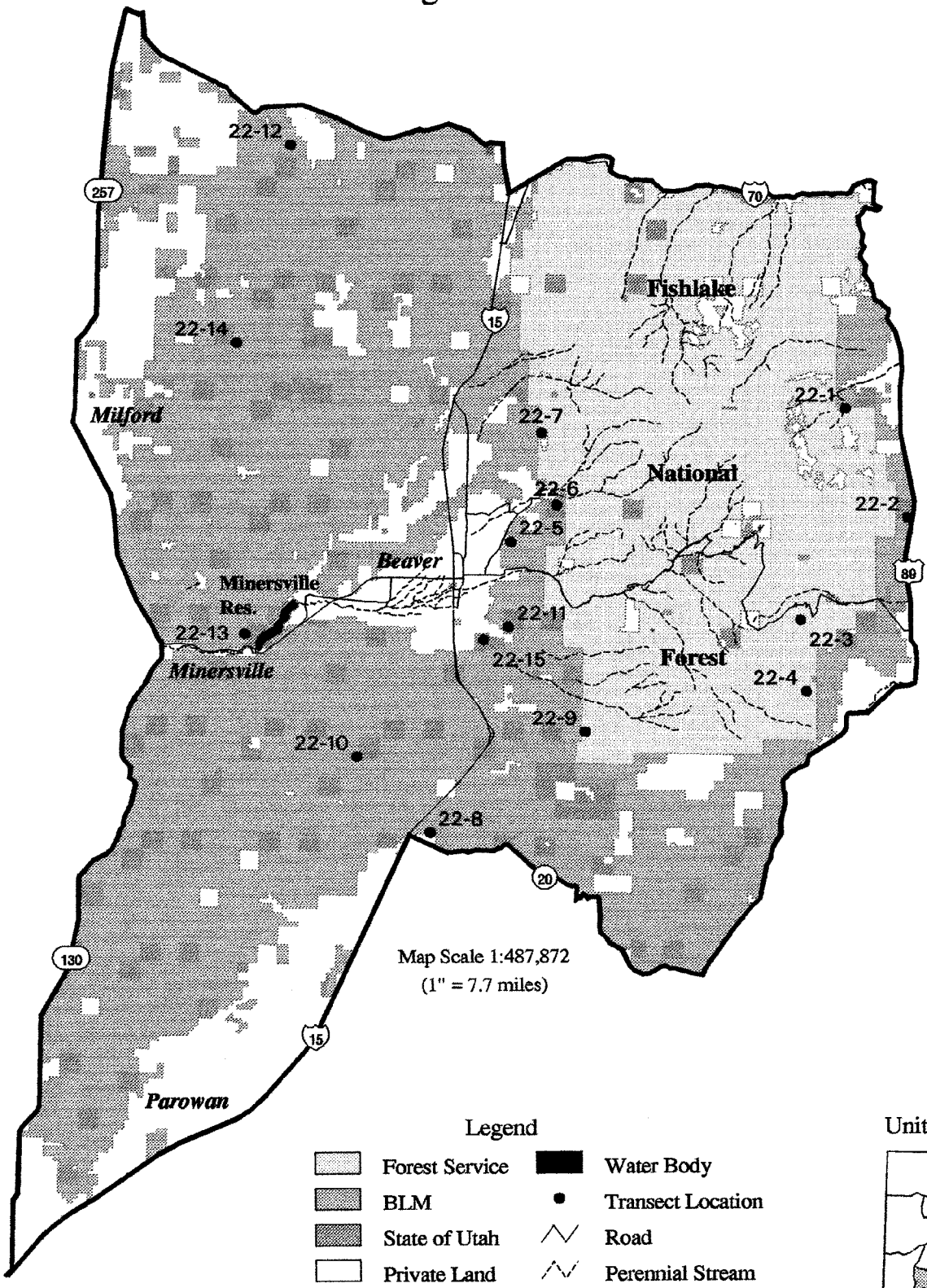
AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
M	98	33	-	-	2	-	-	-	-	-	35	-	-	-	700	6	10	35
D	98	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
X	98	-	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 05%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		860	Dec:		7%
Gutierrezia sarothrae																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	14	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Mahonia repens																		
S	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	98	55	-	-	2	-	-	-	-	-	57	-	-	-	1140			57
M	98	160	-	-	23	-	-	-	-	-	183	-	-	-	3660	4	7	183
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		4800	Dec:		-
Opuntia spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	9	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Pinus monophylla																		
S	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Ribes cereum cereum																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	27	0
D	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 100%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	34	-	-	4	-	-	1	-	-	39	-	-	-	780			39
M	98	150	12	-	29	-	-	4	-	-	195	-	-	-	3900	13	27	195
D	98	16	-	-	-	-	-	-	-	-	15	-	-	1	320			16

% Plants Showing '98	Moderate Use 05%	Heavy Use 00%	Poor Vigor .40%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	5000	Dec:	6%

Management Unit 22



WILDLIFE MANAGEMENT UNIT - 22 (49, 56) - BEAVER

Boundary Description

Iron, Garfield, Piute, Beaver, and Millard counties - Boundary begins at SR-130 and I-15; north on SR-130 to SR-21; north on SR-21 to SR-257; north on SR-257 to the Black Rock road; east on the Black Rock road to I-15; south on I-15 to I-70 to US-89; south on US-89 to SR-20 to I-15; south on I-15 to SR-130.

Management Unit Description

The Beaver wildlife management unit has been enlarged by combining deer herd unit 56 (Beaver) with deer herd unit 49 (Marysville-Circleville). The wildlife management unit now includes both slopes of the Tushar Mountains south of I-70. It also contains the Mineral Mountains south of the Black Rock road, a portion of Parowan Valley, Black Mountain, and Fremont Wash. Total usable range in the wildlife management unit is 1,154,477 acres. Sixty-one percent of the range is considered winter range and 39% is considered summer range. There is no yearlong range.

On the west side of the wildlife unit, the Black Mountains and the Mineral Mountains are typical of the arid mountains of western Utah. Neither support streams with permanent flows. They lack good summer range, but are vegetatively similar to most deer wintering areas of southern Utah. Both the Black and Mineral Mountains have relatively steep, rugged slopes and areas of rocky outcrops. Black Mountain is unlike the Mineral Mountains in that the top is dominated by gently rolling sagebrush hills and dry meadows.

The Tushar Mountains are more typical of the high elevation mountains of central and southern Utah and contain good summer range for deer and elk. The Tushar's have many small lakes and perennial streams. The western slopes of the Tushar Mountains are more gradual and receive sufficient precipitation to create good intermediate deer range which is used in the spring and fall and during mild winters. Delano Peak on the Tushar Mountains is the unit's highest point at an elevation of 12,173 feet. The low point in the unit is about 5,000 feet in the valley near Milford. The highest point in the Mineral Mountains is 9,578 feet on Granite Peak and Jack Henry Knoll at 8,668 feet is the highest area in the Black Mountains.

The east side of the Tushar Mountains is comprised of drainages which empty into the Sevier River. The major tributaries are Deer Creek, Beaver Creek, Bullion Creek, Cottonwood Creek, Ten Mile Creek, City Creek, Birch Creek, Pine Creek and Chokecherry Creek. Between Circleville and Marysvale, a broad river valley with gradual slopes joins the steep mountain slopes and sheer cliffs of the Tushar mountains. The portions north of Marysvale and south of Circleville (including Marysvale and Circleville Canyons) are composed of disjunct pinyon-juniper canyons. Towns in this area include: Sevier, Marysvale, Junction, and Circleville.

Most of the winter range (87%) is located on Forest Service or BLM managed lands. Additionally, 8% of the winter range is located on private land holdings and 6% are located on Utah State School Trust Lands and Division of Wildlife Resources management areas. In 1996 a fire burned on the north end of the management unit burning large tracts of winter range (see Antelope Mountain site #22-14).

On the west side of the Tushar Mountains, most of the winter range use is on the Black and Mineral Mountains. The winter ranges on these mountains were used quite extensively in the past by deer migrating from summer range on the Tushars. These migrations were essentially eliminated by the construction and fencing of I-15. Two underpasses and one overpass constructed for deer crossings have had moderate success in allowing deer to cross the freeway. The winter range on the east side of I-15 must carry the burden when animals are not willing to use the under and overpasses. Still, there is ample range for deer in normal winters. Only in severe winters when the usable range is limited to the lowest areas near the freeway does winterkill become a significant problem.

On the east side of the Tushar Mountains, the normal winter range boundaries range from 6,200 feet on the valley floor to 8,500 feet in the upper basins. Oak Basin often winters deer up to the 8,600 foot level. The upper limit along the steeper portions of the east face of Tushar Mountains is 7,200 feet. Severe winter range occupies 47,223 acres, 71% of the normal winter range (Huff and Bowns 1965). The upper limit of severe winter range is normally 7,000 feet, but goes as high as 8,000 feet in Oak Basin. Winter deer concentrations are found on south and southeast facing slopes. Minor migrations from the summer ranges of units 23 and 24 onto unit 22 winter ranges occur each year, but the major movement is an elevational movement from summer to winter range within the unit.

Wildlife Unit Management Objectives

Current management objectives for wildlife are to achieve a target population of 11,000 wintering deer with a post season buck to doe ratio of 15:100. Thirty percent of these bucks are to be three point or better. The target winter herd size for elk is to be 950 with a post season composition of 8 bulls to 100 cows. At least 4 of these bulls must be 2½ years of age or older. The deer herd on the Beaver unit had an estimated 1996 post season population of 10,000 head.

Trend Study 22-1-98

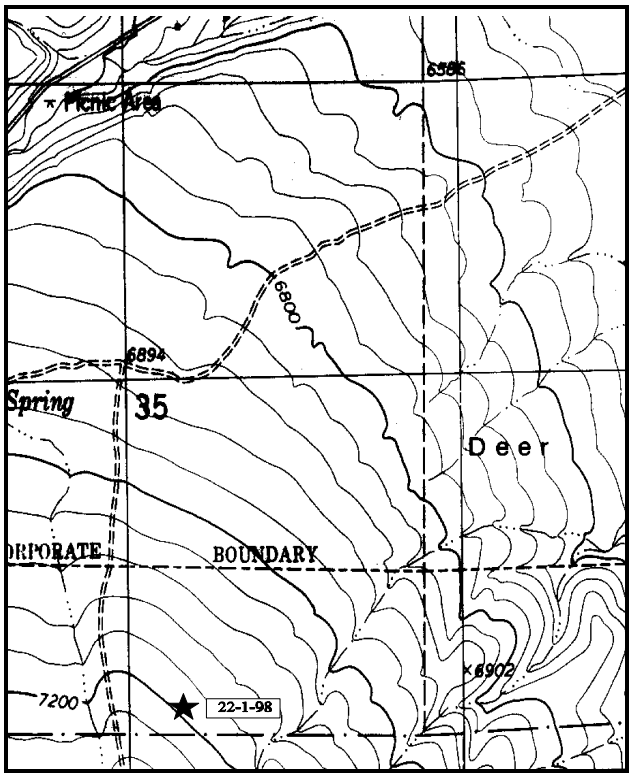
Study site name: Deer Flat . Range type: Chained, Cabled, Seeded, PJ .

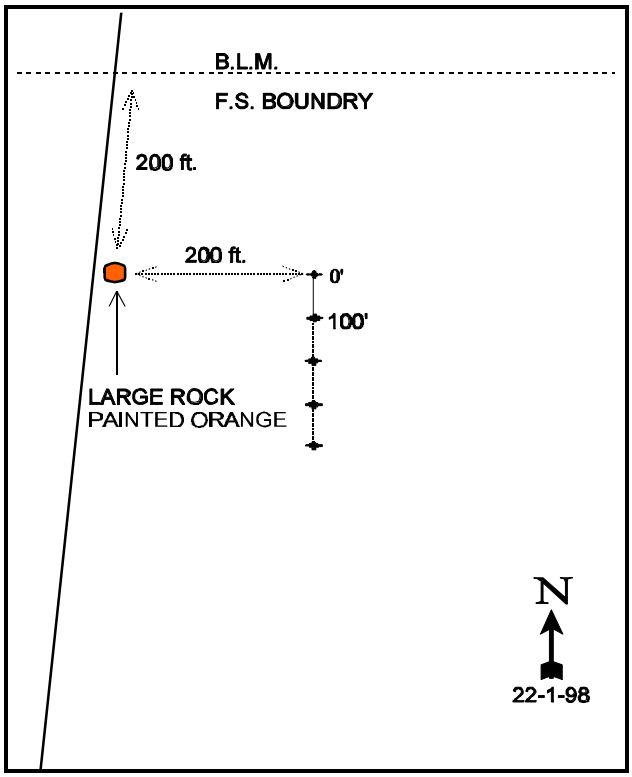
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 179 south of Marysvale, proceed 0.6 miles and turn right on a dirt road. The road forks immediately beyond a fence, stay to the right. Proceed 0.5 miles to another fork in the road at a fence corner. Go straight through the gate, passing a road on each side. Continue 0.1 miles and turn right. Proceed 2.8 miles up this road, following a ditch, passing 2 ponds and passing through a DWR fence to another fork. Turn left. Go 0.65 miles (through a gate) to a large painted rock on the left side of the road. The 0-foot baseline stake is 200 feet due east of the rock. It is a rebar with a browse tag #7106 attached.





Map Name: Mount Brigham, Utah

Diagrammatic Sketch

Township 27S , Range 4W , Section 35

UTM 4252025.198 N, 388051.581 E

DISCUSSION

Trend Study No. 22-1 (49-1)

The Deer Flat trend study is located on BLM administered land and is considered an important deer wintering area. The area was chained and seeded to perennial grasses in 1968. The slope is 15%-20% with a northwest aspect and an elevation of 6,800 feet. Water is available in Pine Creek which is located about ½ mile to the north. Across the Forest Service-BLM boundary, 200 feet to the north, is another chaining and seeding project completed in 1981. A pellet group transect read in 1998 on the site indicates 58 deer days use/acre, 12 elk days use/acre, and 11 cow days use/acre.

Soil textural analysis shows it to be a sandy clay loam which appears to have good permeability and water holding capacity. Parent material appears to be sandstone and limestone. The soil profile is rocky throughout with an average effective rooting depth (see methods) of almost 9 inches. The soil temperature is 54°F measured at a depth of over 10 inches. The pH is slightly acidic (6.2). Erosion is currently not a problem on the site, although the road to the site crosses a small creek and the water washes down the road causing severe erosion.

In 1998, 13 browse species were encountered on the transect. Mountain big sagebrush was the key species. In both 1985 and 1991, a high percentage of plants were classified as young, 54% and 47% respectively. Percent decadence increased from 4% in 1985 to 22% in 1991. In 1998, the mountain big sagebrush density was estimated to be 3,640 plants/acre. This much lower estimate is mostly because of the much larger sample size that gives more accurate estimates for browse populations, because the dead within the population can only explain 2% of the decrease. The number of young plants encountered in 1998 declined to 13% of the population and no seedlings were encountered. Percent decadency is similar to that of 1991 at 19%. Utilization is comparable over all years with mostly moderate use. Percent cover for mountain big sagebrush is currently 19%. This is a maturing population that appears stable and healthy. Black sagebrush currently has an estimated density of 3,920 plants/acre. Percent decadency is currently the same as reported in 1991 at 16% and higher then reported in 1985 (7%). Utilization is light to moderate in 1985 and 1998, and moderate to heavy in 1991.

Other valuable browse plants common to the area are mountain mahogany, slenderbush eriogonum, and Gambel oak. The lower overall density estimates for these species in 1998 is due to the greatly increased sample size. The less desirable species, broom snakeweed, pricklypear cactus, Greene's rabbitbrush, stickyleaf low rabbitbrush, and gray horsebrush are less abundant and have low biotic potential. Point-centered quarter data collected in 1998 indicates 39 pinyon trees/acre and 13 Utah juniper trees/acre. Average trunk diameter is nearly 4 inches for both species. Photographs show a noticeable increase in the size (height and width) of the trees across the site over all years, however densities are still very low.

Crested wheatgrass provides 35% of the grass cover and 31% of the total herbaceous cover. Muttongrass also provides some cover, but nested frequency values show a significant decline over all years. Other abundant grasses include: smooth brome, Junegrass, and Sandberg bluegrass. These grasses are desirable species that add variety to the diets of game animals and livestock. Cheatgrass is present, but is currently in low abundance. Perennial grass sum of nested frequency is currently 432, the lowest of all years.

Forbs are diverse yet offer little cover or forage. Longleaf phlox and redroot eriogonum are the most common species. The forbs are an important source of deer forage during early spring green-up when energy demands for fetal development and antler growth are high.

1985 APPARENT TREND ASSESSMENT

Erosion was not detected and the soil appears stable to improving. Seventeen years after the chaining, the vegetative community appears healthy with high diversity and a good mixture of grasses, forbs and shrubs.

The community appears stable, although age composition indicates that the shrub component may expand somewhat.

1991 TREND ASSESSMENT

Here again is the repetitious theme, the extended drought has apparently aggravated the situation with increases in percent bare ground, decreases in litter and rock-pavement cover, thus exposing the soil to the harmful effects of high intensity summer storms. The soil trend is slightly downward. Most of the key shrubs (black sagebrush, mountain big sagebrush, curlleaf mountain mahogany) have experienced some kind of increases in their respective densities. Mountain mahogany was the only key browse species that experienced a noticeable decrease in it's density. Rates of decadency have increased for all key browse species regardless of the direction of their respective population changes. Another important characteristic to monitor is the proportion of the plants that are considered to be in poor vigor. This trend should turn around with better precipitation patterns in coming years and an end to the extended drought. The browse trend is slightly up. Most of the herbaceous understory species are also experiencing increased values for nested and quadrat frequency. The herbaceous understory trend is slightly upward.

TREND ASSESSMENT
soil - slightly downward
browse - slightly up
herbaceous understory - slightly upward

1998 TREND ASSESSMENT

Vegetation and litter cover are abundant on this site and there is little sign of current erosion. The soil trend is stable. With the exception of black sagebrush, the browse populations show a decrease in density. This decrease is due to the much larger sample size now used to estimate density. Mountain big sagebrush age structure indicates a maturing population that is currently healthy. The black sagebrush population is also healthy, although more seedling plants for each population would be beneficial. The browse trend is stable. The herbaceous understory trend is slightly downward due a decrease in perennial herbaceous understory sum of nested frequency. Grasses dominate the herbaceous understory and account for most of the nested frequency decline.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly downward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 1

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	a75	b104	ab107	32	44	38	5.05
G	Agropyron spicatum	4	10	14	2	4	6	.42
G	Bouteloua gracilis	a-	c39	b10	-	14	5	.07
G	Bromus inermis	27	45	41	12	20	14	1.92
G	Bromus tectorum (a)	-	-	37	-	-	16	.56
G	Carex spp.	12	14	20	4	5	8	.14
G	Koeleria cristata	59	43	60	30	19	29	1.04
G	Oryzopsis hymenoides	-	5	-	-	2	-	-
G	Poa fendleriana	c255	b195	a107	87	75	41	3.30
G	Poa secunda	a-	a-	b45	-	-	18	1.68
G	Sitanion hystrix	a40	b65	a21	22	35	11	.20
G	Sporobolus contractus	b14	a-	a-	8	-	-	-
G	Stipa comata	a9	b49	a7	4	21	4	.19
Total for Annual Grasses		0	0	37	0	0	16	0.56
Total for Perennial Grasses		495	569	432	201	239	174	14.05
Total for Grasses		495	569	469	201	239	190	14.61
F	Agoseris glauca	a-	b9	ab6	-	6	3	.04
F	Antennaria rosea	-	2	3	-	2	1	.03
F	Arabis demissa	3	-	1	1	-	1	.03
F	Astragalus spp.	11	5	9	5	3	6	.08
F	Astragalus utahensis	-	-	2	-	-	1	.00
F	Castilleja chromosa	-	11	-	-	5	-	-
F	Camelina microcarpa (a)	-	-	1	-	-	1	.00
F	Calochortus nuttallii	b14	b18	a-	7	9	-	-
F	Castilleja spp.	-	-	1	-	-	1	.00
F	Erigeron pumilus	-	3	6	-	1	2	.06
F	Eriogonum racemosum	23	26	31	12	14	16	.25
F	Lesquerella intermedia	-	-	1	-	-	1	.00
F	Lithospermum ruderale	2	1	3	2	1	2	.30
F	Lomatium spp.	-	3	-	-	3	-	.00
F	Machaeranthera canescens	-	-	-	-	-	-	.01
F	Microsteris gracilis (a)	-	-	2	-	-	1	.00
F	Orobanche fasciculata	-	-	7	-	-	3	.04
F	Petradoria pumila	14	12	15	7	5	6	.66
F	Phlox longifolia	41	58	55	20	29	25	.23
F	Polygonum douglasii (a)	-	-	15	-	-	9	.04
F	Sphaeralcea coccinea	7	7	3	4	4	1	.03
F	Tragopogon dubius	4	-	-	2	-	-	-

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Trifolium spp.	$_{c}$28	$_{b}$31	$_{a}$12	11	17	6	.03
F	Unknown forb-perennial	2	-	-	1	-	-	-
Total for Annual Forbs		0	0	18	0	0	11	0.05
Total for Perennial Forbs		149	186	155	72	99	75	1.82
Total for Forbs		149	186	173	72	99	86	1.87

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 1

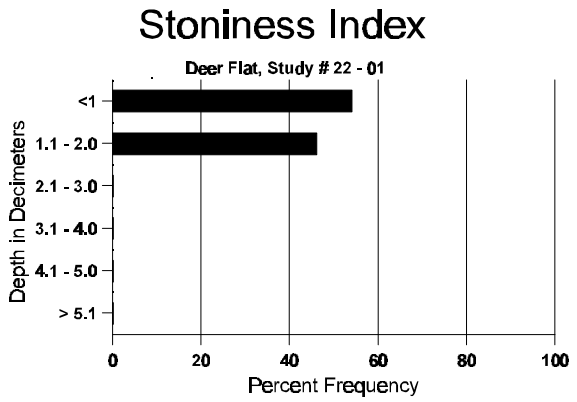
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	53	8.77
B	Artemisia tridentata vaseyana	83	18.67
B	Cercocarpus ledifolius	5	.06
B	Cercocarpus montanus	18	.38
B	Chrysothamnus depressus	5	.01
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Eriogonum microthecum	14	.73
B	Gutierrezia sarothrae	1	.03
B	Juniperus osteosperma	0	-
B	Mammillaria spp.	0	-
B	Opuntia spp.	26	.41
B	Pinus edulis	5	2.64
B	Purshia tridentata	-	.00
B	Quercus gambelii	9	1.80
B	Sclerocactus	2	.01
B	Tetradymia canescens	0	-
Total for Browse		222	33.52

BASIC COVER --
Herd unit 22 , Study no: 1

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	322	9.50	11.00	42.20
Rock	248	9.50	11.75	15.98
Pavement	221	8.00	3.50	9.25
Litter	388	60.00	53.50	50.24
Cryptogams	59	0	.25	.58
Bare Ground	230	13.00	20.00	12.41

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 01, Study Name: Deer Flat

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.7	53.8 (10.5)	6.2	52.0	27.4	20.6	6.5	12.1	233.6	1.0



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 1

Type	Quadrat Frequency '98
Rabbit	37
Elk	5
Deer	55
Cattle	7

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	85	7	-	-	-	-	-	-	-	-	7	-	-	-	466			7
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	15	4	-	-	-	-	-	-	-	19	-	-	-	1266			19
	91	6	4	5	1	-	-	-	-	-	16	-	-	-	1066			16
	98	23	-	-	2	-	-	-	-	-	25	-	-	-	500			25
M	85	4	5	-	-	-	-	-	-	-	9	-	-	-	600	13	20	9
	91	5	3	12	1	1	3	-	-	-	25	-	-	-	1666	10	17	25
	98	100	29	2	9	-	-	-	-	-	140	-	-	-	2800	15	23	140
D	85	2	-	-	-	-	-	-	-	-	1	-	1	-	133			2
	91	1	2	2	-	1	1	-	-	1	5	-	-	3	533			8
	98	27	4	-	-	-	-	-	-	-	28	-	-	3	620			31
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	30%	00%	03%	+39%
'91	22%	49%	06%	+17%
'98	17%	01%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1999	Dec:	7%
	'91	3265		16%
	'98	3920		16%

Artemisia tridentata vaseyana																		
S	85	17	1	-	-	-	-	-	-	-	18	-	-	-	1200			18
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	53	22	-	-	-	-	-	-	-	74	-	1	-	5000			75
	91	28	18	12	3	-	7	-	-	-	66	-	2	-	4533			68
	98	22	2	-	-	-	-	-	-	-	23	-	1	-	480			24
M	85	22	34	3	-	-	-	-	-	-	58	1	-	-	3933	23	29	59
	91	11	12	14	2	1	5	-	-	-	44	-	1	-	3000	24	28	45
	98	61	51	11	1	-	-	-	-	-	117	7	-	-	2480	22	32	124
D	85	1	5	-	-	-	-	-	-	-	6	-	-	-	400			6
	91	4	17	6	-	2	1	1	-	-	26	-	2	3	2066			31
	98	16	18	-	-	-	-	-	-	-	33	-	-	1	680			34
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	44%	02%	.71%	+ 3%
'91	35%	31%	06%	-62%
'98	39%	06%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	9333	Dec:	4%
	'91	9599		22%
	'98	3640		19%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus ledifolius																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	1	-	1	-	-	-	-	2	-	-	-	133			2
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	16	16	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+50%
'91	50%	50%	00%	-10%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		-
'91	133			-
'98	120			-

Cercocarpus montanus																		
S	85	14	-	-	-	-	-	-	-	-	14	-	-	-	933			14
	91	-	1	1	-	-	-	-	-	-	2	-	-	-	133			2
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	85	2	2	15	-	-	-	-	-	-	19	-	-	-	1266			19
	91	-	-	4	-	-	-	-	-	-	4	-	-	-	266			4
	98	7	2	-	1	2	-	1	-	-	13	-	-	-	260			13
M	85	-	2	-	-	-	-	-	-	-	2	-	-	-	133	15	13	2
	91	-	-	1	1	-	4	1	-	-	7	-	-	-	466	9	11	7
	98	3	1	1	-	1	-	-	-	-	6	-	-	-	120	18	18	6
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	3	-	-	-	-	-	-	2	-	-	1	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	19%	71%	00%	-33%
'91	00%	86%	07%	-59%
'98	32%	05%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	1399	Dec:		0%
'91	932			21%
'98	380			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus depressus																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	1	-	-	-	-	-	-	-	2	1	-	-	60			3
M	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133	2	5	2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60	2	8	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	17%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	133	Dec:	-
	'91	0		-
	'98	120		-

Chrysothamnus viscidiflorus viscidiflorus																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	4	9	1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	11	13	1
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	100%	00%
'98	00%	00%	00%

%Change
+ 0%
-70%

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	0%
	'91	66		100%
	'98	20		0%

Eriogonum microthecum																		
Y	85	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	91	3	1	-	1	-	-	-	-	-	5	-	-	-	333			5
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	10	1	2	-	-	-	-	-	-	13	-	-	-	866	5	7	13
	91	9	4	4	4	-	2	3	-	-	26	-	-	-	1733	6	6	26
	98	14	2	-	2	-	-	-	-	-	18	-	-	-	360	6	12	18
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	1	-	-	-	1	-	-	1	133			2
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	05%	10%	00%
'91	15%	21%	03%
'98	10%	00%	05%

%Change
+36%
-82%

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1399	Dec:	0%
	'91	2199		6%
	'98	400		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	85	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	22	-	-	-	-	-	-	-	-	22	-	-	-	1466	7	5	22
	91	5	-	-	-	-	-	-	-	-	5	-	-	-	333	8	8	5
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	5	1
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-78%
'91	00%	00%	00%	-95%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	1799	Dec:		0%
'91	399			17%
'98	20			0%

Juniperus osteosperma																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	44	33	1
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66	63	67	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	66	Dec:	-
'91	66		-
'98	0		-

Mammillaria spp.																		
B	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	85	8	-	2	-	-	-	-	-	-	9	-	1	-	666			10
	91	15	-	3	2	-	-	-	-	-	20	-	-	-	1333			20
	98	8	-	-	1	-	-	-	-	-	9	-	-	-	180			9
M	85	30	-	1	-	-	-	-	-	-	24	-	7	-	2066	4	6	31
	91	13	-	2	-	-	-	-	-	-	15	-	-	-	1000	5	11	15
	98	24	-	-	1	-	-	-	-	-	25	-	-	-	500	5	10	25
D	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	07%	18%	-16%
'91	00%	14%	00%	-71%
'98	00%	00%	06%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	2932	Dec:		7%
'91	2466			5%
'98	720			6%

Pinus edulis																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	-	-	5
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	+34%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	66			-
'98	100			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	1	1	-	-	-	-	-	-	2	-	-	-	133			2
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	12	2	7	-	-	-	-	-	-	21	-	-	-	420	31	28	21
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	100%	00%	00%	+50%
'91	50%	50%	00%	+75%
'98	07%	26%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	0%
	'91	133		0%
	'98	540		4%

Sclerocactus																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	2	3	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	66		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	4	6	1
	91	-	-	-	1	-	-	1	-	-	-	2	-	-	133	6	7	2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+50%
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	133		-
	'98	0		-

Trend Study 22-2-98

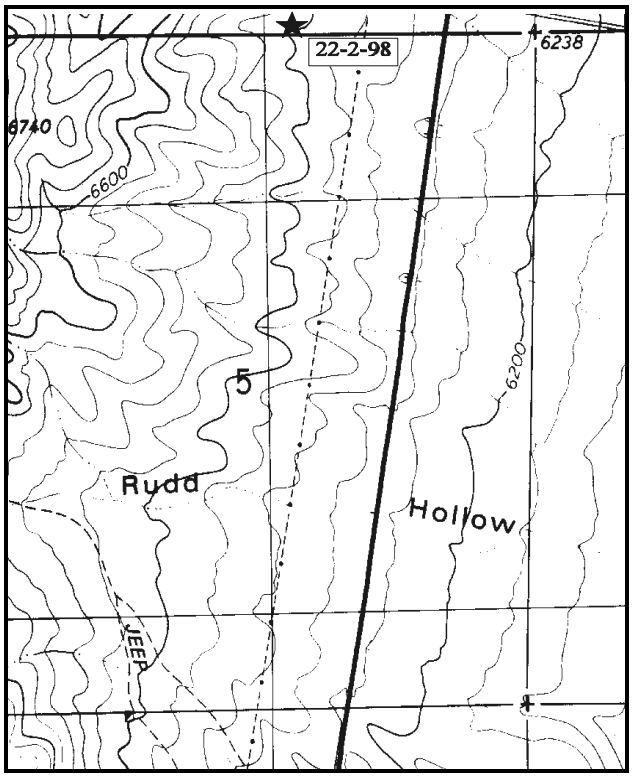
Study site name: Piute Reservoir . Range type: Big Sagebrush .

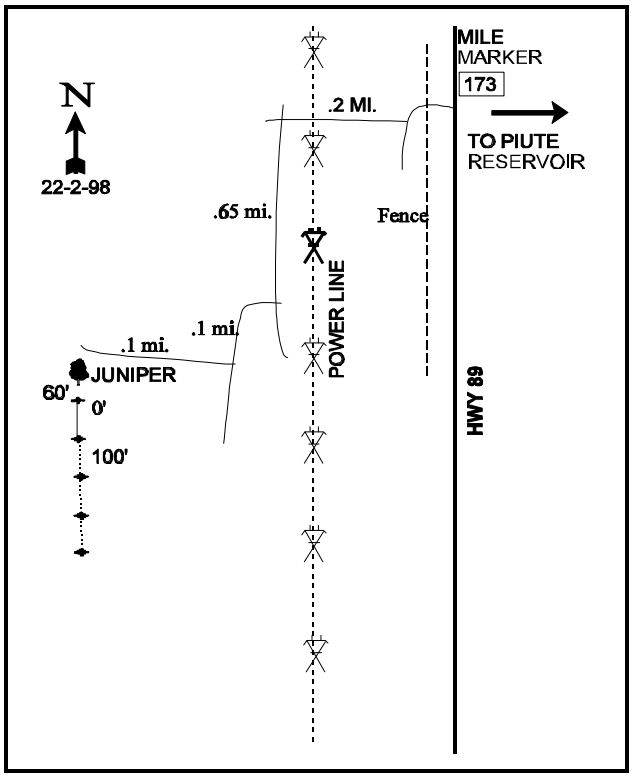
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 173 on Route 89 south of Marysvale, go 0.1 miles south and turn west on a faint, grassy road. Take and immediate right after going through the fence. Proceed 0.2 miles to a fork, go left for 0.65 miles to a fork. Go right for 0.1 miles to another fork and then immediately right for 0.1 miles to a juniper located 20 yards south of the road. The 0-foot end of the frequency baseline is 5 yards south of the juniper. The stakes are all rebar and the 0-foot stake has a browse tag #7080 attached.





Map Name: Piute Reservoir Diagrammatic Sketch

Township 29S , Range 3W , Section 5 UTM 4242529.130 N, 393135.041 E

DISCUSSION

Trend Study No. 22-2 (49-2)

The Piute Reservoir transect is located on BLM administered land approximately 1½ miles west of the dam and 1/4 mile west of Highway 89. The slope is gentle (2-3%) with a southeast aspect and an elevation of 6,400 feet. The range type is Wyoming big sagebrush. The study is within the Junction Cattle Allotment with joint Forest Service and BLM use seasons from May 1 through June 10 and November 1 through February 15 annually. Deer use occurs mainly during the winter and early spring. In 1991, it was noted that pellet groups were scattered throughout the area and one antler shed was found. In 1998, a pellet group transect on the site indicated 21 deer days use/acre. Additionally, 5 shed deer antlers were found in the area.

Soil textural analysis indicates a sandy loam soil with a neutral pH (7.3). The soil is loose and infiltration rates and water holding capacity are probably quite high. Soil temperature was 71.6°F at a depth of 14 inches. Percent rock and pavement cover together have slowly declined since 1985, while percent bare ground has slowly increased. In 1991, small erosion rills were common on the slopes and active gullies were prominent throughout the area. In 1998, some erosion was apparent, but it did not appear to be excessive or accelerated.

The key browse on the site is Wyoming big sagebrush. These plants average 20 inches in height and show light to moderate hedging. In 1991, the age distribution indicated a slowly increasing population. Thirty-four percent of the plants encountered were young, while 28% were classified as mature. Percent decadency increased from 19% in 1985 to 34% in 1991. The percentage of plants in poor vigor increased from 3% (1985) to 31% (1991). Currently, the population has become more mature with 14% of the plants classified as young and 57% classified as mature. In 1998, the estimated density is 3,560 plants/acre and percent cover is just above 18%. Percent decadency has decreased slightly since 1991 to 29%, however the number of decadent plants classified as dying has greatly increased from 6% to 47%. Low rabbitbrush (*Chrysothamnus viscidiflorus stenophyllus*) density is currently estimated to be 3,400 plants/acre. Age structure indicates a mature population with fewer seedling and young plants encountered in 1998 than in any previous years. The mature plants are approximately ½ the size of mature sagebrush plants. The rabbitbrush showed light to moderate use in 1985, but no use in 1991 or 1998. Pricklypear cactus is the only other browse plant common to the area and is present in very low densities. A pinyon and Utah juniper community in the foothills 1/8 mile to the west, provides escape and thermal cover.

Herbaceous vegetation continues to be sparse as illustrated by a total cover of less than 2%. Five grasses were encountered in 1998; bottlebrush squirreltail, Indian ricegrass, cheatgrass, a sedge, and needle-and-thread grass. All are cool-season grasses with relatively low densities. Five species of perennial forbs were again observed in 1998, all in very low abundance. An annual ragweed is particularly abundant along washes and the disturbed roadway.

1985 APPARENT TREND ASSESSMENT

The soil is one of high erosion potential and soil loss is common throughout the area. Both of the prominent browse species, Wyoming big sagebrush and low rabbitbrush, appear to be increasing in the absence of competition from grasses and forbs. Sod-forming grasses are conspicuously lacking. Herbaceous species are sparse and provide very little soil protection between the shrubs. Thus, trend of both the soil and the vegetative community is downward due in large measure to the absence of sod-forming grasses and more desirable forbs. Perhaps spring grazing should be eliminated for several years.

1991 TREND ASSESSMENT

The soil trend is downward because of the sharp increase in percent bare ground and decrease in litter cover at only 24%, which for this area, makes it much more susceptible to soil loss during high intensity summer storms which occur often. Wyoming big sagebrush and low rabbitbrush, have noted increases in their

respective densities, but percent decadency has increased for sagebrush (34%). There are two more critical measurements that are of concern for this sagebrush community. This would include the form class which is showing that 29% of the plants are heavily browsed, but more importantly, the proportion of the population that are classified as having poor vigor is now up to 30%. The browse trend is slightly downward. There are very few forbs or grasses occurring on the site and most have shown declines since 1985. The trend for herbaceous understory is slightly downward. The only way to turn around this trend is to discontinue habitual spring grazing.

TREND ASSESSMENT
soil - down
browse - slightly downward
herbaceous understory - slightly downward

1998 TREND ASSESSMENT

The soil trend is stable, but the soil is very vulnerable to high intensity rainstorms. Percent bare ground cover is increasing, while percent rock and pavement cover combined is also decreasing. The shrub interspaces are devoid of any protective ground cover. The browse trend is slightly downward with an increase in the percentage of the plants classified as dying. Percent decadency has stayed relatively stable since 1991 while the percentage of plants classified with poor vigor has declined to 15%. The herbaceous understory trend is slightly upward. Perennial grass sum of nested frequency has increased from 33 in 1991 to 75 in 1998. Similarly, perennial herbaceous understory sum of nested frequency has increased from 54 in 1991 to 191 in 1998.

TREND ASSESSMENT
soil - stable, but very vulnerable to erosion
browse - slightly downward
herbaceous understory - slightly upward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 2

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Bromus tectorum (a)	-	-	3	-	-	1	.00
G	Carex spp.	-	2	1	-	2	1	.00
G	Oryzopsis hymenoides	3	11	11	1	6	6	.28
G	Sitanion hystrix	22	19	36	14	9	15	.71
G	Stipa comata	$_{ab}$12	$_{a}$1	$_{b}$25	7	1	9	.65
Total for Annual Grasses		0	0	3	0	0	1	0.00
Total for Perennial Grasses		37	33	73	22	18	31	1.65
Total for Grasses		37	33	76	22	18	32	1.65
F	Ambrosia spp.	2	-	-	1	-	-	-
F	Astragalus spp.	$_{b}$29	$_{a}$5	$_{ab}$15	15	3	7	.23
F	Chaenactis douglasii	-	-	1	-	-	1	.00
F	Cryptantha spp.	-	-	6	-	-	2	.06

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Eriogonum cernuum (a)	$_{b}$35	$_{a}$7	$_{a}$5	14	4	2	.01
F	Orobanche fasciculata	-	-	1	-	-	1	.00
F	Phlox longifolia	3	6	3	1	3	1	.00
F	Unknown forb-annual (a)	-	7	-	-	3	-	-
F	Unknown forb-perennial	3	3	-	1	2	-	-
Total for Annual Forbs		35	14	5	14	7	2	0.00
Total for Perennial Forbs		37	14	26	18	8	12	0.30
Total for Forbs		72	28	31	32	15	14	0.31

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 2

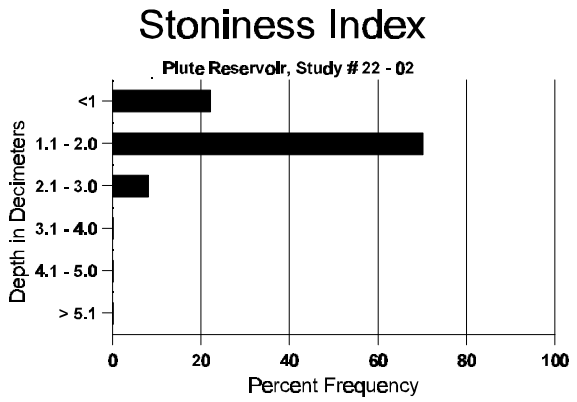
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	1	-
B	Artemisia tridentata wyomingensis	84	18.43
B	Cercocarpus ledifolius	0	-
B	Chrysothamnus viscidiflorus stenophyllus	63	7.55
B	Juniperus osteosperma	0	-
B	Leptodactylon pungens	-	.38
B	Opuntia spp.	1	.15
B	Pinus edulis	2	.18
Total for Browse		151	26.70

BASIC COVER --
Herd unit 22 , Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	188	3.00	4.25	29.79
Rock	161	.75	3.25	3.83
Pavement	339	58.50	48.75	43.54
Litter	355	29.25	24.25	26.39
Cryptogams	5	0	.25	.15
Bare Ground	302	8.50	19.25	21.88

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 02, Study Name: Piute Reservoir

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.2	71.6 (14.1)	7.3	68.0	17.4	14.6	3.9	16.2	332.8	.9



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 2

Type	Quadrat Frequency '98
Rabbit	11
Deer	6

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	0%
	'91	0		0%
	'98	20		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	40	1	-	-	-	-	-	-	-	41	-	-	-	2733			41
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	85	27	7	1	-	-	-	-	-	-	34	-	1	-	2333			35
	91	25	9	4	1	-	-	1	-	-	29	-	5	6	2666			40
	98	14	11	-	-	-	-	-	-	-	23	-	2	-	500			25
M	85	12	28	8	-	-	-	-	-	-	48	-	-	-	3200	20	24	48
	91	1	12	10	3	2	1	-	-	-	18	3	8	-	1933	18	25	29
	98	53	42	3	2	2	-	-	-	-	101	-	1	-	2040	20	33	102
D	85	4	15	-	-	-	-	-	-	-	17	-	2	-	1266			19
	91	1	12	15	2	3	-	2	-	-	17	5	11	2	2333			35
	98	23	23	5	-	-	-	-	-	-	27	-	-	24	1020			51
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	49%	09%	03%	+ 2%
'91	37%	29%	31%	-49%
'98	44%	04%	15%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	6799	Dec:	19%
	'91	6932		34%
	'98	3560		29%

Cercocarpus ledifolius																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	1	-	-	-	-	-	-	-	1	-	-	-	66	11	5	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	100%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	66		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
S	85	151	-	-	-	-	-	-	-	-	151	-	-	-	10066			151
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
Y	85	12	-	-	-	-	-	-	-	-	11	-	1	-	800			12
	91	1	-	-	8	-	-	3	-	-	11	-	-	1	800			12
	98	11	-	-	1	-	-	-	-	-	12	-	-	-	240			12
M	85	10	3	1	-	-	-	-	-	-	14	-	-	-	933	13	9	14
	91	8	-	-	10	-	-	3	-	-	20	1	-	-	1400	12	8	21
	98	107	-	3	20	-	-	3	-	-	129	4	-	-	2660	12	13	133
D	85	2	1	3	-	-	-	-	-	-	6	-	-	-	400			6
	91	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	98	25	-	-	-	-	-	-	-	-	17	-	-	8	500			25
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	13%	13%	03%	+ 6%
'91	00%	03%	06%	+33%
'98	00%	02%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	2133	Dec:		19%
'91	2266			3%
'98	3400			15%

Juniperus osteosperma

S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	0			-

Opuntia spp.

M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	5	9	1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66	5	8	1
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		-
'91	66			-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus edulis																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	40		-

Trend Study 22-3-98

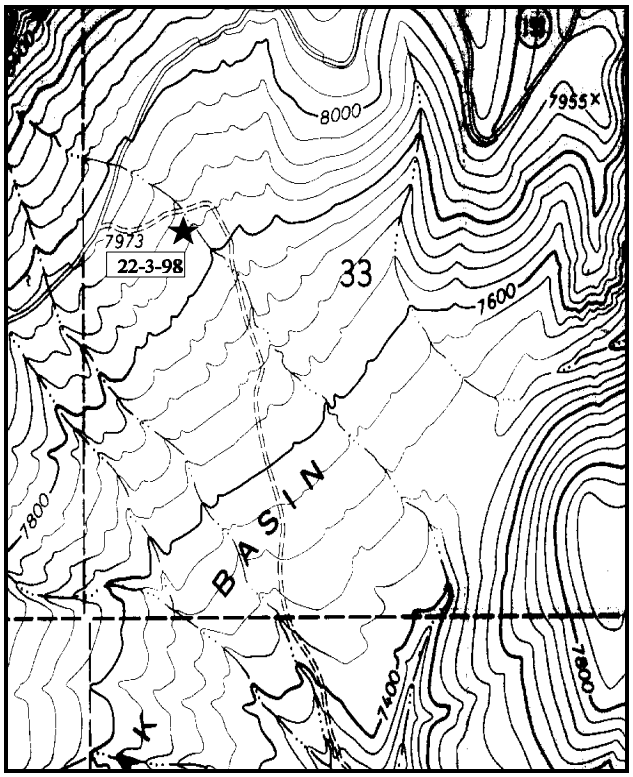
Study site name: Oak Basin . Range type: Chained, Railed Shrubland .

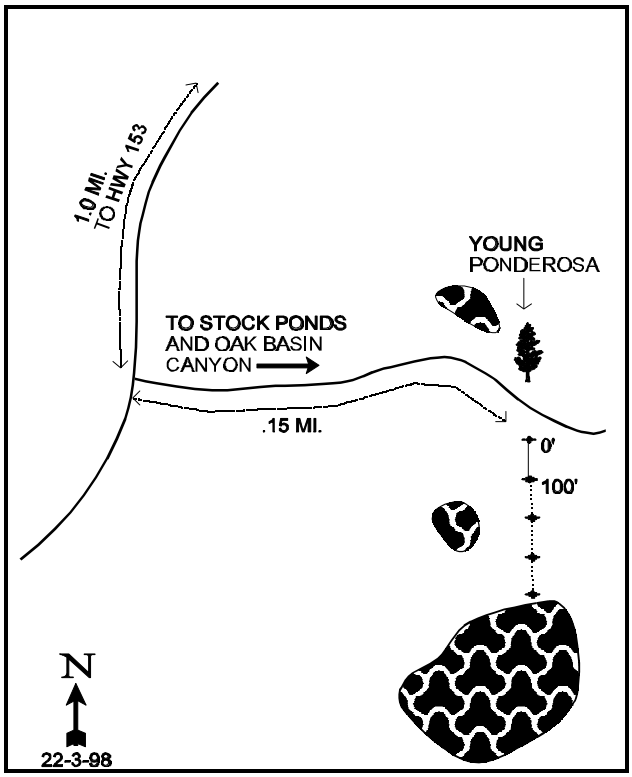
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the center of Junction in Piute County, turn west on Highway 153. Proceed 5.8 miles to a fork in the road. Turn left. Continue on Highway 153 for 1.75 miles to an intersection at mile marker 34. (An Interagency pellet transect begins here and parallels the left fork on the west side.) Take the left fork and go just under 1 mile to another fork. Turn left and go 0.15 miles to a lone Ponderosa Pine 15 feet to the left of the road. The baseline starts 100 feet south of the pine. The 0-foot stake is a steel rebar tagged #7044.





Map Name: Circleville, Utah Diagrammatic Sketch

Township 29S , Range 4W , Section 33 UTM 4233610.836 N, 384258.226 E

DISCUSSION

Trend Study No. 22-3 (49-3)

The Oak basin trend transect is located in Oak Basin approximately 5 miles northeast of Circleville, Utah. The slope is 20-25% with a southeast aspect and an elevation of 7,800 feet. The study is part of a 600-acre tract that was dixie harrowed and seeded in 1965. Deer use the area as spring-fall range and during light winters. The Circleville Cattle Allotment is on a 3 year rest rotation system. In the first year 360 cattle graze the area from June 1 to July 24. In the second year 360 cattle graze from July 24 through October 15. The pasture is then rested in the third year. Oak Basin pellet group transect is located 200 to 300 feet higher in elevation and about ½ mile to the north. Deer days use/acre rose from 13 in 1976-77 to 42 in 1984-85 with 5-year averages of 16 deer days between 1976 and 1981 and 75 deer days between 1981 and 1985 (Jense et al. 1985). The trend for deer days use/acre appears stable from 1985-86 through 1991-92 with an average of 28 (Jense et al. 1991). Pellet group data was not collected in 1992-93, but beginning in 1993-94, there was an obvious decline in use patterns with average days use/acre dropping to an average of 4 between 1993-94 through 1996-97 (Evans et al. 1997). A pellet group transect read on the site in 1998 indicated 39 deer days use/acre and 75 cow days use/acre in 1998. Jackrabbits, cottontail rabbits, sage grouse, and blue grouse can be found nearby.

Soil textural analysis indicates a sandy clay loam with a slightly acidic pH (6.3). The average effective rooting depth (see methods) is almost 9 inches with an average soil temperature of 61.2°F at 12 inches. Parent material is metamorphic rock originating from the cliffs west of the transect. In 1985, there was 6% bare ground which then increased to 18% in 1991. Currently, percent bare ground is about 10%. Percent litter is steadily decreasing while percent rock and pavement cover combined have changed little. In 1998, no signs of erosion were noted and the soil appeared to be building. Many of the changes shown on most all of the measured parameters was brought about by a fire that had gone through the site prior to 1991.

Mountain big sagebrush is the key species and the most prominent plants on the site. In 1985, the age structure of this species indicated a maturing population since seedlings and young plants account for only 1% and 10% respectively of the total. All plants were vigorous and hedging was light to moderate depending on the ecotypic variation of individual plants. Due to a fire that burned through the site between 1985 and 1991, there were no mountain big sagebrush plants encountered in the density plots in 1991. The population has since returned with an estimated density of 1,240 in 1998. Sixty percent of the plants were classified as mature, 26% young, and 1% seedlings. Utilization is currently light to moderate with few plants exhibiting poor vigor.

Next in importance is antelope bitterbrush and Gambel oak. The bitterbrush is scattered throughout the site with an estimated density of 120 plants/acre in 1998. In 1991, there were no bitterbrush plants encountered due to the fire. Although utilization is currently heavy, the bitterbrush are vigorous and healthy. The Gambel oak population was drastically reduced from 15,799 plants/acre in 1985 and 9,066 plants/acre in 1991, to a current estimated density of 520 plants/acre due to the fire. This is now a young population with good vigor. The remainder of the browse species are relatively unimportant in terms of total production, but add diversity and offer variety to the deer diet.

Ten grasses were encountered on the site in 1998. Intermediate wheatgrass and crested wheatgrass, two seeded species, were the most abundant and together account for 94% of the grass cover. Also important are two native species, muttongrass and Letterman needlegrass. Most had sustained moderate utilization from the cattle which were present when the transect was read in 1998. The grasses under the canopy of browse plants received the lightest use, while those in the interspaces were generally clipped to within a few inches of the ground. Perennial grass sum of nested frequency has declined over all years from 760 in 1985, to 646 in 1991, and finally 601 in 1998.

Ten forb species were observed on the site in 1998. Silvery lupine is currently the most abundant providing 94% of the forb cover. Most other species are sparse in the area. Use of these forbs by cattle was light, however the forbs, especially the lupine, are unquestionably important in the spring and summer deer diet.

1985 APPARENT TREND ASSESSMENT

The soil is well protected and building, with no indication of erosion problems. Vegetative trend was influenced by the seeding project in 1965. Species diversity is good and there is a healthy balance between the grass, forb, and shrub components. With the exception of spreading patches of Gambel oak, the community appears stable at present. In the long-term, the browse species can be expected to slowly decline unless reproduction increases.

1991 TREND ASSESSMENT

Because of a recent wildfire, the soil trend has changed dramatically since 1985. Percent bare ground has increased from 6% to 18% and percent litter has decreased substantially. Trend is down and should be watched closely. Browse trend is obviously down with the loss of all browse except for Gambel oak and pricklypear cactus to the fire. The herbaceous understory trend is slightly downward. Of the 29 species encountered, 14 show downward trends. Even with crested wheatgrass and intermediate wheatgrass with quadrat frequencies of 67 and 99 respectively, the overall trend with the effects of long-term drought and a relatively recent fire is slightly down.

TREND ASSESSMENT
soil - down
browse - down, loss of browse to wildfire
herbaceous understory - slightly down, have not yet recovered from the fire

1998 TREND ASSESSMENT

The soil trend is slightly upward with a decrease in percent bare ground cover. There currently appears to be adequate vegetation and litter cover to protect the soil from accelerated erosion. Percent rock and litter cover have stayed relatively the same over all years. The browse trend is upward with the recovery of mountain big sagebrush after the fire. The population appears healthy, although few seedling plants were encountered in 1998. Utilization is light to moderate with a percent decadency of 15%. The herbaceous understory trend is downward. Perennial herbaceous understory sum of nested frequency has continually declined from 873 in 1985, to 809 in 1991, and finally 704 in 1998.

TREND ASSESSMENT
soil - slightly upward
browse - upward
herbaceous understory - downward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 3

Type	Species	Nested Frequency '85	Nested Frequency '91	Nested Frequency '98	Quadrat Frequency '85	Quadrat Frequency '91	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	$_{b}$221	$_{a}$169	$_{ab}$176	79	67	71	4.73
G	Agropyron intermedium	$_{ab}$316	$_{a}$303	$_{b}$326	98	99	95	20.23
G	Agropyron trachycaulum	-	4	-	-	2	-	-
G	Bouteloua gracilis	4	2	1	2	1	1	.03
G	Bromus inermis	$_{b}$16	$_{a}$-	$_{b}$12	7	-	4	.16
G	Carex spp.	34	24	26	19	16	13	.55
G	Elymus junceus	$_{b}$10	$_{a}$-	$_{a}$-	5	-	-	-
G	Koeleria cristata	1	3	-	1	1	-	-
G	Oryzopsis hymenoides	-	-	3	-	-	1	.00
G	Poa fendleriana	$_{b}$127	$_{b}$102	$_{a}$28	52	44	13	.33
G	Poa pratensis	8	-	3	3	-	1	.00
G	Sitanion hystrix	1	1	2	1	1	1	.00
G	Stipa comata	3	7	-	1	3	-	-
G	Stipa lettermani	19	31	24	10	13	9	.46
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		760	646	601	278	247	209	26.53
Total for Grasses		760	646	601	278	247	209	26.53
F	Agoseris glauca	$_{a}$-	$_{b}$13	$_{ab}$9	-	6	3	.01
F	Arabis spp.	$_{a}$-	$_{b}$16	$_{a}$-	-	7	-	-
F	Astragalus convallarius	$_{ab}$6	$_{b}$7	$_{a}$-	3	5	-	-
F	Astragalus spp.	4	-	6	2	-	3	.16
F	Castilleja chromosa	$_{b}$10	$_{b}$14	$_{a}$-	6	6	-	-
F	Calochortus nuttallii	2	9	3	1	5	1	.00
F	Chenopodium album (a)	-	8	-	-	3	-	-
F	Cryptantha spp.	5	-	-	3	-	-	-
F	Eriogonum racemosum	5	6	2	4	4	1	.03
F	Hackelia patens	-	2	2	-	1	1	.00
F	Lactuca serriola	-	-	4	-	-	2	.01
F	Lomatium spp.	-	2	-	-	1	-	-
F	Lotus utahensis	$_{b}$12	$_{a}$4	$_{a}$-	6	2	-	-
F	Lupinus argenteus	$_{a}$45	$_{ab}$50	$_{b}$70	19	28	34	7.11
F	Medicago sativa	4	1	4	2	1	2	.06
F	Phlox longifolia	$_{a}$12	$_{b}$33	$_{a}$3	7	19	2	.01
F	Polygonum douglasii (a)	-	-	47	-	-	17	.16
F	Zigadenus paniculatus	$_{b}$8	$_{ab}$6	$_{a}$-	4	2	-	-
Total for Annual Forbs		0	8	47	0	3	17	0.15
Total for Perennial Forbs		113	163	103	57	87	49	7.41

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
Total for Forbs		113	171	150	57	90	66	7.57

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 3

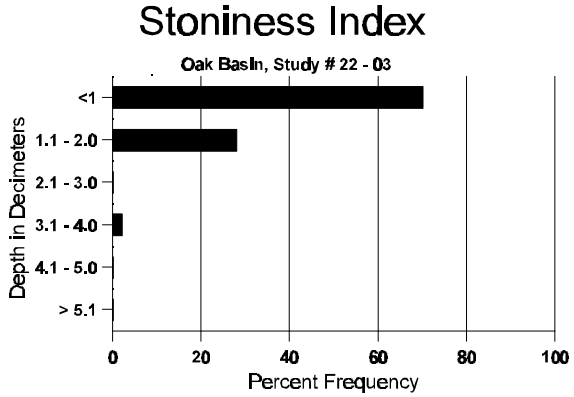
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	0	-
B	Artemisia tridentata tridentata	0	-
B	Artemisia tridentata vaseyana	41	3.79
B	Cercocarpus ledifolius	0	.15
B	Chrysothamnus depressus	0	-
B	Chrysothamnus viscidiflorus	1	-
B	Juniperus osteosperma	2	.85
B	Opuntia spp.	6	.36
B	Purshia tridentata	6	.18
B	Quercus gambelii	7	.21
Total for Browse		63	5.54

BASIC COVER --
Herd unit 22 , Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	356	7.50	7.25	46.47
Rock	232	17.75	20.25	19.61
Pavement	133	2.00	1.00	1.47
Litter	377	66.50	53.75	48.23
Cryptogams	11	0	.25	.05
Bare Ground	233	6.25	17.50	9.83

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 03, Study Name: Oak Basin

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.5	61.2 (11.6)	6.3	70.0	9.4	20.6	3.9	16.2	332.8	.9



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 3

Type	Quadrat Frequency '98
Rabbit	5
Elk	1
Deer	25
Cattle	17

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
D	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	100%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		100%
'91	0			0%
'98	0			0%

Artemisia tridentata tridentata																			
M	85	-	2	-	-	-	-	-	-	-	2	-	-	-	133	30	26	2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	100%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
'85	133	Dec:	-
'91	0		-
'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	85	6	1	1	-	-	-	-	-	-	8	-	-	-	533			8
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	10	4	-	2	-	-	-	-	-	16	-	-	-	320			16
M	85	24	11	6	-	-	-	-	-	-	41	-	-	-	2733	20	19	41
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	28	9	-	-	-	-	-	-	-	37	-	-	-	740	21	26	37
D	85	7	16	5	-	-	-	-	-	-	28	-	-	-	1866			28
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	6	-	-	-	-	-	-	-	7	-	-	2	180			9
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	300			15

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	36%	16%	00%	
'91	00%	00%	00%	
'98	31%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	5132	Dec:		36%
'91	0			0%
'98	1240			15%

Cercocarpus ledifolius																		
Y	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	200	Dec:		-
'91	0			-
'98	0			-

Chrysothamnus depressus																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	6	1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		-
'91	0			-
'98	0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	10	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	20			-

Juniperus osteosperma																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	40			-

Opuntia spp.																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	1	-	-	-	-	-	-	-	-	-	-	1	-	66	9	16	1
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	7	12	6
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	1	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	100%	+53%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	66	Dec:		0%
'91	66			0%
'98	140			14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	3	2	-	-	-	-	-	-	5	-	-	-	333	18	20	5
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	3	-	-	3	-	-	-	6	-	-	-	120	11	26	6
D	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	71%	29%	00%	
'91	00%	00%	00%	
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	465	Dec:	14%
	'91	0		0%
	'98	120		0%

Quercus gambelii																		
S	85	34	-	-	-	-	-	-	-	-	34	-	-	-	2266			34
	91	78	-	-	-	-	-	8	-	-	86	-	-	-	5733			86
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	200	-	-	-	-	-	-	-	-	194	4	2	-	13333			200
	91	135	-	-	1	-	-	-	-	-	136	-	-	-	9066			136
	98	13	3	-	-	-	-	-	-	-	16	-	-	-	320			16
M	85	21	9	-	-	-	-	-	-	-	27	3	-	-	2000	33	14	30
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	8	-	-	-	-	-	-	-	10	-	-	-	200	24	24	10
D	85	4	3	-	-	-	-	-	-	-	3	1	3	-	466			7
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	05%	00%	02%	-43%
'91	00%	00%	00%	-94%
'98	42%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	15799	Dec:	3%
	'91	9066		0%
	'98	520		0%

Trend Study 22-4-98

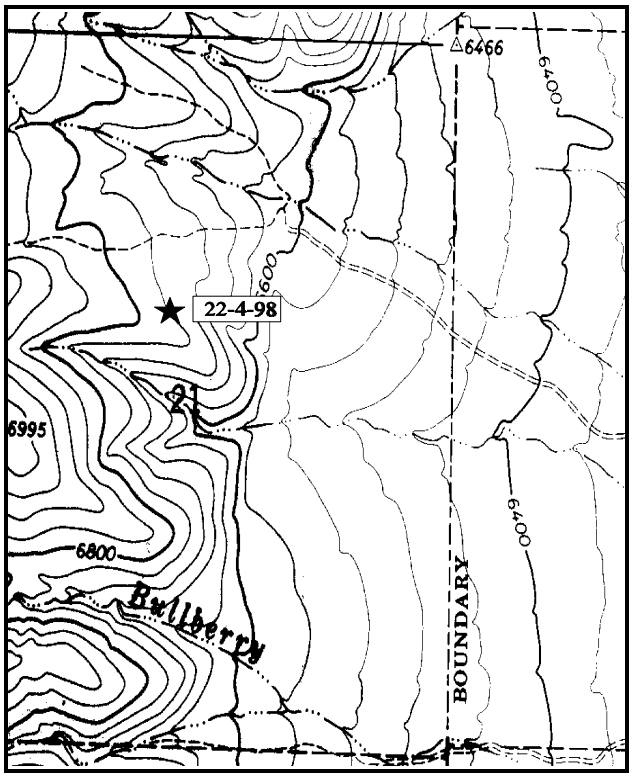
Study site name: Wades Canyon . Range type: Big Sagebrush-Grass .

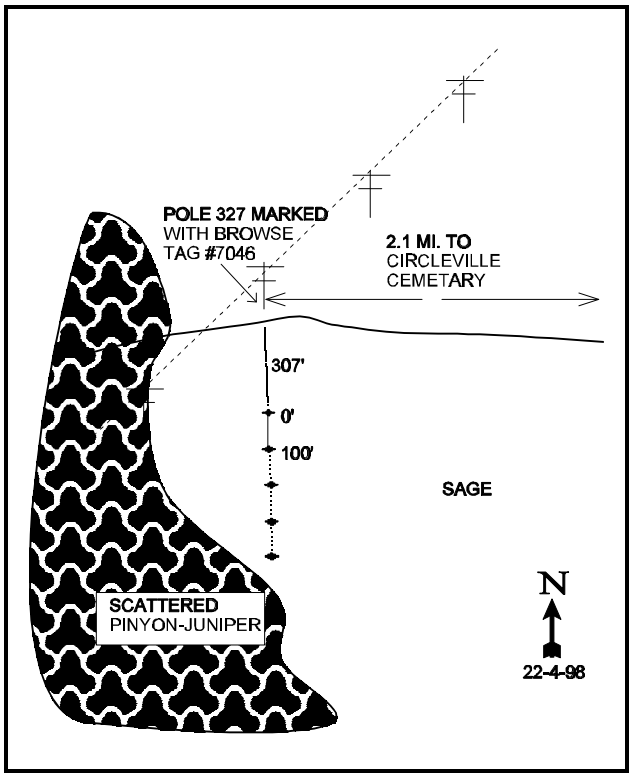
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 161 on US 89, north of Circleville, drive south 1/2 mile to a dirt road. Turn west and go 1.55 miles through the north end of Circleville to a jog in the road. Continue west past the jog 0.15 miles to the Circleville cemetery. Drive around the cemetery to the northeast corner. From the corner, a faint road takes off at a 45-degree angle to the northwest. Proceed up this road 2.1 miles to the point where it crosses under a high tension powerline. Stop here. The pole (# 327) nearest the road has a red browse tag #7046 attached under a yellow reflector. Walk 300 feet due south to the first frequency baseline stake. The 0-foot stake is a 2-1/2 foot tall rebar tagged #7045. There is an unmarked pellet group transect here also.





Map Name: Circleville, Utah

Diagrammatic Sketch

Township 30S , Range 4W , Section 21

UTM 4227352.251 N, 384705.478 E

DISCUSSION
Trend Study No. 22-4 (49-4)

The Wades Canyon trend study is located northwest of Circleville just inside the Forest Service boundary at an elevation of 6,600 feet. Slope is 10-12% with an east aspect. The vegetation type is sagebrush-grass, but pinyon-juniper are encroaching onto the site. The Wades Canyon pellet group transect, which is located near the trend site, show that deer use increased from 3 deer days use/acre in 1976-77 to 17 in 1980-81, with a 5-year mean of 12. It then increased to 31 in 1984-85, with a 5-year average between 1981 and 1985 of 24 deer days use/acre (Jense et al. 1985). Between 1986 and 1990, it continued to increase with an average 27 deer days use/acre. It appears that 1990 was the last time the pellet group transect was read. A pellet group transect read on the site in 1998 indicates 42 deer days use/acre and <1 cow days use/acre.

Soil textural analysis indicates a loam soil with a neutral pH (7.1). The average effective rooting depth (see methods) is 11 inches with an average temperature of 62°F measured at a depth of 12 inches. A dense hardpan is found at a depth of about 10-12 inches. Vegetative growth may be limited due to relatively low amounts of phosphorous (8.8 ppm) where 10 ppm is considered necessary for normal plant growth. The soil's water holding capacity is poor. Some soil movement is detectable, but the negligible slope reduces the potential for serious erosion problems.

Wyoming big sagebrush is the principal key species with a density of 2,920 plants/acre and providing 52% of the browse cover in 1998. The Wyoming big sagebrush population is currently in poor health. Although the intensity of utilization has decreased, percent decadence continues to increase and currently accounts for 61% of the population. The percentage of decadent plants classified as dying has also increased since 1991. It is now up to 67% in 1998. In 1991, most of the sagebrush was given a good vigor rating (conversely 31% were given a poor vigor rating) even though they displayed a clubbed appearance and few seed stalks were being produced. Because of the much larger sample size utilized in 1998, the estimated density for sagebrush was shown to decrease substantially. The number of dead plants in the population can explain about 40% of the decrease, the remainder would not be actual losses, but the larger sample giving improved accuracy for estimating clumped and/or discontinuous shrub populations. Also in 1985, it was reported that surrounding the Circleville dump, located between Circleville and the transect, there was an extensive area (1-2 square miles) where the sagebrush appeared very sick. Except for a healthy-looking row on either side of the road, these plants appeared to have lost most of their leaves and were just starting to grow new ones. This could have been due to a Rouga moth infestation.

Narrowleaf low rabbitbrush is the most abundant browse plant at 4,840 plants/acre in 1998, yet only provides 38% of the browse cover. However on average, these plants are half the size of the sagebrush and are generally less preferred by deer and livestock. Broom snakeweed density shows a slight increase in density to 1,680 plants/acre, which coincides with the poor health of the Wyoming sagebrush population. Prickly pear cactus is also present but in low abundance. Point-centered quarter data indicates 57 pinyon trees/acre and 47 Utah juniper trees/acre in 1998.

Indian ricegrass and bottlebrush squirreltail are the only perennial grasses on the site. Bottlebrush squirreltail nested frequency has significantly increased since 1991. Perennial grass sum of nested frequency has increased over all years from 201 in 1985, to 217 in 1991, and 334 in 1998. Only six forbs were found in 1991 and 1998. Prickly phlox and low fleabane are the most abundant forbs and comprise 96% of the forb cover. The herbaceous vegetation is more common under the browse canopy than in the openings, indicating heavy grazing pressure. Perennial forb sum of nested frequency has steadily decreased over all years from 367 in 1985, to 290 in 1991, and finally 247 in 1998.

1985 APPARENT TREND ASSESSMENT

The soil appears stable due largely to the gentle slope. Trend in the vegetative community is stable to slightly downward. The sagebrush is receiving increasingly heavy use from wintering deer, and reproduction and vigor may be declining. Pinyons appear to be encroaching into the sagebrush flats.

1991 TREND ASSESSMENT

Since 1985, percent bare ground cover has increased from 8% to 14%. Percent litter, rock, and vegetation cover have all decreased. This indicates a slight downward trend for soil. This could turn around with an end to this extended drought we are now in. The two key browse species are Wyoming big sagebrush and low rabbitbrush. They have both experienced increases in their respective densities, but percent decadency for sagebrush is high at 47%. The trend for browse is slightly downward. The herbaceous understory has for the most part declined since 1985, with only 3 of 12 species having shown any stability or increase.

TREND ASSESSMENT
soil - slightly downward
browse - slightly downward
herbaceous understory - slightly downward

1998 TREND ASSESSMENT

The soil trend is slightly upward with an increase in percent litter cover and a decrease in percent bare ground. Erosion potential is low due to the relative levelness of the site. The browse trend is downward with the health of the Wyoming big sagebrush population continuing to deteriorate. There is an increase in percent decadency and the percentage of plants classified as dying. Currently, there are 3 live plants for every 1 dead encountered. It appears that this will continue to increase in the future. The herbaceous understory trend is stable. Grass sum of nested frequency has increased while forb sum of nested frequency has decreased. Overall, herbaceous sum of nested frequency values are similar over all years.

TREND ASSESSMENT
soil - slightly upward
browse - downward
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 4

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Bromus tectorum (a)	-	-	1	-	-	1	.00
G	Oryzopsis hymenoides	138	133	150	63	62	63	5.26
G	Sitanion hystrix	a63	a84	b184	34	42	73	7.67
Total for Annual Grasses		0	0	1	0	0	1	0.00
Total for Perennial Grasses		201	217	334	97	104	136	12.94
Total for Grasses		201	217	335	97	104	137	12.94
F	Arabis spp.	-	4	-	-	2	-	-
F	Astragalus calycosus	b46	b62	a12	22	27	7	.08
F	Castilleja chromosa	b15	a-	a-	8	-	-	-
F	Chaenactis douglasii	b28	a9	a3	17	5	1	.00
F	Erigeron pumilus	b150	a95	ab118	65	42	54	1.21
F	Physaria chambersii	b36	a-	a3	17	-	2	.01

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Phlox hoodii	a72	b99	ab82	35	46	31	2.44
F	Physaria spp.	a-	b21	b29	-	12	13	.09
F	Thlaspi montanum	b19	a-	a-	11	-	-	-
F	Unknown forb-perennial	1	-	-	1	-	-	-
Total for Annual Forbs		0	0	0	0	0	0	0
Total for Perennial Forbs		367	290	247	176	134	108	3.84
Total for Forbs		367	290	247	176	134	108	3.84

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 4

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	76	11.38
B	Chrysothamnus viscidiflorus stenophyllus	73	8.23
B	Gutierrezia sarothrae	36	.79
B	Juniperus osteosperma	2	.78
B	Opuntia spp.	2	.03
B	Pinus edulis	2	.63
Total for Browse		191	21.85

CANOPY COVER --
Herd unit 22 , Study no: 4

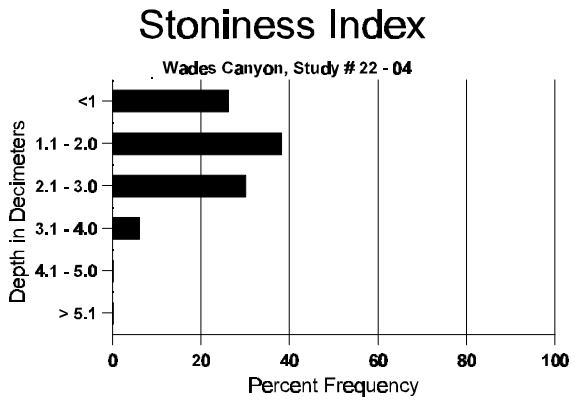
Species	Percent Cover '98
Pinus edulis	1

BASIC COVER --
Herd unit 22 , Study no: 4

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	310	6.25	5.25	34.92
Rock	271	21.25	17.75	17.62
Pavement	316	39.75	41.50	30.56
Litter	371	25.00	17.25	26.46
Cryptogams	82	.25	4.75	2.44
Bare Ground	224	7.50	13.50	6.94

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 04, Study Name: Wades Canyon

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.0	62.0 (12.2)	7.1	42.0	31.4	26.6	3.0	8.8	96.0	.7



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 4

Type	Quadrat Frequency '98
Rabbit	18
Deer	24

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	85	7	3	-	-	-	-	-	-	-	10	-	-	-	666			10
	91	4	4	3	-	-	-	-	-	-	11	-	-	-	733			11
	98	7	3	-	1	-	-	1	-	-	9	-	2	1	240			12
M	85	5	23	5	-	-	-	-	-	-	32	-	1	-	2200	20	24	33
	91	1	9	11	1	2	8	-	-	-	26	5	1	-	2133	17	22	32
	98	29	14	-	2	-	-	-	-	-	24	-	21	-	900	19	27	45
D	85	3	14	9	-	-	-	-	-	-	23	-	3	-	1733			26
	91	2	3	5	1	4	23	-	-	-	10	4	1	23	2533			38
	98	58	21	6	4	-	-	-	-	-	15	4	10	60	1780			89
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1000			50

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	58%	20%	06%	+15%
'91	27%	62%	31%	-46%
'98	26%	04%	64%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	4599	Dec:	38%
	'91	5399		47%
	'98	2920		61%

Chrysothamnus viscidiflorus stenophyllus																		
Y	85	15	3	-	-	-	-	-	-	-	18	-	-	-	1200			18
	91	5	1	-	-	-	-	-	-	-	6	-	-	-	400			6
	98	18	-	-	-	-	-	-	-	-	16	-	-	2	360			18
M	85	69	5	-	-	-	-	-	-	-	74	-	-	-	4933	10	10	74
	91	2	19	52	10	7	5	1	-	-	96	-	-	-	6400	8	9	96
	98	202	3	-	5	-	-	2	-	-	209	3	-	-	4240	12	16	212
D	85	11	5	-	-	-	-	-	-	-	16	-	-	-	1066			16
	91	-	1	16	2	-	3	-	-	-	16	-	-	6	1466			22
	98	9	-	-	3	-	-	-	-	-	10	-	-	2	240			12
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	12%	00%	00%	+13%
'91	23%	61%	05%	-41%
'98	01%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	7199	Dec:	15%
	'91	8266		18%
	'98	4840		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	16	-	-	1	-	-	-	-	-	17	-	-	-	340			17
M	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200	8	5	3
	91	4	-	1	-	-	-	-	-	-	5	-	-	-	333	7	6	5
	98	61	-	-	3	-	-	-	-	-	64	-	-	-	1280	8	9	64
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	-	-	1	2	60			3
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+40%
'91	00%	20%	00%	+80%
'98	00%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	200	Dec:		0%
'91	333			0%
'98	1680			4%

Juniperus osteosperma																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	40		-

Opuntia spp.																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	3	-	-	-	-	-	-	-	-	-	-	3	-	200	5	3	3
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133	5	9	2
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	5	11	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	75%	-50%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	266	Dec:	-
'91	133		-
'98	40		-

Pinus edulis

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	40		-

Trend Study 22-5-98

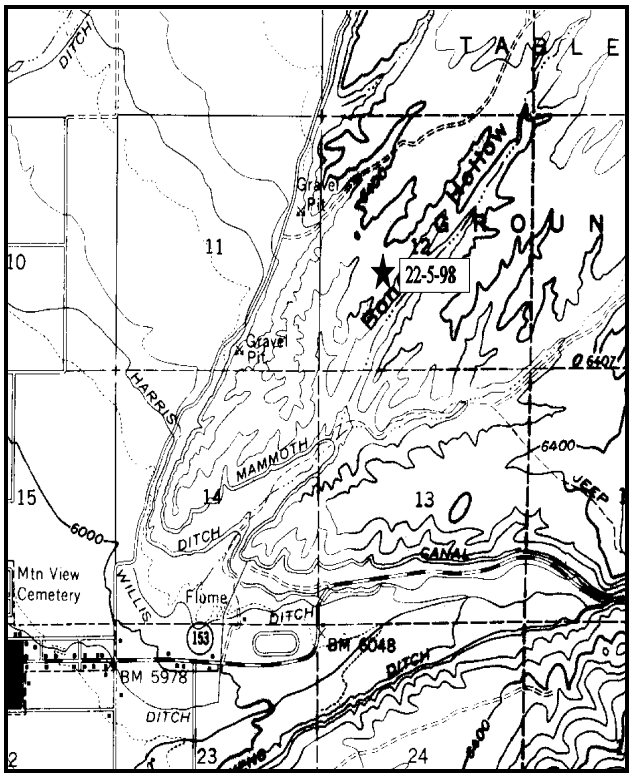
Study site name: Bone Hollow . Range type: Big Sagebrush-Grass .

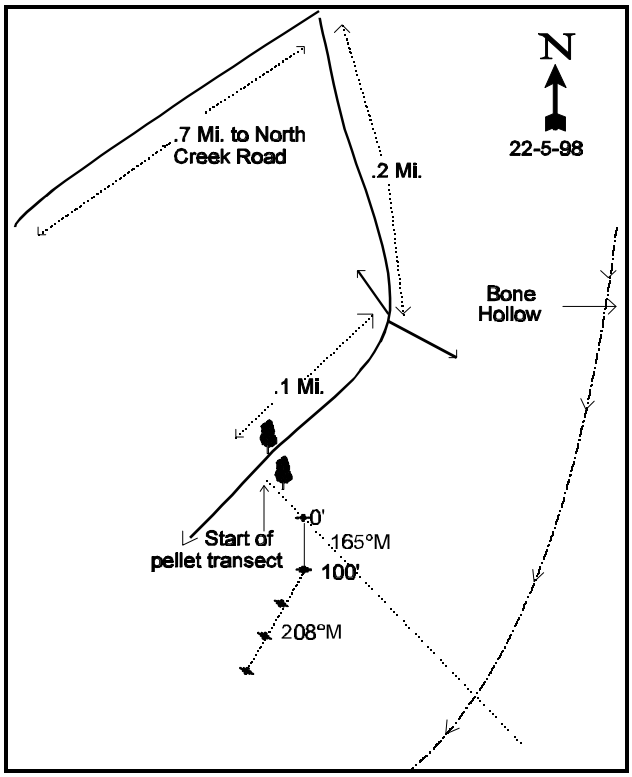
Compass bearing: frequency baseline 165 M degrees. Lines 2-4 208° M

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of the North Creek Road and SR153 on the east side of Beaver, go north 1.95 miles past an irrigation pond on the left to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw (ignore the numerous other small dirt roads). Drive up this road 0.75 miles to a fork. Turn right onto another major dirt road and go south 0.2 miles to another major right turn (there is also a left fork and a hard right). Go 0.1 miles west just past where the road goes closely between two junipers. Look for a fencepost 50 feet to the left. The fencepost marks the start of a pellet group transect. The pellet group transect is marked by short yellow rebar running southeast at 25-foot intervals. The frequency baseline starts between pellet stakes 3 and 4 and is marked by a 3-foot rebar tagged #7048.





Map Name: Beaver, Utah Diagrammatic Sketch

Township 29S , Range 7W , Section 12 UTM 4240484.709 N, 3604463463 E

DISCUSSION

Trend Study No. 22-5 (56A-1)

The Bone Hollow trend study samples an area of Wyoming big sagebrush and juniper administered by the BLM. The transect is located on a slight south facing slope at an elevation of 6,400 feet. This is typical of the untreated winter ranges on the benches above Beaver, which are historically important deer winter range. Deer use is moderate to heavy and varies somewhat from year to year depending on the winter weather. A pellet group transect read on the site in 1998 indicates 93 deer days use/acre.

The soil is moderately deep, fairly compacted, and very stony throughout. Average effective rooting depth (see methods) is estimated to be just over 12 inches with an average soil temperature of 49°F at almost 15 inches. Soil textural analysis indicates a sandy clay loam with a neutral pH (6.7). Plant development may be limited due to relatively low amounts of phosphorous (8.5 ppm). Past erosion is apparent with a high percentage of pavement (27%) and rock (6%) on the soil surface. Litter and herbaceous vegetation are found mostly under the sagebrush. The potential for continued erosion is high within the bare shrub interspaces.

A fairly dense and uniform stand of Wyoming big sagebrush, along with an open woodland of juniper and pinyon, gives this extensive area it's vegetative aspect. The Wyoming big sagebrush is the only desirable browse species present. The junipers provide good cover and many have been high-lined. Browsing pressure continues to be moderate to heavy on the sagebrush. Seed production appeared low in both 1991 and 1998. In 1985, the age structure indicated a relatively dynamic population with 22% of the plants classified as young and a biotic potential of 19% in 1985. In 1991, only 5% of the plants were young and the biotic potential was 0. Percent decadency increased from 30% in 1985 to 33% in 1991. Also, the percentage of plants classified as dying accounted for 57% of the decadent portion of the population. In 1998, the population still exhibits a downward trend with percent decadency again increasing to 35% of the population. Currently, utilization continues to be moderate to heavy with the plants generally in good vigor. With extended drought, this problem is intensified by the dominance of cheatgrass in the understory. At present, it almost makes up 80% of the herbaceous cover. Other browse species scattered throughout the site in low abundance include: broom snakeweed, narrowleaf low rabbitbrush, and prickly pear cactus. Point-centered quarter data collected in 1998 estimates 39 pinyon trees/acre and 149 Utah juniper trees/acre.

A variety of grass species are found on the site. The most abundant is cheatgrass which provides 79% of the herbaceous understory cover and 40% of the total vegetative cover. Cheatgrass was encountered in every quadrat in 1998, with a nested frequency value of 379 out of a possible 400. The most abundant perennial grasses are bottlebrush squirreltail and Indian ricegrass. Most of the grass species, whether abundant or not, are found under the protection of the sagebrush.

Forbs occur sporadically throughout the community. They are mostly small and contribute little forage in the spring. Current utilization is light. Perennial herbaceous understory sum of nested frequency has changed very little over all years.

1985 APPARENT TREND ASSESSMENT

The soil trend may be slightly downward with erosion occurring in the openings and slow soil building under browse plants. The vegetative composition and age structures indicate a stable Wyoming sagebrush/grass community with slow pinyon-juniper encroachment. Cool season herbaceous species are conspicuously absent as a result of constant heavy spring grazing in the past. A chaining could be used to restore the area to a more productive state, but the rockiness of the surface soil would limit the success of broadcast seeding unless the soil is sufficiently disturbed.

1991 TREND ASSESSMENT

The soil trend is still considered slightly downward. Vegetative basal cover is still low at 4%. Rock-pavement cover has decreased, with percent bare ground rising to 19% and percent litter cover decreasing to 40%. There is only one key browse species, Wyoming big sagebrush, which has a 4% increase in it's population density. The biotic potential has decreased and the young age class of plants has also decreased, but the percent of decadency is fairly stable and high. The percentage of plants classified as having poor vigor has more than doubled to 18%. The browse trend is slightly downward with the decline of the young age class and biotic potential. The trend for herbaceous understory is down as the sum of nested frequency is declining with the drought.

TREND ASSESSMENT
soil - slightly down
browse - slightly downward
herbaceous understory - down, poor condition

1998 TREND ASSESSMENT

The soil trend is stable. There does not appear to be accelerated erosion on the site at this time. Percent bare ground cover has declined since 1991, as well as combined percent rock and pavement cover. Percent litter cover has increased to 48% in 1998, although much of the litter is comprised of fine fuels contributed by cheatgrass. The browse trend is slightly downward. Percent decadency has increased since 1991. Although the percentage of dying plants has decreased, there are still many dying plants encountered and few seedling or young plants were encountered in 1998. The herbaceous understory trend is stable with little change in perennial herbaceous understory sum of nested frequency. Cheatgrass is dominate and could carry a catastrophic fire where all the browse would be lost.

TREND ASSESSMENT
soil - stable
browse - slightly downward
herbaceous understory - stable, but dominated by cheatgrass

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 5

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron spicatum	1	3	1	1	1	1	.03
G	Bouteloua gracilis	1	-	12	1	-	4	.12
G	Bromus tectorum (a)	-	-	379	-	-	100	20.28
G	Oryzopsis hymenoides	50	35	34	22	20	16	1.51
G	Poa secunda	[a]-	[b]11	[a]2	-	6	1	.00
G	Sitanion hystrix	122	99	103	55	45	43	2.21
G	Stipa comata	9	12	11	4	5	6	.64
Total for Annual Grasses		0	0	379	0	0	100	20.28
Total for Perennial Grasses		183	160	163	83	77	71	4.52
Total for Grasses		183	160	542	83	77	171	24.80

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Agoseris glauca	$_{a}$5	$_{a}$5	$_{b}$17	2	3	7	.11
F	Alyssum alyssoides (a)	-	-	9	-	-	3	.01
F	Antennaria rosea	-	3	4	-	1	2	.01
F	Arabis demissa	1	1	5	1	1	3	.04
F	Astragalus spp.	$_{a}$-	$_{ab}$4	$_{b}$17	-	2	6	.10
F	Chaenactis douglasii	$_{a}$7	$_{b}$20	$_{a}$5	3	10	3	.01
F	Cryptantha spp.	10	20	-	5	9	-	-
F	Descurainia pinnata (a)	-	-	3	-	-	1	.00
F	Erigeron pumilus	$_{b}$10	$_{a}$-	$_{a}$3	6	-	1	.00
F	Leucelene ericoides	-	7	5	-	3	2	.03
F	Machaeranthera canescens	$_{b}$11	$_{a}$2	$_{a}$-	6	2	-	-
F	Microsteris gracilis (a)	-	-	1	-	-	1	.00
F	Phlox austromontana	$_{ab}$17	$_{a}$9	$_{b}$27	8	5	13	.23
F	Ranunculus testiculatus (a)	-	-	33	-	-	12	.16
F	Sphaeralcea coccinea	5	14	16	4	6	7	.22
Total for Annual Forbs		0	0	46	0	0	17	0.18
Total for Perennial Forbs		66	85	99	35	42	44	0.79
Total for Forbs		66	85	145	35	42	61	0.97

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 5

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	-	.00
B	Artemisia tridentata wyomingensis	87	17.43
B	Chrysothamnus nauseosus	1	.03
	Chrysothamnus viscidiflorus stenophyllus	0	-
B	Gutierrezia sarothrae	4	.06
B	Juniperus osteosperma	11	4.32
B	Opuntia spp.	4	.03
B	Pinus edulis	2	2.65
B	Sclerocactus	1	-
Total for Browse		110	24.54

CANOPY COVER --
Herd unit 22 , Study no: 5

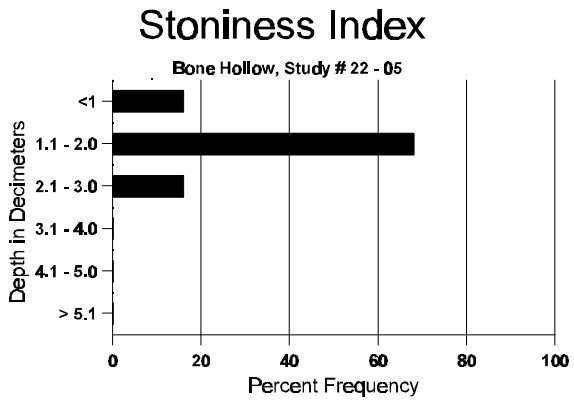
Species	Percent Cover '98
Juniperus osteosperma	9
Pinus edulis	2

BASIC COVER --
Herd unit 22 , Study no: 5

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	381	3.75	3.75	41.04
Rock	190	1.75	2.25	6.06
Pavement	315	42.75	35.25	27.36
Litter	397	43.00	39.75	48.47
Cryptogams	23	0	.50	.26
Bare Ground	253	8.75	18.50	14.31

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 05, Study Name: Bone Hollow

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.4	49.0 (14.9)	6.7	52.4	23.1	24.6	2.6	8.5	96.0	.7



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 5

Type	Quadrat Frequency '98
Rabbit	34
Deer	66
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	16	1	-	-	-	-	-	-	-	17	-	-	-	1133			17
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	85	12	6	1	-	-	-	-	-	-	18	-	1	-	1266			19
	91	4	1	-	-	-	-	-	-	-	5	-	-	-	333			5
	98	9	1	-	-	-	-	-	-	-	10	-	-	-	200			10
M	85	13	22	8	-	-	-	-	-	-	42	-	1	-	2866	15	15	43
	91	13	31	11	2	-	-	-	-	-	56	1	-	-	3800	13	24	57
	98	29	94	14	-	6	-	-	-	-	141	-	-	-	2860	17	27	143
D	85	10	11	5	-	-	-	-	-	-	21	-	5	-	1733			26
	91	13	9	2	5	-	-	1	-	-	12	1	-	17	2000			30
	98	17	34	27	1	2	-	-	-	-	62	1	5	13	1620			81
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	2	-	-	-	-	-	-	-	2	-	-	-	680			34

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	44%	16%	08%	+ 4%
'91	45%	14%	18%	-24%
'98	59%	18%	08%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	5865	Dec:	30%
	'91	6133		33%
	'98	4680		35%

Chrysothamnus nauseosus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Chrysothamnus viscidiflorus stenophyllus																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	100%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	66		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	7	9	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	-25%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	133		-
	'98	100		-

Juniperus osteosperma																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	8	-	-	1	-	-	-	-	-	9	-	-	-	180			9
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	6	-	-	2	-	-	-	-	-	8	-	-	-	160			8
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	1	-	-	-	2	-	4	-	-	-	80	-	-	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	+73%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	240		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	2	-	-	1	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	4	-	-	-	-	-	-	-	-	4	-	-	-	266	5	6	4
	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80	5	10	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+86%
'91	00%	00%	00%	-83%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	466		-
	'98	80		-

Pinus edulis

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	40		-

Sclerocactus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	2	4	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Trend Study 22-6-98

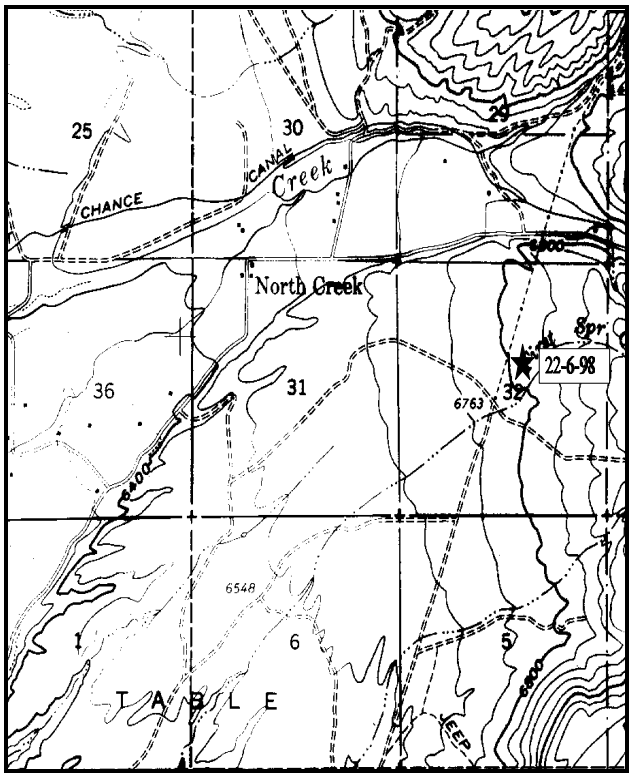
Study site name: Beaver Table . Range type: Cabled, Reseeded P-J .

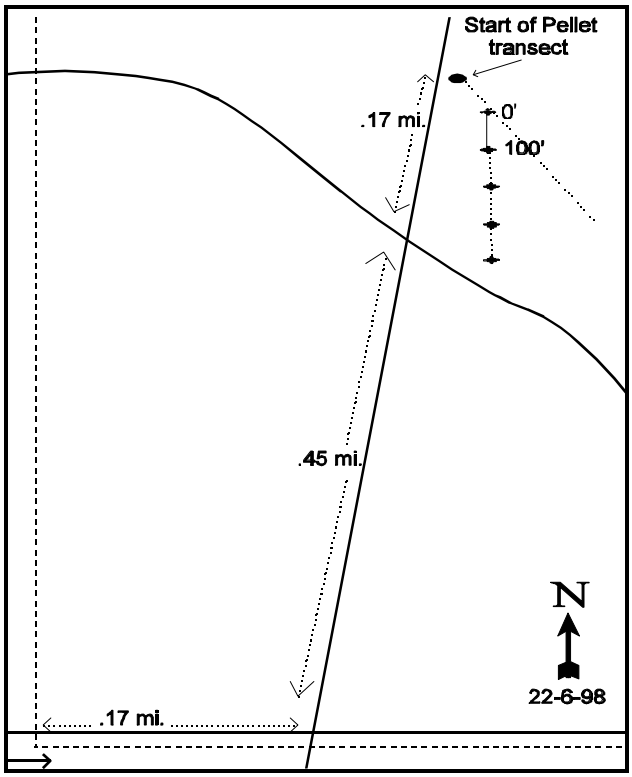
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the corner of North Creek Road and SR153 in Beaver, go north 1.95 miles to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw. Drive up this road 0.75 miles to a fork, go straight (right fork goes to Bone Hollow transect). Continue 0.8 miles to a fork, turn right through the fence. Go 0.5 miles to another fork, go straight heading north then east 0.5 miles to a fence. Continue east past the fence 0.25 miles to another fence line with a fork just beyond it. Go straight (east) another 0.25 miles to a junction with a road going north-south, turn left (north). Go 0.45 miles to a junction with a road going east-west. Continue north 0.15 miles to a fencepost 15 feet off the road to the right. This fencepost marks the start of a pellet group transect which runs 158 degrees from the post with a short yellow stake every 25 feet. Count down 3 short stakes to locate the 0-foot baseline stake, a 3-foot rebar tagged #7049.





Map Name: Beaver, Utah

Diagrammatic Sketch

Township 28S , Range 6W , Section 32

UTM 4243683.833 N, 364221.951 E

DISCUSSION

Trend Study No. 22-6 (56A-2)

The Beaver Table trend study is located on a bench at the foot of the Tushar Mountains northeast of Beaver. The Beaver bench area is recognized as critical range to wintering deer, especially since completion of I-15 has restricted movement to the extensive winter ranges west of I-15. The study is in the center of a Division of Wildlife Resources owned section, which was cabled and seeded in 1957. The general terrain is a long gentle slope (3-5%) with a western aspect and an elevation of 6,800 feet. The vegetative community is dominated by Wyoming big sagebrush and scattered bitterbrush and juniper.

No cattle grazing is authorized in the area. With an average of 40 deer days use/acre between 1981 and 1985, the pellet group transect on the site recorded the second highest 5-year average for annual use on this herd unit at the time (Jense et al. 1985). Since then, through the winter of 1990-91, the average was even higher at 56 deer days use/acre (Jense et al. 1991). Between 1993 and 1997, deer days use/acre averaged 18 (Evans et al. 1997). A pellet group transect read on the site in 1998 indicates 47 deer days use/acre.

The soil is alluvially deposited with an average effective rooting depth (see methods) of 17 inches. Soil textural analysis indicates a clay soil with a neutral pH (6.6). There is a lime cemented hardpan approximately two feet below the surface, which could limit rooting depth. A number of large rocks from basaltic parent material are found throughout the soil profile. There is also a concentration of rocks and pavement on and near the soil surface. Good litter and vegetative cover and the gentle slope moderates the hazard of severe soil erosion, which occurs only to a small degree on the site. Some overland water movement is apparent near the end of the transect.

The dominant species is Wyoming big sagebrush. This population is currently a mixture of mature (51%) and decadent (48%) plants. Percent decadency is similar to that reported in 1991, but the percentage of decadent plants classified as dying has increased to 25%. Intensity of utilization is consistent over all years with most plants showing light to moderate use. With an exception in 1985 for young plants, seedling and young plants have rarely been encountered. Plants displaying poor vigor has remained relatively consistent and is currently at 13% of the population. The relatively large decrease in sagebrush density from 1991 and 1998 can be partially explained by number of dead plants in the population, however the majority of the change is because of a much larger sample size giving more accurate estimates for browse populations with clumped and/or discontinuous distributions. Antelope bitterbrush, an important species, provides only 4% cover on the site. It is a highly preferred species by deer and has been moderately to heavily hedged in the past. Currently, hedging is moderate and the plants average 27 inches in height. Past intense grazing does not seem to have adversely effected the plants vigor, as they are spreading out over the ground and also producing good numbers of young.

Young Utah junipers are scattered over the area and show signs of reinvasion in the upper end of the treated section. Point-centered quarter data from 1998 estimate 107 Utah juniper trees/acre. Broom snakeweed, an undesirable browse species, shows high fluctuations in density between all years. Current density is estimated to be 7,640 plants/acre with 69% of the population classified as mature and 31% as young. This high fluctuation in density is typical for areas that have experienced the extended drought followed by years with normal precipitation patterns.

The dominate grass is cheatgrass which accounts for 56% of the herbaceous understory cover and 27% of the total vegetative cover. Cheatgrass was found in 99 out of 100 quadrats and had a nested frequency of 345 out of a possible 400. Bottlebrush squirreltail, Indian ricegrass, muttongrass, and bluebunch wheatgrass occur rather sporadically, but enough to provide some forage. Indian ricegrass and bluebunch wheatgrass have significantly increased in nested frequency, while bottlebrush squirreltail has significantly decreased in nested frequency since 1991. The grasses are vigorous and currently not utilized. Perennial herbaceous understory sum of nested frequency has declined slightly over all years from 238 in 1985 to 199 in 1998.

A variety of herbaceous vegetation besides the grasses is present. Seventeen species of forbs were encountered, a few of which are large enough and common enough to be a valuable forage source. These include lobeleaf groundsel, longleaf phlox, and sulfur eriogonum. No seeded species were found.

1985 APPARENT TREND ASSESSMENT

An increase in the frequency of herbaceous vegetation and litter cover indicates an improving soil condition and the slowing of soil erosion and adding organic matter. With the apparent increase in grasses and forbs, vegetative trend is also upward for the time being. However, snakeweed and juniper appear to be slowly increasing in this area. Since deer use appears to be increasing, the added pressure on the more palatable species may favor these invaders and accelerate their invasion into the community. Chaining and seeding projects similar to this one could be done in adjacent areas and alleviate some of the browsing pressure to maintain the range in good condition for a longer period.

1991 TREND ASSESSMENT

Soil trend is slightly down because vegetative basal cover is down, as well as litter, with percent bare ground increasing to 32%. Browse trend is slightly downward. Wyoming big sagebrush density is increasing, but percent decadency has also increased. Broom snakeweed decreased by 84%. Antelope bitterbrush density has also increased by 32% with a good percent of young plants present. The sum of nested frequency values indicates a stable herbaceous understory trend.

TREND ASSESSMENT
soil - slightly downward
browse - slightly downward with an increase in percent decadency for Wyoming big sagebrush
herbaceous understory - stable

1998 TREND ASSESSMENT

The soil trend is slightly upward. Percent bare ground cover has declined while percent litter cover has increased. Some erosion is apparent near the end of the transect, but this is not accelerated and more of the soil is becoming protected from erosion. Much of the litter is fine fuels, provided chiefly from the cheatgrass, and could carry a fire throughout the site. The browse trend is downward. Wyoming big sagebrush percent decadency is still high with 48% of the population classified as decadent. A disturbing element of the Wyoming big sagebrush population is the increase in the percentage of decadent plants classified as dying. If this trend continues much of the population could be lost. The herbaceous understory is slightly downward. Perennial grass, the important component of the herbaceous understory on this site, shows a consistent decline in sum of nested frequency over all years.

TREND ASSESSMENT
soil - slightly upward
browse - slightly downward
herbaceous understory - slightly downward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 6

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	-	-	1	-	-	1	.00
G	Agropyron spicatum	a-	a-	b14	-	-	8	.44
G	Bromus japonicus (a)	-	-	4	-	-	1	.03
G	Bromus tectorum (a)	-	-	345	-	-	99	11.17
G	Oryzopsis hymenoides	a35	a24	b50	14	12	26	2.58
G	Poa fendleriana	20	17	19	8	10	8	.71
G	Poa pratensis	-	-	1	-	-	1	.03
G	Sitanion hystrix	b182	b180	a114	71	77	53	3.65
G	Stipa lettermani	1	3	-	1	1	-	-
Total for Annual Grasses		0	0	349	0	0	100	11.20
Total for Perennial Grasses		238	224	199	94	100	97	7.42
Total for Grasses		238	224	548	94	100	197	18.62
F	Agoseris glauca	-	-	7	-	-	3	.01
F	Alyssum alyssoides (a)	-	-	5	-	-	2	.01
F	Antennaria rosea	a-	a-	b6	-	-	4	.04
F	Arabis demissa	ab15	b27	a6	8	16	2	.01
F	Astragalus convallarius	ab3	a-	b8	1	-	5	.15
F	Astragalus spp.	-	-	4	-	-	2	.03
F	Castilleja chromosa	-	6	-	-	3	-	-
F	Calochortus nuttallii	2	-	-	1	-	-	-
F	Castilleja spp.	-	-	-	-	-	-	.00
F	Chaenactis douglasii	b35	b33	a6	17	19	2	.04
F	Cymopterus spp.	4	-	-	2	-	-	-
F	Epilobium paniculatum (a)	-	-	31	-	-	13	.09
F	Eriogonum umbellatum	3	2	6	2	1	3	.06
F	Lactuca serriola	-	-	2	-	-	1	.00
F	Lotus utahensis	-	-	1	-	-	1	.00
F	Machaeranthera canescens	ab3	a-	b10	1	-	5	.17
F	Penstemon spp.	-	-	1	-	-	1	.03
F	Phlox longifolia	a17	b42	ab41	6	22	16	.15
F	Polygonum douglasii (a)	-	-	9	-	-	4	.02
F	Senecio multilobatus	b24	a7	ab12	12	5	8	.07
F	Sphaeralcea coccinea	29	24	22	11	9	10	.30
Total for Annual Forbs		0	0	45	0	0	19	0.12
Total for Perennial Forbs		135	141	132	61	75	63	1.10
Total for Forbs		135	141	177	61	75	82	1.22

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 6

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	90	13.81
B	Gutierrezia sarothrae	61	4.11
B	Juniperus osteosperma	3	.78
B	Opuntia spp.	0	-
B	Pinus edulis	1	-
B	Purshia tridentata	30	3.14
B	Ribes cereum cereum	1	-
Total for Browse		186	21.86

CANOPY COVER --
Herd unit 22 , Study no: 6

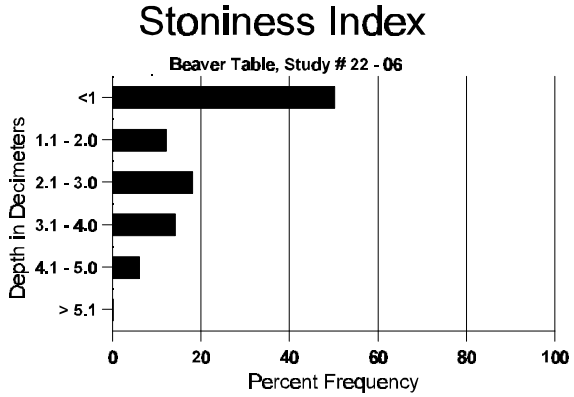
Species	Percent Cover '98
Juniperus osteosperma	.60

BASIC COVER --
Herd unit 22 , Study no: 6

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	360	6.50	5.25	41.77
Rock	209	14.50	10.25	9.70
Pavement	247	11.50	12.25	11.98
Litter	391	40.75	39.25	47.04
Cryptogams	9	.25	.75	.02
Bare Ground	253	26.50	32.25	18.15

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 06, Study Name: Beaver Table

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.1	62.4 (16.5)	6.6	36.7	22.7	40.6	2.2	10.6	73.6	.6



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 6

Type	Quadrat Frequency '98
Rabbit	39
Deer	43

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	3	1	-	-	-	-	-	-	-	4	-	-	-	266			4
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	22	9	1	-	-	-	-	-	-	23	4	5	-	2133			32
	91	-	3	-	3	-	-	-	-	-	6	-	-	-	400			6
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	85	31	29	-	-	-	-	-	-	-	57	-	3	-	4000	15	20	60
	91	24	18	10	2	6	3	1	-	-	55	5	2	2	4266	17	26	64
	98	59	66	8	1	3	-	-	-	-	136	1	-	-	2740	19	26	137
D	85	9	23	1	-	-	-	-	-	-	25	2	5	1	2200			33
	91	30	17	11	9	6	4	3	-	-	57	3	10	10	5333			80
	98	68	47	13	-	1	-	-	-	-	94	1	2	32	2580			129
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	1380			69

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	49%	02%	11%	+17%
'91	33%	19%	16%	-46%
'98	43%	08%	13%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	8333	Dec:	26%
	'91	9999		53%
	'98	5420		48%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	85	35	-	-	-	-	-	-	-	-	34	1	-	-	2333			35
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	18	-	-	-	-	-	-	-	-	18	-	-	-	360			18
Y	85	42	-	-	-	-	-	-	-	-	42	-	-	-	2800			42
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	119	-	-	1	-	-	-	-	-	120	-	-	-	2400			120
M	85	67	-	-	-	-	-	-	-	-	67	-	-	-	4466	9	8	67
	91	8	-	-	2	-	-	1	-	-	11	-	-	-	733	9	6	11
	98	259	-	-	3	-	-	-	-	-	262	-	-	-	5240	13	11	262
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	4	-	-	1	-	-	-	-	-	4	-	-	1	333			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-84%
'91	00%	00%	06%	+85%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	7266	Dec:		0%
'91	1132			29%
'98	7640			0%

Juniperus osteosperma																		
S	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133	69	45	2
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133	78	68	2
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	199	Dec:	-
'91	199		-
'98	60		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	3	1	1	-	-	-	-	-	-	4	-	1	-	333			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133	5	12	2
	91	1	-	-	-	-	-	-	-	-	-	-	1	-	66	4	6	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	19	0
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	1	-	-	-	-	-	1	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+71%
'91	14%	14%	43%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	133	Dec:		0%
'91	465			14%
'98	0			0%

Pinus edulis																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	1	-	-	2	-	-	-	40			2
Y	85	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	2	7	2	-	1	-	1	-	-	13	-	-	-	866			13
	98	12	-	-	3	-	-	-	-	-	15	-	-	-	300			15
M	85	-	3	8	-	-	-	-	-	-	11	-	-	-	733	22	11	11
	91	-	-	1	-	-	1	-	-	-	2	-	-	-	133	33	53	2
	98	3	14	7	-	-	-	-	-	-	24	-	-	-	480	27	46	24
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	1	1	-	2	-	-	-	-	2	-	2	-	266			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	38%	62%	00%	+32%
'91	58%	26%	11%	-38%
'98	36%	18%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	866	Dec:		0%
'91	1265			21%
'98	780			0%

Ribes cereum cereum																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	12	16	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	100		-

Trend Study 22-7-98

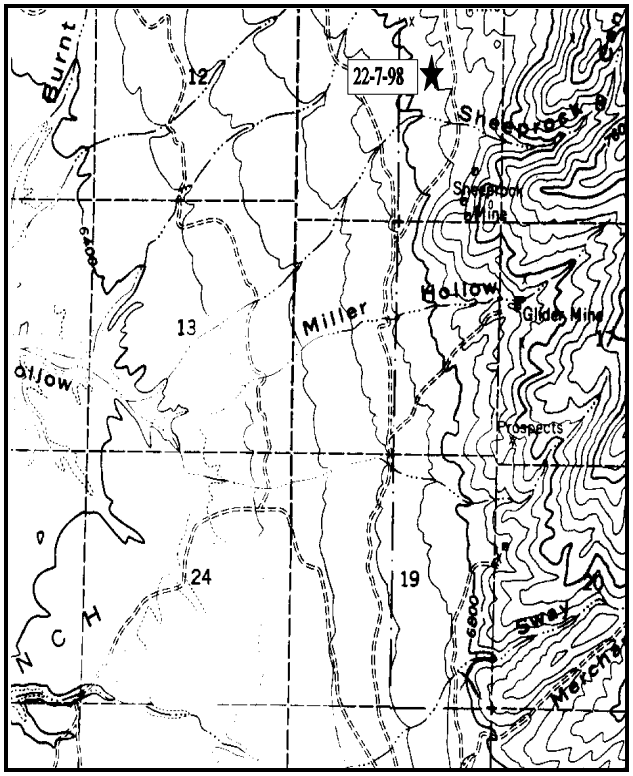
Study site name: Sheep Rock . Range type: Chained, Cabled, Seeded P-J .

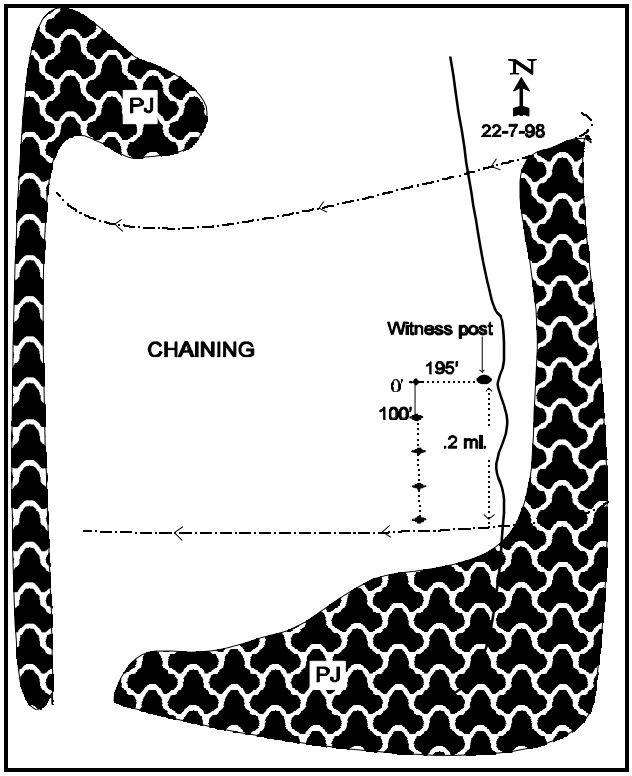
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the junction of SR153 and North Creek Road east of Beaver, proceed north on the North Creek Road 5.0 miles to a fork. Keep to the right on the pavement and continue 0.5 miles to another fork. Turn left and drive 0.55 miles, crossing a bridge, to a fork in the road with a sheeprock sign. Turn left and after 100 yards take a sharp bend to the left to stay on the good road. Drive about 200 yards and keep to the right at another fork. Continue 0.175 miles and again keep right at a fork. Go 1.625 miles to a cattle guard and 0.15 miles beyond it to a fork. Turn to the left instead of crossing a cattle guard into a chained area. Drive 0.9 miles further to cross a cattleguard and enter the chained area. Go 0.35 miles to a fork, stay left. After 0.25 miles you will again enter directly into the chained area. Continue 0.2 miles into the chaining to a witness post on the left side of the road. The frequency baseline starts 195 feet west of the witness post. The 0-foot baseline stake is a short rebar with a browse tag #7058 attached.





Map Name: Beaver, Utah Diagrammatic Sketch

Township 28S , Range 6W , Section 7 UTM 4249989.529 N, 362980.603 E

DISCUSSION

Trend Study No. 22-7 (56A-3)

The Sheep Rock trend study is located near the mouth of Sheep Rock Canyon on the gentle (5-10%) west sloping foothills of the Tushar Mountains. Elevation is 6,800 feet. The study samples a Forest Service chaining and seeding project completed in the fall of 1981. The Forest Service two-way chaining effectively removed the pinyon-juniper overstory and the site is currently dominated by seeded perennial grasses. Fire has also apparently been an influence as the site burned after the chaining. The fire consumed many of the downed pinyon-juniper snags and continued up the mountain into the untreated woodland. The lack of adequate browse species is the most notable effect of the past wildfire. One-quarter mile to the west is the BLM boundary and a 25-year old chaining.

In some winters, deer spend much of the season at lower elevations. Judging from data collected at the Sheep Rock deer pellet group transect, use is generally low. With its abundance of valuable early season grasses, the area makes an excellent early spring range for mule deer and winter range for elk. There was an increase in use in the winter of 1984-85 (Jense et al. 1985). Since then, the deer days use/acre has risen to 11 (Jense et al. 1991). It appears that the pellet group transect has not been read since that time. A pellet group transect read on the site in 1998 indicates 12 deer days use/acre and 52 cow days use/acre.

Soil textural analysis indicates a sandy loam with a slightly acidic pH (6.5). The average effective rooting depth (see methods) is just over 11 inches with an average soil temperature of 47°F at a depth of 15 inches. The grasses provide a high percentage of ground cover (85%) with all the seeded species considered valuable for watershed protection. There was only a small amount of bare soil (9%) in 1985, which has increased to 26% in 1991, and has now dropped to 7% in 1998. There is no evidence of conspicuous soil erosion.

Large shrubs are currently lacking on the site. Few young or seedling plants of big sagebrush, antelope bitterbrush, true mountain mahogany, and Gambel oak are found in the area. Some pinyon and Utah juniper trees are present, but they are quite scattered. Point-centered quarter data from 1998 estimate 15 pinyon and 47 Utah juniper trees/acre.

By far the most abundant and productive class of vegetation is the grasses which provides 85% of the vegetation cover. Cheatgrass is one of the abundant species, but there are many other seeded grasses present which will help keep cheatgrass in check. The most abundant perennial species are smooth brome, crested wheatgrass, and intermediate wheatgrass. Smooth brome sum of nested frequency has shown a significant increase in value every year since 1985. Perennial grass sum of nested frequency has continued to increased from 411 in 1985, to 542 in 1991, and is currently 613.

In 1985, the only forbs identified were two seeded species, alfalfa and small burnet. At that time it was felt that the abundance of the highly preferred alfalfa will be an important indicator of range trend in the future. Alfalfa has not been encountered on the site since 1985. This is probably an illustration of the effects of an extended drought coupled with excessive selective grazing. Many annual forbs are present on the site and they include: pale alyssum, little flower collinsia, annual stickseed, and little polecat. American vetch is by far the most abundant forb and is of moderate to high palatability for wildlife and livestock.

1985 APPARENT TREND ASSESSMENT

The chaining and seeding was successful and trend is upward for herbaceous species. The soil is stable and protected by a variety of grasses. The grasses appear to be increasing in density, but not so much as to compete with the upcoming browse component. Several species of valuable deer browse are present and as they increase, the area will be even better for deer, although it is now excellent elk range.

1991 TREND ASSESSMENT

The trend for soil is down since vegetative basal cover has decreased to only 3% from a high of 11%. Percent bare ground has increased from 9% to 26%. The large increase in percent bare ground and decreases in vegetational basal cover, pavement, and rock would indicate possible movement of soils across the soil surface. The browse trend is basically non-existent because of the chaining-seeding and wildfire going through the area after treatment. The grasses of the herbaceous understory have a higher nested frequency value, but forbs are very scarce. Even with a slight decrease for forbs, they are still so scarce they are of little use on this site. Trend for herbaceous understory is up.

TREND ASSESSMENT
soil - down
browse - none available since the treatment and fire
herbaceous understory - up for grasses, few forbs on site

1998 TREND ASSESSMENT

The soil trend is upward. There is abundant vegetation and litter cover to protect from erosion at this time. Additionally, percent bare ground has decreased from 26% in 1991 to 7% in 1998. The browse trend is basically non-existent because of the chaining-seeding and wildfire going through the area after treatment. Photographs show that the pinyon and Utah juniper trees are increasing in size over time. The herbaceous understory trend is upward. Perennial herbaceous understory sum of nested frequency has increased from 546 in 1991 to 749 in 1998. Although cheatgrass is present on the site, it will remain under control with the very competitive perennial species on the site.

TREND ASSESSMENT
soil - upward
browse - none available since the treatment and fire
herbaceous understory - upward with an increase in perennial herbaceous understory sum of nested frequency

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 7

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	a89	b136	b170	44	59	63	8.96
G	Agropyron intermedium	b173	b240	a174	78	98	53	9.92
G	Agropyron spicatum	-	-	2	-	-	1	.03
G	Bromus inermis	a95	b135	c219	41	54	75	9.84
G	Bromus tectorum (a)	-	-	298	-	-	87	11.51
G	Elymus junceus	b29	ab11	a4	14	6	3	.33
G	Poa secunda	a3	a2	b40	1	2	14	.91
G	Sitanion hystrix	b22	b18	a4	12	12	2	.01
Total for Annual Grasses		0	0	298	0	0	87	11.51
Total for Perennial Grasses		411	542	613	190	231	211	30.01
Total for Grasses		411	542	911	190	231	298	41.53

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Agoseris glauca	-	-	4	-	-	2	.01
F	Alyssum alyssoides (a)	-	-	63	-	-	22	.16
F	Arabis spp.	-	3	5	-	2	2	.01
F	Astragalus convallarius	-	-	1	-	-	1	.03
F	Astragalus spp.	-	-	2	-	-	1	.00
F	Camelina microcarpa (a)	-	-	17	-	-	7	.03
F	Calochortus nuttallii	-	-	2	-	-	1	.00
F	Chaenactis douglasii	-	-	1	-	-	1	.00
F	Collinsia parviflora (a)	-	-	56	-	-	23	.11
F	Crepis acuminata	-	-	1	-	-	1	.03
F	Cymopterus spp.	-	-	1	-	-	1	.00
F	Draba spp. (a)	-	-	12	-	-	4	.02
F	Eriogonum racemosum	-	-	3	-	-	1	.03
F	Holosteum umbellatum (a)	-	-	3	-	-	2	.01
F	Lappula occidentalis (a)	-	-	32	-	-	15	.10
F	Leucelene ericoides	-	-	5	-	-	2	.15
F	Medicago sativa (ladak)	$_{b}$35	$_{a}$-	$_{a}$-	15	-	-	-
F	Microsteris gracilis (a)	-	-	20	-	-	7	.16
F	Orobanche fasciculata	-	-	2	-	-	1	.00
F	Phacelia spp.	-	1	-	-	1	-	-
F	Phlox longifolia	-	-	2	-	-	2	.01
F	Polygonum douglasii (a)	-	-	5	-	-	2	.01
F	Ranunculus testiculatus (a)	-	-	5	-	-	3	.06
F	Sanguisorba minor	1	-	-	1	-	-	-
F	Tragopogon dubius	-	-	2	-	-	1	.00
F	Unknown forb-perennial	$_{b}$20	$_{a}$-	$_{a}$-	8	-	-	-
F	Vicia americana	$_{a}$-	$_{a}$-	$_{b}$105	-	-	43	2.28
Total for Annual Forbs		0	0	213	0	0	85	0.67
Total for Perennial Forbs		56	4	136	24	3	60	2.59
Total for Forbs		56	4	349	24	3	145	3.26

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 7

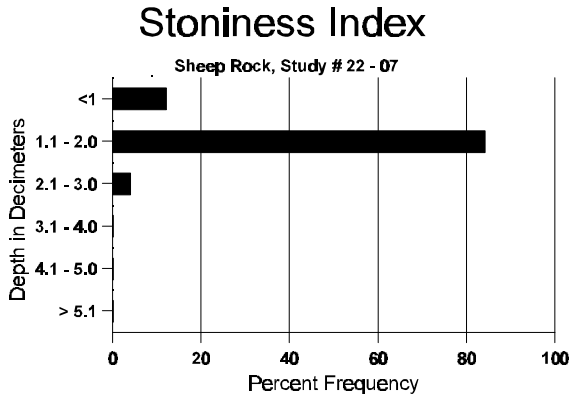
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	0	-
B	Artemisia tridentata vaseyana	1	.63
B	Cercocarpus montanus	0	-
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	2	1.79
B	Pinus edulis	0	-
B	Purshia tridentata	0	-
B	Quercus gambelii	4	1.79
Total for Browse		7	4.21

BASIC COVER --
Herd unit 22 , Study no: 7

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	384	10.50	3.00	48.07
Rock	86	1.50	2.50	3.09
Pavement	285	28.75	16.25	21.02
Litter	396	50.25	52.25	50.47
Cryptogams	10	0	0	.05
Bare Ground	196	9.00	26.00	7.12

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 07, Study Name: Sheep Rock

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.2	47.0 (15.1)	6.5	54.0	28.4	17.6	3.0	10.0	172.8	.9



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 7

Type	Quadrat Frequency '98
Rabbit	6
Elk	1
Deer	4
Cattle	28

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	19	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'85	0		-
'91	0		-
'98	0		-

Artemisia tridentata vaseyana																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	27	38	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'85	0		-
'91	0		-
'98	20		-

Cercocarpus montanus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	27	30	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'85	0		-
'91	0		-
'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	66	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	0			-

Chrysothamnus viscidiflorus																		
Y	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	11	-	-	-	-	-	-	-	-	11	-	-	-	733	13	11	11
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	866	Dec:		-
'91	0			-
'98	0			-

Gutierrezia sarothrae																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	4	-	-	-	-	-	-	-	-	4	-	-	-	266	10	11	4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	12	12	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	266			-
'98	0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66	38	36	1
	98	1	-	-	-	-	-	1	-	-	2	-	-	-	40	-	-	2
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	40		-

Pinus edulis																		
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	0		-

Purshia tridentata																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	100%	100%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	0%
	'91	66		100%
	'98	0		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
Y	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	2	-	-	3	-	-	-	-	-	5	-	-	-	100			5
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260	44	30	13
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	100%	00%	00%	+65%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	133	Dec:		0%
'91	133			0%
'98	380			5%

Trend Study 22-8-98

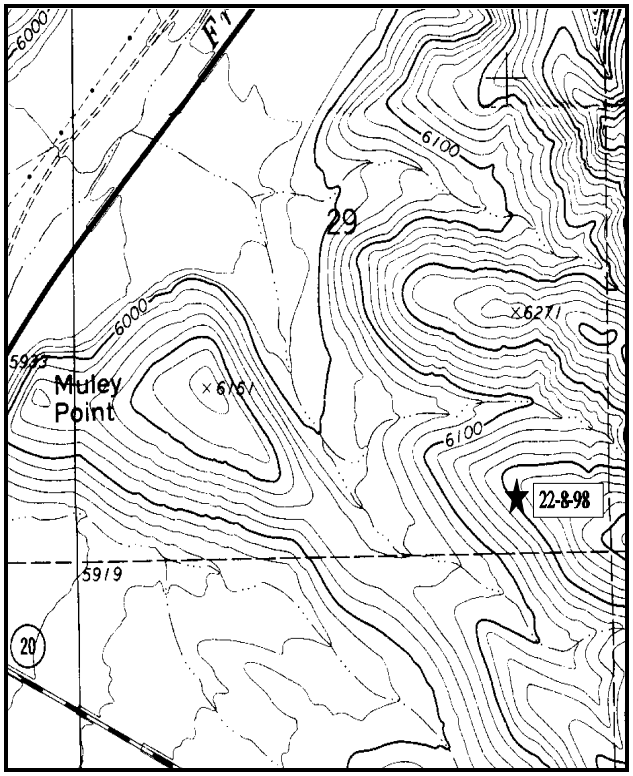
Study site name: Muley Point . Range type: Big Sagebrush .

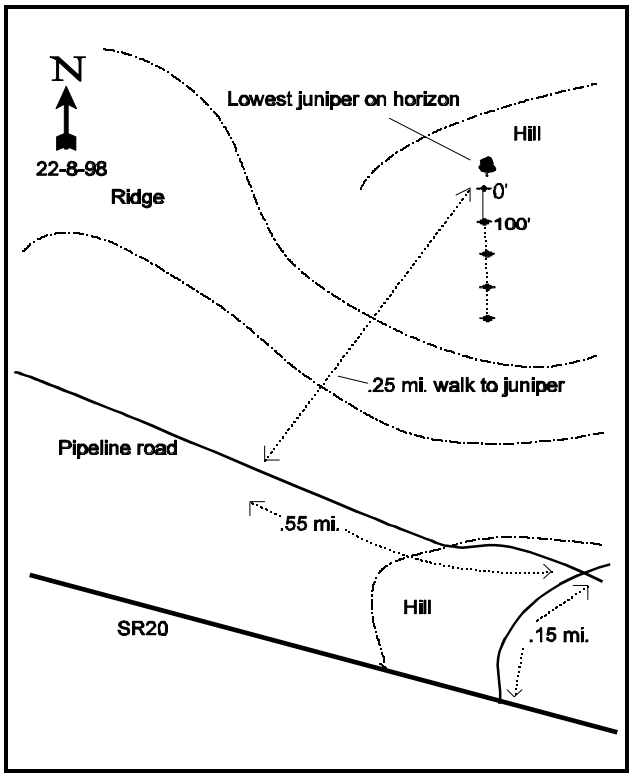
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From exit #95 on I-15 (junction with SR20) go to the east side of the freeway, then go 1.2 miles east from the cattleguard on SR20 to a small wooden H in the fence on the left. Go north, through the gate for 0.15 miles to a 4-way intersection. Turn left on the pipeline road and go 0.55 miles then stop. On the ridge to the north locate the lowest JUOS on the skyline. Walk to the juniper, about 1/4 mile. The base line starts 10 feet south of the JUOS. The 0-foot stake consists of a 3-foot rebar with browse tag #7051 attached.





Map Name: Buckhorn Flat, Utah Diagrammatic Sketch

Township 31S , Range 7W , Section 29 UTM 4215187.646 N, 353663.949 E

DISCUSSION

Trend Study No. 22-8 (56B-1)

The Muley Point trend study is located on a ridge overlooking an expansive sagebrush valley. The study is on BLM administered land at an elevation of 6,200 feet. On the site, and for many miles around, the vegetation is dominated by dense, low growing Wyoming big sagebrush. The site has a moderately steep slope of 25% with a south-southwest aspect. This area lies below the Hurricane Cliffs and is critical deer winter range. The winter range on the adjacent management unit 28 is increasingly threatened by the elimination of sagebrush and conversion to agricultural fields where deer are excluded. This in effect, concentrates deer use on the remainder of the public land on unit 22. Pinyon-juniper density gradually increase to the east as you approach the mountains. Moderately heavy deer use occurs in the winter judging from the pellet group transect data in 1998 with an estimated 80 deer days use/acre on the site.

Soil textural analysis indicates a sandy clay loam with a neutral pH (7.3). The average effective rooting depth (see methods) is 11 inches with an average soil temperature of 62.4°F at 13 inches. Plant development may be limited due to relatively low amounts of phosphorous (5.8 ppm). The soil surface is covered with high amounts of rock (18%) and pavement (34%). Rock and pavement are also present throughout the soil profile. The rocks appear to be from basaltic parent material with some exhibiting calcite deposits. Erosion is minimal with little bare ground cover (12%). There appears to be a hardpan or compacted soil layer about 12 inches below the soil surface which could be limiting to root development.

Although two subspecies of sagebrush, basin big sagebrush and Wyoming big sagebrush, are present, Wyoming big sagebrush is the dominate and the only one to occur in the density strips. These plants average 22 inches in height and continue to display good vigor with moderate hedging. In 1985, 28% of the plants were classified as decadent. This changed dramatically to 75% in 1991. In 1998, percent decadency had declined to 37% of the population. The sagebrush losses noted in 1998 can be partially explained by dead plants in the population (56% of it can be accounted for), the remainder is because of the much larger sample size utilized in 1998. This larger sample size more accurately estimates shrub populations that have discontinuous and/or clumped distributions. Photographs from all years show a thinning of the Wyoming big sagebrush population. Although pinyon and Utah juniper trees are sparse on the study area, they do provide some cover and have all been highlined to about 5 feet.

The herbaceous understory continues to be rather sparse and stunted. Photographs from 1985 and 1991 show no or little cheatgrass was present on the site. In 1998, it is by far the most common grass and provides a dense carpet throughout the shrub interspaces. Most of the other grasses and forbs are found growing under the protection of sagebrush canopies. Perennial grass sum of nested frequency has increased, but only slightly. The most common perennial grasses are bottlebrush squirreltail and Indian ricegrass, which provide a small amount of winter and spring forage. Scarlet globemallow and heath aster significantly increased in nested frequency since 1991. Perennial forb sum of nested frequency has increased since 1991, mostly due to an increase in scarlet globemallow.

1985 APPARENT TREND ASSESSMENT

Now that the surface is covered by a layer of erosion pavement and rock, the soil surface appears basically stable. The indicators also point to a static vegetative trend. Populations appear stable, and the plant composition is not likely to change for a long time unless there is increased browsing pressure from sheep and deer.

1991 TREND ASSESSMENT

The soil trend appears to be stable. However, vegetational basal cover has gone even lower, from 2% to 1%. Percent cover for rock-pavement and litter have changed very little. Percent bare ground has not changed. The key browse species, Wyoming big sagebrush, has decreased by 40%, while the percent decadence has more than doubled to 75%. With the high density of 8,132 plants/acre in 1985, this poor site in conjunction with the extended drought has caused a great deal of thinning within the community. The population should stabilize at a somewhat lower density, but this trend should be monitored closely. Trend for browse is down. The narrative for the herbaceous understory is similar. The sum of nested frequency for both grasses and forbs has dropped substantially since 1985. The only event that can help improve this site is an end this prolonged drought.

TREND ASSESSMENT
soil - stable, but poor condition and poor site potential
browse - downward
herbaceous understory - downward

1998 TREND ASSESSMENT

The soil trend continues to be stable with little erosion apparent. Percent rock and pavement cover has slightly declined over all years, while percent bare ground has stayed relatively similar. The browse trend is downward. Wyoming big sagebrush percent decadency has declined from a high of 75% in 1991 to 37% in 1998, although this is still higher than the 1985 estimate of 28%. The population is slowly declining with low numbers of seedling or young plants encountered in 1998. The dense carpet of cheatgrass in the shrub interspaces provides excessive competition for sagebrush seedling establishment. The herbaceous understory trend is downward. Although perennial herbaceous understory sum of nested frequency has increased, the dense cheatgrass carpet that was not present in the past is a severe fire hazard which could ultimately eliminate the Wyoming big sagebrush population and the value of this area as deer winter range. Perennial grasses and forbs need to increase in abundance to decrease the possibility of a devastating fire.

TREND ASSESSMENT
soil - stable, but poor condition and poor site potential
browse - downward
herbaceous understory - downward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 8

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Aristida purpurea	-	11	26	-	7	11	.32
G	Bromus tectorum (a)	-	-	342	-	-	99	13.36
G	Hilaria jamesii	a-	a-	b8	-	-	4	.19
G	Oryzopsis hymenoides	a44	ab67	b77	21	29	38	2.42
G	Sitanion hystrix	b179	a101	a91	70	47	44	1.56
G	Stipa comata	11	-	4	4	-	2	.04
Total for Annual Grasses		0	0	342	0	0	99	13.36
Total for Perennial Grasses		234	179	206	95	83	99	4.53

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
Total for Grasses		234	179	548	95	83	198	17.90
F	Astragalus cibarius	18	21	37	9	12	11	5.86
F	Astragalus spp.	-	2	-	-	1	-	-
F	Chaenactis douglasii	$_{b}$21	$_{ab}$15	$_{a}$4	9	6	3	.02
F	Cryptantha spp.	-	3	-	-	3	-	-
F	Descurainia pinnata (a)	-	-	2	-	-	2	.03
F	Eriogonum cernuum (a)	$_{b}$39	$_{a}$10	$_{a}$1	15	5	1	.00
F	Leucelene ericoides	$_{a}$-	$_{a}$-	$_{b}$10	-	-	5	.12
F	Phlox longifolia	-	-	4	-	-	2	.01
F	Sphaeralcea coccinea	$_{a}$4	$_{a}$4	$_{b}$20	2	2	9	.31
F	Unknown forb-perennial	14	-	-	8	-	-	-
Total for Annual Forbs		39	10	3	15	5	3	0.03
Total for Perennial Forbs		57	45	75	28	24	30	6.34
Total for Forbs		96	55	78	43	29	33	6.38

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 8

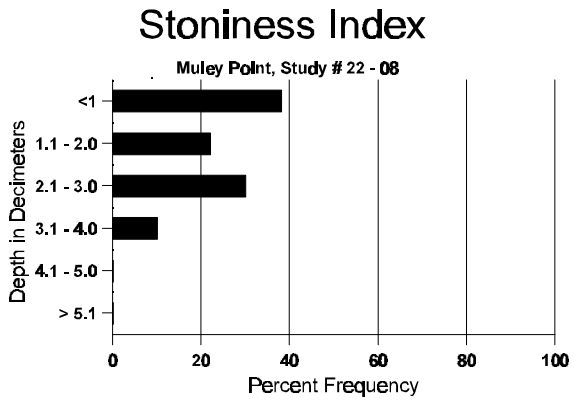
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	81	14.77
B	Chrysothamnus viscidiflorus stenophyllus	0	-
B	Opuntia whipplei	1	.00
Total for Browse		82	14.77

BASIC COVER --
Herd unit 22 , Study no: 8

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	349	2.00	1.00	33.02
Rock	278	16.25	17.75	17.63
Pavement	354	46.25	42.25	33.62
Litter	378	24.25	28.25	29.89
Cryptogams	6	0	0	.01
Bare Ground	277	11.25	10.75	11.50

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 08, Study Name: Muley Point

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.2	62.4 (13.0)	7.3	52.0	27.4	20.6	1.3	5.8	156.8	.6



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 8

Type	Quadrat Frequency '98
Rabbit	29
Deer	53

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	85	16	2	-	-	-	-	-	-	-	17	-	1	-	1200			18
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	17	-	-	2	-	-	-	-	-	19	-	-	-	380			19
M	85	36	34	-	-	-	-	-	-	-	69	-	1	-	4666	17	22	70
	91	3	6	2	3	3	-	-	-	-	16	-	1	-	1133	17	19	17
	98	28	57	1	-	-	-	-	-	-	86	-	-	-	1720	22	28	86
D	85	19	15	-	-	-	-	-	-	-	29	-	5	-	2266			34
	91	6	10	11	15	11	1	1	-	-	45	-	1	9	3666			55
	98	13	47	1	-	-	-	-	-	-	37	-	-	24	1240			62
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	860			43

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	42%	00%	06%	-40%
'91	41%	19%	15%	-31%
'98	62%	01%	14%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	8132	Dec:	28%
	'91	4865		75%
	'98	3340		37%

Chrysothamnus viscidiflorus stenophyllus																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	9	4	1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	0		-
	'98	0		-

Opuntia whipplei																		
M	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200	7	7	3
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	11	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	12	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	-67%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	200	Dec:	-
	'91	66		-
	'98	20		-

Trend Study 22-9-98

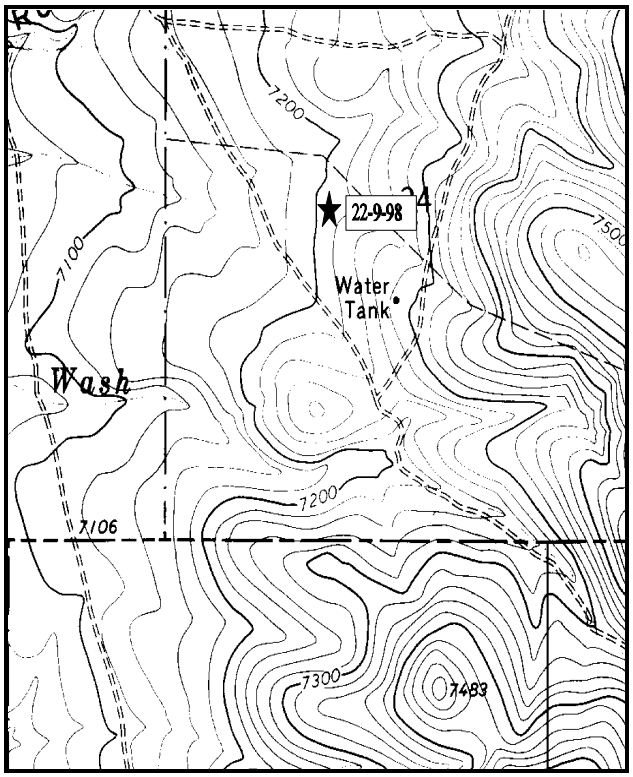
Study site name: Rocks Reseeding . Range type: Chained, Cabled, Reseeded P-J .

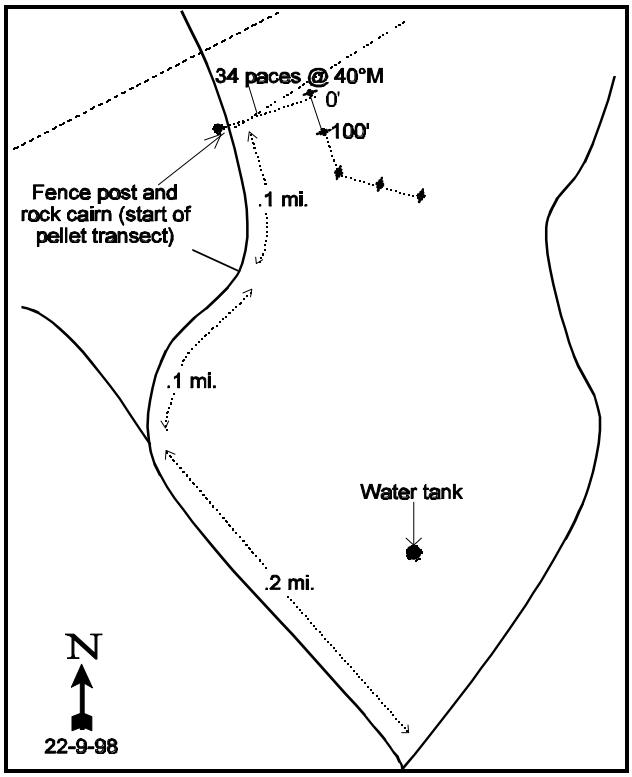
Compass bearing: frequency lines 1-2 163 M degrees. Lines 3-4 116 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Begin on I-15 at exit #100, 9 miles south of Beaver. On the east side of the freeway there is a frontage road and a road going straight east. Go east 0.6 miles to an intersection. Turn left and go 3.6 miles to a fork, stay right. Go 2.0 miles to a crossroad then turn left (north) and go 0.2 miles to a cattleguard. Continue 0.65 miles to a fork. Take the middle fork (right) go 1.0 mile and turn left under a stock pond. Go up a steep hill 0.1 miles to a major fork, stay left and go 0.2 miles to another fork. Stay right and go another 0.1 mile to a fork. Keep right and continue 0.1 miles to a pile of rocks painted yellow and a fencepost on the left side of the road. The rocks and fencepost mark the start of a pellet group transect. From the fencepost walk at a bearing of 51 degrees true along the transect. There are small rebar every 30 feet. The baseline starts 10 feet south of the fifth small rebar (150 feet from the fencepost). The frequency baseline is marked by 2-3 foot rebar and the 0-foot stake is tagged #7050. The 200,300 and 400 stakes are half-high fenceposts.





Map Name: Kane Canyon, Utah Diagrammatic Sketch

Township 30S , Range 6W , Section 34 UTM 4224120.643 N, 366399.455 E

DISCUSSION

Trend Study No. 22-9 (56B-2)

The Rocky Reseeding trend study is located on USFS administered land that has basically been developed for livestock grazing. The elevation is 7,200 feet with a westerly aspect and a 4-6% slope. This site was Dixie harrowed in 1962. Large areas were then seeded, mostly with crested wheatgrass. There were also numerous water developments and fencing was completed. A water trough is located about 1/3 of a mile from the site. There is a healthy stand of mountain big sagebrush and antelope bitterbrush with a low density of young Utah juniper scattered throughout the community. Point-centered quarter data indicates 54 juniper trees/acre and 19 pinyon trees/acre in 1998. A pellet group transect read on the site in 1998 indicates light deer use with an estimated 18 deer days use/acre along the pellet group transect. Cattle use also appears light with 20 cow days use/acre. The Circleville Cattle Allotment is on a 3 year rest rotation system. In the first year 360 cattle graze the area from June 1 to July 24. In the second year 360 cattle graze from July 24 through October 15. The pasture is then rested in the third year.

Soil textural analysis indicates a clay loam with a neutral pH (6.6). Average effective rooting depth (see methods) is 13 inches with a soil temperature of 41.6°F measured at a depth of 15 inches. Vegetative development may be limited due to relatively low amounts of phosphorous (9.8 ppm). The soil surface is covered with rocks and pavement that appear to be from basaltic parent material. On the exposed areas the soil is loosely compacted and dusty. Slight erosion is evident, but does not appear excessive.

The overstory is a mixture of mountain big sagebrush and Antelope bitterbrush. Both of these key species are for the most part vigorous, available, abundant, and well utilized. The bitterbrush is the most preferred species and the mature plants have been heavily browsed. Currently, it provides 45% of the browse cover. Some of the bitterbrush plants are getting quite large, up to four feet in height, and were producing abundant flowers in 1998 (indicating improved vigor). This type does not appear to increase by spreading vegetatively (layering). Percent decadency was reported the highest in 1991 at 56%. With increased precipitation and relatively lower use, mostly moderate use (57%), percent decadency has now declined to 10% in 1998. In 1998, mountain big sagebrush density was estimated to be 3,420 plants/acre. Utilization is currently light to moderate and the plants exhibit good vigor. Currently, insect galls are common on most plants and seed heads from the previous year are still attached to the seed stalks. Percent decadency has declined from a high of 33% in 1991 to only 8% in 1998.

Crested wheatgrass is the most abundant grass. It currently provides 93% of the herbaceous cover and 44% of the total vegetative cover, and has significantly increased its nested frequency value since 1991. However, bluebunch wheatgrass, muttongrass, and junegrass have all significantly decreased in nested frequency since 1991. This has caused a decline in sum of nested frequency over all years. Other grasses in low abundance include: galleta, red three-awn, and Indian ricegrass. Utilization of the grasses is heavy over all years.

A variety of forbs were encountered on the site, but none are very abundant, totaling less than 1% cover. The most common is longleaf phlox. Foothill deathcamas, desert Indian paintbrush, and milkvetch all show signs of utilization.

1985 APPARENT TREND ASSESSMENT

There is some soil loss from the site, but protection provided by the vegetative cover helps to curtail erosion. The rest-rotation grazing system should allow the grasses to remain vigorous and productive and also allow some buildup of litter. Grazing pressure on the area by cattle should be closely monitored to insure they do not feed excessively on the bitterbrush during dry years, which is already utilized by deer and is a key species that should remain in the community. Vegetative trend is up until the density of juniper becomes too high.

1991 TREND ASSESSMENT

There has obviously been some soil movement on the site with rock and pavement cover declining from 27% to 19% and percent bare ground more than doubling to 27%. Vegetative basal cover and litter cover have both declined. Trend for soil is down. Trend for browse is confounded, for mountain big sagebrush is increasing while bitterbrush is decreasing. Bitterbrush's biotic potential has decreased along with the percentage of individuals in the young age class. Another critical parameter is that percent decadency for bitterbrush has risen from 9% to 56% and the percentage of plants with heavy use has also risen from 59% to 77%. The biotic potential for sagebrush is still high at 70% and the young age class is also high at 21%. Trend for browse is stable. The trend for herbaceous understory is down for both grasses and forbs even with the rest-rotation grazing system in place. The extended drought has seized control of this grazing program. The forbs have never been very abundant on this site, with many of them having disappeared since the last survey.

TREND ASSESSMENT
soil - downward
browse - stable
herbaceous understory - downward

1998 TREND ASSESSMENT

The soil trend is stable with a slight increase in percent rock and pavement cover and a slight decrease in percent bare ground cover. Erosion is currently negligible. The browse trend is slightly upward with a decrease in percent decadency and an increase in the percentage of plants with good vigor for both key browse species. The bitterbrush population is recovering from high percent decadence in 1991 and appears to be healthy. The herbaceous understory trend is stable with a slight decrease in grass sum of nested frequency and a slight increase in forb sum of nested frequency.

TREND ASSESSMENT
soil - stable
browse - slightly upward
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 9

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	$_{b}$294	$_{a}$258	$_{b}$301	96	92	96	22.16
G	Agropyron spicatum	$_{b}$77	$_{b}$60	$_{a}$9	35	28	3	.56
G	Aristida purpurea	-	-	2	-	-	1	.03
G	Hilaria jamesii	-	-	3	-	-	1	.03
G	Koeleria cristata	$_{ab}$4	$_{b}$8	$_{a}$-	1	5	-	-
G	Oryzopsis hymenoides	4	-	1	2	-	1	.03
G	Poa fendleriana	$_{c}$51	$_{b}$20	$_{a}$3	23	10	1	.15
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		430	346	319	157	135	103	22.96

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
Total for Grasses		430	346	319	157	135	103	22.96
F	Agoseris glauca	-	-	1	-	-	1	.03
F	Arabis demissa	$_{b}$8	$_{a}$-	$_{ab}$3	5	-	1	.00
F	Astragalus convallarius	2	-	3	1	-	1	.15
F	Astragalus spp.	$_{ab}$1	$_{a}$-	$_{b}$6	1	-	4	.33
F	Castilleja chromosa	3	-	-	1	-	-	-
F	Chaenactis douglasii	3	-	-	1	-	-	-
F	Collinsia parviflora (a)	-	-	1	-	-	1	.00
F	Cymopterus spp.	-	-	2	-	-	2	.01
F	Delphinium nuttallianum	-	-	5	-	-	3	.04
F	Descurainia pinnata (a)	-	-	2	-	-	1	.00
F	Draba spp. (a)	-	-	2	-	-	1	.00
F	Erigeron spp.	4	-	-	2	-	-	-
F	Eriogonum racemosum	-	-	2	-	-	1	.03
F	Lactuca serriola	-	-	1	-	-	1	.00
F	Lomatium spp.	2	1	4	1	1	3	.01
F	Microsteris gracilis (a)	-	-	9	-	-	5	.02
F	Phlox longifolia	51	37	32	25	20	16	.18
F	Trifolium spp.	3	-	-	1	-	-	-
F	Vicia americana	-	-	3	-	-	2	.03
F	Zigadenus paniculatus	-	-	3	-	-	1	.00
Total for Annual Forbs		0	0	14	0	0	8	0.03
Total for Perennial Forbs		77	38	65	38	21	36	0.84
Total for Forbs		77	38	79	38	21	44	0.88

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 9

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	84	14.66
B	Chrysothamnus viscidiflorus stenophyllus	0	-
B	Juniperus osteosperma	5	.15
B	Opuntia whipplei	0	-
B	Pinus edulis	1	-
B	Purshia tridentata	48	12.26
Total for Browse		138	27.07

CANOPY COVER --

Herd unit 22 , Study no: 9

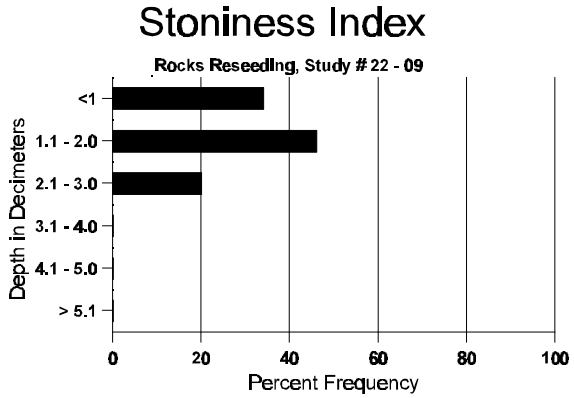
Species	Percent Cover '98
Juniperus osteosperma	.60

BASIC COVER --
Herd unit 22 , Study no: 9

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	323	10.25	8.25	39.93
Rock	241	12.50	11.75	11.52
Pavement	239	14.00	6.75	11.13
Litter	377	50.00	45.50	42.81
Cryptogams	18	0	1.00	.45
Bare Ground	241	13.25	26.75	21.22

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 09, Study Name: Rocks Reseeding

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.1	41.6 (15.2)	6.6	38	31.4	30.6	2.5	9.8	185.6	.7



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 9

Type	Quadrat Frequency '98
Rabbit	23
Elk	2
Deer	21
Cattle	18

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	41	-	-	-	-	-	-	-	-	41	-	-	-	2733			41
	91	23	-	-	-	-	-	-	-	-	23	-	-	-	1533			23
	98	13	-	-	4	-	-	-	-	-	17	-	-	-	340			17
Y	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	5	2	-	-	-	-	-	-	-	7	-	-	-	466			7
	98	37	-	-	7	-	-	1	-	-	45	-	-	-	900			45
M	85	9	9	-	-	-	-	-	-	-	18	-	-	-	1200	28	27	18
	91	9	6	-	-	-	-	-	-	-	15	-	-	-	1000	25	31	15
	98	75	22	2	13	-	-	-	-	-	109	1	2	-	2240	27	37	112
D	85	2	5	1	-	-	-	-	-	-	7	1	-	-	533			8
	91	5	4	2	-	-	-	-	-	-	6	-	1	4	733			11
	98	4	8	-	1	1	-	-	-	-	12	-	-	2	280			14
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	48%	03%	00%	+12%
'91	36%	06%	15%	+36%
'98	18%	01%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1933	Dec:	28%
	'91	2199		33%
	'98	3420		8%

Chrysothamnus viscidiflorus stenophyllus																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	3	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	2	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+75%
'91	50%	25%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	0%
	'91	266		25%
	'98	0		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	1	-	-	1	-	-	1	-	-	3	-	-	-	60			3
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+50%
'91	00%	00%	00%	-25%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	133		-
	'98	100		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia whipplei																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	8	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	0		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus edulis																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	85	18	-	-	-	-	-	-	-	-	16	-	2	-	1200			18
	91	3	1	-	-	-	-	-	-	-	4	-	-	-	266			4
	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
Y	85	4	3	-	-	-	-	-	-	-	7	-	-	-	466			7
	91	1	-	2	-	-	-	-	-	-	3	-	-	-	200			3
	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
M	85	-	2	11	-	-	-	-	-	-	13	-	-	-	866	35	28	13
	91	-	-	-	-	2	3	-	-	-	5	-	-	-	333	26	30	5
	98	17	38	1	3	1	-	-	-	-	60	-	-	-	1200	41	53	60
D	85	-	-	2	-	-	-	-	-	-	2	-	-	-	133			2
	91	1	4	1	-	-	4	-	-	-	8	-	-	2	666			10
	98	3	2	1	1	-	-	-	-	-	7	-	-	-	140			7
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	23%	59%	00%	-18%
'91	33%	56%	11%	+17%
'98	57%	03%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	1465	Dec:	9%
	'91	1199		56%
	'98	1440		10%

Trend Study 22-10-98

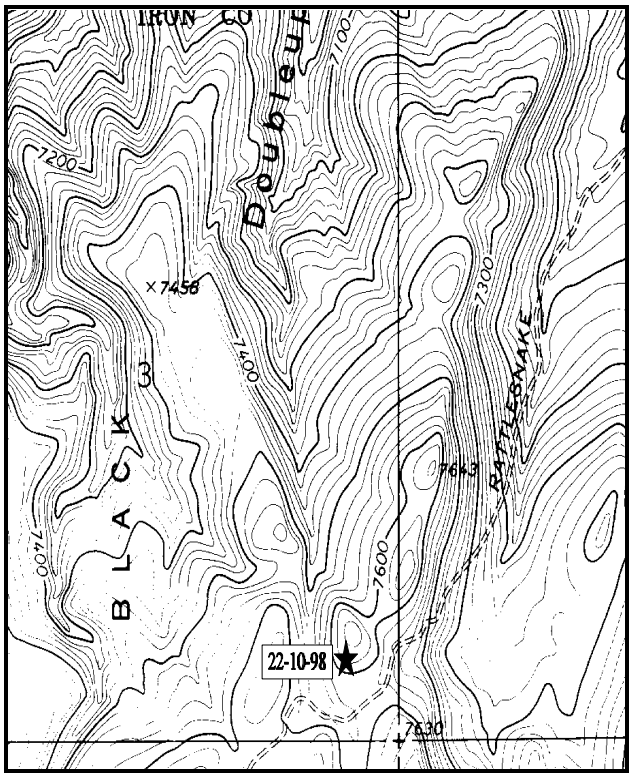
Study site name: Doubleup Hollow . Range type: Mixed Mountain Brush .

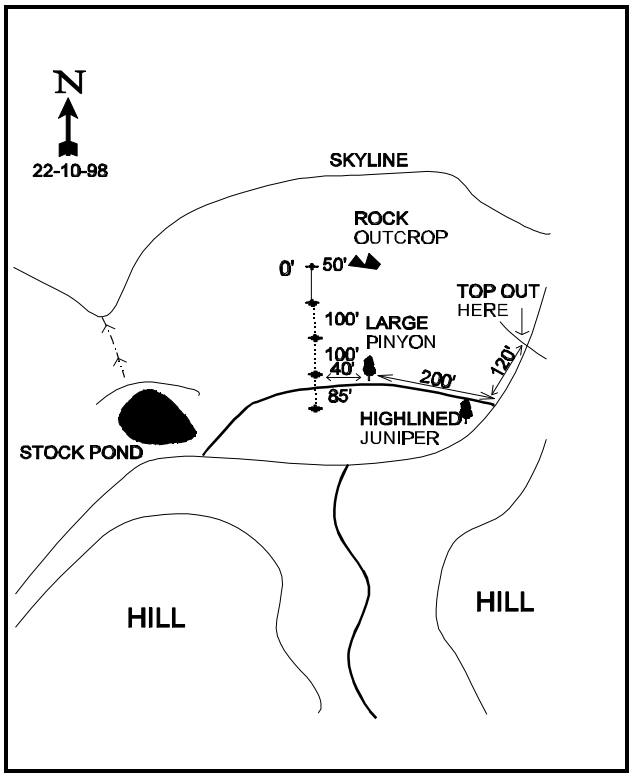
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Start from the cattleguard in front of the Chevron Station on the west side of the I-15 interchange at the south end of Beaver. Turn left onto the frontage road and go 0.7 miles south, then 1.6 miles west. Go past the turnoff to the Beaver International Airport 0.2 mile to a corner then 0.2 miles south to an intersection. Turn right, paralleling a fence line and proceed 1.7 miles west to an intersection, turn left onto a major dirt road. Follow this main road (also known as the Rattlesnake Trail) for 6.7 miles, keeping to the right at all forks. At the fork near a small loading corral and water troughs, keep right again and go 1.4 miles to the top of the hill. From the half-high fencepost that marks the top, go 120 feet to a faint road forking off to the right. Go 200 feet on the faint road to a large round pinyon with a red stake under it and possibly an old Clover trap next to it. Walk about 200 feet straight up the hill (north) to a rock outcrop. The frequency baseline starts 50 feet to the west of these rocks. The 300-foot stake is rebar tagged #7075.





Map Name: Greenville Bench, Utah Diagrammatic Sketch

Township 31S , Range 8W , Section 3 UTM 4222014.839 N, 347593.208 E

DISCUSSION

Trend Study No. 22-10 (56B-3)

The Doubleup Hollow trend study samples an area of high deer winter range on the north end of the Black Mountains. The study is located on BLM administered land. There is not any higher elevation range in area, therefore the site would have year round use by resident deer. The vegetation in the hollow is a mixture of open patches of sagebrush interspersed with pinyon, juniper, and curlleaf mountain mahogany. The study site is on a rather open hillside with a slope of 5-10% and a southern aspect. Elevation is 7,600 feet. Grazing pressure appears light on this particular hillside with an estimated 18 deer days use/acre from a pellet group transect on the site in 1998. In the past, hedging on the browse plants reflected use by both deer and livestock, but there was no livestock sign encountered in 1998.

Large rock outcrops and the high percentage of rocks and pavement on the surface (32%) indicates the rockiness of the subsurface soil horizons. The upper soil is grayish brown, fine-textured, and loosely compacted. Soil textural analysis indicates a clay loam with a neutral pH (6.6). The average effective rooting depth (see methods) is almost 13 inches with an average soil temperature of 51.2°F at just over 13 inches. At a depth of approximately 10-12 inches there is an apparent hardpan or compacted layer. The vegetation and litter cover aid in soil stabilization and keep erosion to a minimum. Phosphorous levels in the soil profile measure 7.1 ppm and may be limiting to vegetative development because 10 ppm is thought to minimal for normal plant development.

The browse component is abundant and varied. The key browse species on the site are Antelope bitterbrush and mountain big sagebrush. The bitterbrush appears to still be the most preferred species although utilization has shifted from moderate-heavy in 1985 and 1991 to light-moderate in 1998. Percent decadency has shifted from 18% in 1991 to 5% in 1998 with the population currently exhibiting good vigor. In 1998, the Antelope bitterbrush showed abundant flowering. In the past, the sagebrush was identified as both black sagebrush and mountain big sagebrush. In 1998, it was determined that the majority of the sagebrush population was in fact mountain big sagebrush. The browse data tables refer to the sagebrush as both subspecies in 1985 and 1991. In 1998, the data tables refer to the population as predominately mountain big sagebrush. In 1985, it was reported that the sagebrush was producing a large amount of seed, which did not become established due to dry conditions. Currently, mountain big sagebrush shows light to moderately hedging and shows signs of improved vigor and lower percent decadency. Cover is estimated at nearly 24% in 1998. Insect galls are present on some plants and seedheads from the previous season still on the seed stalks. The slow decline of the sagebrush is strongly associated to the prolonged drought, and further accentuated on this site by the increased presence of many young junipers, pinyons, and oak. This indicates that this site is developing in a similar manner as much of the surrounding area.

Other valuable forage species present in lower numbers includes: curlleaf mountain mahogany, Gambel oak, and snowberry. Point-centered quarter data from 1998 indicates 13 Utah juniper trees/acre and 125 pinyon trees/acre. In 1998, line intercept canopy cover for Utah juniper and pinyon was estimated to be 2% and 8% respectively. Ten percent overhead canopy cover would easily cause about 40% decrease in understory production.

Bottlebrush squirreltail, which significantly decreased in nested frequency since 1991, is the most common perennial grass and occurs primarily under the crown of the sagebrush. There are several other species of perennial grasses present, but none are very common. Cheatgrass is scattered throughout, but it is small statured. Perennial grass sum of nested frequency has declined over all years. Forbs are rather scarce with the most common species encountered in 1998 being lupine. Perennial forb sum of nested frequency has more than doubled since 1991, but is still rather insignificant on the site as they barely total 2% cover.

1985 APPARENT TREND ASSESSMENT

The soil is stable and well-protected from erosion. However, the rocks on the surface are easily moved by disturbances such as trampling, and trails and erosion channels are easily formed. Large sagebrush openings still occupy much of the surrounding land, but these openings are apparently getting smaller. The relative abundance of the various browse species is slowly changing and the increase of pinyon and juniper indicates an overall slightly downward trend. The composition of grasses and forbs is fair and appears stable.

1991 TREND ASSESSMENT

The soil trend is slightly downward because vegetative basal cover is declining, litter cover is also decreasing, and percent bare ground has increased to 8%. Browse trend for all three key species is down. Black sagebrush, Mountain big sagebrush, and bitterbrush all experienced losses in their respective populations with corresponding increases in their rates of decadency and the percentage of individuals that are considered in poor vigor. Sum of nested frequency for both grasses and forbs has also declined substantially indicating a downward trend.

TREND ASSESSMENT
soil - slightly downward
browse - downward
herbaceous understory - downward

1998 TREND ASSESSMENT

The soil trend is stable with only slight changes in percent rock, pavement, and bare ground covers. Erosion is only slight with adequate vegetation and litter cover to protect the soil. The browse trend is stable. The decrease in bitterbrush is mostly because of the much larger sample size giving more accurate estimates of shrub densities which characteristically have discontinuous and/or clumped distributions. Also, the number of dead plants in the population can only explain about 18% of the decrease. Utilization by wildlife or livestock is significantly lower at this time than previously reported. Percent decadency and the percentage of plants exhibiting good vigor have improved since 1991. Percent vegetative cover for sagebrush is moderately high at an estimated 24% and will negatively affect the herbaceous understory production. The herbaceous understory trend is stable. Perennial grass sum of nested frequency has slightly declined while perennial forb sum of nested frequency has increased, offsetting the losses in the grasses.

TREND ASSESSMENT
soil - stable
browse - stable, decreased percent decadency and improved vigor for sagebrush and bitterbrush
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 10

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron spicatum	6	11	18	3	5	7	.35
G	Bouteloua gracilis	6	12	6	2	4	2	.01
G	Bromus tectorum (a)	-	-	96	-	-	39	1.78
G	Carex spp.	6	6	17	4	4	7	.26
G	Koeleria cristata	8	6	3	4	3	1	.00
G	Oryzopsis hymenoides	9	7	10	4	4	4	.02
G	Poa fendleriana	1	5	9	1	3	3	.30
G	Sitanion hystrix	$_{b}$140	$_{b}$113	$_{a}$78	63	55	37	1.53
Total for Annual Grasses		0	0	96	0	0	39	1.78
Total for Perennial Grasses		176	160	141	81	78	61	2.49
Total for Grasses		176	160	237	81	78	100	4.27
F	Arabis demissa	1	6	12	1	3	5	.05
F	Astragalus spp.	2	-	1	1	-	1	.00
F	Chaenactis douglasii	$_{b}$23	$_{a}$7	$_{ab}$6	11	3	5	.07
F	Cryptantha spp.	12	11	12	6	5	7	.08
F	Cymopterus spp.	-	-	7	-	-	3	.01
F	Descurainia pinnata (a)	-	-	3	-	-	1	.00
F	Epilobium paniculatum (a)	-	-	9	-	-	5	.05
F	Erigeron pumilus	4	-	4	2	-	3	.06
F	Lupinus argenteus	-	-	21	-	-	9	1.44
F	Lygodesmia spinosa	1	4	-	1	2	-	-
F	Machaeranthera canescens	10	-	4	5	-	3	.01
F	Microsteris gracilis (a)	-	-	6	-	-	2	.01
F	Penstemon spp.	4	-	4	2	-	3	.04
F	Petradoria pumila	-	-	4	-	-	2	.38
F	Phlox longifolia	3	2	2	1	2	2	.01
F	Senecio multilobatus	1	2	-	1	1	-	-
Total for Annual Forbs		0	0	18	0	0	8	0.06
Total for Perennial Forbs		61	32	77	31	16	43	2.18
Total for Forbs		61	32	95	31	16	51	2.25

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 10

Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Artemisia nova	3	.03
B	Artemisia tridentata vaseyana	87	23.73
B	Cercocarpus ledifolius	1	.41
B	Gutierrezia sarothrae	1	-
B	Juniperus osteosperma	2	1.70
B	Mahonia repens	1	.01
B	Opuntia spp.	3	-
B	Pinus edulis	2	6.09
B	Purshia tridentata	50	13.92
B	Symphoricarpos oreophilus	5	1.29
Total for Browse		155	47.20

CANOPY COVER --
Herd unit 22 , Study no: 10

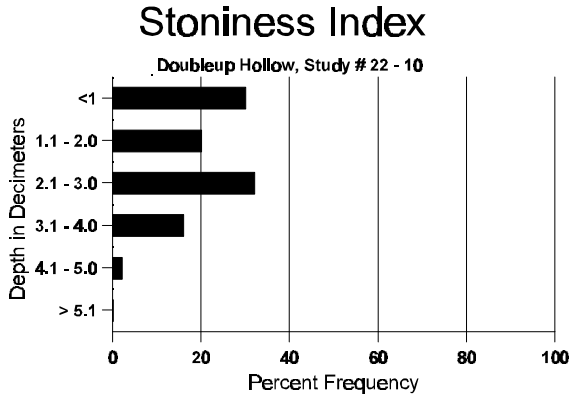
Species	Percent Cover ‘98
Juniperus osteosperma	2
Pinus edulis	8

BASIC COVER --
Herd unit 22 , Study no: 10

Cover Type	Nested Frequency ‘98	Average Cover % '85	'91	'98
Vegetation	249	3.75	3.25	45.72
Rock	221	9.75	14.25	12.25
Pavement	228	25.25	20.50	20.12
Litter	370	56.75	53.00	49.04
Cryptogams	10	0	1.00	.19
Bare Ground	113	4.50	8.00	6.00

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 10, Study Name: Doubleup Hollow

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.7	51.2 (13.4)	6.6	44.0	27.4	28.6	2.7	7.1	204.8	.8



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 10

Type	Quadrat Frequency '98
Rabbit	27
Elk	2
Deer	36

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	8	1	-	-	-	-	-	-	-	9	-	-	-	600			9
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	28	12	1	-	-	-	-	-	-	40	-	1	-	2733	11	16	41
	91	7	11	4	3	1	-	-	-	-	26	-	-	-	1733	8	21	26
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	10	13	3
D	85	16	8	-	-	-	-	-	-	-	12	-	8	4	1600			24
	91	14	2	-	3	-	-	3	-	-	5	-	-	17	1466			22
	98	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	28%	01%	18%	-34%
'91	29%	08%	35%	-96%
'98	00%	00%	33%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
	'85	4933	32%
	'91	3265	45%
	'98	120	50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	10	-	-	-	-	-	1	-	-	11	-	-	-	220			11
Y	85	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	85	6	9	2	-	-	-	-	-	-	17	-	-	-	1133	20	17	17
	91	6	2	-	5	3	-	-	-	-	16	-	-	-	1066	20	24	16
	98	77	39	-	24	-	-	1	-	-	140	-	1	-	2820	22	30	141
D	85	3	10	2	-	-	-	-	-	-	13	-	1	1	1000			15
	91	3	7	-	2	5	-	-	-	-	4	-	1	12	1133			17
	98	41	4	-	3	-	-	-	-	-	27	-	3	18	960			48
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	1240			62

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	53%	11%	06%	- 6%
'91	50%	00%	38%	+42%
'98	22%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	2399	Dec:	42%
	'91	2265		50%
	'98	3900		25%

Cercocarpus ledifolius																		
S	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	48	53	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	66		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	4	-	-	1	-	-	-	-	-	5	-	-	-	333	10	8	5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	-94%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	333			-
'98	20			-

Juniperus osteosperma																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	40			-

Mahonia repens																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	-	-	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:		-
'91	0			-
'98	120			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	5	14	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	80		-

Pinus edulis																		
Y	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-55%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	133	Dec:	-
	'91	133		-
	'98	60		-

Purshia tridentata																		
S	85	7	-	-	-	-	-	-	-	-	7	-	-	-	466			7
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	98	7	-	-	2	-	-	-	-	-	9	-	-	-	180			9
Y	85	8	9	2	-	-	-	-	-	-	19	-	-	-	1266			19
	91	1	2	1	-	-	-	1	-	-	5	-	-	-	333			5
	98	5	2	-	2	-	-	1	-	-	10	-	-	-	200			10
M	85	2	16	26	-	-	-	-	-	-	43	-	1	-	2933	24	26	44
	91	-	11	3	3	9	1	-	-	-	27	-	-	-	1800	27	51	27
	98	37	21	-	3	2	-	-	-	-	63	-	-	-	1260	34	45	63
D	85	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	3	1	-	-	2	-	-	1	5	-	-	2	466			7
	98	1	-	1	2	-	-	-	-	-	3	-	-	1	80			4
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	200			10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	39%	45%	02%	-39%
'91	64%	23%	05%	-41%
'98	32%	01%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	4265	Dec:	2%
	'91	2599		18%
	'98	1540		5%

Symphoricarpos oreophilus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	7	1	-	-	-	-	-	-	-	8	-	-	-	160	12	25	8

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	13%	00%	00%

Total Plants/Acre (excluding Dead & Seedlings)			%Change	
	'85	0	Dec:	-
	'91	0		-
	'98	160		-

Trend Study 22-11-98

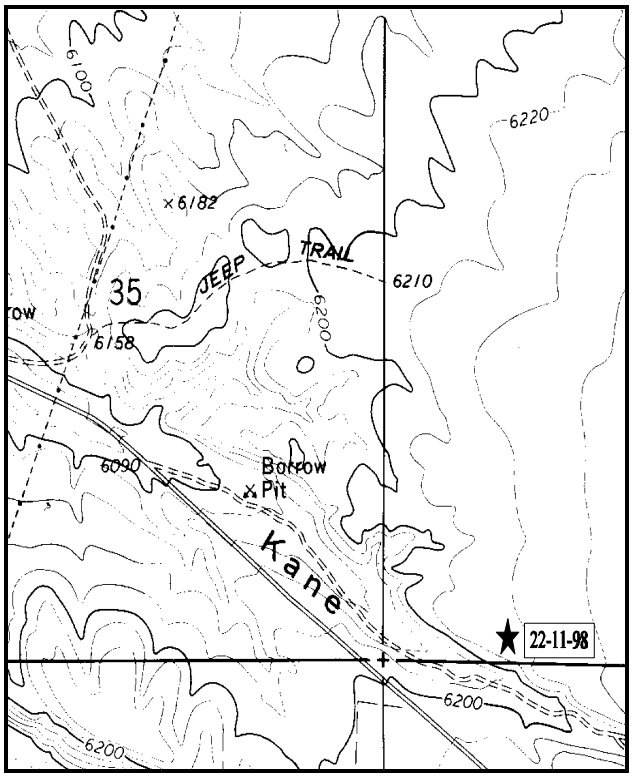
Study site name: "B" Hill . Range type: Big Sagebrush-Grass .

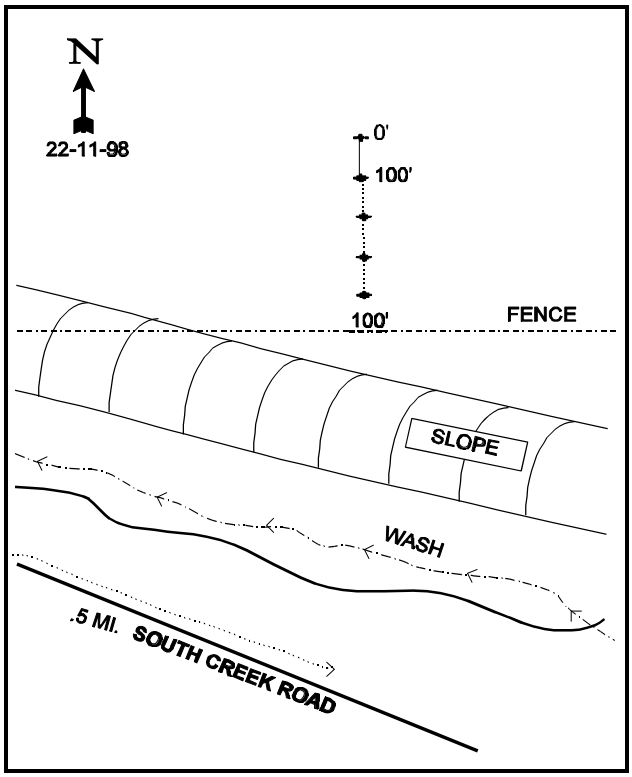
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Starting from Beaver High School on Main Street, go south 1.6 miles. On the east side of the road there is a rock monument commemorating the "Lee's Ranch Indian Raid". Turn east at the monument onto South Creek Road. Go 0.6 miles to a three-way fork, keep right on the main road. Proceed 1.3 miles to another fork and turn right. Go 0.4 miles and turn left onto a poorly maintained road. This road is now impassable (actually a wash bottom), so continue down the main road until you see a fence braced by wooded cross-members on the hill to the left. Hike up the hill. From the left wood post go 100 feet at 360 degrees true to the 400-foot stake. The study is marked by 2 1/2-foot rebar, 100 feet apart. The 0-foot baseline stake is marked by a short rebar tagged #7059.





Map Name: Kane Canyon, Utah

Diagrammatic Sketch

Township 29S , Range 7W , Section 36

UTM 4233070.021 N, 360208.618 E

DISCUSSION

Trend Study No. 22-11 (56B-4)

The "B" Hill study is located on a section of DWR land which is part of the critical and limited deer winter range south of Beaver and east of I-15. Deer concentrate here in the South Creek area in the winter with the accompanying problems of spring crop depredation and generally overuse on the range. The range type is sagebrush-grass. A pinyon-juniper eradication project was done in 1959 and the site was aerially seeded. Some locations were harrowed and drilled. The wash just to the south of the study site contains an open stand of Utah junipers and provides the only cover near the flat. The site is nearly level with only a slight slope to the west. Elevation is 6,200 feet. The "B" Hill pellet group transect, which samples a slightly higher elevation area near the study site, averaged 53 deer days use/acre from 1980 through 1985 (Jense et al. 1985). Deer days use/acre appears to have increased since 1985 to an average of 55 deer days use/acre (Jense et al. 1991). The pellet transect was not read in 1992. From 1993 through 1997, deer averaged 17 days use/acre (Evans et al. 1997). A pellet group transect read on the site in 1998 estimated 5 deer days use/acre and 13 cow days use/acre.

Due to the levelness of the terrain, runoff and the hazard of erosion is low. The soil surface and profile are very rocky and there are current signs of pedestaling around some of the plants. Soil textural analysis indicates a sandy clay loam with a neutral pH (7.1). Average effective rooting depth (see methods) is a little over 13 inches with an average soil temperature of 39.6°F at 14 inches. Phosphorous levels in the soil profile measure 4.6 ppm and may be limiting to vegetative development because 10 ppm is considered minimal for normal plant growth. There appears to be a hardpan at just over one foot from the soil surface.

Wyoming big sagebrush is the only key browse species on the site. In 1998, the Wyoming big sagebrush population is estimated to be 1,200 plants/acre and appears to be a stable to slightly expanding population. The percentage of plants in poor vigor has increased to 13% in 1998, where it was 0% in 1985 and 1991. The plants average 18 inches in height and appear rather stunted. They were moderately hedged in the past, but utilization of the current years growth is now light to moderate. More young and seedling plants were encountered in 1998 than in any other year, which should indicate the population could slightly increase in the future. Broom snakeweed is also present but in low abundance. A few bitterbrush and young Utah junipers can also be found along the fence.

The most common grasses are crested wheatgrass, Russian wildrye, intermediate wheatgrass, and western wheatgrass. Intermediate wheatgrass has significantly increased in nested frequency, while western wheatgrass and Russian wildrye have significantly declined in nested frequency since 1991. Indian ricegrass occurs occasionally. Growth and production is likely depressed as a result of overgrazing with the accompanying prolonged drought. In 1985, the plants were short, but seed production appeared to have been good. Perennial grass sum of nested frequency has declined since 1991 and is lower than what was reported in 1985. Forbs, except for a small scarlet globemallow and heath aster, are rare.

1985 APPARENT TREND ASSESSMENT

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The soil trend is stable due mostly to the relatively level terrain. The vegetative condition has the potential to improve if livestock grazing is eliminated for a few years. Increased enforcement of regulations and fence repairs should help curtail the trespass problems. There is a lack of diversity in the vegetative community, but competition with seeded species should keep annuals and other invaders from increase. A rest from livestock grazing would allow the sagebrush and various grasses present to regain vigor, reproduce, and build up litter.

1991 TREND ASSESSMENT

The soil trend for the site is down even with the increase in basal vegetative cover, because litter cover has decreased to only 20% and percent bare ground has doubled to 40%. There is only one key browse species present, Wyoming big sagebrush, which has demonstrated declining numbers and vigor with increased decadency. Trend for browse is slightly down. The trend for both grasses and forbs is slightly up with increased nested frequency values.

TREND ASSESSMENT
soil - downward
browse - slightly downward
herbaceous understory - slightly upward

1998 TREND ASSESSMENT

The soil trend is slightly upward with a decrease in percent bare ground cover since 1991. Percent rock and pavement cover combined have declined as well. There are some signs of pedestaling, but the levelness of the site prevents excessive erosion from occurring. The browse trend is stable. Wyoming big sagebrush density has increased slightly since 1991, but still remains low. Currently, it only accounts for 3% cover. Percent decadency has remained the same while the percentage of plants reported in poor vigor has increased to 13%. The herbaceous understory trend is downward. Perennial herbaceous understory sum of nested frequency is currently lower than what was reported in any other year. Grasses dominate the site and individual species have shifted slightly over the years.

TREND ASSESSMENT
soil - slightly upward
browse - stable
herbaceous understory - downward

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 11

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	205	198	211	81	75	72	18.53
G	Agropyron dasystachyum	b15	a-	a-	8	-	-	-
G	Agropyron intermedium	a4	a14	b37	3	7	17	.38
G	Agropyron smithii	b73	c140	a37	30	50	17	.50
G	Agropyron spicatum	-	-	1	-	-	1	.00
G	Agropyron trachycaulum	-	-	2	-	-	1	.03
G	Aristida purpurea	-	3	-	-	1	-	-
G	Bromus tectorum (a)	-	-	15	-	-	5	.45
G	Elymus junceus	b152	b168	a96	59	62	38	3.58
G	Oryzopsis hymenoides	26	28	14	11	13	7	.58
G	Poa fendleriana	7	-	4	3	-	2	.03
G	Sitanion hystrix	-	-	2	-	-	1	.00
G	Stipa comata	3	7	4	1	3	3	.18

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
Total for Annual Grasses		0	0	15	0	0	5	0.45
Total for Perennial Grasses		485	558	408	196	211	159	23.84
Total for Grasses		485	558	423	196	211	164	24.29
F	Astragalus cibarius	11	2	8	6	2	6	.13
F	Cryptantha spp.	2	2	-	1	1	-	-
F	Cymopterus spp.	-	-	1	-	-	1	.00
F	Leucelene ericoides	$_{a}$33	$_{b}$66	$_{a}$30	13	31	14	.29
F	Orobanche fasciculata	-	-	1	-	-	1	.00
F	Phlox longifolia	$_{a}$-	$_{b}$11	$_{ab}$3	-	5	2	.01
F	Phlox spp.	-	1	-	-	1	-	-
F	Ranunculus testiculatus (a)	-	-	16	-	-	6	.03
F	Schoencrambe linifolia	-	-	2	-	-	1	.00
F	Sisymbrium altissimum (a)	-	-	2	-	-	1	.03
F	Sphaeralcea coccinea	$_{b}$131	$_{b}$131	$_{a}$57	51	56	23	.41
Total for Annual Forbs		0	0	18	0	0	7	0.06
Total for Perennial Forbs		177	213	102	71	96	48	0.86
Total for Forbs		177	213	120	71	96	55	0.92

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 11

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	44	3.05
B	Gutierrezia sarothrae	4	.03
Total for Browse		48	3.08

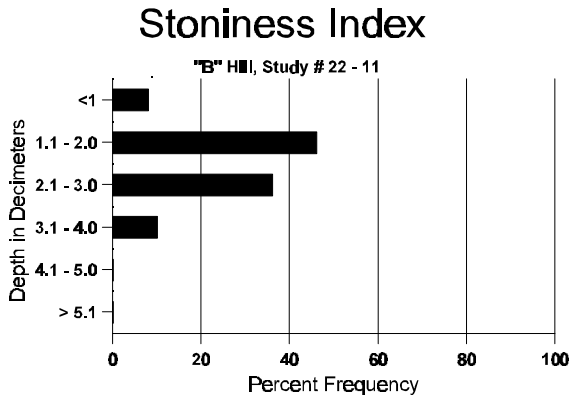
BASIC COVER --
Herd unit 22 , Study no: 11

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	327	8.25	14.50	36.55
Rock	215	3.50	2.75	6.62
Pavement	335	34.00	22.00	12.07
Litter	377	34.50	19.50	22.30
Cryptogams	253	0	1.50	7.95
Bare Ground	329	19.75	39.75	29.41

SOIL ANALYSIS DATA --

Herd Unit 22, Study # 11, Study Name: “B” Hill

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.3	39.6 (14.0)	7.1	52.0	23.4	24.6	1.9	4.6	211.2	.8



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 11

Type	Quadrat Frequency ‘98
Rabbit	16
Deer	15
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 11

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	12	-	-	-	-	-	-	-	-	12	-	-	-	240			12
M	85	1	10	1	-	-	-	-	-	-	12	-	-	-	800	20	22	12
	91	2	6	1	-	-	-	-	-	-	9	-	-	-	600	24	27	9
	98	25	5	5	-	-	-	-	-	-	35	-	-	-	700	18	31	35
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	2	-	-	1	-	-	-	-	3	-	-	-	200			3
	98	4	3	2	-	-	4	-	-	-	5	-	-	8	260			13
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	71%	07%	00%	- 7%
'91	69%	08%	00%	+28%
'98	13%	18%	13%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	933	Dec:		0%
'91	866			23%
'98	1200			22%

Gutierrezia sarothrae																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	8	9	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	120		-

Trend Study 22-12-98

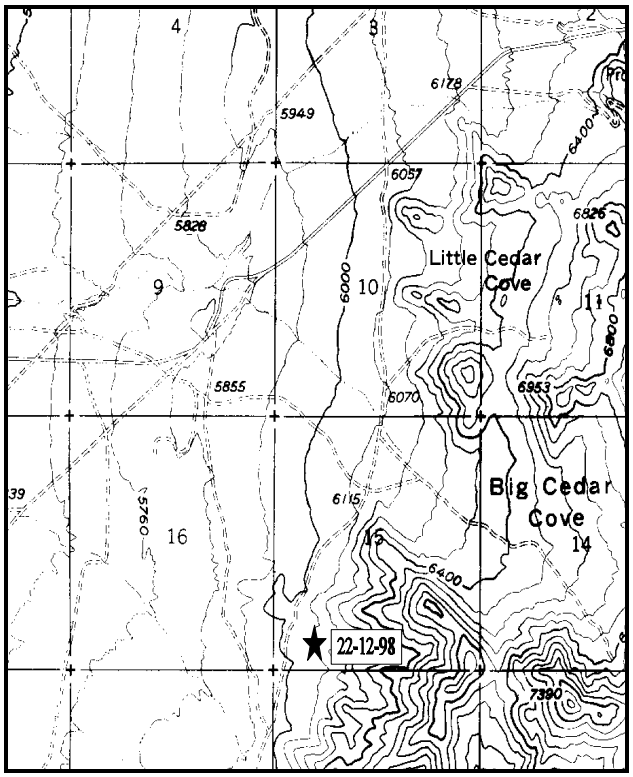
Study site name: Big Cedar Cove . Range type: Big Sagebrush-Grass .

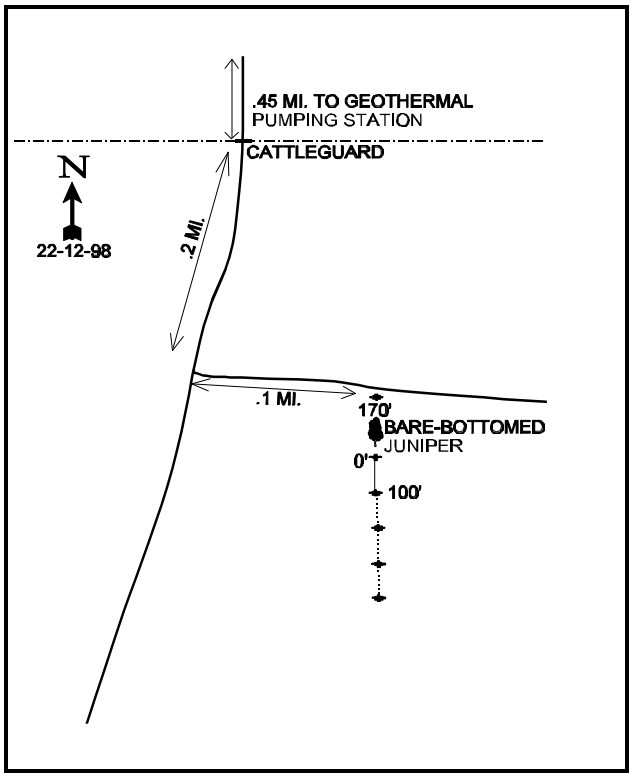
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 4 on SR257 north of Milford, go 0.55 miles north. Turn right (Roosevelt Hot Springs Road) and drive 2.65 miles to a major fork. Continue straight and go 5.0 miles. Just across the cattleguards turn right and go 1.0 miles to a 4-way fork. Turn right and continue 0.45 miles (past Phillips Oil well-head on the right) to another cattleguard. Go another 0.20 miles to a junction. Turn left and drive 0.1 miles. Stop here. The transect starts 170 feet due south of the road beside a highlined juniper tree. The 0-foot baseline stake is a steel rebar three feet tall with a browse tag #7079 attached.





Map Name: Bearskin Mountain, Utah Diagrammatic Sketch

Township 27S , Range 9W , Section 15 UTM 4257959.182 N, 337936.683 E

DISCUSSION

Trend Study No. 22-12 (56C-1/48-12)

The Big Cedar Cove trend study is located on the sagebrush-grass range that covers the gentle slopes of the foothills on the west side of the Mineral Mountains. The study has a southwest exposure at an elevation of 6,000 feet. The site, along with most of the land on the Mineral Mountains, is administered by the BLM. The area is grazed by cattle in the spring, but the scarcity of water may limit use. Deer use appears light with 12 deer days use/acre and 6 cow days use/acre estimated in 1998 on a pellet transect read on the site. A geothermal plant is located nearby and has the potential to impact deer in the area through habitat loss and increased disturbance.

Soil textural analysis indicates a sandy loam soil with a neutral pH (6.7). The soil is relatively deep and coarse with 49% of the soil surface covered with pavement and rocks. Effective rooting depth (see methods) is 19 inches with a soil temperature of 45.4°F at 17 inches. Vegetative growth may be limited due to relatively low amounts of phosphorous (7.5 ppm). There are signs of pedestaling around the bunchgrasses and browse plants. The soil is slightly eroded, showing signs of sheet erosion which likely occurs during high intensity summer thunderstorms.

A moderately dense stand of Wyoming big sagebrush dominates the site. In 1985, close to 25% of the population were young plants, with 35% classified as decadent. No seedlings were found in 1991 with young plants accounting for 16% of the population. Furthermore, over half of the sagebrush on the site are were decadent (53%), a 34% increase, while plants classified as having poor vigor have increased to 39%. Currently, sagebrush canopy cover is estimated to be 16%. Mature sagebrush average 22 inches in height, display generally good vigor, and are light to moderately browsed. Although percent decadence has declined to 37% of the population, few seedling or young plants were encountered in 1998. The shrub interspaces are occupied by various invaders such as narrowleaf low rabbitbrush, broom snakeweed, prickly phlox, and young pinyon pine. Broom snakeweed density is currently estimated to be 10,080 plants/acre, a great increase from previous years. This species has a highly fluctuating density depending on weather patterns. Ephedra density is currently estimated to be 320 plants/acre and plants show moderate utilization. Point-centered quarter data from 1991 estimate 39 pinyon trees/acre and 16 Utah juniper trees/acre. In 1998, point-centered quarter data estimate 54 pinyon trees/acre and 19 Utah juniper trees/acre.

Perennial grasses occur mainly under the protection of sagebrush crowns. Nested frequency values have improved since 1985. The more common species are Sandberg bluegrass, galleta, and bottlebrush squirreltail. Cheatgrass appears as the most abundant herbaceous species, providing 36% of the herbaceous understory cover and 13% of the total vegetative cover. Only five forbs were sampled in 1985. Ten forbs were sampled during the 1991 and 1998 reading. Some of the more abundant forbs includes: long leaf phlox, low fleabane, and an astragalus species.

1985 APPARENT TREND ASSESSMENT

All of the soil trend parameters indicate a stable condition. Vegetative trend may be slowly declining as the populations of various undesirable plants, including pinyon pine and cheatgrass seem to be on the increase.

1991 TREND ASSESSMENT

The soil trend appears slightly down due to litter cover decreasing by 18% and bare ground increasing by over 50%. The key browse species, Wyoming big sagebrush, shows only a slight increase in population (3%), a decreased reproductive potential, increased decadence, and plants with poor vigor have increased to 39%. These factors all indicate a slightly downward trend. The trend for grasses and forbs are up due to increased nested frequency values, but it is still in very poor condition, especially for the forbs.

TREND ASSESSMENT
soil - slightly down
browse - slightly down
herbaceous understory - upward, but still poor condition

1998 TREND ASSESSMENT

The soil trend is slightly downward with a slight increase in percent bare ground, rock, and pavement cover. Due to a recent rainstorm in 1998, cryptogams were more easily identified and common, including mosses, lichens, and mushrooms. The browse trend is considered stable. The Wyoming big sagebrush population still exhibits relatively high percent decadency, but appears to be recovering from poor conditions reported in 1991. Although the broom snakeweed density has greatly increased, these are small plants and provide very little cover to the site. Broom snakeweed density can fluctuate highly and this population will likely show great increases and decreases in the future. The herbaceous understory trend is stable. The perennial herbaceous understory sum of nested frequency has changed very little since 1991.

TREND ASSESSMENT
soil - slightly downward
browse - stable, Wyoming big sagebrush percent decadence is still high
herbaceous understory - stable, but still poor condition

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 12

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Aristida purpurea	13	17	19	6	9	8	.66
G	Bromus tectorum (a)	-	-	308	-	-	95	4.59
G	Hilaria jamesii	56	61	65	26	23	28	1.18
G	Oryzopsis hymenoides	-	4	5	-	2	3	.19
G	Poa secunda	a68	b116	b137	29	52	57	3.09
G	Sitanion hystrix	a41	b75	ab68	19	35	35	1.93
G	Stipa comata	a11	b29	a14	6	11	6	.16
Total for Annual Grasses		0	0	308	0	0	95	4.59
Total for Perennial Grasses		189	302	308	86	132	137	7.22
Total for Grasses		189	302	616	86	132	232	11.81
F	Agoseris glauca	3	-	-	1	-	-	-
F	Agoseris spp.	-	7	-	-	3	-	-
F	Arabis demissa	2	-	2	1	-	1	.00
F	Astragalus spp.	-	4	7	-	2	2	.06
F	Castilleja chromosa	-	-	3	-	-	2	.03
F	Calochortus nuttallii	1	5	1	1	2	1	.00
F	Crepis spp.	-	4	-	-	1	-	-
F	Delphinium nuttallianum	-	5	-	-	3	-	-
F	Erigeron pumilus	3	5	10	1	2	4	.59

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Lomatium spp.	-	1	2	-	1	2	.01
F	Lupinus argenteus	-	-	1	-	-	1	.00
F	Microsteris gracilis (a)	-	-	1	-	-	1	.00
F	Navarretia intertexta (a)	-	-	12	-	-	5	.05
F	Phlox longifolia	$_{a}$-	$_{b}$31	$_{b}$23	-	16	12	.11
F	Sphaeralcea coccinea	-	-	-	-	-	-	.00
F	Zigadenus paniculatus	3	-	-	1	-	-	-
Total for Annual Forbs		0	0	13	0	0	6	0.05
Total for Perennial Forbs		12	62	49	5	30	25	0.83
Total for Forbs		12	62	62	5	30	31	0.89

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 12

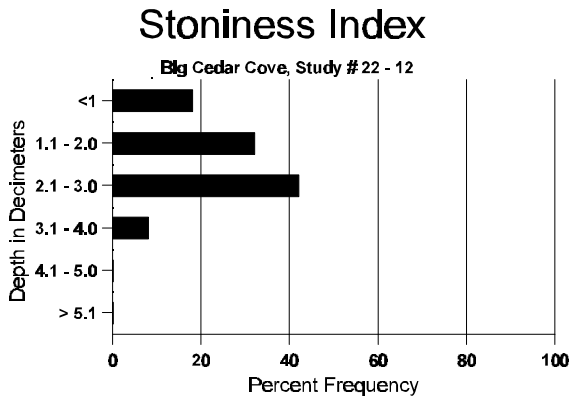
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	1	-
B	Artemisia tridentata wyomingensis	87	16.49
B	Chrysothamnus viscidiflorus stenophyllus	36	1.00
B	Ephedra fasciculata fasciculata	7	.74
B	Gutierrezia sarothrae	61	3.37
B	Juniperus osteosperma	1	-
B	Leptodactylon pungens	1	-
B	Opuntia spp.	7	-
B	Pinus edulis	3	.58
B	Ribes cereum cereum	1	-
Total for Browse		205	22.21

BASIC COVER --
Herd unit 22 , Study no: 12

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	346	3.00	6.00	31.45
Rock	158	2.00	3.25	5.42
Pavement	352	37.50	35.75	43.72
Litter	386	51.25	42.25	36.46
Cryptogams	142	0	0	1.37
Bare Ground	298	6.25	12.75	13.13

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 12, Study Name: Big Cedar Cove

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
18.8	45.4 (16.7)	6.7	62.7	20.7	16.6	1.8	7.5	96.0	.6



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 12

Type	Quadrat Frequency '98
Rabbit	28
Deer	21
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Artemisia tridentata wyomingensis																		
S	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
Y	85	9	4	-	-	-	-	-	-	-	13	-	-	-	866			13
	91	3	5	-	2	-	-	-	-	-	10	-	-	-	666			10
	98	1	-	-	1	-	-	-	-	-	1	1	-	-	40			2
M	85	5	18	3	-	-	-	-	-	-	26	-	-	-	1733	21	26	26
	91	1	10	1	3	4	-	-	-	-	19	-	-	-	1266	17	20	19
	98	71	36	-	-	-	-	-	-	-	105	-	1	-	2140	22	34	107
D	85	1	16	4	-	-	-	-	-	-	21	-	-	-	1400			21
	91	1	13	5	2	8	3	1	-	-	9	-	-	24	2200			33
	98	44	17	3	1	-	-	-	-	-	45	2	1	17	1300			65
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	600			30

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	63%	12%	00%	+ 3%
'91	65%	15%	39%	-16%
'98	30%	02%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	3999	Dec:	35%
	'91	4132		53%
	'98	3480		37%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
Y	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	13	2	-	-	-	-	-	-	-	14	1	-	-	1000	8	10	15
	91	5	3	-	1	-	-	-	-	-	5	1	3	-	600	9	11	9
	98	38	-	-	2	-	-	-	-	-	35	-	-	-	800	12	19	40
D	85	2	8	-	-	-	-	-	-	-	6	-	4	-	666			10
	91	5	2	1	3	-	-	1	-	-	4	-	-	8	800			12
	98	5	-	-	-	-	-	-	-	-	2	-	-	3	100			5
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	37%	00%	15%	-19%
'91	23%	05%	50%	-39%
'98	00%	00%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	1799	Dec:		37%
'91	1466			55%
'98	900			11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra fasciculata fasciculata																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	4	-	-	-	-	-	-	-	4	-	-	-	266			4
	98	4	4	-	-	-	-	-	-	-	8	-	-	-	160			8
M	85	-	3	-	-	-	-	-	-	-	3	-	-	-	200	15	11	3
	91	-	4	-	-	-	-	-	-	-	4	-	-	-	266	15	14	4
	98	1	2	4	-	-	-	-	-	-	4	-	3	-	140	20	27	7
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	1	-	-	-	-	-	-	-	-	-	1	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	100%	00%	00%	+50%
'91	100%	00%	00%	-40%
'98	44%	25%	25%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	266	Dec:		0%
'91	532			0%
'98	320			6%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	100	-	-	-	-	-	-	-	-	100	-	-	-	2000			100
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	3	-	-	-	-	-	-	-	-	1	-	2	-	200	9	7	3
	98	400	-	-	-	-	-	-	-	-	400	-	-	-	8000	8	9	400
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	1	-	-	-	-	-	-	-	-	3	200			3
	98	4	-	-	-	-	-	-	-	-	2	-	-	2	80			4
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	63%	+95%
'98	00%	00%	.39%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	0%
	'91	533		38%
	'98	10080		1%

Juniperus osteosperma

Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Leptodactylon pungens

Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	9	5	1
	91	-	-	-	3	-	-	-	-	-	3	-	-	-	200	7	5	3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	10	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+67%
'91	00%	00%	00%	-90%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	200		-
	'98	20		-

Opuntia spp.

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	1	-	-	-	-	-	7	-	-	-	140	6	10	7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	140		-

Pinus edulis

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	69	71	1
	91	-	-	-	1	-	-	-	-	-	1	-	-	-	66	116	75	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	- 9%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	60		-

Ribes cereum cereum

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	-	-	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	120		-

Trend Study 22-13-98

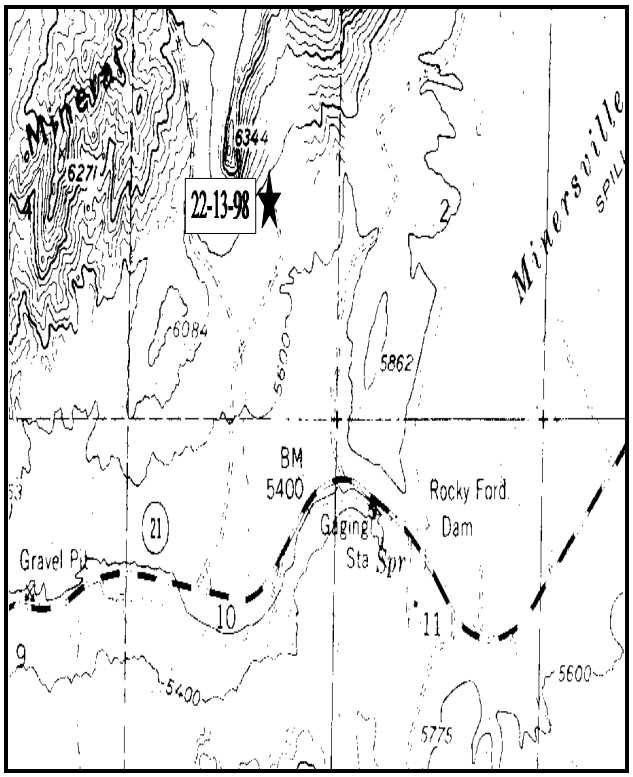
Study site name: Minersville Reservoir . Range type: Big Sagebrush-Grass .

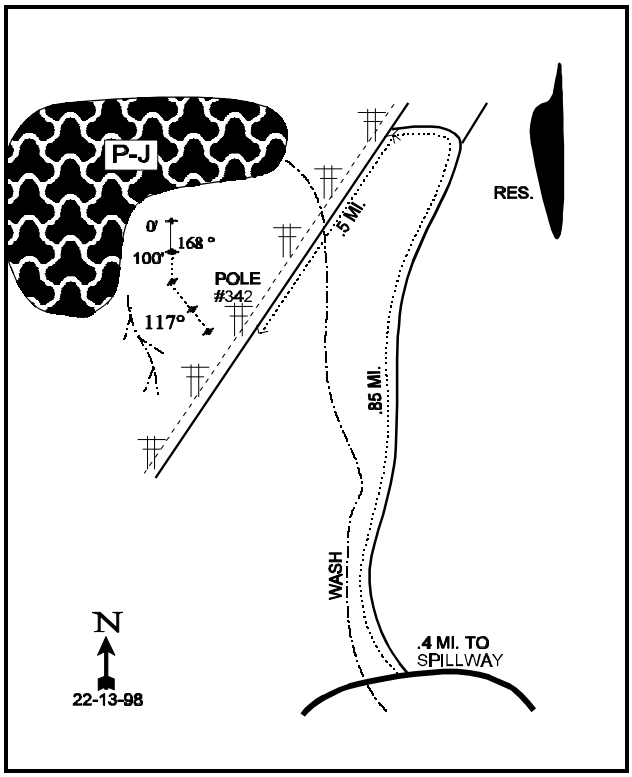
Compass bearing: frequency lines 1-2 168 degrees, lines 3-4 117 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Beaver go west on SR21 to Minersville Reservoir. From the Minersville Reservoir sign south of the reservoir, drive 1.35 miles further west on SR21 to an intersection with a dirt road. Turn right and go 0.85 miles. Take a left onto the road that takes you under the powerlines. Go 0.5 miles down across a wash and up a small hill to powerpole #342. From the pole walk 400 feet west to the 400-foot stake. The 0-foot baseline stake is marked by browse tag #7185. The 0', 100' and 200' stakes are rebar; the 300' and 400' stakes are green, half-high fenceposts.





Map Name: Minersville, Utah

Diagrammatic Sketch

Township 30S , Range 9W , Section 3

UTM 4232574.037 N, 338473.366 E

DISCUSSION

Trend Study No. 22-13 (56C-2)

The Minersville Reservoir trend study was set up to monitor trend on a small area of critical deer winter range located about 3/4 of a mile west of Minersville Reservoir. It is an open sagebrush flat with scattered Utah juniper. The transect has a south-southeast aspect with a gentle slope of 6-8% and an elevation of 5,700 feet.

Use by both livestock and mule deer was reported to be moderate in 1985. In 1991, 17 deer days use/acre was determined with little sign of livestock being observed. In both years abundant coyote sign was observed. A pellet group transect read in 1998 on the site, estimated 62 deer days use/acre and 3 cow days use/acre. Thermal and escape cover are provided by dense junipers on the hillside north of the study site. Most of the grasses on the site are warm season grasses, which can escape early season use.

Soil textural analysis indicates a sandy clay loam with a slightly acidic pH (6.3). A caliche layer occurs at a depth of about 10-12 inches. Average effective rooting depth (see methods) is 11 inches with an average soil temperature of 65.6°F at 10 inches. Although some signs of erosion are apparent, erosion does not appear to be accelerated. There are some active gullies near the site, some moderately large. The main factor limiting vegetative growth is the low amount of annual precipitation (10 to 12 inches) caused by the rain shadow effect of mountain ranges to the east and west.

Wyoming big sagebrush, the key species, shows a steady increase in percent decadence since 1985 to where it is currently at 51%. The mature plants currently average 2 feet in height, most are vigorous and only lightly browsed. In 1985, no seedlings were found and only 2% of the population were classified as young. During the 1991 reading, seedlings (biotic potential) accounted for 12% of the population, however no young were found. In 1998, 1% of the population were classified as seedlings and 5% of the population were classified as young. Eighty-five percent of the losses to the sagebrush community can be explained by the number of dead in the population. Other woody species are rare on the site and include pricklypear cactus, rabbitbrush, and young Utah junipers.

The understory consists almost exclusively of grasses. Cheatgrass is the dominate grass and provides enough fine fuels to carry a very destructive fire which would wipe out the Wyoming big sagebrush population. Cheatgrass currently accounts for 68% of the herbaceous understory cover and 48% of the total vegetation cover. Nested frequency declined significantly for galleta grass in 1991, while nested frequency significantly increased for blue grama and bottlebrush squirreltail. Nested frequencies for these species in 1998 are similar to those of 1991, although perennial grass sum of nested frequency has declined from 272 in 1991 to 208 in 1998. The forbs and some perennial grasses have possibly been depleted by severe overgrazing in the past.

1985 APPARENT TREND ASSESSMENT

The vegetative trend appears to be declining. There is very little regeneration of the sagebrush and junipers appear to be slowly invading the site. This area is generally not considered suitable for treatment and seeding because of the rocky soil surface and low precipitation. The soil trend is stable.

1991 TREND ASSESSMENT

The soil trend appears to be declining slightly with a 75% decrease in vegetative basal cover and a 38% increase in bare ground. The trend for the key browse species, Wyoming big sagebrush, appears to be stable even with the 8% increase in it's population due to further increases in decadency and 23% of the population now considered to have poor vigor. Even though the reproductive potential increased due to the number of seedlings counted in 1991, no young sagebrush were encountered and it is not known how many of the seedlings will survive. Grass and forb trend is improving due to increased nested frequencies, but it still is considered in very poor condition.

TREND ASSESSMENT
soil - declining
browse - stable
herbaceous understory - improving

1998 TREND ASSESSMENT

The soil trend is down with little current erosion evident, however percent bare ground has increased while percent rock and pavement have decreased. The browse trend is down. Wyoming big sagebrush percent decadency is steadily increasing each year and 27% of the population is now dead. The herbaceous understory trend is slightly downward. Cheatgrass is the dominate grass and constitutes a great fire hazard which could ultimately cause the loss of the Wyoming big sagebrush to the site. The perennial herbaceous trend is slightly down. Perennial herbaceous understory sum of nested frequency has declined from 272 in 1991 to 208 in 1998.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - slightly downward, cheatgrass dominates and poses a fire threat

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 13

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Aristida purpurea	56	59	33	27	23	14	1.61
G	Bouteloua gracilis	$_{a}$-	$_{b}$16	$_{b}$19	-	7	8	.29
G	Bromus tectorum (a)	-	-	356	-	-	99	15.16
G	Hilaria jamesii	$_{b}$138	$_{a}$90	$_{a}$72	62	46	35	2.92
G	Oryzopsis hymenoides	-	2	11	-	1	4	.32
G	Sitanion hystrix	$_{a}$34	$_{b}$76	$_{b}$65	16	39	33	1.95
Total for Annual Grasses		0	0	356	0	0	99	15.16
Total for Perennial Grasses		228	243	200	105	116	94	7.10
Total for Grasses		228	243	556	105	116	193	22.27
F	Alyssum alyssoides (a)	-	-	1	-	-	1	.00
F	Calochortus nuttallii	1	5	6	1	4	2	.01
F	Phlox longifolia	$_{a}$3	$_{b}$23	$_{a}$2	1	16	2	.01
F	Sphaeralcea coccinea	-	1	-	-	1	-	-
F	Unknown forb-perennial	3	-	-	1	-	-	-
Total for Annual Forbs		0	0	1	0	0	1	0.00
Total for Perennial Forbs		7	29	8	3	21	4	0.01
Total for Forbs		7	29	9	3	21	5	0.02

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 13

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	81	8.84
B	Ephedra viridis	-	.00
B	Chrysothamnus viscidiflorus stenophyllus	2	-
B	Echinocereus engelmanii	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	1	.06
B	Opuntia spp.	2	.03
B	Pinus edulis	-	.38
Total for Browse		86	9.31

CANOPY COVER --
Herd unit 22 , Study no: 13

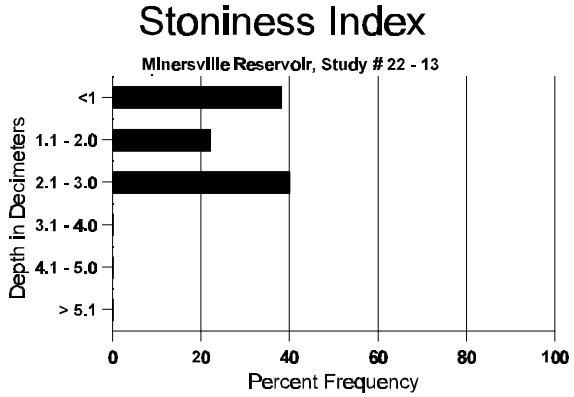
Species	Percent Cover '98
Juniperus osteosperma	.80

BASIC COVER --
Herd unit 22 , Study no: 13

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	367	8.00	1.75	30.53
Rock	180	7.00	12.00	11.05
Pavement	303	45.50	31.25	25.52
Litter	389	31.75	41.75	34.77
Cryptogams	5	0	0	.01
Bare Ground	279	7.75	13.25	18.45

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 13, Study Name: Minersville Reservoir

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.3	65.6 (10.1)	6.3	54.0	21.4	24.6	1.0	7.1	121.6	.5



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 13

Type	Quadrat Frequency '98
Rabbit	13
Deer	36
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 13

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	2	-	-	4	-	-	2	-	-	3	5	-	-	533			8
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	6	-	-	1	-	-	-	-	-	7	-	-	-	140			7
M	85	30	1	-	-	-	-	-	-	-	31	-	-	-	2066	26	26	31
	91	21	7	1	4	-	-	-	-	-	30	2	1	-	2200	24	25	33
	98	46	15	-	-	-	-	-	-	-	61	-	-	-	1220	24	31	61
D	85	15	7	1	-	-	-	-	-	-	23	-	-	-	1533			23
	91	20	2	1	4	-	-	-	-	-	10	4	4	9	1800			27
	98	61	9	-	-	-	-	-	-	-	50	-	-	20	1420			71
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1040			52

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	15%	02%	00%	+ 8%
'91	15%	03%	23%	-31%
'98	17%	00%	14%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	3665	Dec:	42%
	'91	4000		45%
	'98	2780		51%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	1	-	1	-	-	-	-	-	-	2	-	-	-	133	8	7	2
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	13	19	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	50%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:	-
'91	133		-
'98	40		-

Echinocereus engelmanii																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	7	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	0		-

Gutierrezia sarothrae																		
D	85	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	133	Dec:	100%
'91	0		0%
'98	0		0%

Juniperus osteosperma																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	-	-	1	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	100%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	66	Dec:	-
'91	66		-
'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	11	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	40		-

Trend Study 22-14-98

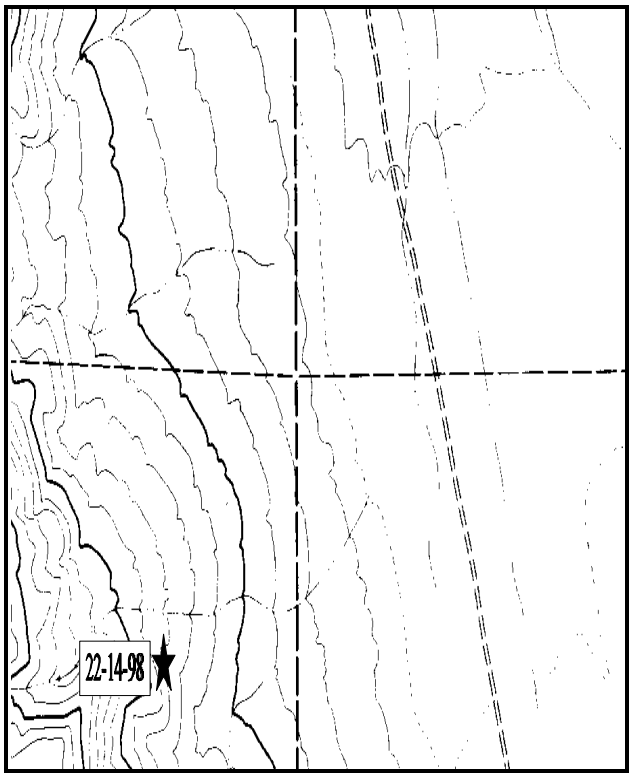
Study site name: Antelope Mountain . Range type: Big Sagebrush-Grass .

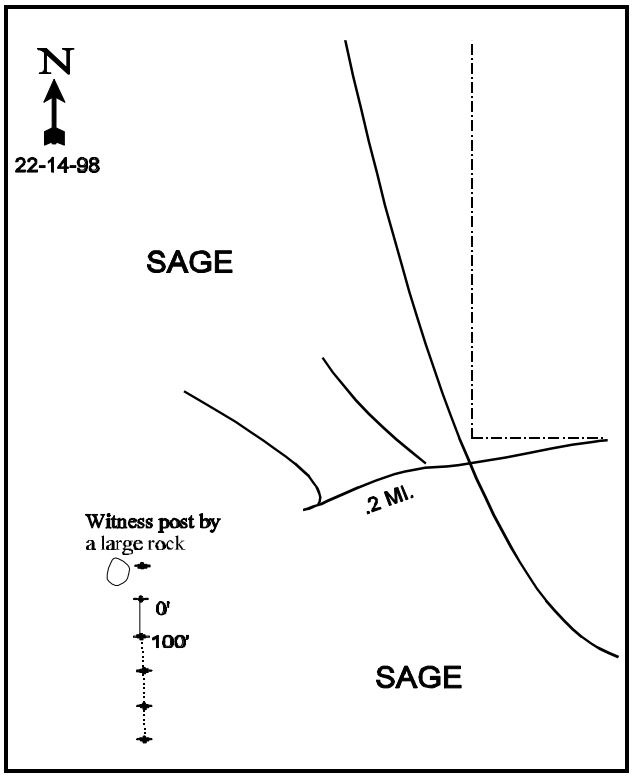
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Cove Fort exit on I-15 (a few miles north of the Junction with I-70), proceed 12.3 miles west on a gravel road staying right at one major fork. Turn left at the intersection and continue for 2.4 miles to the southwest corner of a fence. Turn right and go 0.6 miles up this faint road. This road no longer exists. Take a bearing of 233 degrees magnetic from the old fence corner to the site. Then walk or dive off road to a witness post near a large rock. The 0-foot frequency baseline stake is 20 feet east of this rock. The baseline is marked by steel rebar posts.





Map Name: Pinnacle Pass, Utah Diagrammatic Sketch

Township 25S , Range 9W , Section 25 UTM 4275149.643 N, 342435.804 E

DISCUSSION

Trend Study No. 22-14 (56C-3)

The Antelope Mountain study is located on the northeast end of the Mineral Mountains. The transect is on an alluvial fan with a 20-25% east-facing slope at an elevation of 5,700 feet. When the study was established in 1985, the range type was big sagebrush-grass. A fire burned the entire area in 1996 and the site was then seeded and chained. There is currently a good establishment of seeded grass and forbs and some native, residual grasses.

Little sign of recent livestock use was visible on the hillside and winter deer use appeared light in 1991 with deer days use/acre estimated at 14. Two antler drops from mature bucks were found on the site, but use appears to be more concentrated a few hundred yards up slope within the head of a large draw. In 1998, a pellet group transect on the site estimated 13 deer days use/acre and 6 cow days use/acre. Overall, grass utilization was light although some intermediate wheatgrass did exhibit heavy use. Alfalfa was heavily utilized by grasshoppers which were extremely abundant in 1998. Small burnet was lightly utilized as well.

Soil textural analysis indicates a loam clay loam with a neutral pH (7.1). The soil depth is moderate and pale brown in color. The effective rooting depth (see methods) is 13 inches with an average soil temperature of 41°F measured at a depth of 13 inches. Vegetative growth may be limited due to a low amount of phosphorous (6.0 ppm) in the soil, where 10 ppm is considered minimal for normal plant development. This soil type is excessively drained and is further limited by a low water-holding capacity. Permeability is rapid and the hazard of erosion is moderate. After the fire, percent bare ground cover increased to 19% and percent cover from rock and pavement combined increased to 61%.

Prior to the fire in 1996, mountain big sagebrush was the dominant plant with the majority being lightly to moderately hedged and fairly vigorous mature plants. Thirty-five percent of the population was classified as decadent in 1985, while only 6% were categorized as young plants. In 1991, the population dropped 21% with young plants accounting for only 4% of the population and the number of decadent plants increased to 59%. After the fire, no mountain big sagebrush plants were sampled. Broom snakeweed is the most abundant browse on the site with an estimated density of 1,000 plants/acre in 1998, while contributing less than 2% cover. Broom snakeweed exhibited abundant seed heads in 1998, with no seedlings and few young plants encountered. A few cliffrose were found around the site in previous years, but these were no longer there in 1998. A few tipped over juniper skeletons are still present on the site, but it appears most trees were totally burnt.

After the fire and seeding, the dominant species on the site are crested wheatgrass, intermediate wheatgrass, bluebunch wheatgrass, and galleta. In 1991, there was a significant increase in the quadrat and nested frequency values for bluebunch wheatgrass. Sandberg bluegrass also showed a moderate increase. Forbs continue to be are quite sparse, but the ones encountered most frequently in 1998 were alfalfa, pale alyssum, Utah locoweed, and storksbill.

1985 APPARENT TREND ASSESSMENT

The range condition and trend appears to be very similar to the situation on site 56C-2/22-13. Sagebrush reproduction is limited although the plants are generally vigorous. Seedling establishment may be limited by the rocky and dry soil conditions. The soil trend is stable.

1991 TREND ASSESSMENT

The soil trend appears to be stable due to the protective covering of erosion pavement and rock. Litter cover has increased slightly since the last reading and bare ground dropped by 56%. The trend for mountain big

sagebrush is down due to decreased nested frequency values, lower population density, a 41% increase in decadent plants, an increase in plants that are heavily browsed (37%, up from 5%), an increase in the number of plants that are in poor vigor (29%, up from 10%), and a decreased reproductive potential. Trend for grasses and forbs is up.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - up

1998 TREND ASSESSMENT

The soil trend is downward with an increase in percent bare ground, rock, and pavement cover due to the wildfire in 1996. Erosion appears moderate at this time and is mostly due to the steepness of the slope and the rocky soil surface. The key browse species, Wyoming big sagebrush, was wiped out by the fire. Broom snakeweed is currently the most abundant shrub on the site. The browse trend is downward. The herbaceous understory trend is stable. Although perennial herbaceous understory sum of nested frequency is lower in 1998 then in 1991, considering there was a fire, the herbaceous understory appears to have established well. Cheatgrass abundance is low and the perennial species should be able to keep it that way.

TREND ASSESSMENT
soil - downward
browse - downward, loss of the mountain big sagebrush and surrounding bitterbrush populations to fire
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 14

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
G	Agropyron cristatum	a-	a-	b158	-	-	61	6.78
G	Agropyron intermedium	a-	a-	b94	-	-	39	3.18
G	Agropyron spicatum	a11	c103	b58	6	42	26	3.55
G	Aristida purpurea	-	-	2	-	-	2	.01
G	Bromus tectorum (a)	-	-	47	-	-	17	.37
G	Hilaria jamesii	b134	b105	a53	48	44	22	2.12
G	Oryzopsis hymenoides	-	1	-	-	1	-	-
G	Poa secunda	b161	c211	a9	71	82	6	.03
Total for Annual Grasses		0	0	47	0	0	17	0.37
Total for Perennial Grasses		306	420	374	125	169	156	15.69
Total for Grasses		306	420	421	125	169	173	16.07
F	Alyssum alyssoides (a)	-	-	37	-	-	16	.08
F	Astragalus utahensis	a-	b35	b26	-	15	10	1.00
F	Comandra pallida	b26	b39	a-	10	17	-	-
F	Draba spp. (a)	-	-	1	-	-	1	.00

Type	Species	Nested Frequency '85	'91	'98	Quadrat Frequency '85	'91	'98	Average Cover % '98
F	Erodium cicutarium (a)	-	-	23	-	-	8	.95
F	Erigeron pumilus	$_{ab}$4	$_{b}$20	$_{a}$-	3	12	-	-
F	Leucelene ericoides	-	-	1	-	-	1	.00
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{b}$46	-	-	25	4.86
F	Phlox longifolia	$_{a}$-	$_{a}$19	$_{ab}$3	-	10	1	.03
F	Sanguisorba minor	-	-	5	-	-	3	.10
F	Sphaeralcea coccinea	$_{a}$-	$_{a}$-	$_{b}$5	-	-	4	.18
F	Zigadenus paniculatus	$_{c}$19	$_{b}$8	$_{a}$-	12	5	-	-
Total for Annual Forbs		0	0	61	0	0	25	1.03
Total for Perennial Forbs		49	121	86	25	59	44	6.20
Total for Forbs		49	121	147	25	59	69	7.23

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 22 , Study no: 14

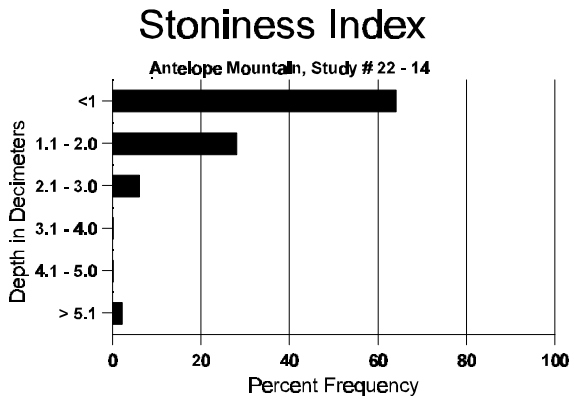
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	0	-
B	Chrysothamnus nauseosus	1	-
B	Chrysothamnus nauseosus albicaulis	0	-
B	Chrysothamnus viscidiflorus stenophyllus	0	-
B	Ephedra nevadensis	0	-
B	Ephedra viridis	1	-
B	Gutierrezia sarothrae	27	1.62
B	Juniperus osteosperma	0	-
B	Opuntia spp.	1	-
B	Tetradymia canescens	1	-
Total for Browse		31	1.62

BASIC COVER --
Herd unit 22 , Study no: 14

Cover Type	Nested Frequency '98	Average Cover % '85	'91	'98
Vegetation	306	6.25	5.00	25.04
Rock	317	25.50	31.75	21.07
Pavement	366	27.50	22.75	39.57
Litter	391	32.25	36.25	39.48
Cryptogams	60	0	0	.66
Bare Ground	323	8.50	4.25	19.08

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 14, Study Name: Antelope Mountain

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.9	41.0 (13.0)	7.1	36.0	37.4	26.6	2.2	6.0	201.6	.6



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 14

Type	Quadrat Frequency '98
Rabbit	4
Deer	16
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 14

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	85	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	91	1	-	1	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	16	17	3	-	-	-	-	-	-	36	-	-	-	2400	18	18	36
	91	-	10	5	-	1	2	-	-	-	17	1	-	-	1200	20	26	18
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	85	17	5	-	-	-	-	-	-	-	16	-	5	1	1466			22
	91	2	14	9	1	2	1	-	-	-	13	2	-	14	1933			29
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	35%	05%	10%	-21%
'91	55%	37%	29%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	4132	Dec:	35%
	'91	3266		59%
	'98	0		0%

Chrysothamnus nauseosus																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	17	26	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	20		-

Chrysothamnus nauseosus albicaulis																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	27	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	-
	'91	0		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
S	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	18	-	-	-	-	-	-	-	-	18	-	-	-	1200			18
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	41	3	-	-	-	-	-	-	-	43	1	-	-	2933	6	5	44
	91	2	-	-	-	-	-	-	-	-	1	-	-	1	133	10	10	2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	85	8	2	-	-	-	-	-	-	-	6	-	3	1	666			10
	91	2	-	-	-	-	-	-	-	-	-	-	-	2	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	07%	00%	06%	-94%
'91	00%	00%	75%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'85	4799	Dec:		14%
'91	266			50%
'98	0			0%

Ephedra nevadensis																		
M	85	-	1	-	-	-	-	-	-	-	1	-	-	-	66	16	12	1
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66	17	25	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	100%	00%	00%	+ 0%
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	66	Dec:	-
'91	66		-
'98	0		-

Ephedra viridis																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	18	14	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'85	0	Dec:	-
'91	0		-
'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	24	-	-	-	-	-	-	-	-	23	1	-	-	1600			24
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	52	-	-	-	-	-	-	-	-	51	-	1	-	3466	7	11	52
	98	45	-	-	-	-	-	-	-	-	45	-	-	-	900	10	17	45
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	10	-	-	-	-	-	-	-	-	6	-	-	4	666			10
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	
'91	00%	00%	06%	-83%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	0	Dec:	0%
	'91	5732		12%
	'98	1000		2%

Juniperus osteosperma																		
Y	85	1	1	-	-	-	-	-	-	-	2	-	-	-	133			2
	91	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	50%	00%	00%	-50%
'91	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	133	Dec:	-
	'91	66		-
	'98	0		-

Opuntia spp.																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	5	9	1
	91	1	-	-	-	-	-	-	-	-	-	-	1	-	66	6	10	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	8	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'85	00%	00%	00%	+ 0%
'91	00%	00%	100%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'85	66	Dec:	-
	'91	66		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	9	12	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'85	00%	00%	00%
'91	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'85	0	Dec:	-
'91	0		-
'98	20		-

Trend Study 22-15-98

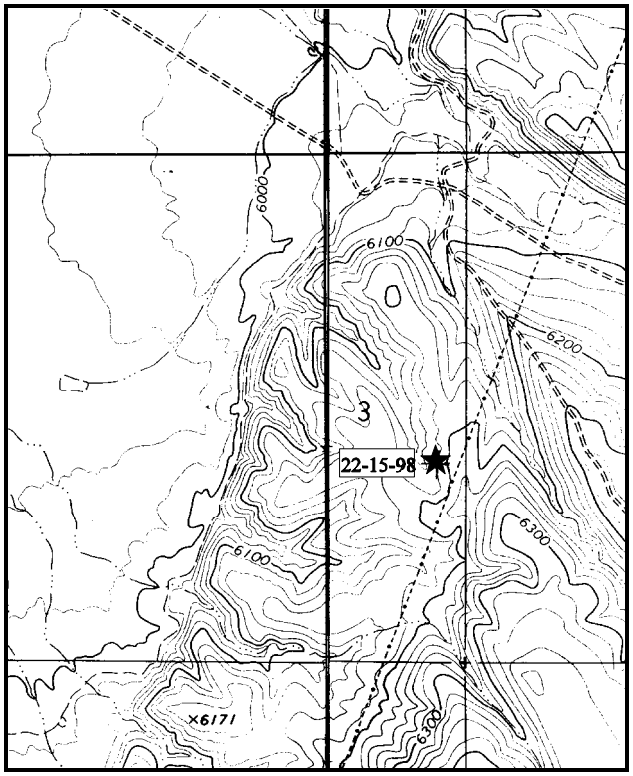
Study site name: Fremont Wash . Range type: Wyoming Big Sage/Grass

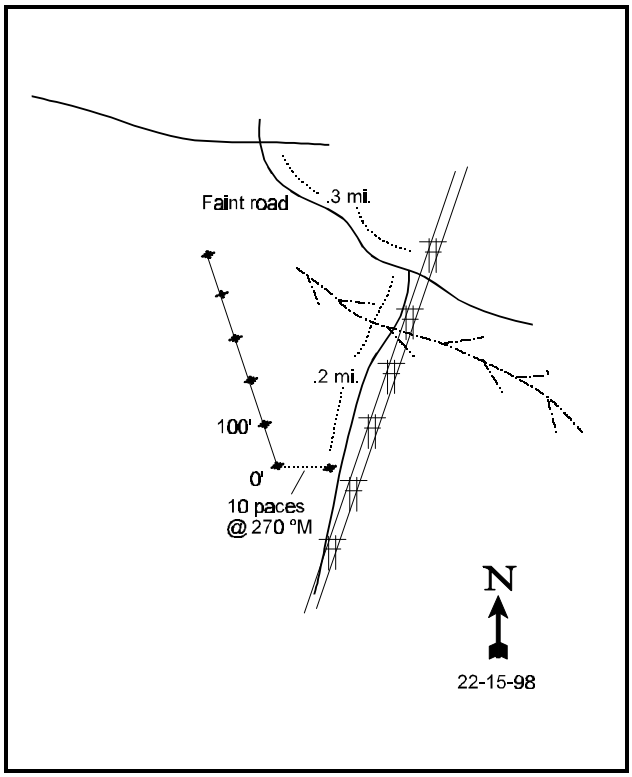
Compass bearing: frequency baseline 328 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From I-15 take exit 109 and go past the Texaco station and turn right (south) onto campground road. Go 1.2 miles to where the pavement ends and a road takes off at an angle to the southeast. Take this road and go 1.4 miles to a cattleguard. Go straight another 0.5 miles to an intersection . Turn right onto a faint road down a draw for 0.3 miles. At this point there is another faint road on the right along the powerlines. Go down this road for 0.2 miles to a witness post on the right. From the witness post the 0-foot stake is 10 paces away at 270°M. The 0-foot stake is marked with browse tag #474.





Map name: Kane Canyon

Diagrammatic sketch

Township 31S , Range 7W , Section 3

UTM 4231954.946 N, 358161.973 E

DISCUSSION

Trend Study No. 22-15

The Fremont Wash trend study is located on BLM administered land south of Beaver and was established in August 1998. The area is deer winter range with a westerly aspect and a slope of 8%. Elevation is 6,200 feet. The nearest perennial water source may be the Beaver River, for there were no stock ponds or water troughs visible in the immediate area. Range type is sagebrush-grass with scattered junipers surrounding the site. Limited escape and thermal cover is located in juniper covered draws to the east and west. A pellet group transect on the site estimated 68 deer days use/acre, 1 elk day use/acre, and 41 cow days use/acre in 1998. The pellet groups encountered varied in age from a few months old to possibly approaching a year. An old (~6 years) deer antler shed was found on the site in 1998.

The moderate slope and low percent bare ground cover (8%) combine to keep erosion to a minimum. The deep draws to the east and west show extensive signs of decades of erosion. The rock and pavement cover appear to be basaltic and granitic in origin. Rocks and pavement are abundant on the soil surface and throughout the soil profile. The average effective rooting depth (see methods) is 10 inches with an average soil temperature of 67°F at 11 inches. The stoniness index indicates that many rocks and pavement are located within the upper 8 inches of the soil profile. Soil textural analysis indicates a sandy clay loam with a neutral pH (7.0). Phosphorous levels in the soil profile measure 7.1 ppm and may be limiting to vegetative growth (10 ppm is minimal for normal plant development).

The browse consists mainly of a mature Wyoming big sagebrush stand. The plants average 21 inches in height and most exhibit good vigor. Percent decadency is moderately high at 32%. Biotic potential (seedlings) may not be adequate to replace this population as it appears to be thinning, likely due to past drought conditions. There are very few plants with seed heads, and utilization is currently mostly moderate. Other browse species encountered on the site and in low densities include: Utah serviceberry, pricklypear cactus, and broom snakeweed.

The most abundant grass on the site is cheatgrass. Cheatgrass accounts for 54% of the herbaceous cover and 39% of the total vegetative cover. With the exception of cheatgrass, the site supports a good stand of warm season grasses. The most abundant is galleta followed by sand dropseed, red three-awn, blue grama, and needle-and-thread grass. There was no apparent utilization of grasses in 1998. Forbs are scarce with scarlet globemallow being the most abundant.

1998 APPARENT TREND ASSESSMENT

The soil trend appears stable with little erosion currently occurring. The moderate slope and ample vegetation and litter cover provide protection for the soil. The browse trend appears slightly downward. There are many decadent and dead plants found throughout this population. Currently, 20% of the population is dead and 31% of the decadent plants are classified as dying. Competition from the cheatgrass may not allow sagebrush seedlings to establish, thereby dying plants are not being replaced. The herbaceous trend appears stable, although the cheatgrass needs to be controlled to allow the more desirable perennial species to become establish.

HERBACEOUS TRENDS --
Herd unit 22 , Study no: 15

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	88	37	2.01
G	Bouteloua gracilis	61	20	1.86
G	Bromus tectorum (a)	466	100	12.83
G	Hilaria jamesii	116	44	2.55
G	Oryzopsis hymenoides	26	11	.25
G	Sitanion hystrix	13	6	.20
G	Sporobolus cryptandrus	102	46	2.83
G	Stipa comata	55	28	.79
G	Vulpia octoflora (a)	8	2	.01
Total for Annual Grasses		474	102	12.84
Total for Perennial Grasses		461	192	10.51
Total for Grasses		935	294	23.36
F	Astragalus spp.	6	2	.01
F	Lappula occidentalis (a)	1	1	.00
F	Microsteris gracilis (a)	1	1	.00
F	Sphaeralcea coccinea	39	13	.36
Total for Annual Forbs		2	2	0.00
Total for Perennial Forbs		45	15	0.37
Total for Forbs		47	17	0.37

BROWSE TRENDS --
Herd unit 22 , Study no: 15

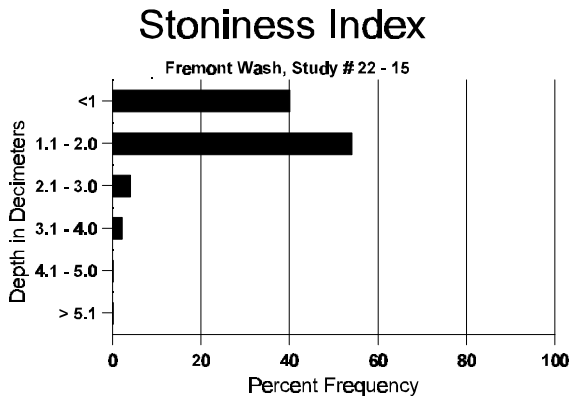
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	1	-
B	Artemisia tridentata wyomingensis	89	9.00
B	Chrysothamnus viscidiflorus viscidiflorus	-	.03
B	Gutierrezia sarothrae	0	-
B	Opuntia spp.	2	-
Total for Browse		92	9.02

BASIC COVER --
Herd unit 22 , Study no: 15

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	473	42.79
Rock	206	4.00
Pavement	415	22.86
Litter	499	50.62
Cryptogams	14	.03
Bare Ground	292	8.14

SOIL ANALYSIS DATA --
Herd Unit 22, Study # 15, Study Name: Fremont Wash

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.2	67.0 (10.7)	7.0	53.4	22.0	24.6	1.8	7.1	134.4	.6



PELLET GROUP FREQUENCY --
Herd unit 22 , Study no: 15

Type	Quadrat Frequency '98
Rabbit	8
Elk	1
Deer	47
Cattle	10

BROWSE CHARACTERISTICS --
Herd unit 22 , Study no: 15

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Artemisia tridentata wyomingensis																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	20	2	3	-	-	-	-	-	-	25	-	-	-	500			25
M	98	28	49	20	-	-	-	-	-	-	97	-	-	-	1940	21	30	97
D	98	6	30	22	-	-	-	-	-	-	39	-	1	18	1160			58
X	98	4	-	-	-	-	-	-	-	-	4	-	-	-	900			45
% Plants Showing '98				Moderate Use 45%			Heavy Use 25%				Poor Vigor 11%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		3600	Dec:		32%
Gutierrezia sarothrae																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	7	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Opuntia spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	4	2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-

SUMMARY

WILDLIFE MANAGEMENT UNIT - 22 (48) - BEAVER

The unit wide soil trend appears to be improving. In 1991, twelve sites showed downward soil trends with only two sites showing stable soil trends. In 1998 many sites show stable or upward trends, with the exception of Big Cedar Cove (22-12), Minersville Reservoir (22-13), and Antelope Mountain (22-14) which showed increases in percent bare ground, rock, and pavement cover.

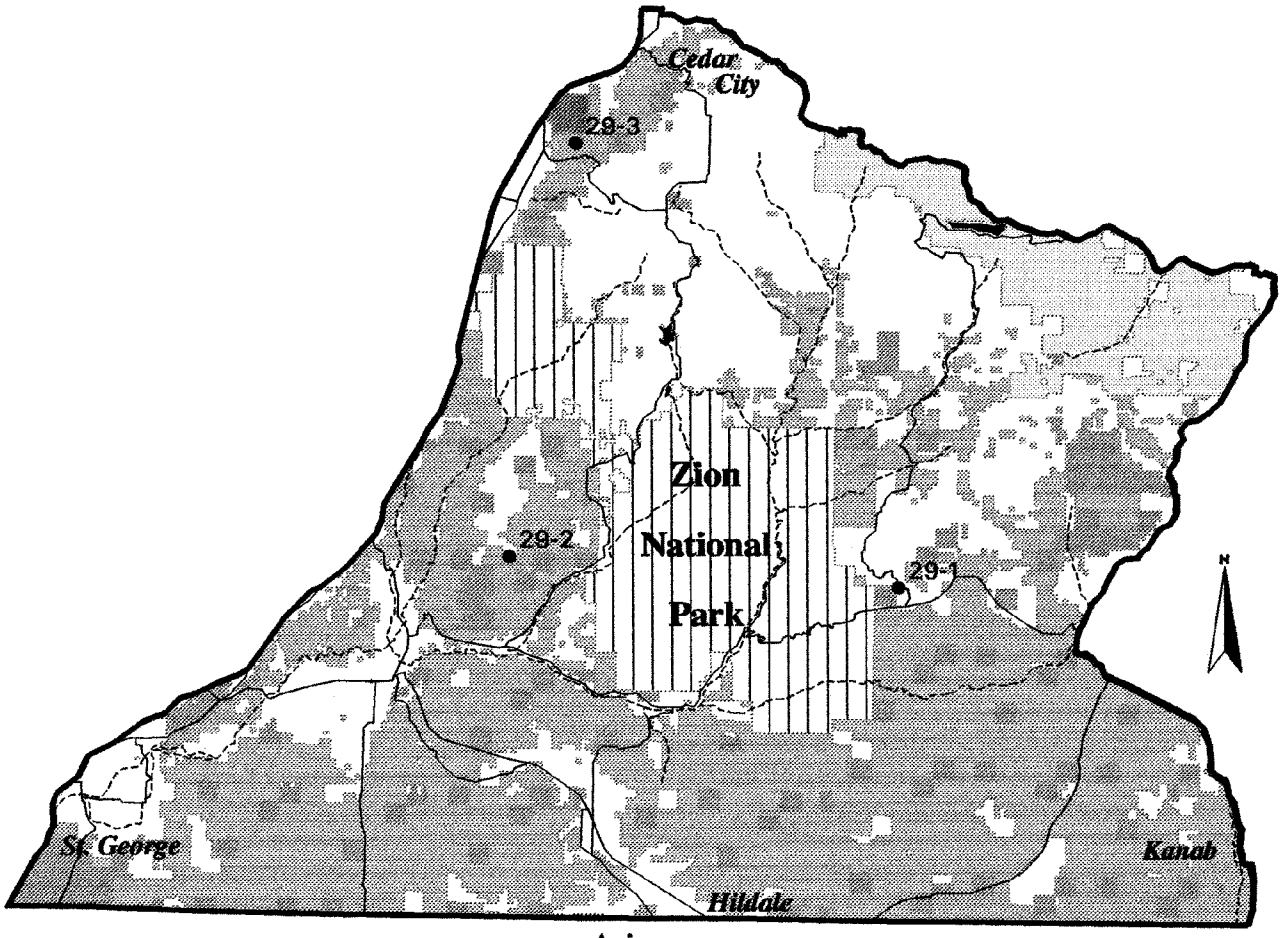
Due to the fire on the Antelope Mountain site (22-14), no browse species are present on the site anymore. Double Up Hollow (22-10), 'B' Hill (22-11), and Big Cedar Cover (22-12) all showed downward browse trends in 1991 and stable browse trends in 1998. Many of the remaining sites show downward or slightly downward trends for browse continued from 1991. These downward browse trends are exclusively due to increased percent decadency or continued high decadency of the key browse species. Oak Basin (22-03) and Rocky Reseeding (22-09) showed upward trends with healthy browse populations and a decrease in percent decadency of preferred browse species.

The herbaceous understory trends are generally improving, with a few exceptions. Deer Flat (22-1), Oak Basin (22-3), and 'B' Hill (22-11) show decreases in perennial herbaceous understory nested frequency since 1992. Minersville Reservoir (22-13) shows a decrease in perennial herbaceous understory nested frequency and a high amount of cheatgrass in the understory. Beaver Table (22-6) does not show a decrease in perennial herbaceous understory species, but photographs indicate an increase in cheatgrass abundance between 1992 ad 1998.

	1991			1998		
Site	Soil	Browse	Grass & Forb	Soil	Browse	Grass & Forb
22-01 Deer Flat	-	+	+	0	0	-
22-02 Piute Reservoir	-	-	-	0	-	+
22-03 Oak Basin	-	-	-	+	+	-
22-04 Wades Canyon	-	-	-	+	-	0
22-05 Bone Hollow	-	-	-	0	-	0
22-06 Beaver Table	-	-	0	+	-	-
22-07 Sheep Rock	-	NONE	+	+	NONE	+
22-08 Muley Point	0	-	-	0	-	-
22-09 Rocky Reseeding	-	0	-	0	+	0
22-10 Doubleup Hollow	-	-	-	0	0	0
22-11 'B' Hill	-	-	+	+	0	-
22-12 Big Cedar Cove	-	-	+	-	0	0
22-13 Minersville Reservoir	-	0	+	-	-	-
22-14 Antelope Mountain	0	-	+	-	NONE	0
22-15 Fremont Wash	ESTABLISHED IN 1998					

(0) = stable, (+) = upward, (-) = downward

Management Unit 29

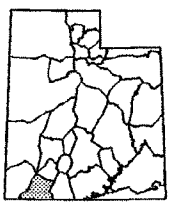


Map Scale 1:570,240 (1" = 9 miles)

Legend

- Forest Service
- BLM
- State of Utah
- Native American Reservation
- Private Land
- National Park
- Water Body
- Transect Location
- Road
- Perennial Stream

Unit Location



UDAF GIS March, 1999

WILDLIFE MANAGEMENT UNIT 29 (51) - 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.

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 on the unit. 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 predominately occurs on BLM land (54%), with an additional 20% in Zion National Park, and 18% private.

Herd Unit Management Objectives

Current population management objectives are to maintain a target modeled winter herd population of 7,000 deer. Population density was estimated at 5,000 in 1996. A total of 1,170 bucks are to be harvested annually. The herd composition is to be managed at 15 bucks/100 does post season, with 30% of those bucks being 3 point or better. The buck-doe ratio for 1996-97 was only 7 bucks/100 does.

Peak harvests were reached in the mid 1960's with over 1,700 bucks harvested in 1965 and 1966. Since then, harvests have shown a downward trend, the lowest harvest was in 1979 when less than 400 bucks were harvested. Harvests quickly rebounded in 1986 and 1989. Between 1990 and 1995, an average of 1,091 bucks were harvested from the unit. Fawn/100 doe ratios have been good and have averaged 72 between 1991-92 and 1995-96.

Study Site Description

Only one key area was selected for study on 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 which is located just east of Zion National Park boundary, north of Highway 9. This site was reread in 1992 and 1998. In 1998, two additional trend study sites were established, one at Smith Mesa and the other at North Hills. Both occur on the west side of the unit.

Trend Study 29-1-98

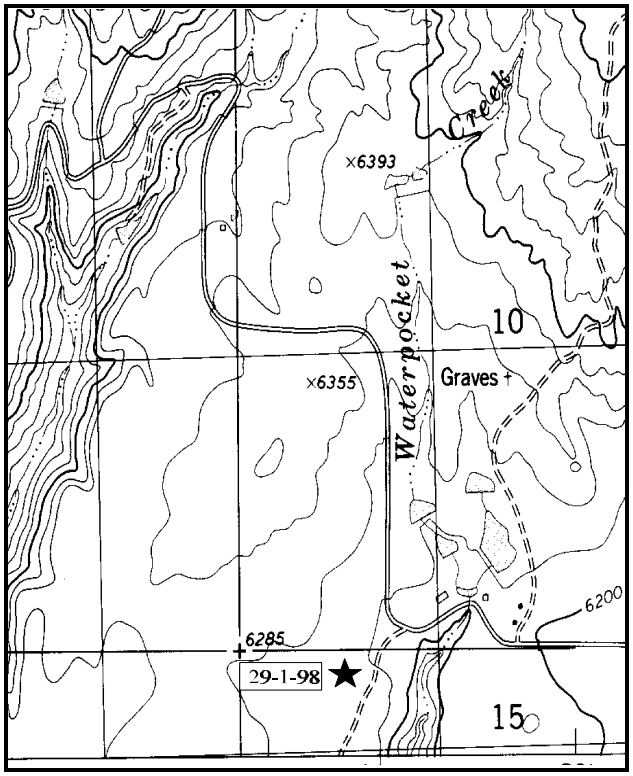
Study site name: Wilson Ranch . Range type: Big Sagebrush .

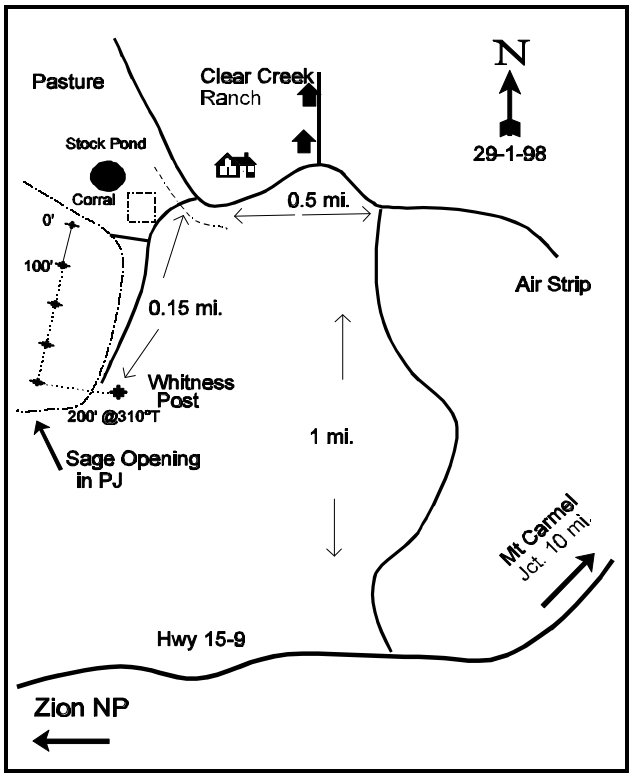
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From Mt. Carmel Junction, travel west on SR-9 for about 10.8 miles to a road going towards the Clear Creek Ranch and Zion Narrows. Go 1.0 mile north on this road to an intersection by the airstrip. Turn left, go past the Clear Creek Ranch houses and barn for 0.5 miles to where the main road curves to the right around the ranch - take a small fork to the left here. Go through a gate and to a corral. Bear left into the P-J at a fork just past the corral, go 0.15 miles and stop by a witness post. Walk northwest about 200 feet into the P-J to a sagebrush opening and the end of the baseline. The 0-foot stake is 400 feet north, and the 2' fencepost is marked by browse tag #7159.





Map Name: Clear Creek Mountain Diagrammatic Sketch

Township 41S , Range 9W , Section 15 UTM 4124150.795 N, 336644.852 E

DISCUSSION

Trend Study No. 29-1

The Wilson Ranch trend study samples an area of deer winter range located on the Kolob Terrace. The land was part of the privately owned Wilson Ranch. Ownership appears to have changed since 1987. During the 1992 reading, the ranch was called the Cedar Creek Ranch, and in 1998 it was called the Clear Creek Ranch. The study samples a small opening of Wyoming big sagebrush surrounded by pinyon-juniper with scattered oak clones. It has a slight northern aspect with a gentle slope of approximately 2% and an elevation of 6,200 feet. Cattle grazing, which occurred during the 1987 reading, appeared to have been discontinued in 1992. However, cattle use was noted again in 1998. Pellet group data from 1998 estimate light cattle use at 11 days use/acre. Deer use appears to be very high with an estimated 111 days use/acre. Most of the deer pellet groups were several months old, but some fresh tracks were found on the site. Pellet groups appeared to be concentrated in the sagebrush clearing, with dramatically less frequent sign outside the sagebrush opening. About 1/4 of a mile to the east are irrigated hay fields, which deer may be using during the summer. Quadrat frequency of deer pellet groups have increased since 1992, indicating a higher level of use.

Soil on the site is relatively shallow with an effective rooting depth (see methods) estimated at 15 inches. At that depth, the soil becomes very compacted and there may be a hardpan, or some kind of other restrictive layer present. Texture is a sandy loam with a neutral pH (6.8). Rock and pavement are not common on the surface or within the soil profile. The red, sandy loam soil is highly erodible. Rills are common across the site, leading to small gullies in the pinyon-juniper north of the baseline. The effects of erosion are minimized by the levelness of the terrain.

The dominant shrub in the opening is Wyoming big sagebrush which had an estimated density of 2,466 plants/acre in 1987. The age structure of the population at that time appeared stable, with 57% of the plants classified as mature, 24% decadent, and 19% young. Seedlings numbered 333/acre. Forty-six percent of the sagebrush were heavily hedged. Wyoming big sagebrush density increased to an estimated 9,820 plants/acre by 1992. Some of this increase is due to the much larger sample size taken during that year, but the population definitely increased with large numbers of young plants sampled at that time (5,340 plants/acre). Percent decadency remained similar, while the proportion of shrubs displaying heavy hedging declined to 9%. Density declined 59% by 1998 from 9,820 to 4,060 plants/acre. This decline is mostly due to a decline in density of young plants (5,340 to 720 plants/acre). Dead plants, first included in the 1998 surveys, were abundant with 33% of the decadent plants classified as dying. Utilization is similar to 1992 levels, but with more moderate use. Percent decadency has increased slightly from 21% in 1992 to 34% by 1998. Young plants are still common and represent 18% of the population.

Other important browse species on the site consist of Utah serviceberry, black sagebrush, and small numbers of squaw-apple. Black sagebrush displayed extremely heavy use in 1987, but more moderate use in 1992 and 1998. The small population of squaw-apple was all heavily hedged in 1987 and 1998. It likely receives dual use from cows and deer.

Broom snakeweed was the most numerous shrub on the site with an estimated density of 2,933 plants/acre in 1987, increasing to 13,080 by 1992. Density declined to 8,680 plants/acre by 1998. Biotic potential is still high at 17%. The proportion of young plants has increased from 18% in 1987 to 34% in 1998. Pinyon and juniper trees are encroaching into the clearing. Point quarter data from 1998 estimate 32 Utah juniper and 29 pinyon pine trees/acre. Average basal diameter is 6.7 inches for juniper and 3.6 inches for pinyon.

The herbaceous understory is poor and lacking perennial species. Annual cheatgrass dominates the understory. It provided 32% of the grass cover in 1992, increasing to 69% by 1998. Cheatgrass cover also increased from 1% to 9% during the same period. The second most abundant grass is another annual, sixweeks fescue. Four species of perennial grass include the following: Indian ricegrass, mutton bluegrass,

sand dropseed, and bottlebrush squirreltail are found on the site, yet none provide more than 1% cover. Most of the grass is found in the protection of shrubs. Forbs are diverse, although they provide very little forage. The most common species is the annual bur buttercup.

1987 APPARENT TREND ASSESSMENT

Over half of the ground surface is exposed soil due to the lack of vegetation cover between the individual sagebrush. There are a few patches of cryptogams. Litter cover is estimated at 43%, making a total ground cover of 47%. A healthy population of Wyoming big sagebrush represents the key browse species for this site. Age class analysis indicates a stable population. Less abundant shrubs consisting of squaw-apple and bitterbrush are heavily hedged. Broom snakeweed is the most numerous browse which appears to be increasing. Herbaceous species are fairly diverse, yet not very abundant.

1992 TREND ASSESSMENT

Most of the herbaceous vegetation occurs under shrub and tree canopies leaving the interspaces prone to erosion. Bare ground estimates have declined slightly from 53% to 43%, but litter cover also declined from 43% to 31%. Trend is considered stable, although it is in very poor condition. Trend for browse is considered up with increased densities of Wyoming big sagebrush. Utilization is lighter and reproduction improved. Herbaceous plants, growing mostly under the shrub and tree canopies, are diverse and not abundant, producing little usable forage. Sum nested frequencies for perennial grasses remained stable, while those for forbs increased, indicating a slightly upward trend.

TREND ASSESSMENT
soil - stable, but in very poor condition
browse - up
herbaceous understory - up slightly

1998 TREND ASSESSMENT

Trend for soil appears stable with similar amounts of bare ground compared to 1992. Conditions are still poor however. Trend is down for the key species, Wyoming big sagebrush. Density has declined by 59%, use is heavier, percent decadence has increased from 21% to 34%, and a larger proportion of decadent plants appear to be dying. Trend for the herbaceous understory is stable for perennial grasses, but down significantly for forbs, although forbs make up 19% of the herbaceous understory cover. The annual, cheatgrass, has increased significantly in nested frequency since 1992. It currently provides 69% of the grass cover and 55% of the total herbaceous cover. Another annual, sixweeks fescue, has also increased significantly in nested frequency and is now the second most abundant grass on the site providing an additional 13% of the grass cover. Perennial grasses are scarce and found growing exclusively under the protection of shrubs. Forbs are very diverse but annuals dominate the composition. Overall, trend is considered down and in poor condition.

TREND ASSESSMENT
soil - stable, but in very poor condition
browse - down
herbaceous understory - down and dominated by annuals

HERBACEOUS TRENDS --
Herd unit 29 , Study no: 1

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'87	'92	'98	'87	'92	'98	'92	'98
G	Bromus tectorum (a)	-	a98	b253	-	40	83	1.02	9.04
G	Oryzopsis hymenoides	17	30	33	9	15	16	.54	.63
G	Poa fendleriana	29	33	25	12	15	12	.47	.69
G	Sitanion hystrix	b75	a41	ab46	31	18	26	.53	.38
G	Sporobolus cryptandrus	21	40	35	10	19	17	.53	.74
G	Stipa comata	-	-	2	-	-	1	-	.00
G	Vulpia octoflora (a)	-	a17	b72	-	8	28	.06	1.68
Total for Annual Grasses		0	115	325	0	48	111	1.09	10.73
Total for Perennial Grasses		142	144	141	62	67	72	2.09	2.46
Total for Grasses		142	259	466	62	115	183	3.18	13.19
F	Antennaria rosea	-	-	1	-	-	1	-	.03
F	Arabis spp.	a-	b7	b9	-	5	5	.02	.07
F	Astragulus piutensis	3	-	-	2	-	-	-	-
F	Calochortus nuttallii	a-	b12	ab3	-	5	1	.02	.01
F	Chenopodium spp. (a)	-	b6	a-	-	4	-	.02	-
F	Cymopterus spp.	-	3	-	-	1	-	.00	-
F	Dalea searlsiae	2	-	1	2	-	1	.04	.03
F	Draba spp. (a)	-	a-	b20	-	-	10	-	.05
F	Epilobium brachycarpum (a)	-	27	23	-	10	9	.10	.04
F	Erigeron divergens	59	62	66	28	25	31	.22	.65
F	Ipomopsis aggregata	4	-	-	2	-	-	-	-
F	Lomatium spp.	-	2	1	-	1	1	.00	.03
F	Lotus utahensis	-	-	4	-	-	2	-	.03
F	Lupinus argenteus	-	-	3	-	-	1	-	.03
F	Microsteris gracilis (a)	-	b146	a73	-	58	33	.36	.36
F	Orobanche corymbosa	-	4	-	-	2	-	.01	-
F	Penstemon linarioides	b11	a-	a-	6	-	-	-	-
F	Phlox longifolia	a-	ab7	b7	-	3	4	.02	.02
F	Polygonum douglasii (a)	-	b135	a52	-	57	22	.43	.18
F	Portulaca oleracea	4	-	-	2	-	-	-	-
F	Ranunculus testiculatus (a)	-	a65	b159	-	25	55	.20	1.44
F	Sanguisorba minor	-	-	3	-	-	1	-	.03
F	Senecio multilobatus	-	3	2	-	1	2	.00	.01
F	Sphaeralcea parvifolia	1	10	3	1	6	2	.13	.01
F	Tragopogon dubius	-	-	1	-	-	1	-	.03
F	Trifolium spp.	-	2	5	-	1	2	.00	.03
F	Verbena bracteata	-	-	-	-	-	-	.00	-
F	Viguiera multiflora	-	3	3	-	1	1	.00	.00

Type	Species	Nested Frequency '87	'92	'98	Quadrat Frequency '87	'92	'98	Average Cover % '92	'98
Total for Annual Forbs		0	244	327	0	97	129	0.68	2.09
Total for Perennial Forbs		84	250	112	43	108	56	0.95	1.03
Total for Forbs		84	494	439	43	205	185	1.63	3.12

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

BROWSE TRENDS --
Herd unit 29 , Study no: 1

Type	Species	Strip Frequency '92	'98	Average Cover % '92	'98
B	Amelanchier utahensis	6	5	3.70	4.19
B	Artemisia nova	14	4	.30	.00
B	Artemisia tridentata wyomingensis	82	73	13.49	7.36
B	Chrysothamnus depressus	1	0	-	-
B	Gutierrezia sarothrae	76	79	2.20	4.53
B	Juniperus osteosperma	5	4	5.99	7.11
B	Opuntia spp.	2	3	.00	.00
B	Peraphyllum ramosissimum	1	1	.00	.03
B	Pinus edulis	2	5	-	.03
B	Purshia tridentata	0	0	-	-
B	Quercus gambelii	2	2	.85	.78
B	Ribes cereum cereum	0	1	-	-
Total for Browse		191	177	26.55	24.06

CANOPY COVER --
Herd unit 29 , Study no: 1

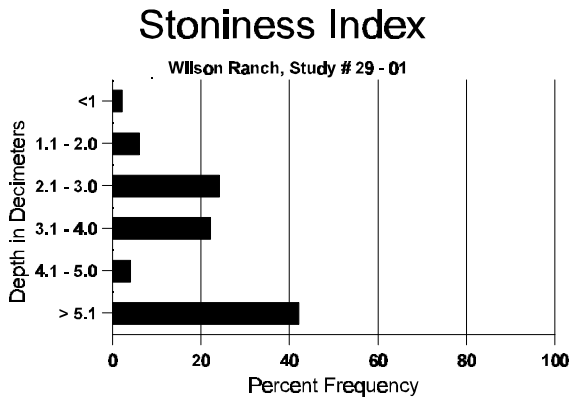
Species	Percent Cover '98
Juniperus osteosperma	11
Quercus gambelii	1

BASIC COVER --
Herd unit 29 , Study no: 1

Cover Type	Nested Frequency '92	'98	Average Cover % '87	'92	'98
Vegetation	319	334	1.00	30.22	36.04
Rock	158	90	2.25	2.61	2.96
Pavement	35	174	0	.06	1.72
Litter	309	380	43.00	31.02	41.09
Cryptogams	79	72	.50	1.25	1.62
Bare Ground	297	298	53.25	43.19	44.02

SOIL ANALYSIS DATA --
Herd Unit 29, Study # 01, Study Name: Wilson Ranch

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.1	63.6 (15.1)	6.8	56.7	23.4	19.8	1.7	9.9	80.0	.4



PELLET GROUP FREQUENCY --
Herd unit 29 , Study no: 1

Type	Quadrat Frequency '92	'98
Rabbit	27	20
Deer	42	76
Cattle	-	3

BROWSE CHARACTERISTICS --
Herd unit 29 , Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	3	-	-	4	-	-	-	80			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	15	-	27	-	-	42	-	-	-	840			42
	98	5	-	-	9	-	-	-	-	-	14	-	-	-	280			14
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	1	-	-	3	-	4	-	-	8	-	-	-	160	-	-	8
	98	24	1	-	35	-	-	-	-	-	60	-	-	-	1200	80	72	60
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	1	-	-	-	-	-	2	-	-	-	40			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	37%	02%	00%	+30%
'98	01%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	0	Dec:		0%
'92	1040			4%
'98	1480			0%

Artemisia nova																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	4	1	1	2	-	-	-	-	-	8	-	-	-	160			8
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66	16	26	1
	92	3	7	1	-	-	-	-	-	-	11	-	-	-	220	-	-	11
	98	-	2	-	-	-	-	-	-	-	2	-	-	-	40	12	23	2
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	4	2	-	-	-	-	-	-	5	-	-	1	120			6
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	00%	+87%
'92	48%	16%	04%	-76%
'98	33%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'87	66	Dec:	0%
'92	500		24%
'98	120		67%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	87	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	34	-	-	6	-	-	5	-	-	45	-	-	-	900			45
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	87	5	2	-	-	-	-	-	-	-	7	-	-	-	466			7
	92	163	22	1	78	-	-	3	-	-	267	-	-	-	5340			267
	98	26	10	-	-	-	-	-	-	-	36	-	-	-	720			36
M	87	-	12	9	-	-	-	-	-	-	21	-	-	-	1400	18	28	21
	92	33	41	9	-	-	-	-	-	-	82	-	1	-	1660	-	-	83
	98	30	63	3	2	-	-	-	-	-	98	-	-	-	1960	15	24	98
D	87	-	1	8	-	-	-	-	-	-	8	-	-	1	600			9
	92	25	29	35	2	8	-	2	-	-	78	2	16	5	2020			101
	98	24	36	9	-	-	-	-	-	-	45	1	-	23	1380			69
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1380			69

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	41%	46%	03%	+73%
'92	22%	10%	05%	-55%
'98	54%	06%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	2466	Dec:	24%
	'92	9020		22%
	'98	4060		34%

Chrysothamnus depressus																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	20		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	21	-	-	-	-	-	-	-	-	21	-	-	-	1400			21
	92	739	-	-	15	-	-	-	-	-	754	-	-	-	15080			754
	98	91	-	-	-	-	-	-	-	-	91	-	-	-	1820			91
Y	87	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	92	155	-	-	3	-	-	-	-	-	158	-	-	-	3160			158
	98	133	-	-	-	-	-	-	-	-	133	-	-	-	2660			133
M	87	36	-	-	-	-	-	-	-	-	36	-	-	-	2400	11	12	36
	92	460	-	-	7	-	-	-	-	-	467	-	-	-	9340	-	-	467
	98	300	-	-	-	-	-	-	-	-	300	-	-	-	6000	10	9	300
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	1	-	1	-	40			2
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	+77%
'92	00%	00%	.15%	-31%
'98	00%	00%	.23%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	2933	Dec:		0%
'92	12540			0%
'98	8680			0%

Juniperus osteosperma																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	1	-	-	1	-	-	4	-	-	-	80			4
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	1	-	-	-	-	2	-	-	-	40			2
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	2	1	3	-	-	-	60	-	-	3
	98	-	-	-	-	-	-	2	1	-	3	-	-	-	60	-	-	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	20%	20%	00%	-20%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	0	Dec:		-
'92	100			-
'98	80			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	20	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	+33%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	40		-
	'98	60		-

Peraphyllum ramosissimum																		
M	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66	35	71	1
	92	-	-	-	-	2	-	-	-	-	2	-	-	-	40	-	-	2
	98	-	-	2	-	-	-	-	-	-	2	-	-	-	40	53	63	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	00%	-39%
'92	100%	00%	00%	+ 0%
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	66	Dec:	-
	'92	40		-
	'98	40		-

Pinus edulis																		
S	87	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	-	-	-	1	1	-	1	-	-	3	-	-	-	60			3
	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	1	-	-	2	-	-	-	40			2
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	+60%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	40		-
	'98	100		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66	19	53	1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	47	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	66	Dec:	-
	'92	0		-
	'98	0		-

Quercus gambelii																		
S	87	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	87	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	-	-	-	4	-	-	-	-	-	4	-	-	-	80			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	2	-	-	-	-	-	-	-	-	2	-	-	-	133	198	162	2
	92	1	3	-	-	-	-	-	-	-	4	-	-	-	80	-	-	4
	98	-	-	-	5	-	-	-	7	-	12	-	-	-	240	53	35	12
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-66%
'92	38%	00%	00%	+33%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	466	Dec:	-
	'92	160		-
	'98	240		-

Ribes cereum cereum																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	17	-	-	-	-	-	-	-	-	17	-	-	-	340	-	-	17

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	0		-
	'98	340		-

Trend Study 29-2-98

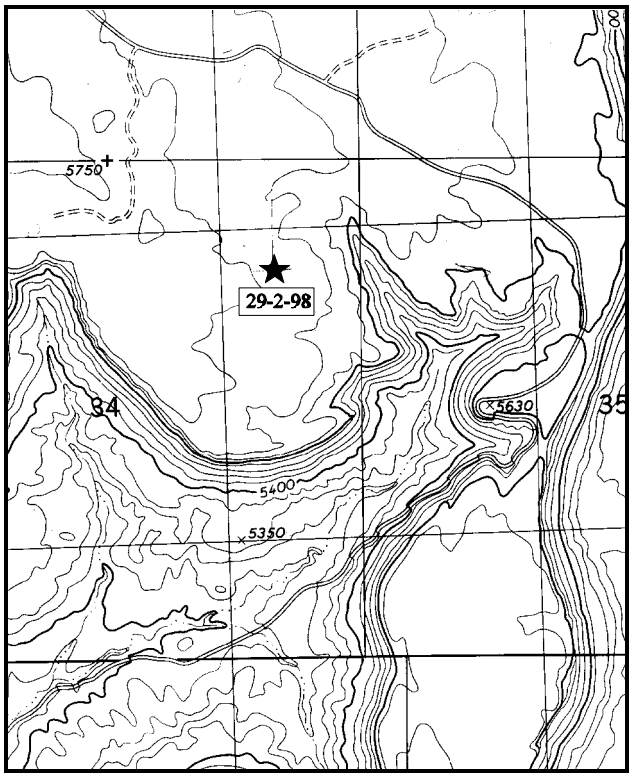
Study site name: Smith's Mesa . Range type: Big Sagebrush-Grass .

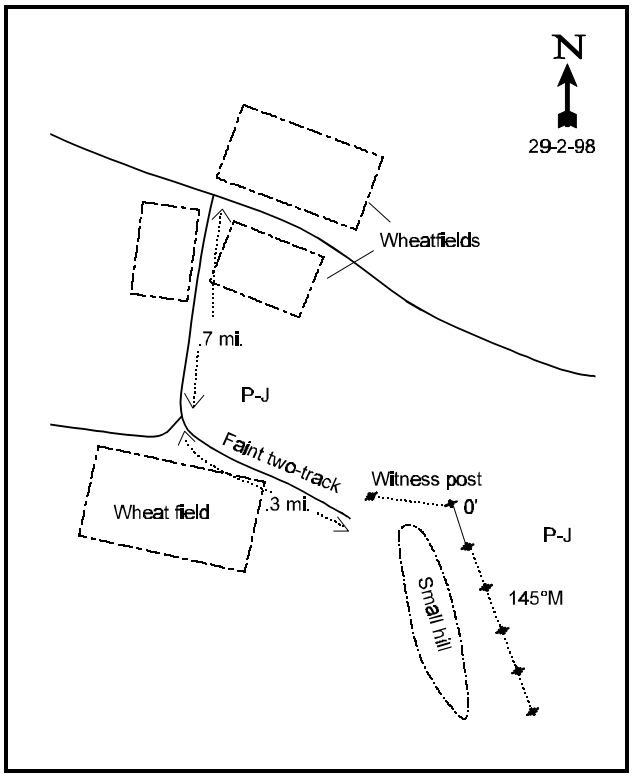
Compass azimuth: frequency baseline 145 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From mile marker 18 in Virgin, drive west 0.9 miles to a road on the north side of the 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 0.7 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° magnetic and is marked by half-high green fenceposts.





Map Name Smith Mesa

Diagrammatic Sketch

Township 40S , Range 12W , Section 34

UTM 4126851.082 N, 306165.742 E

DISCUSSION

Trend Study No. 29-2

The Smith's Mesa trend study was established in a Wyoming big sagebrush clearing on Smith Mesa. It is surrounded on 3 sides by pinyon and juniper trees, and dryland wheat fields to the west . Slope is gentle (2-3%) with a southwest aspect and an elevation of above 5,600 feet. The large mesa is found about 3 miles north of the town of Virgin. It rises about 2,000 feet about 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 a large area of private land. Smith Mesa provides important winter range for deer which summer in the Zion Park area. Pellet group data from the site estimate 38 deer days use/acre. Some cattle sign was also encountered with an estimated 7 cow days use/acre. A cattle pond is found about 1/3 of a mile east of the site.

Soil on the site is very sandy and relatively deep. Effective rooting depth (see methods) was estimated at 23 inches. Soil texture is a sandy loam with a slightly acid pH (6.2). Phosphorus may be limiting to plant growth at 8.1 ppm, when 10 ppm is considered a minimum value for normal plant development. Rock is absent on the surface and in the profile. Due to the sandy nature of the soil, average soil temperature is moderately high at 70.6°F at a depth of 21 inches. Under most conditions, this would cause rapid drying of the soil within the surface horizons during the summer. Herbaceous plants, mostly in the form of winter annuals, are common and provide adequate soil protection. In addition, cryptogamic crusts are abundant, leaving 33% of the ground surface exposed as bare ground. There appears to be some pedestaling of soil around shrubs, possibly caused as much by wind as water. However, erosion is not a problem due to the gentle terrain.

The site supports a good stand of Wyoming big sagebrush with a few antelope bitterbrush. Sagebrush is estimated at 2,200 plants/acre which provide 66% of the shrub cover. The majority of these plants are mature (76%). Thirteen percent of the population were classified as decadent, with 43% of these classified as dying. Biotic potential is fairly good at 9% with another 10% of the population consisting of young plants. Utilization of the sagebrush is mostly light to moderate with heavy use reported on some isolated plants. Vigor is good on most plants and percent decadence is relatively low. Only a few bitterbrush plants occur on the site and only 1 was sampled.

Broom snakeweed, the increaser/invader, is the most abundant shrub on the site with a population of 5,380 plants/acre. Ninety percent of the population is mature, although young plants are common and more than adequate to maintain the population. Pinyon and juniper trees appear to be slowly encroaching into the clearing, but numbers are still low. Point quarter data estimate 6 Utah juniper and 6 singleleaf pinyon trees/acre. Average basal diameter is 10.4 inches for pinyon and 5.7 inches for juniper.

The herbaceous understory is very poor with two annual grasses, cheatgrass and six weeks fescue, providing 100% of the grass cover. Also, annual forbs account for 96% of the forb cover. Three perennial grasses were encountered on the site, although they are rare and often growing in the protection of shrub crowns. The only fairly abundant forb consists of the annual storksbill.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable, primarily due to the level terrain and rapid infiltration capacity of the soil. Trend for browse also appears stable with a relatively healthy population of Wyoming big sagebrush. Use is light to moderate, vigor normal, and percent decadence moderately low at 13%. Reproduction is adequate to maintain the population if conditions do not change significantly. The herbaceous understory is poor. Composition of grasses and forbs is totally dominated by annuals. Perennial species are present yet rare.

HERBACEOUS TRENDS --
Herd unit 29 , Study no: 2

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	436	99	22.90
G	Poa secunda	15	5	.05
G	Sitanion hystrix	-	-	.00
G	Sporobolus cryptandrus	2	1	.03
G	Vulpia octoflora (a)	304	85	7.54
Total for Annual Grasses		740	184	30.45
Total for Perennial Grasses		17	6	0.08
Total for Grasses		757	190	30.53
F	Draba spp. (a)	25	10	.05
F	Erodium cicutarium (a)	78	23	1.95
F	Eriogonum umbellatum	4	1	.03
F	Lappula occidentalis (a)	32	12	.11
F	Microsteris gracilis (a)	17	7	.06
F	Navarretia intertexta (a)	5	2	.03
F	Oenothera pallida	4	2	.01
F	Orobanche fasciculata	1	1	.00
F	Plantago patagonica (a)	11	3	.39
F	Polygonum douglasii (a)	3	1	.00
F	Senecio multilobatus	17	6	.05
F	Unknown forb-perennial	2	1	.00
Total for Annual Forbs		171	58	2.60
Total for Perennial Forbs		28	11	0.11
Total for Forbs		199	69	2.71

BROWSE TRENDS --
Herd unit 29 , Study no: 2

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata wyomingensis	54	11.80
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Gutierrezia sarothrae	51	3.29
B	Juniperus osteosperma	-	.78
B	Opuntia spp.	3	.18
B	Pinus monophylla	1	1.70
B	Purshia tridentata	1	.00
B	Salvia dorrii	1	-
Total for Browse		111	17.76

CANOPY COVER --
Herd unit 29 , Study no: 2

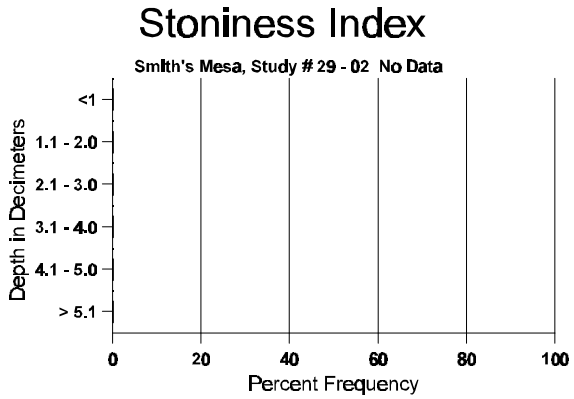
Species	Percent Cover '98
Pinus monophylla	1

BASIC COVER --
Herd unit 29 , Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	472	46.12
Rock	6	.03
Pavement	24	.04
Litter	486	39.47
Cryptogams	244	12.36
Bare Ground	381	33.09

SOIL ANALYSIS DATA --
Herd Unit 29, Study # 02, Study Name: Smith's Mesa

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
23.2	70.6 (20.9)	6.2	72.7	17.4	9.8	.7	8.1	3.2	.2



PELLET GROUP FREQUENCY --
Herd unit 29 , Study no: 2

Type	Quadrat Frequency '98
Rabbit	23
Deer	44
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 29 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	7	3	1	-	-	-	-	-	-	11	-	-	-	220			11
M	98	56	26	3	-	-	-	-	-	-	85	-	-	-	1700	28	39	85
D	98	11	2	-	1	-	-	-	-	-	8	-	-	6	280			14
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	28%	04%	05%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	2200	Dec:	13%

Chrysothamnus viscidiflorus viscidiflorus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	13	0

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	22	-	-	-	-	-	-	-	-	22	-	-	-	440			22
M	98	242	-	-	-	-	-	-	-	-	242	-	-	-	4840	9	11	242
D	98	5	-	-	-	-	-	-	-	-	4	-	-	1	100			5
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor .37%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		5380	Dec:		2%
Opuntia spp.																		
M	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	6	16	3
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Pinus monophylla																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	23	99	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Salvia dorrii																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	13	46	1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

Trend Study 29-3-98

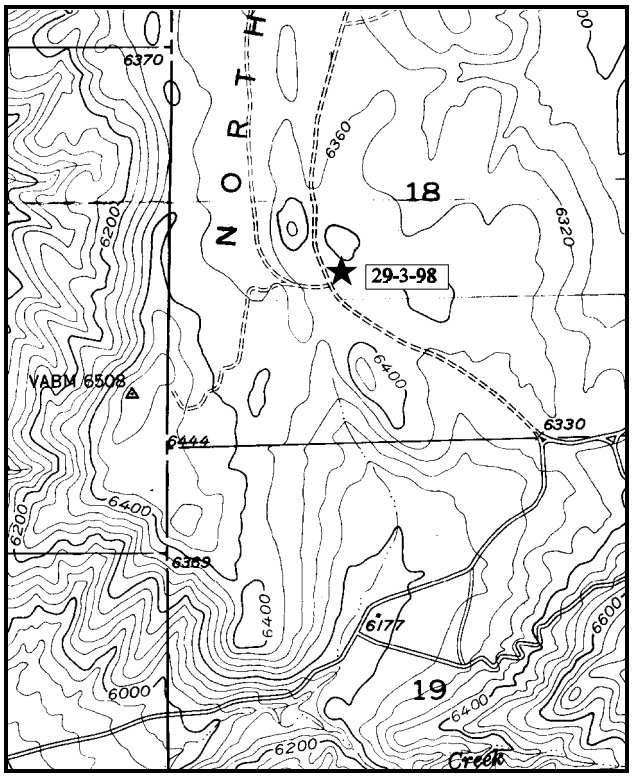
Study site name: North Hills . Range type: Chained, Seeded P-J

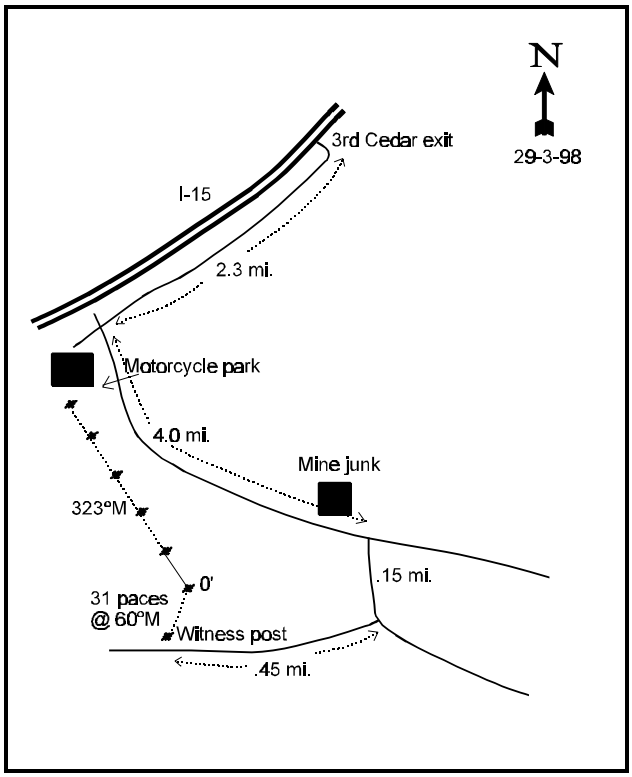
Compass azimuth: frequency baseline 323 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the third Cedar City exit on the south end of town drive south down the frontage road 2.3 miles. Turn left (east) next to a motorcycle park. Drive south east 4.0 miles on the main road past some old mine wreckage. Turn right and drive south 0.15 miles to a fork turn right (west) and drive 0.45 miles into a chaining and a witness post on the right side of the road (north). The study is marked by green, half-high fenceposts.





Map Name Kanarraville

Diagrammatic Sketch

Township 37S , Range 11W , Section 18

UTM 4161123.287 N, 311511.648 E

DISCUSSION

Trend Study No. 29-3

The North Hills trend study was established in 1998 on a chained and seeded pinyon-juniper site in the North Hills, located north of Kanarraville. The area lies between I-15 and the Hurricane Cliffs to the east. The site was chained in 1967 and seeded to crested wheatgrass and intermediate wheatgrass which now dominates the site. The area contains rolling terrain with the study established on a wide ridge top. Slope is gentle (5%) with a south aspect and an elevation of about 6,400 feet. Pinyon pine and Utah juniper trees are found on the site in low densities. Point quarter data estimate only 18 pinyon and 29 juniper trees/acre. Average basal diameter is 2 inches for pinyon and 1.3 inches for juniper. There is some evidence of hand cutting of young trees in the past. Deer use on the site is moderately heavy. There is also some sign of elk and cattle use. Pellet group data estimate 103 deer days use/acre. Most pellet groups appeared to be several months old, but a deer was seen near the site during study site establishment on July 16th. Estimated elk and cattle use is low at 6 elk and 4 cow days use/acre. Cows pats appeared to be from last fall.

Soil is shallow with a moderate amount of rock and pavement on the surface and within the profile. Effective rooting depth (see methods) is estimated at only 10 inches. Soil texture is a sandy loam with a neutral pH (6.8). Average soil temperature is very high at 77.8°F at a depth of almost 12 inches. Erosion is not a problem on the site due to the abundant herbaceous vegetation cover, combined with the gentle terrain.

The site supports a variety of browse species including: Utah serviceberry, black sagebrush, Wyoming big sagebrush, and Gambel oak. Wyoming big sagebrush is the most numerous species with a cover value of 13%, representing 73% of the browse cover. Density is estimated at 1,860 plants/acre. Utilization is moderate to heavy with vigor reduced on 13% of the population. Percent decadence is 31%. Reproduction is limited, but currently adequate to replace decadent/dying plants. There is also a small number moderately utilized black sagebrush which are actually black Wyoming big sagebrush hybrids.

Utah serviceberry numbers 1,040 plants/acre. They display light to moderate use, good vigor, and low decadence. There are also some isolated thick oak clones on the site. Mature plants average over 4 feet in height, making much of the oak partly unavailable to browsing. Available plants appear unutilized however. A few scattered moderately hedged bitterbrush provide some additional browse forage.

The herbaceous understory dominates the site with seeded perennial grasses, crested wheatgrass and intermediate wheatgrass, providing 94% of the grass cover and 93% of the total vegetative cover. Four other perennial and 2 annual grasses are also occasionally found on the site. Forbs are severely limited with only 4 species encountered. Combined, forbs produce less than ½ of 1% cover.

1998 APPARENT TREND ASSESSMENT

The soil appears stable with abundant and well dispersed herbaceous vegetation. The browse trend appears stable for now, but reproduction of the key species, Wyoming big sagebrush, is poor. Utilization of preferred browse species is mostly moderate. There is evidence that sometime in the past about 20% of the population has died off, probably during the extended drought in conjunction with winter injury. The herbaceous understory is abundant, although composition is poor and dominated by seeded grasses. Forbs are nearly absent. Trend will continue to be stable as long as the these exotic grasses remain in high numbers.

HERBACEOUS TRENDS --
Herd unit 29 , Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	271	76	19.65
G	Agropyron intermedium	142	52	3.04
G	Bromus tectorum (a)	24	8	.23
G	Hilaria jamesii	6	2	.41
G	Oryzopsis hymenoides	3	1	.00
G	Poa secunda	10	3	.33
G	Sitanion hystrix	21	9	.46
G	Vulpia octoflora (a)	3	1	.00
Total for Annual Grasses		27	9	0.23
Total for Perennial Grasses		453	143	23.91
Total for Grasses		480	152	24.15
F	Arabis spp.	1	1	.00
F	Astragalus spp.	12	7	.30
F	Lithospermum spp.	10	5	.03
F	Navarretia intertexta (a)	1	1	.00
Total for Annual Forbs		1	1	0.00
Total for Perennial Forbs		23	13	0.34
Total for Forbs		24	14	0.34

BROWSE TRENDS --
Herd unit 29 , Study no: 3

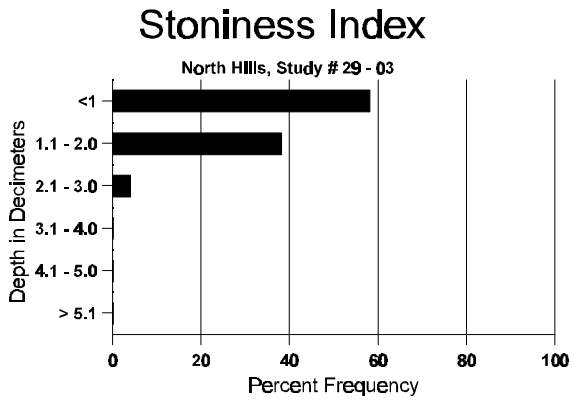
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	15	2.34
B	Artemisia nova	5	.30
B	Artemisia tridentata wyomingensis	59	13.00
B	Chrysothamnus viscidiflorus	0	.00
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	0	-
B	Opuntia spp.	2	-
B	Purshia tridentata	1	-
B	Quercus gambelii	6	2.19
Total for Browse		88	17.84

BASIC COVER --
Herd unit 29 , Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	361	39.57
Rock	195	6.71
Pavement	267	12.20
Litter	459	51.77
Cryptogams	20	.41
Bare Ground	307	21.43

SOIL ANALYSIS DATA --
Herd Unit 29, Study # 03, Study Name: North Hills

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.9	77.8 (11.6)	6.8	70.0	14.2	15.8	3.1	9.4	16.0	.5



PELLET GROUP FREQUENCY --
Herd unit 29 , Study no: 3

Type	Quadrat Frequency '98
Rabbit	28
Elk	5
Deer	58
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 29 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
Y	98	-	1	-	18	-	-	-	-	-	19	-	-	-	380			19
M	98	19	7	1	1	3	-	-	-	-	31	-	-	-	620	38	56	31
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing '98		Moderate Use 21%		Heavy Use 02%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1040	Dec:		4%
Artemisia nova																		
M	98	1	4	-	-	-	-	-	-	-	5	-	-	-	100	13	24	5
D	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 83%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		120	Dec:		17%
Artemisia tridentata wyomingensis																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	3	1	-	1	-	-	-	-	-	5	-	-	-	100			5
M	98	20	29	10	-	-	-	-	-	-	57	-	2	-	1180	26	37	59
D	98	4	22	3	-	-	-	-	-	-	19	-	5	5	580			29
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	500			25
% Plants Showing '98		Moderate Use 56%		Heavy Use 14%		Poor Vigor 13%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1860	Dec:		31%
Chrysothamnus viscidiflorus																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	12	9	0
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Opuntia spp.																		

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	6	1
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	00%	00%	50%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	40	Dec:	50%

Purshia tridentata

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	39	72	1

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	20	Dec:	-

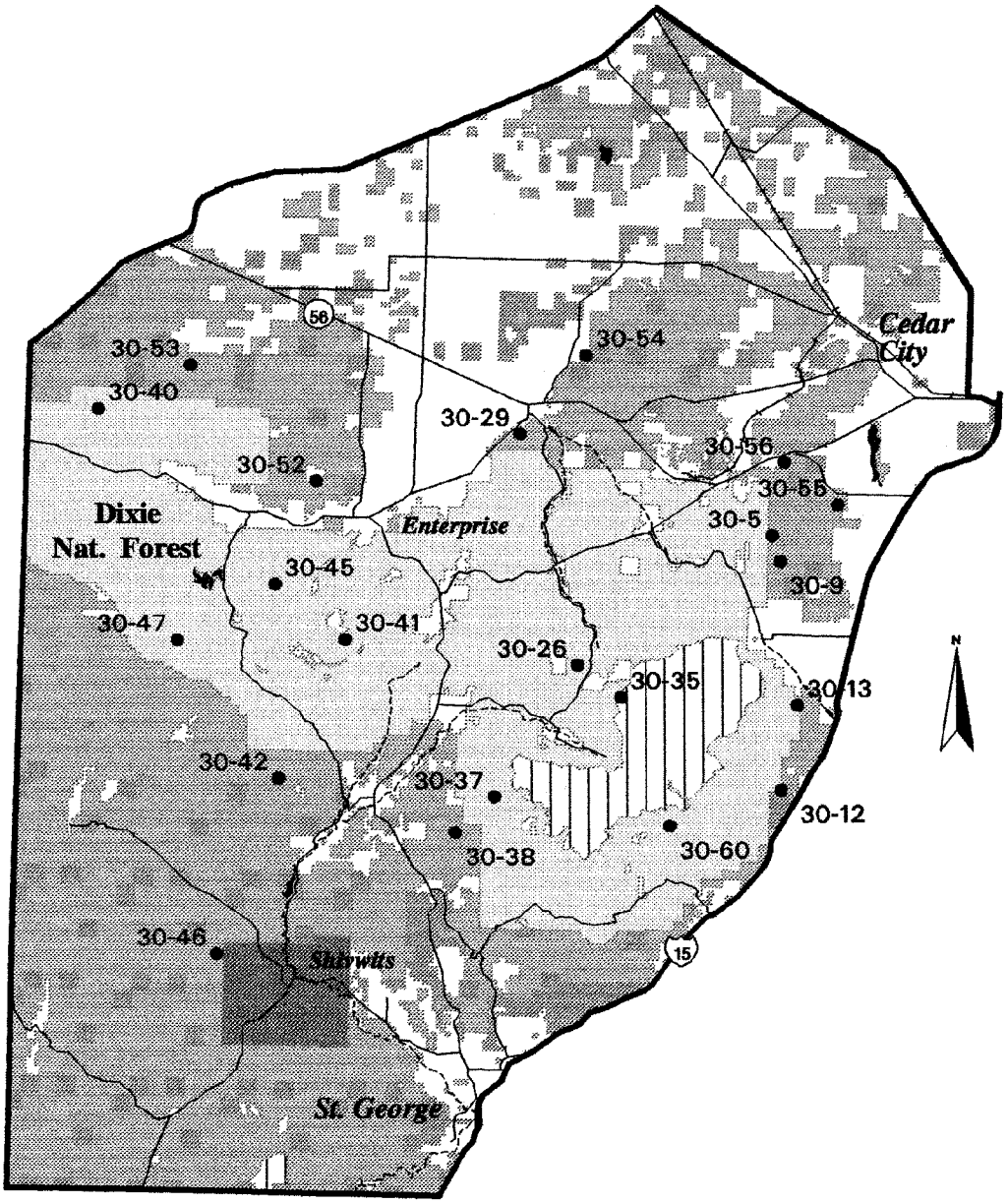
Quercus gambelii

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	98	-	-	-	17	-	-	-	-	-	17	-	-	-	340			17
M	98	14	-	-	-	-	-	-	16	-	30	-	-	-	600	50	28	30

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	940	Dec:	-

Management Unit 30

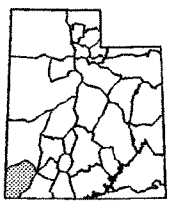


Map Scale 1:633,600 (1" = 10 miles)

Legend

- Forest Service
- BLM
- State of Utah
- Native American Reservation
- Private Land
- National Park/Wild. Area
- Water Body
- Transect Location
- Road
- Railroad

Unit Location



UDAF GIS March, 1999

WILDLIFE MANAGEMENT UNIT 30 (50A&B)- 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.

This unit was divided into 3 sub units; 30A West Pine Valley, 30B Commanche and 30C Pine Valley/Browse prior to 1992. Subunits A & B were combined in 1992.

Management Unit Description

Management unit 30A (formally 50A) is one of the smaller units in the state. Total area equals 227,200 acres. Of this amount, approximately 111,808 acres are winter range and 41,300 acres are summer range. The remaining 74,092 acres are considered non-habitat (Coles and Pederson 1969). 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. Unit 30A is not independent of the surrounding units as it shares a common summer range with unit 30B. In addition, the important winter range areas of unit 30B shelter and feed substantial numbers of deer that summer within unit 30A. There is also a resident deer population in the New Harmony area which further complicates management. Of all the herd subunits in the state, 30A is perhaps the most (contrived) artificial.

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 30A.

Herd unit 30A 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.

Livestock Grazing

Critical winter range sites sampled again include: Upper Broad Hollow (#3), Pintura Bench (#12), and Black Ridge (#13). Upper Broad Hollow is administered by the BLM. It is located in the summer pasture of the BLM

Rock Spring cattle allotment. Grazing occurs from June 1 through September 30 annually. In June, the cattle are trailed up to Harmony Mountain. As the cattle drift back down the mountain in the fall, they utilize the relatively steep, south facing slopes of the study area.

All other winter range study sites on this unit occur on National Forest land. Pintura bench is on an unallotted area and is not grazed. Black Ridge occurs on the New Harmony allotment which is grazed on a rest rotation system by 40 cattle from June 1 to September 30.

Summer range sites administered by the BLM include Harmony Mountain Summit (#5) and Upper Lime Spring (#9). Harmony Mountain Summit and Upper Lime Spring are located in the Summer Pasture of the BLM Rock Spring cattle allotment mentioned earlier. Cattle use likely occurs from June 1 through September 30 annually.

The other study sites occur on land administered by the U.S. Forest Service. Four sites are found on the east side of the Pine Valley Mountains in an area which was burned in the early summer of 1986. These sites include: Spirit Creek South Burn (#58), Upper Horse Creek (#59), and Jones Hollow (#60). Cattle grazing was removed from this area in the 1960's for watershed protection. The other summer range sites, Grant's Range Trail (#18), Big Water Reservoir (#19), and Upper Comanche Canyon (#21), were not read in 1998 and are being discontinued. They occur in the Pine Valley roadless area. These sites are within the Pine Valley grazing allotment and are used by 1,057 cattle from July 15 to October 15. Due to drought conditions, the number of cattle were reduced by 35% in 1990, 25% in 1991 and 15% in 1992.

Management Unit 30B (50B) - West Pine Valley

Deer herd unit 30B is a combination of the old deer herd units 61B and 61C which were combined in 1992. Deer herd unit 30A, previously deer herd unit 61A, lies to the east of 30B. Winter range for 30B is estimated to be 500,600 acres and summer range is estimated at 217,000 acres (Jense et al. 1993). The herd unit varies from altitudes 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: Truman Bench, 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 upper 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 Sonoran 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.

Livestock Grazing

Winter Range

Six of the 8 study sites which occur on winter range are administered by the BLM. These include: Southwest of Newcastle (#29), Sevy Hollow (#53), Wide Canyon (#38), Northwest of Enterprise (#52), Grapevine Spring (#42), and Pahcoon Bench (#46). Truman Bench (#37) and Telegraph Draw (#40) are administered by the Forest Service.

Southwest of Newcastle is part of the Pinto Creek allotment which is grazed after the growing season, from August 1 to November 15. Since 1982, cattle grazing has been eliminated in order to enhance site conditions.

The Truman Bench study site is located in an area of Forest Service property that has not been allotted for livestock use since the 1960's. The Telegraph Draw and Sevy Hollow study sites are located in the USFS Terryshoal Creek allotment in a pasture that is set aside for wild horses and burros and is not grazed by livestock. Wide Canyon lies within the Wide Canyon pasture of the Veyo allotment. Cattle use is authorized from November 16 to June 28.

The study, Northwest of Enterprise is located in the Haystack Mountain BLM cattle allotment. It is grazed under a deferred rotation grazing system with use alternating from spring (April 1 until May 16) to fall and winter (Nov 1 until Jan. 31). Grapevine Spring is in the Cactus pasture of the Twin Peaks allotment which is grazed from November through May under a three pasture deferred rotation grazing system which provides spring rest two years out of every three. Long term utilization studies by the BLM indicate moderate use (40% to 60%). Pahcoon Bench lies within the Pahcoon Seeding pasture of the Jackson Wash allotment. Cattle use is allowed from November 16th through May 20, but use on the Pahcoon Seeding pasture occurs from November 16 to December 31 each year.

Summer Range

The Grassy Flat Ridge (#26), Paradise (#24), and Deep Canyon (#35) studies are located on the USFS Pine Valley allotment. This allotment is grazed from July 15 to October 15 and encompasses about 67,000 acres. Due to increased pressure on riparian areas, the number of cattle allowed to graze was reduced in 1990 through 1992. Before this time, 1,057 head of cattle were allotted. Livestock are managed on a deferred rotation system each year. The Joe Spring (#41) study site is on the USFS Gunlock allotment and is grazed from July 15 to September 30 by 621 head of cattle. The Lost Peak (#47) study site is on the USFS Bull Valley allotment. The livestock are managed by alternating spring and fall grazing each year.

Herd Unit Management Objectives

Current management objectives are to maintain limited entry hunting on the Browse and Comanche units on the east side of the Pine Valley Mountains, along with the high country buck hunt on the Pine Valley Wilderness area. A hunter success rate of 50% or better is wanted on the limited entry hunts but these areas are not currently providing the expected quality of a limited entry hunt.

Target winter herd sizes for the entire unit is modeled at 16,000 deer with 2,000 of these from the Commanche subunit, and 1,000 from the Browse subunit. Herd composition for the West Pine Valley area is to be managed at 15 bucks:100 does with 30% of the bucks being 3 point or better. The Browse and Commanche areas will be managed to produce 20 bucks:100 does post season, with 50% or more of those bucks being 3 point or larger.

Trend Study Site Description

Trend study sites were originally established on the unit in 1982. Most of these sites were reread in 1992. 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. Text for discontinued sites can be found at the end of the Unit 30 section.

Trend Study 30-3-98

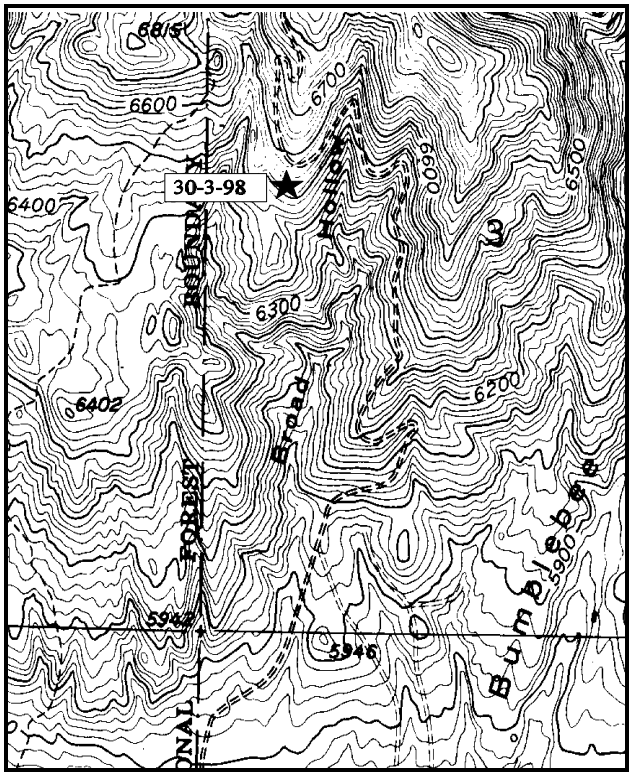
Study site name: Upper Broad Hollow . Range type: Mountain Brush .

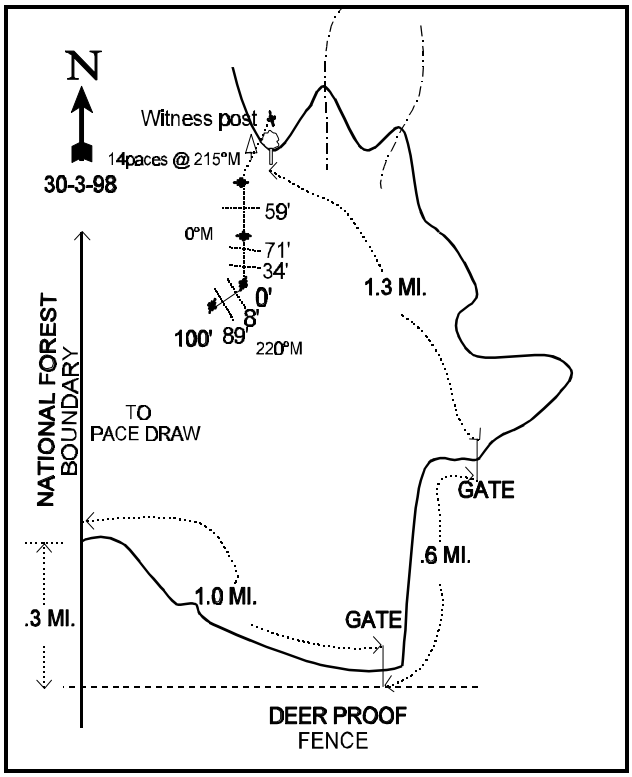
Compass azimuth: frequency baseline 220 degrees. (Line 2 & 3 0°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (8 & 89ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

From the Dixie National Forest boundary, proceed north on Pace Draw Road 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 1.95 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°M to the 300-foot of the baselines. The 0-foot stake is 200 feet. 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 UTM 4154969.278 N,296258.725 E

DISCUSSION

Trend Study No. 30-3 (50A-3)

This site at Upper Broad Hollow is intermediate in elevation, but is still critical deer winter range. Elevation is 6,500 feet, slightly above the juniper-pinyon belt with a southerly aspect and a steep slope of 35%. The range type is a 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 and antelope bitterbrush prevail. On more easterly slopes, there is more shrub-live oak and Utah serviceberry with considerable amounts of bitterbrush, and occasional clumps of Gambel oak. 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 Broad Hollow pellet group transect taken from 1988 through 1992, indicate heavy deer use with an average of 75 deer days use/acre, the highest average on the herd unit (Jense et al. 1992). No signs of livestock grazing were noticed. Pellet group data from the site taken in 1998 also estimate a high level of deer use at 110 deer days use/acre.

Soils are shallow, rocky, and derived from limestone parent material. Effective rooting depth (see methods) is estimated at only a little over 7 inches. Rocks are very common on the surface and within the soil profile. Erosion is not currently a serious problem due to the abundant protective ground cover.

The key browse species are Utah Serviceberry, mountain big sagebrush, and antelope bitterbrush. Important secondary species would include curlleaf mountain mahogany. Big sagebrush currently (‘98) provides 28% of the browse cover on the site. It has remained at a relatively similar density since 1982 at around 2,300 plants/acre. Utilization has been moderate with little heavy use. Vigor has remained good on most plants and percent decadence has increased slightly from 18% in 1982 to 24% by 1998. Reproduction is good with a steadily increasing proportion of young plants.

Bitterbrush displays heavier use, especially in 1992 when 69% of the plants were classified as heavily hedged. Currently (‘98), 55% are heavily utilized with an additional 32% moderately hedged. Density declined by 50% (2,133 to 1,066 plants/acre) between 1982 and 1992, but has since increased by 19% to 1,320 plants/acre by 1998. Some of the difference in density may be due to the much larger sample taken in 1998. Vigor is currently good and percent decadence has declined from a high of 31% in 1992 to 14% by 1998. Reproduction is adequate to maintain the population.

Utah serviceberry, curlleaf mountain mahogany, and shrub-live oak are mainly large, mature populations. Serviceberry was encountered in higher density with the larger sample used in 1998. Currently, the population density is estimated at 1,880 plants/acre. The average mature plant is about 4 feet in height. Utilization is mostly light to moderate with some heavy use on certain plants. Vigor is normal on most plants, percent decadency low and reproduction adequate to maintain the population. Occasional shrubs which occur on the site, but were not encountered on the density plots in 1982 and 1992 include: true mountain mahogany, narrowleaf low rabbitbrush, grey horsebrush, broom snakeweed, yellowleaf silktassel, Colorado pinyon, Utah juniper, and a low woody eriogonum. The new and much larger sample used in 1998 picked up many of these species in low numbers. Point quarter data from 1998 estimate 26 pinyon and 12 juniper trees/acre. Average basal diameter is 8 inches for pinyon and 7 inches for juniper.

Due to the soil conditions, grasses and forbs are fairly sparse, but moderately diverse. Currently (‘98), 6 perennial and one annual grass produce 24% cover. The most common species is mutton bluegrass which provides 54% of that cover. The annual, cheatgrass, is also common providing an additional 39% of the grass cover. All other grasses occur occasionally. Forbs are very diverse but the 17 annual and perennial species encountered in 1998 produce only 4.5% cover. The only common species include: false dandelion, milkvetch, tansy mustard, bluedicks *(Dichelostemma pulchellum*), and storksbill.

1982 APPARENT TREND ASSESSMENT

Soil trend appears stable to declining. Erosion is ongoing but not greatly excessive, considering the character of the site. Vegetative trend is also stable but will depend in large part on future soil conditions. At present, browse populations seem healthy but static. Herbaceous understory conditions are fair but somewhat precarious. This is a relatively fragile site that could rapidly deteriorate if animal use, especially from livestock, were to become much more intense than it is now.

1992 TREND ASSESSMENT

The soil trend is slightly up due to increased total protective ground cover. Basal vegetative cover has increased along with a 59% decrease in bare ground. Trend for browse is down due to declining populations of mountain big sagebrush and especially bitterbrush. Bitterbrush declined 50% in density and percent decadency increased to 31%. The number of heavily hedged plants rose from 22% in 1982 to 69% in 1992, while the number of plants displaying poor vigor also increased (0 to 13%). Trend for herbaceous understory is stable with increased quadrat frequency for perennial grasses and decreased quadrat frequency of perennial forbs.

TREND ASSESSMENT
soil - slightly up, but still in poor condition
browse - down
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground declined slightly, but percent rock and pavement cover increased from 24% to 33% and litter cover declined slightly. Trend for key browse species, mountain big sagebrush, bitterbrush and serviceberry, appear stable. Sagebrush displays similar density, light to moderate use, good vigor, improved reproduction, and percent decadency of 24%. Bitterbrush also shows a similar density compared to 1992. Use continues to be moderate to heavy, but vigor has improved and percent decadence has declined from 31% to 14%. More serviceberry was picked up in the much larger sample used in 1998. It shows lighter use, good vigor, and low decadence. Trend for the herbaceous understory is mixed. Sum of nested frequency of perennial grasses has declined slightly while frequency of perennial forbs has increased. Mutton bluegrass increased significantly in nested frequency, while bottlebrush squirreltail declined significantly. Overall, trend for the herbaceous understory is considered up.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 3

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	-	-	-	-	-	.03
G	Bouteloua gracilis	2	3	-	2	1	.15
G	Bromus tectorum (a)	-	264	-	-	86	9.47
G	Festuca ovina	-	3	-	-	1	.00

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Koeleria cristata	34	31	13	12	17	.81
G	Poa fendleriana	166	*216	45	65	74	13.11
G	Sitanion hystrix	118	*19	37	49	10	.31
G	Stipa comata	7	6	13	3	3	.36
Total for Annual Grasses		0	264	0	0	86	9.47
Total for Perennial Grasses		327	278	108	131	106	14.79
Total for Grasses		327	542	108	131	192	24.26
F	Agoseris glauca	6	*46	3	3	26	.58
F	Allium spp.	-	*10	-	-	4	.04
F	Androstephium breviflorum	1	-	-	1	-	-
F	Artemisia ludoviciana	18	*-	5	6	-	-
F	Astragalus straturensis	7	*-	35	4	-	-
F	Aster spp.	-	1	-	-	1	.00
F	Astragalus spp.	32	19	-	19	13	.91
F	Brodiaea pulchella	-	-	8	-	-	-
F	Astragalus utahensis	-	-	-	-	-	.03
F	Castilleja linariaefolia	23	6	13	8	3	.06
F	Collinsia parviflora (a)	-	14	-	-	7	.03
F	Cymopterus spp.	-	8	-	-	3	.06
F	Descurainia pinnata (a)	-	57	-	-	26	.38
F	Dichelostemma pulchellum	-	*33	-	-	16	1.55
F	Draba spp. (a)	-	2	-	-	1	.00
F	Eriogonum caespitosum	-	-	2	-	-	-
F	Erysimum asperum	4	3	-	2	2	.03
F	Erodium cicutarium (a)	-	13	-	-	6	.52
F	Erigeron pumilus	1	8	3	1	4	.07
F	Lactuca serriola	6	-	-	2	-	-
F	Lotus utahensis	-	-	1	-	-	-
F	Microsteris gracilis (a)	-	10	-	-	6	.03
F	Oenothera caespitosa	-	-	1	-	-	-
F	Orobanche uniflora	-	-	2	-	-	-
F	Sphaeralcea grossulariaefolia	-	6	-	-	3	.06
F	Stephanomeria tenuifolia	16	16	8	9	6	.13
F	Zigadenus paniculatus	-	3	-	-	1	.00
Total for Annual Forbs		0	96	0	0	46	0.97
Total for Perennial Forbs		114	159	81	55	82	3.57
Total for Forbs		114	255	81	55	128	4.54

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 3

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	30	12.87
B	Artemisia tridentata vaseyana	64	8.79
B	Cercocarpus ledifolius	0	-
B	Chrysothamnus parryi parryi	6	.30
B	Chrysothamnus viscidiflorus viscidiflorus	5	.15
B	Garrya flavescens	4	-
B	Gutierrezia sarothrae	1	-
B	Juniperus osteosperma	1	.78
B	Opuntia spp.	3	.15
B	Pinus edulis	3	2.99
B	Purshia tridentata	34	5.40
B	Quercus turbinella	4	.39
B	Tetradymia canescens	1	.03
Total for Browse		156	31.87

CANOPY COVER --
Herd unit 30 , Study no: 3

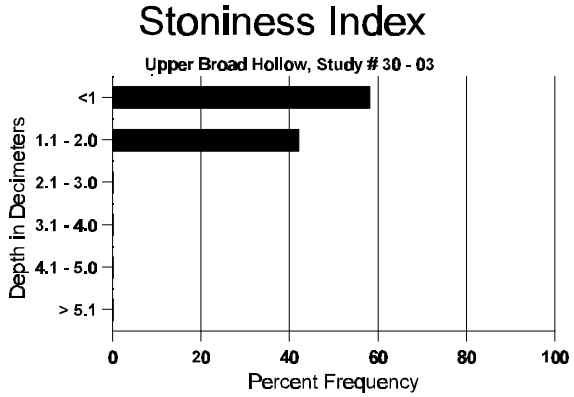
Species	Percent Cover '98
Juniperus osteosperma	5
Pinus edulis	4

BASIC COVER --
Herd unit 30 , Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	350	13.00	15.25	50.70
Rock	271	14.00	19.50	27.54
Pavement	195	-	4.25	5.34
Litter	381	49.00	51.75	45.95
Cryptogams	2	3.00	0	.03
Bare Ground	159	21.50	9.25	7.44

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 03, Study Name: Upper Broad Hollow

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
7.3	43.5 (11.2)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 3

Type	Quadrat Frequency '98
Rabbit	29
Deer	59

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	2	-	-	11	-	-	16	-	-	-	320			16
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	2	-	-	-	-	-	2	-	-	-	133			2
	98	10	-	-	4	1	-	-	-	-	15	-	-	-	300			15
M	82	1	-	-	-	1	-	1	-	-	1	-	-	-	200	33	41	3
	92	1	-	2	-	-	-	-	-	-	3	-	-	-	200	34	36	3
	98	27	23	1	22	1	-	-	-	-	74	-	-	-	1480	50	55	74
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	1	3	-	-	-	-	-	3	-	-	2	100			5
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	33%	00%	00%	+40%
'92	00%	40%	00%	+82%
'98	27%	02%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	200	Dec:	0%
	'92	333		0%
	'98	1880		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	2	-	-	2	-	-	-	-	-	4	-	-	-	266			4
	98	16	-	-	2	-	-	-	-	-	18	-	-	-	360			18
M	82	13	12	4	-	-	-	-	-	-	28	1	-	-	1933	18	26	29
	92	4	14	3	-	1	-	-	-	-	22	-	-	-	1466	16	18	22
	98	44	23	-	2	-	-	-	-	-	69	-	-	-	1380	20	30	69
D	82	5	-	-	2	-	-	-	-	-	3	4	-	-	466			7
	92	4	1	-	2	-	-	-	-	-	7	-	-	-	466			7
	98	19	5	1	3	-	-	-	-	-	18	1	-	9	560			28
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	980			49

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	31%	10%	00%	-15%
'92	48%	09%	00%	+ 4%
'98	24%	.86%	08%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	2599	Dec:	18%
	'92	2198		21%
	'98	2300		24%

Cercocarpus ledifolius

M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133	47	51	2
	92	-	-	-	-	-	1	-	-	-	1	-	-	-	66	106	106	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-50%
'92	00%	100%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	-
	'92	66		-
	'98	0		-

Chrysothamnus parryi parryi

Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	18	-	-	6	-	-	-	-	-	24	-	-	-	480	12	15	24

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	520		-

Chrysothamnus viscidiflorus viscidiflorus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	14	24	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	160		-

Garrya flavescens

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	8	-	-	1	-	-	-	-	-	9	-	-	-	180	55	56	9
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	0		0%
	'98	200		10%

Gutierrezia sarothrae

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	10	15	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

Opuntia spp.																		
M	82	2	-	-	-	-	-	-	-	-	-	2	-	-	133	3	8	2
	92	3	-	-	-	-	-	-	-	-	1	-	2	-	200	6	8	3
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60	5	11	3
D	82	1	-	-	-	-	-	-	-	-	-	1	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 1%
'92	00%	00%	67%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	199	Dec:	33%
	'92	200		0%
	'98	60		0%

Pinus edulis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	60		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	1	1	-	-	-	-	-	-	4	-	1	-	333			5
	98	3	-	-	-	1	-	-	-	-	4	-	-	-	80			4
M	82	9	10	2	-	-	5	6	-	-	32	-	-	-	2133	24	32	32
	92	-	-	6	-	-	-	-	-	-	6	-	-	-	400	20	35	6
	98	1	12	30	5	5	-	-	-	-	53	-	-	-	1060	26	39	53
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	1	4	-	-	-	-	-	-	4	-	1	-	333			5
	98	-	2	5	-	1	1	-	-	-	6	-	-	3	180			9
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	31%	22%	00%	-50%
'92	13%	69%	13%	+19%
'98	32%	55%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	2133	Dec:		0%
'92	1066			31%
'98	1320			14%

Quercus turbinella																		
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	1	-	-	-	-	-	1	1	-	-	133			2
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	2	-	-	-	-	-	1	-	-	3	-	-	-	200	45	55	3
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66	39	47	1
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	36	40	3
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	3	-	-	-	-	-	-	-	3	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+33%
'92	17%	50%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	266	Dec:		0%
'92	399			50%
'98	120			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	7	8	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:	-
'92	0		-
'98	20		-

Trend Study 30-5-98

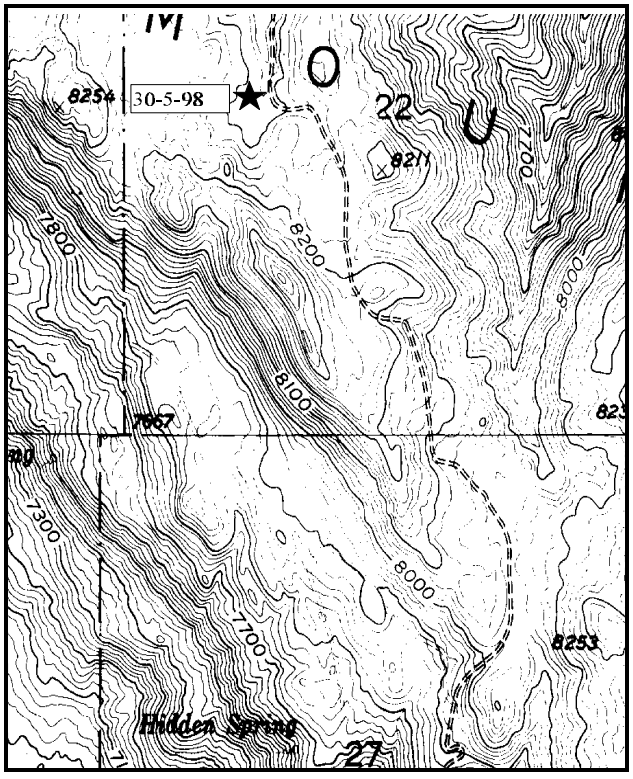
Study site name: Harmony Mountain Summit . Range type: Low Rabbitbrush .

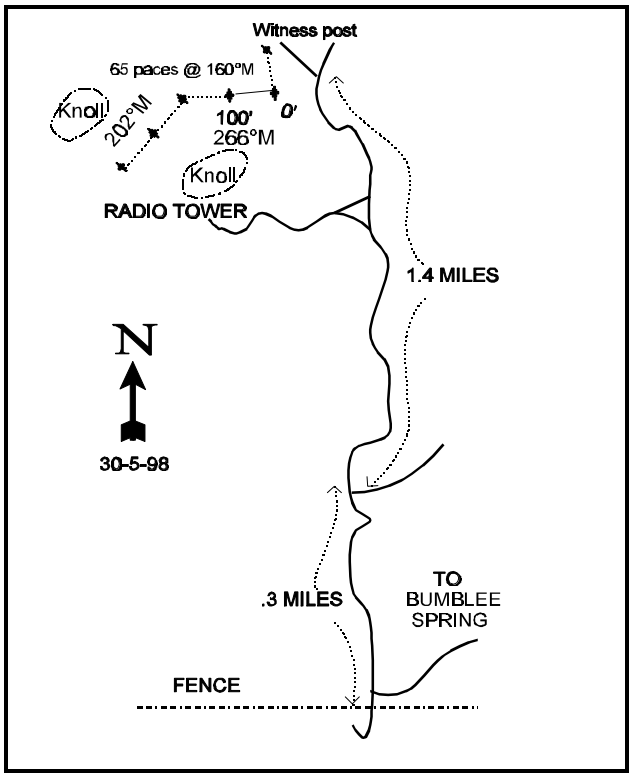
Compass azimuth: frequency baseline 266 M degrees. (Lines 3 & 4 202°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (12 & 87ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

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 1.60 miles, at which point you should come to a gate. From the fence continue on the main road 4.4 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

Diagrammatic Sketch

Township 37S , Range 13W , Section 22

UTM 4159822.538 N, 296543.628 E

DISCUSSION

Trend Study No. 30-5 (50A-5)

The Harmony Mountain Summit trend study monitors deer summer range at 8,100 feet elevation near the summit of Harmony Mountain. Slope is 10% to 15% with a northeast aspect. This area is characterized by open parks interspersed with scattered aspen and oak clones. The area has been heavily impacted by domestic livestock grazing and undergone a nearly complete type conversion to rabbitbrush. What formerly was a mountain big sagebrush-grass type is now dominated by stickyleaf low rabbitbrush, needlegrass species, and limited numbers of increaser forb species. Cattle were using the site in mid-June of 1992. Deer also utilize the area in summer as two does were encountered on the site during the 1992 reading. Pellet group data taken on the site in 1998 estimates 73 deer and 26 cow days use/acre. Many of the deer pellet groups appeared to be relatively recent. Cattle pats appeared to be older, although cows were seen down the road from the site.

Soils are relatively deep and formed by sedimentation from surrounding ridges. Effective rooting depth (see methods) is estimated at just over 17 inches. Soil texture is a sandy loam with a strongly acid pH (5.4). Soil organic matter is comparatively high at 4.5%. The principal soil disturbance is the activities of pocket gophers and rock squirrels, and the trampling of livestock. Soil erosion is minimal due to the abundant vegetation and litter cover.

The key browse species is mountain big sagebrush, although it only provides 37% of the browse cover, while stickyleaf low rabbitbrush now dominates by making up 62% of the browse cover. Sagebrush did show an increase from 1,532 plants/acre in 1982 to 6,666 in 1992, a 77% increase. Young plants were common and accounted for 64% of the population. By 1998, the population has remained comparable with a change to a more mature population. Young plants are still common, but the proportion has declined from 64% to 26%. Density of mature plants increased from 2,000 to 4,000 plants/acre. Utilization was moderate in 1982, although lighter in 1992 and 1998.

Sticky low rabbitbrush is the most abundant shrub on the site. It currently provides the majority of the shrub cover on the site. It had increased in density from 8,666 to 14,132 plants/acre between 1982 and 1992. The much larger sample used in 1998 estimated 11,140 plants/acre. Reproduction is still good, but the population is becoming increasingly mature. Most plants are not utilized.

Slenderbush eriogonum was relatively abundant in 1992, however it was not encountered in the larger sample of 1998. It is possible that there is an isolated population of slenderbush eriogonum that was sampled by the small sample in 1992, but not in 1998.

Grass is abundant, but composition consists largely of the increaser species, Letterman needlegrass, subalpine needlegrass, and needle-and-thread grass. These grasses account for 92% of the grass cover on the site. Virtually all grass plants were 30% to 50% utilized in 1982. Many of the grasses were grazed in 1992, but percent utilization was not estimated. The site was reread on July 1st of 1998 and it did not appear that cows had been on the site at that time.

Forbs are also abundant, except they consist largely of the low growing increasers like pale agoseris, common dandelion, and the poisonous silky lupine. The more palatable species, Wyoming painted cup and redroot eriogonum, have shown evidence of at least moderate use in the past. During the 1998 reading, pale agoseris and silky lupine alone produced 69% of the forb cover. Most other forbs produce less than ½ of 1% cover. Other, more preferred forbs are present, but in low numbers.

1982 APPARENT TREND ASSESSMENT

On this site, soil trend is stable or even improving. However, vegetatively there are definite problems, most coming from livestock use. Stickyleaf low rabbitbrush currently dominates the site and is increasing. The more desirable mountain big sagebrush is declining and increaser grasses, especially the needlegrass species, are quickly increasing. Forbs, which are of great importance to deer in the summer, appear to be slowly declining.

1992 TREND ASSESSMENT

Erosion is not evident on this site. Basal vegetative cover has increased by 12% since 1982, while percent bare ground has decreased by 56%. Trend for soil is up. 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 a low percent decadency. 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. The trend for the herbaceous understory is also up, even though it is dominated by less desirable increaser species and poisonous plants.

TREND ASSESSMENT
soil - up
browse - up slightly
herbaceous understory - up, but dominated by increaser species

1998 TREND ASSESSMENT

Trend for soil is stable with abundant vegetation and litter cover. Percent bare ground increased slightly, but it is still less than 10%. Erosion is not a problem on this site. Trend for browse is stable. Density of mountain big sagebrush is comparable to 1992 estimates. The population has become more mature, yet young plants are still common. Utilization is light, vigor good, and percent decadence low at only 7%. Stickyleaf low rabbitbrush is still the most abundant shrub on the site. Density of this increaser shrub has declined slightly, although some of the difference may be due to the much larger sample size giving more accurate browse population estimates. Young plants are still common, vigor is good, and percent decadence is low at 8%. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses and forbs has declined. Nested frequency of the most common grass, Letterman needlegrass, has remained similar but frequency of subalpine needlegrass declined significantly. Nested frequency of pale agoseris, Indian paintbrush, redroot eriogonum, and silky lupine all declined significantly.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 5

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron trachycaulum	-	4	2	-	3	.09
G	Bouteloua gracilis	-	-	1	-	-	-
G	Bromus carinatus	8	7	-	2	6	.13
G	Carex spp.	7	11	-	4	4	.56
G	Poa fendleriana	3	7	1	1	4	.21

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Poa pratensis	27	20	-	10	9	.55
G	Stipa columbiana	289	*208	55	94	71	5.40
G	Stipa comata	119	112	14	44	45	2.92
G	Stipa lettermani	287	256	66	92	86	10.28
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		740	625	139	247	228	20.17
Total for Grasses		740	625	139	247	228	20.17
F	Achillea millefolium	-	7	-	-	3	.18
F	Agoseris glauca	251	*187	69	87	68	3.87
F	Antennaria rosea	3	-	1	1	-	-
F	Artemisia ludoviciana	3	-	-	1	-	-
F	Astragalus spp.	4	2	-	2	1	.03
F	Astragalus utahensis	-	6	-	-	2	.18
F	Castilleja linariaefolia	53	*23	2	24	11	.27
F	Calochortus nuttallii	-	2	9	-	1	.01
F	Chenopodium spp. (a)	-	28	-	-	11	.13
F	Collinsia parviflora (a)	-	14	-	-	6	.13
F	Crepis acuminata	-	*34	-	-	13	.34
F	Delphinium nuttallianum	-	1	-	-	1	.03
F	Epilobium paniculatum (a)	-	3	-	-	1	.00
F	Erigeron eatonii	-	1	-	-	1	.01
F	Erigeron spp.	3	2	-	2	1	.01
F	Eriogonum racemosum	4	*12	2	2	7	.30
F	Fritillaria atropurpurea	1	-	4	1	-	-
F	Galium boreale	-	13	-	-	5	.21
F	Hackelia patens	10	*28	1	6	14	.56
F	Hymenoxys acaulis	-	6	-	-	2	.01
F	Hydrophyllum occidentale	3	-	-	1	-	-
F	Lomatium spp.	-	1	-	-	1	.00
F	Lupinus sericeus	219	*86	42	92	42	3.59
F	Penstemon spp.	-	3	-	-	1	.03
F	Polygonum douglasii (a)	-	156	-	-	55	.72
F	Taraxacum officinale	32	*15	4	23	6	.22
Total for Annual Forbs		0	201	0	0	73	0.98
Total for Perennial Forbs		586	429	134	242	180	9.90
Total for Forbs		586	630	134	242	253	10.89

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 5

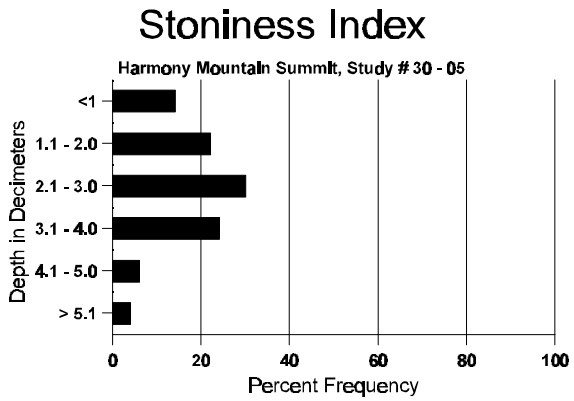
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	92	13.89
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	96	23.36
B	Eriogonum microthecum	0	-
B	Mahonia repens	1	.06
B	Quercus gambelii	1	-
B	Populus tremuloides	0	.18
B	Ribes viscosissimum	0	-
B	Symphoricarpos oreophilus	1	.18
Total for Browse		191	37.68

BASIC COVER --
Herd unit 30 , Study no: 5

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	377	29.00	33.00	60.90
Rock	92	0	0	2.23
Pavement	118	0	.25	1.01
Litter	395	61.75	63.25	63.82
Cryptogams	-	0	0	0
Bare Ground	174	9.25	3.50	8.60

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 05, Study Name: Harmony Mountain Summit

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.2	47.8 (16.1)	5.4	62.0	19.4	18.6	4.5	41.9	268.8	.4



PELLET GROUP FREQUENCY --

Herd unit 30 , Study no: 5

Type	Quadrat Frequency '98
Sheep	2
Deer	44
Cattle	18

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	29	-	-	-	-	-	-	-	-	27	1	1	-	1933			29
	98	40	-	-	3	-	-	1	-	-	44	-	-	-	880			44
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	62	2	-	-	-	-	-	-	-	63	-	1	-	4266			64
	98	78	-	-	1	-	-	-	-	-	79	-	-	-	1580			79
M	82	2	10	-	-	-	-	-	-	-	12	-	-	-	800	15	12	12
	92	18	11	1	-	-	-	-	-	-	29	-	1	-	2000	15	30	30
	98	193	6	-	4	-	-	-	-	-	200	2	1	-	4060	16	24	203
D	82	7	3	-	-	-	-	-	-	-	9	1	-	-	666			10
	92	5	1	-	-	-	-	-	-	-	3	-	1	2	400			6
	98	19	2	-	-	-	-	-	-	-	21	-	-	-	420			21
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	57%	00%	00%	+77%
'92	14%	01%	05%	- 9%
'98	03%	00%	.33%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	1532	Dec:		43%
'92	6666			6%
'98	6060			7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	1	-	-	-	-	-	-	-	4	-	-	-	266			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	4	2	-	-	-	-	-	-	-	6	-	-	-	400	7	6	6
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	30%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	666		-
	'98	0		-

Chrysothamnus viscidiflorus viscidiflorus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	82	32	-	-	-	-	-	-	-	-	32	-	-	-	2133			32
	92	51	1	-	-	-	-	-	-	-	50	-	2	-	3466			52
	98	91	2	-	-	-	-	-	-	-	93	-	-	-	1860			93
M	82	75	-	-	-	-	-	-	-	-	75	-	-	-	5000	12	15	75
	92	122	20	3	-	-	-	-	-	-	142	2	1	-	9666	11	13	145
	98	418	-	-	3	-	-	-	-	-	421	-	-	-	8420	13	21	421
D	82	10	-	-	13	-	-	-	-	-	22	1	-	-	1533			23
	92	13	2	-	-	-	-	-	-	-	14	-	1	-	1000			15
	98	43	-	-	-	-	-	-	-	-	43	-	-	-	860			43
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+39%
'92	11%	01%	02%	-21%
'98	.35%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	8666	Dec:	18%
	'92	14132		7%
	'98	11140		8%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum microthecum																		
Y	82	21	-	-	-	-	-	-	-	-	18	3	-	-	1400			21
	92	87	1	-	-	-	-	1	-	-	89	-	-	-	5933			89
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	41	3	-	-	-	-	-	-	-	44	-	-	-	2933	10	12	44
	92	61	4	-	-	4	-	-	-	-	66	-	3	-	4600	5	7	69
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	82	6	-	-	-	-	-	-	-	-	3	3	-	-	400			6
	92	4	-	-	-	-	-	-	-	-	2	-	2	-	266			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	04%	00%	00%	+56%
'92	06%	00%	03%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	4733	Dec:	8%
	'92	10799		2%
	'98	0		0%

Mahonia repens

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	5	7	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	120		-

Populus tremuloides

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	157	106	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	0			-

Ribes viscosissimum																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	31	31	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	0			-

Symphoricarpos oreophilus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	25	51	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

Trend Study 30-9-98

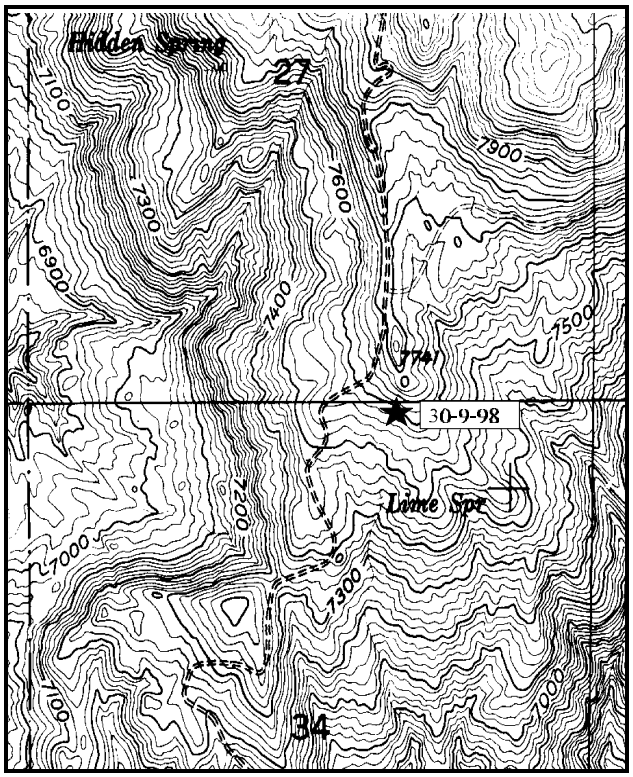
Study site name: Upper Lime Spring . Range type: Mountain Brush .

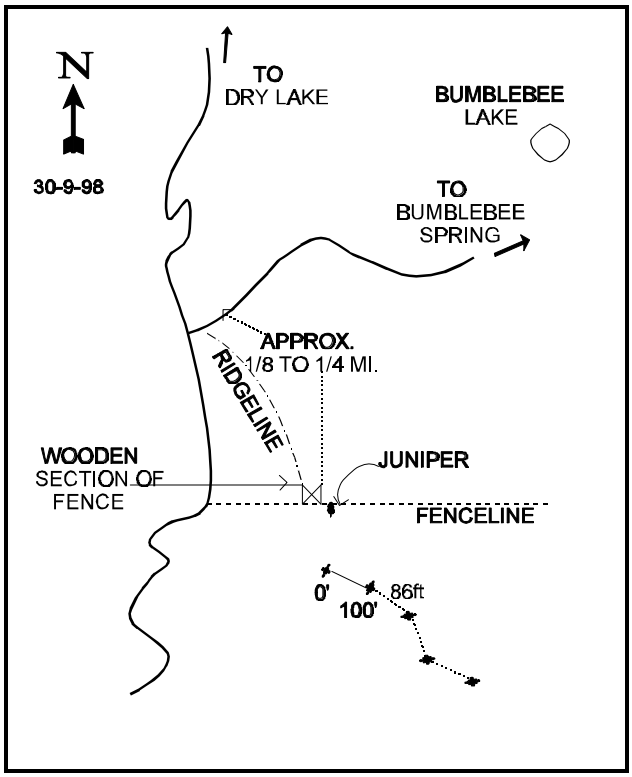
Compass azimuth: frequency baseline 100 degrees. (Line 2 120°M, line 3 170°M, line 4 112°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (14 & 87ft), line 2 (34ft), line 3 (71ft), line 4 (59ft).

LOCATION DESCRIPTION

From the Forest Boundary north of New Harmony, proceed north 0.3 miles on Pace Draw Road. Turn right on the Harmony Mountain Road and proceed 1.6 miles to a gate. Go through the gate 4.4 miles to the junction of Harmony Mountain Road and Bumblebee Spring Road, walk in a southeasterly direction along the top of the ridge. At the end of the ridge, walk down the slope to a barbed wire fence with one wooden section. Nearby is a lone juniper in some oakbrush. From the juniper, the 0-foot baseline stake is located 18 paces away at a bearing of 141 degrees true. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.





Map Name: Stoddard Mountain Diagrammatic Sketch

Township 37S , Range 13W , Section 34 UTM 4157393.117 N, 297284.690 E

DISCUSSION

Trend Study No. 30-9 (50A-9)

The Upper Lime Spring trend study occupies an oakbrush range type on a southeast aspect with slope of approximately 10% to 15%. Elevation is about 7,600 feet. The area is considered summer fawning habitat for deer and also receives some summer cattle use. There was evidence of deer beds and abundant pellet groups during the 1982 and 1992 readings. Pellet group data from 1998 estimate 62 deer days use/acre. No sign of cattle use was observed on the site during the reading on the first of July.

Soils are limestone derived, fine textured, with some surface rockiness. Effective rooting depth (see methods) is estimated at just over 14 inches. Soil texture is a sandy clay loam with an neutral pH (6.9). Phosphorus may be limiting to plant growth at just 4.6 ppm, when 10 ppm is considered the minimum for normal plant development. The surface horizon is a light colored whitish gray soil which lacks structure. At a depth of 8 to 12 inches is a compacted orange-brown clay layer. There are numerous barren shrub interspaces which allow some erosion to occur. Areas dominated by oak clones and serviceberry have a good buildup of litter which helps protect the soil. Overall, soil erosion does not appear to be a problem.

Browse on the site is "patchy" in its distribution. Gambel oak is the most abundant species which varies in size, perhaps due to soil characteristics. Some areas are dominated by short 2 to 3 foot high oak, while more level areas have oak in the 8 to 10 foot range. Some of these taller oak clones are very dense. Density was estimated at 15,132 stems/acre in 1992. The age structure is composed mostly of young plants (68%). Vigor is generally good, yet approximately 20% of the plants encountered in 1992 had extensive insect damage. The level of utilization varied from light to heavy. In 1998, the study site baseline was lengthened in order to take a much larger sample. Density was estimated at 10,480 stems/acre. Average height is lower since more of the low growing oak was encountered in the larger sample. Most of the oak appears unutilized. Vigor is poor however, on approximately 27% of the oak, due to the cold spring weather and late frosts of 1998.

Other important browse plants are Utah serviceberry, mountain big sagebrush, and true mountain mahogany. The serviceberry and mahogany species are generally less than five feet in height and available to browsing. Utah serviceberry has increased dramatically from 4,199 in 1982 to 10,466 plants/acre by 1992 due mostly to the large number of young plants encountered in 1992. The larger sample used in 1998 estimated only 3,300 plants/acre. Vigor has improved since 1982 when insect damage was noted on over 20% of the individuals. No insect damage was encountered on serviceberry during the 1992 or 1998 readings. The proportion of heavily hedged plants also decreased from 67% in 1982 to 34% in 1992, and 12% by 1998. Reproduction remains adequate to maintain the population. True mountain mahogany occurs in limited densities of about 200 plants/acre. These shrubs are moderate to heavily hedged but in good vigor. Mountain big sagebrush has an estimated density of 400 plants/acre. They show mostly moderate use with 25% classified as decadent. Other preferred browse which occur in small numbers include: black sagebrush, cliffrose, and snowberry.

Grasses are nearly nonexistent. Indian ricegrass, needle-and-thread, and a sedge are the only species which occur on the site. These combine to produce less than 1% cover. Forbs are slightly more abundant, but still deficient. Forbs are an important element of summer fawning habitat and should be increased if possible. The principal forb species include American vetch and Leonard penstemon, which currently (‘98) provide 85% of the meager forb cover (5.4%).

1982 APPARENT TREND ASSESSMENT

Soil movement is occurring at a moderate rate, but could be arrested if a decent herbaceous cover were to be established. Overall, soil trend is stable to declining. Vegetation trend is similar. Gambel oak density is probably increasing at a slow rate. The more preferred serviceberry may also be increasing, but will be outperformed by oak. The lack of grasses and forbs is alarming considering that this is spring and summer range for deer.

1992 TREND ASSESSMENT

Protective ground cover has improved since 1982. Basal vegetative cover increased by 71% and percent bare ground decreased by 60% since the last reading. However, active gullies, soil pedestaling, and surface erosion are still occurring on the site. The soil trend has improved since 1982, but a good herbaceous understory is needed to adequately protect the soil from erosion. Browse trend is up for serviceberry and stable for oak. Oak has increased in density 26%, but shows increasing insect damage (11% in 1982 to 22% in 1992) and heavy hedging (1% to 6%). Utah serviceberry has increased 60% and displays less heavy hedging (67% in 1982 to 34% in 1992). Overall, browse trend is up slightly. The trend for herbaceous understory is stable but grasses and forbs are nearly absent on this site. Only two grasses are present in small numbers and more forbs are needed in order to improve forage for summering deer.

TREND ASSESSMENT
soil - stable since 1982, but in poor condition with erosion still occurring
browse - up slightly
herbaceous understory - stable, but nearly absent

1998 TREND ASSESSMENT

The soil trend appears down slightly due to an increase in percent bare ground and a decline in litter cover. The original frequency baseline sampled more oak clones which had a high cover of litter and less bare ground. The lengthened baseline used in 1998 sampled more open areas where litter cover was lower and bare shrub interspaces more abundant. With this, trend for soil is considered stable. Trend for browse is stable. Density changes are mostly due to the increased sample size which better estimates shrub densities that are very clumped distributions on this site. Serviceberry displays mostly good vigor with less heavy use compared to 1992 and low decadence. Reproduction is adequate to maintain the stand. Gambel oak density is down slightly from 1992 estimates primarily due to a decline in percentage of young plants from 10,400 to 4,860 plants/acre. Use is light but vigor reduced due to frost damage on 27% of the plants. Reproduction is good and decadence low. Trend for the herbaceous understory is stable, but depleted. Only two grass species and 1 sedge are found on the site. Forbs consist almost entirely of Leonard penstemon and American vetch. Grasses and forbs combine to produce only 6% cover.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable, but nearly absent

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 9

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Carex spp.	-	*14	-	-	6	.39
G	Oryzopsis hymenoides	7	8	1	4	5	.37
G	Stipa comata	5	-	-	3	-	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		12	22	1	7	11	0.76
Total for Grasses		12	22	1	7	11	0.76

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Agoseris glauca	-	-	1	-	-	-
F	Arabis spp.	1	-	-	1	-	-
F	Astragalus spp.	-	3	-	-	1	.03
F	Calochortus nuttallii	-	3	-	-	1	.00
F	Cymopterus spp.	13	24	16	7	12	.18
F	Epilobium paniculatum (a)	-	1	-	-	1	.00
F	Erigeron eatonii	-	6	-	-	2	.03
F	Hymenopappus filifolius	3	3	1	1	1	.03
F	Hydrophyllum occidentale	-	3	-	-	1	.06
F	Lomatium spp.	-	*8	-	-	6	.10
F	Lotus utahensis	9	*-	-	5	-	-
F	Lupinus argenteus	-	*13	-	-	6	.05
F	Pedicularis centranthera	3	5	2	2	3	.07
F	Penstemon leonardi	26	*49	35	10	24	2.00
F	Penstemon linarioides	44	*-	-	19	-	-
F	Phlox austromontana	2	3	-	1	1	.00
F	Physaria chambersii	3	-	-	1	-	-
F	Phlox longifolia	3	*20	-	3	7	.03
F	Senecio multilobatus	15	*4	1	8	3	.06
F	Taraxacum officinale	-	-	1	-	-	-
F	Trifolium spp.	3	*22	2	2	9	.11
F	Vicia americana	131	*69	45	56	23	2.60
F	Viguiera multiflora	-	-	-	-	-	.00
F	Zigadenus paniculatus	-	2	-	-	2	.01
Total for Annual Forbs		0	1	0	0	1	0.00
Total for Perennial Forbs		256	237	104	116	102	5.43
Total for Forbs		256	238	104	116	103	5.43

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 9

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	55	13.83
B	Artemisia nova	2	.38
B	Arctostaphylos patula	22	9.05
B	Artemisia tridentata vaseyana	9	1.78
B	Cercocarpus montanus	9	2.12
B	Chrysothamnus viscidiflorus	3	.15
B	Cowania mexicana stansburiana	1	.15
B	Gutierrezia sarothrae	1	.00
B	Juniperus osteosperma	1	-
B	Mahonia repens	13	.30
B	Pinus edulis	1	-
B	Quercus gambelii	65	21.56
B	Symphoricarpos oreophilus	2	1.00
B	Tetradymia canescens	5	.16
Total for Browse		189	50.55

CANOPY COVER --
Herd unit 30 , Study no: 9

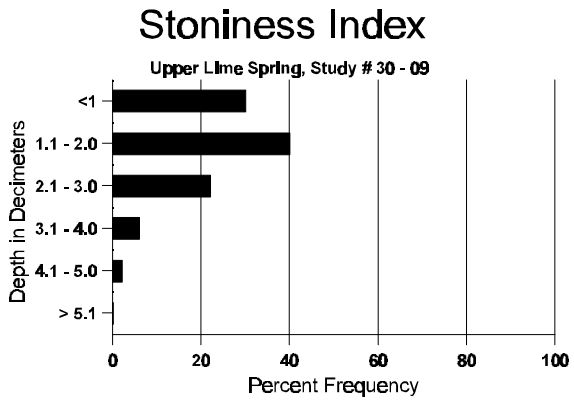
Species	Percent Cover '98
Amelanchier utahensis	.40
Quercus gambelii	9

BASIC COVER --
Herd unit 30 , Study no: 9

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	279	2.00	6.50	54.00
Rock	89	2.00	1.25	2.33
Pavement	197	0	4.50	10.53
Litter	392	71.25	78.75	66.71
Cryptogams	1	0	0	.00
Bare Ground	196	24.75	10.25	14.26

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 09, Study Name: Upper Lime Spring

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.4	51.6 (19.4)	6.9	46.0	21.4	32.6	2.4	4.6	83.2	.7



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 9

Type	Quadrat Frequency '98
Rabbit	2
Deer	9

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	92	3	-	-	3	-	-	5	-	-	11	-	-	-	733			11
	98	4	1	-	4	-	-	6	-	-	14	1	-	-	300			15
Y	82	1	1	3	-	-	-	3	-	-	6	2	-	-	533			8
	92	3	7	1	25	4	-	30	-	-	70	-	-	-	4666			70
	98	16	4	2	5	1	-	7	-	-	35	-	-	-	700			35
M	82	1	-	7	-	7	28	6	-	-	40	9	-	-	3266	27	23	49
	92	2	6	2	1	19	37	-	-	2	69	-	-	-	4600	32	24	69
	98	29	35	13	10	8	4	8	-	-	105	-	2	-	2140	32	34	107
D	82	-	-	-	-	-	4	2	-	-	2	4	-	-	400			6
	92	5	-	-	-	-	3	2	-	8	9	-	-	9	1200			18
	98	10	12	1	-	-	-	-	-	-	12	-	-	11	460			23
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	420			21

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	13%	67%	00%	+60%
'92	23%	34%	06%	-68%
'98	36%	12%	08%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	4199	Dec:	10%
	'92	10466		11%
	'98	3300		14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	1	-	-	-	-	-	-	2	-	-	-	40	14	21	2
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	33%	33%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	0			0%
'98	60			33%

Arctostaphylos patula																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	29	-	-	-	-	-	-	-	-	29	-	-	-	966			29
	98	-	-	-	5	-	-	-	-	-	5	-	-	-	100			5
M	82	28	-	-	-	-	-	-	-	-	24	4	-	-	1866	20	16	28
	92	17	1	-	-	-	-	-	-	-	18	-	-	-	1200	27	30	18
	98	30	-	-	14	-	-	-	-	-	43	-	1	-	880	24	88	44
D	82	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	92	24	-	-	-	-	-	-	-	-	24	-	-	-	1600			24
	98	1	-	-	1	-	-	-	-	-	1	-	-	1	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+49%
'92	01%	00%	00%	-73%
'98	00%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	1932	Dec:		3%
'92	3766			42%
'98	1020			4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	9	-	-	-	-	-	-	-	15	-	-	-	300	18	25	15
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	1	-	-	-	-	-	-	-	4	-	-	1	100			5
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	50%	00%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	0			0%
'98	400			25%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	2	-	-	-	-	-	-	-	2	-	-	-	133	29	18	2
	92	-	1	-	2	-	1	-	-	-	4	-	-	-	266	36	49	4
	98	-	2	4	-	2	-	-	-	-	8	-	-	-	160	49	58	8
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	67%	00%	00%	+40%
'92	20%	20%	00%	-40%
'98	40%	40%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	199	Dec:		0%
'92	332			0%
'98	200			10%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60	8	10	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	60			-

Cowania mexicana stansburiana																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

Gutierrezia sarothrae																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	7	11	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	-60%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	100			-
'98	40			-

Juniperus osteosperma																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Mahonia repens																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	33			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	28	-	-	-	-	-	14	-	-	42	-	-	-	1400			42
	98	15	-	-	2	-	-	-	-	-	17	-	-	-	340			17
M	82	11	-	-	-	-	-	-	-	-	11	-	-	-	733	4	5	11
	92	1	-	-	-	-	-	2	-	-	3	-	-	-	200	7	4	3
	98	18	-	-	6	-	-	11	-	-	35	-	-	-	700	3	5	35

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+54%
'92	00%	00%	00%	-35%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	733	Dec:	-
	'92	1600		-
	'98	1040		-

Pinus edulis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	82	4	-	1	-	-	-	9	-	-	13	1	-	-	933			14
	92	7	-	-	-	-	-	4	-	-	9	3	-	-	733			11
	98	22	-	-	14	-	-	10	-	-	43	-	3	-	920			46
Y	82	61	-	1	-	-	-	6	-	-	68	-	-	-	4533			68
	92	56	58	4	13	7	-	12	6	-	108	44	4	-	10400			156
	98	179	-	-	29	-	-	35	-	-	220	-	23	-	4860			243
M	82	59	-	-	1	-	-	14	23	-	78	19	-	-	6466	72	34	97
	92	5	-	1	-	10	-	-	42	-	58	-	-	-	3866	94	43	58
	98	172	-	6	28	-	-	14	1	-	155	-	66	-	4420	41	24	221
D	82	-	-	-	1	-	-	1	1	-	2	1	-	-	200			3
	92	-	1	2	-	2	5	1	-	2	8	4	1	-	866			13
	98	57	-	-	2	-	-	1	-	-	8	-	38	14	1200			60
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1220			61

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	.59%	00%	+26%
'92	34%	06%	02%	-31%
'98	00%	01%	27%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	11199	Dec:	2%
	'92	15132		6%
	'98	10480		11%

Symphoricarpos oreophilus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	3	-	-	-	-	-	3	-	-	-	60	20	17	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	60		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	5	-	-	-	-	-	-	-	9	-	-	-	180	9	15	9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	42%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	240		-

Trend Study 30-12-98

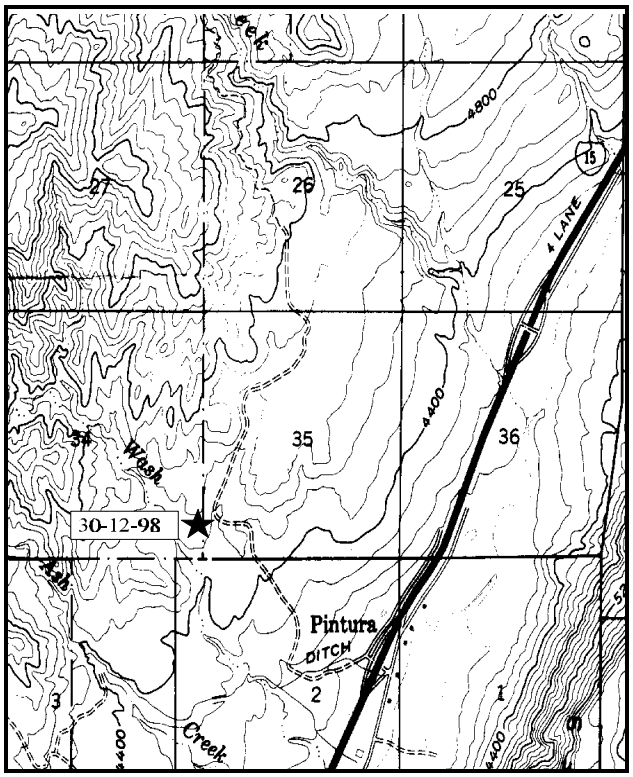
Study site name: Pintura Bench . Range type: Mountain Brush .

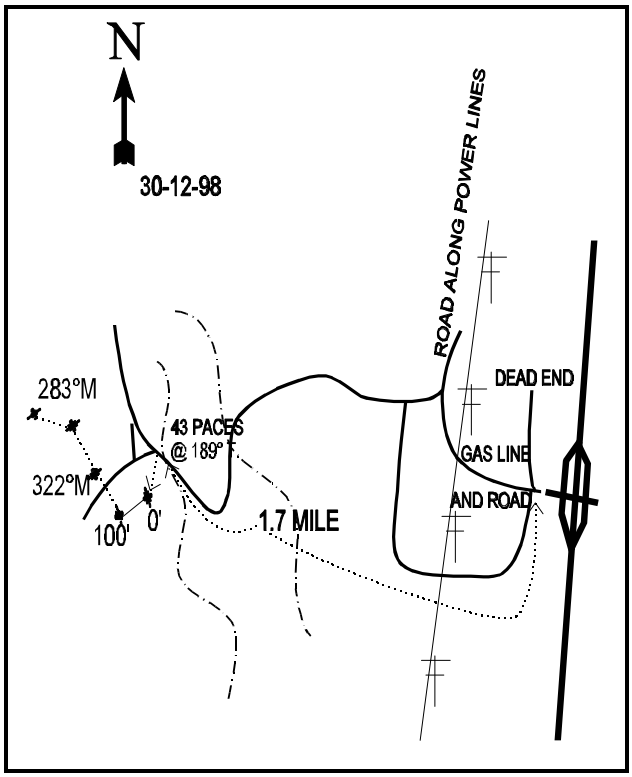
Compass azimuth: frequency baseline 240 M degrees. (Line 2 & 3 322°M, line 4 283°)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (4 & 98ft), line 2 (56ft), line 3 (39ft), line 4 (65ft).

LOCATION DESCRIPTION

Take the Pintura exit (#31) off Interstate 15 between Cedar City and St. George. Proceed west on the dirt road for 1.7 miles, at which point you will pass over an intermittent streambed. From the intersection of the streambed and the road, walk 43 paces at a bearing of 189 degrees true, at which point the 0-foot baseline stake will be located. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.





Map Name: New Harmony Diagrammatic Sketch

Township 39S , Range 13W , Section 34 UTM 4135955.053 N, 297253.060 E

DISCUSSION

Trend Study No. 30-12 (50A-12)

The Pintura Bench study is on winter range located on an old 1960's chained and seeded juniper-pinyon area. Elevation of the study site is 4,800 feet. Terrain slopes gently (10% to 15%) to the east. It was a known concentration area for wintering deer, in which some used to migrate from the Zion unit by crossing the I-15 freeway. A new deer fence was constructed along the freeway in 1990 and 1991, which now prohibits such movement. According to Beal (1996), some mixing of the deer herds occurred between the adjacent Zion and East Pine Valley herd units before the fence was completed, but that no longer occurs. There are places were deer can still cross I-15 by way of overpasses and funnel fences between New Harmony and St. George. Pellet group data from 1998 show a low amount of deer use at 12 deer days use/acre. Cattle sign was also noted with 2 cow days use/acre.

Soils are moderately shallow and rocky with considerable amounts of bare soil and erosion pavement. Effective rooting depth (see methods) is estimated at 14 inches. Soil texture is a clay loam with a neutral pH (7.1). Phosphorus may be limiting to plant development at just 4.6 ppm, when 10 ppm is considered the minimum for normal plant development. The soil is extremely rocky throughout the profile. Calcium carbonate deposits occur on the surface of most of the rocks. Rock and pavement are also common on the surface where they currently provide 37% ground cover. Litter cover is fair and occurs mainly under tree and shrub canopies. Most of the chaining litter has decomposed with the passage of time. Erosion is light to moderate, primarily because of gentle terrain.

Density of desirable browse plants is rather low. The key species are mountain big sagebrush, Utah serviceberry, and desert ceanothus. Total density for these species is currently (‘98) only 1,000 plants/acre. Utilization of sagebrush and desert ceanothus has been light to moderate since 1982, but Utah serviceberry displayed moderate and heavily use in 1982 and 1992. All plants sampled in 1998 appeared only lightly utilized. Vigor of these preferred shrubs is good and decadence is currently low. Other shrubs which provide some additional forage include: Stansbury cliffrose, green ephedra, bitterbrush, shrub live oak and slenderbush eriogonum.

The most numerous shrub is broom snakeweed which increased from 4,532 plants/acre in 1982 to 8,732 by 1992, a 48% increase. Age class evaluation indicated a dynamic expanding population with a biotic potential of 36% and young plants accounting for 91% of the population. However, by 1998 the population declined 51% and now has a similar density to that of 1982 (4,532 to 4,300 plants/acre). Age class analysis indicates a stable population with 92% of the stand consisting of mature plants.

Trees are increasing in size. Data from the point quarter method estimate 41 pinyon and 57 juniper trees/acre in 1992, the majority of which are over 4 feet in height. Point quarter data from 1998 estimate 63 singleleaf pinyon pine and 51 juniper trees/acre. Average basal diameter is 4 inches for pinyon and 4.5 inches for juniper. Most trees are now 8 to 10 feet in height.

Perennial grasses and forbs are sparse. Bottlebrush squirreltail, intermediate, and crested wheatgrass are occasionally present. Cheatgrass brome was very common in 1982, but analysis of photos and notes taken during the 1992 reading indicate that cheatgrass was not prevalent. Annual grasses and forbs were included in the 1998 sample. Cheatgrass and foxtail brome currently account for 99% of the grass cover on the site. These grasses occur in patches and are not particularly widespread. All grasses combined produce only 10% cover. No utilization of grasses was observed. Perennial forbs are slightly more common than perennial grasses. Skunk breadroot is the only perennial forb of any significance. It currently provides 85% of the meager forb cover (4%). Forbs, like grasses, are essentially ungrazed.

1982 APPARENT TREND ASSESSMENT

Range condition is poor and shows few signs of improvement. Over the long term, a small increase in forage production from the key species may be realized, but it is unlikely to be significant in the context of management. The increase of broom snakeweed and narrowleaf Yerba-santa is much more significant. Vegetative trend is stable or slightly declining. Soil trend is stable but at a low condition rating.

1992 TREND ASSESSMENT

This site is still in poor condition. The soil trend is down slightly. Even though bare ground declined from 33% to 18% since 1982, basal vegetative cover also declined, while pavement and rock cover combined doubled. Trend for browse is mixed. The key browse species, mountain big sagebrush and Utah serviceberry, have declined in numbers since the last reading. Percent decadency of Mountain big sagebrush has also increased from zero in 1982, to 67% in 1992. Desert ceanothus has increased in density 31% and has an age class structure of an expanding population. The increaser, broom snakeweed, has also increased significantly since 1982 and has a dynamic reproductive potential. Trend for browse is slightly down. Herbaceous plants are severely lacking. Quadrat frequency of perennial grasses and forbs has declined since 1982, indicating a downward trend.

TREND ASSESSMENT
soil - down slightly and in poor condition
browse - down slightly
herbaceous understory - down and in poor condition

1998 TREND ASSESSMENT

Trend for soil appears stable compared to 1992. Percent bare ground declined slightly but litter cover also declined and rock/pavement cover increased slightly. Some localized erosion is still occurring on the site, but the gentle terrain combined with the protective ground cover limit its effects. Trend for browse is up slightly for the key species, serviceberry, mountain big sagebrush, and desert ceanothus. Density estimates have changed slightly, yet some of the difference may be due to the larger sample used in 1998. Overall however, vigor is good, utilization lighter, and percent decadence lower. Density of broom snakeweed declined 51% since 1992, but rabbitbrush increased 88% from 332 to 2,680 plants/acre. Trend for the herbaceous understory is down and in very poor condition. Quadrat frequency of perennial grasses is just 5%, but sum of nested frequency is similar to 1992 estimates. Sum of nested frequency of perennial forbs declined 67% and both of the most abundant forbs, fendler Euphorbia and skunk breadroot, declined significantly in nested frequency.

TREND ASSESSMENT
soil - stable
browse - up slightly
herbaceous understory - down and in poor condition

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 12

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	2	4	2	1	1	.00
G	Agropyron intermedium	-	1	8	-	1	.00
G	Bromus rubens (a)	-	92	-	-	35	1.45
G	Bromus tectorum (a)	-	306	-	-	92	8.21
G	Poa spp.	3	-	-	2	-	-
G	Sitanion hystrix	9	8	22	7	3	.04
G	Stipa lettermani	-	-	1	-	-	-
G	Vulpia octoflora (a)	-	36	-	-	13	.09
Total for Annual Grasses		0	434	0	0	140	9.75
Total for Perennial Grasses		14	13	33	10	5	0.05
Total for Grasses		14	447	33	10	145	9.80
F	Astragalus spp.	-	2	-	-	1	.03
F	Calochortus nuttallii	-	3	-	-	2	.01
F	Chaenactis douglasii	1	-	-	1	-	-
F	Cryptantha spp.	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	27	-	-	12	.13
F	Draba spp. (a)	-	82	-	-	36	.36
F	Eriogonum cernuum (a)	-	2	-	-	1	.00
F	Euphorbia fendleri	16	*1	16	11	1	.00
F	Gilia spp. (a)	-	1	-	-	1	.00
F	Lepidium spp. (a)	-	8	-	-	3	.01
F	Melilotus officinalis	3	-	10	2	-	-
F	Microsteris gracilis (a)	-	1	-	-	1	.00
F	Pediomelium mephiticum	23	*8	-	18	5	3.52
F	Penstemon spp.	6	2	1	3	1	.03
Total for Annual Forbs		0	121	0	0	54	0.52
Total for Perennial Forbs		49	16	27	35	10	3.60
Total for Forbs		49	137	27	35	64	4.13

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 12

Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Amelanchier utahensis	4	1.48
B	Arctostaphylos patula	2	.63
B	Artemisia tridentata vaseyana	13	1.54
B	Ceanothus greggii	25	2.25
B	Chrysothamnus viscidiflorus	48	6.94
B	Cowania mexicana stansburiana	1	.56
B	Ephedra viridis	5	1.66
B	Eriodictyon angustifolium	0	-
B	Eriogonum microthecum	44	2.36
B	Gutierrezia sarothrae	52	2.57
B	Juniperus osteosperma	1	1.00
B	Pinus monophylla	7	3.13
B	Prunus fasciculata	0	-
B	Purshia tridentata	0	-
B	Quercus turbinella	8	2.82
B	Rhus trilobata trilobata	6	1.51
B	Yucca baccata	1	-
Total for Browse		217	28.52

CANOPY COVER --
Herd unit 30 , Study no: 12

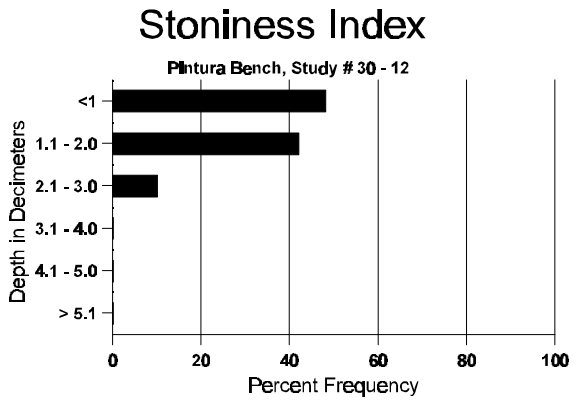
Species	Percent Cover '98
Juniperus osteosperma	.60
Pinus monophylla	4

BASIC COVER --
Herd unit 30 , Study no: 12

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	346	2.50	1.00	39.40
Rock	277	2.75	11.25	15.23
Pavement	327	11.75	22.25	21.93
Litter	381	49.75	47.25	39.86
Cryptogams	21	0	0	.09
Bare Ground	250	33.25	18.25	15.88

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 12, Study Name: Pintura Bench

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.0	49.4 (17.8)	7.1	42.0	29.4	28.6	3.5	4.6	76.8	.6



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 12

Type	Quadrat Frequency '98
Rabbit	18
Deer	19

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	82	-	2	2	-	-	-	-	-	-	4	-	-	-	266	28	30	4
	92	-	-	1	-	1	-	-	-	-	2	-	-	-	133	69	45	2
	98	5	-	-	-	-	-	-	-	-	2	3	-	-	100	64	61	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	50%	50%	00%	-50%
'92	50%	50%	00%	+ 5%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	266	Dec:	-
	'92	133		-
	'98	140		-

Arctostaphylos patula

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	33	61	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

Artemisia tridentata vaseyana

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133	32	26	2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	9	1	1	1	1	-	-	-	-	13	-	-	-	260	22	32	13
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	33%	00%	00%
'92	100%	00%	00%
'98	13%	07%	00%

%Change

	+ 0%
	+34%

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	199	Dec:	0%
	'92	199		67%
	'98	300		13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ceanothus greggii																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	2	-	-	3	-	-	6	-	-	-	120			6
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	-	-	-	1	1	-	-	-	-	2	-	-	-	133			2
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
M	82	7	-	-	-	-	-	-	-	-	7	-	-	-	466	25	31	7
	92	-	3	2	-	4	-	-	-	-	9	-	-	-	600	32	44	9
	98	5	9	5	2	2	-	-	-	-	23	-	-	-	460	28	47	23
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	1	-	-	-	-	-	2	-	-	-	133			2
	98	1	-	-	1	-	-	-	-	-	1	-	-	1	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+31%
'92	62%	23%	00%	-35%
'98	39%	18%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	599	Dec:		0%
'92	866			15%
'98	560			7%

Chrysothamnus viscidiflorus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	12	-	-	-	-	-	-	-	-	12	-	-	-	800			12
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	66	9	5	1
	98	96	-	-	4	-	-	-	-	-	100	-	-	-	2000	17	28	100
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	20	1	-	-	-	-	-	-	-	14	-	-	7	420			21
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	360			18

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+88%
'98	.74%	00%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	332			0%
'98	2680			16%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cowania mexicana stansburiana																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	-	-	1	-	20	56	39	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	100%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

Ephedra viridis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80	31	34	4
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	0%
'92	0		0%
'98	160		13%

Eriodictyon angustifolium																		
S	82	13	-	-	-	-	-	-	-	-	13	-	-	-	866			13
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	14	-	-	-	-	-	-	-	-	14	-	-	-	933	20	17	14
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	1599	Dec:	-
'92	0		-
'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum microthecum																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	98	1	-	-	-	-	-	1	-	-	2	-	-	-	40			2
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	5	1	-	-	-	-	-	-	-	6	-	-	-	400			6
	98	17	-	-	1	-	-	1	-	-	19	-	-	-	380			19
M	82	4	-	-	-	-	-	-	-	-	4	-	-	-	266	12	14	4
	92	3	2	-	-	1	-	-	-	1	7	-	-	-	466	10	10	7
	98	93	-	-	22	-	-	2	-	-	117	-	-	-	2340	17	27	117
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	2	-	1	-	1	-	-	-	4	-	-	-	266			4
	98	4	-	-	1	-	-	-	-	-	2	-	-	3	100			5
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+71%
'92	35%	12%	00%	+60%
'98	00%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	332	Dec:		0%
'92	1132			23%
'98	2820			4%

Gutierrezia sarothrae																		
S	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	73	-	-	-	-	-	-	-	-	73	-	-	-	4866			73
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	82	26	-	-	-	-	-	-	-	-	26	-	-	-	1733			26
	92	119	-	-	-	-	-	-	-	-	119	-	-	-	7933			119
	98	16	-	-	1	-	-	1	-	-	18	-	-	-	360			18
M	82	41	-	-	-	-	-	-	-	-	41	-	-	-	2733	11	11	41
	92	11	-	-	-	-	-	-	-	-	11	-	-	-	733	9	9	11
	98	195	-	-	-	1	-	1	-	-	197	-	-	-	3940	8	10	197
D	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+48%
'92	00%	00%	00%	-51%
'98	.46%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	4532	Dec:		1%
'92	8732			1%
'98	4300			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	67	74	1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66	118	100	1
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'92	66		-
	'98	20		-

Pinus monophylla																		
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	67	47	1
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133	82	68	2
	98	3	-	-	-	-	-	1	-	-	4	-	-	-	80	-	-	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	33%	00%	00%	-30%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	199	Dec:	-
	'92	199		-
	'98	140		-

Prunus fasciculata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	43	69	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	42	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	0		-

Quercus turbinella																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	1	-	-	-	-	-	4	-	-	-	266			4
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	-	2	-	1	-	-	4	-	-	-	266			4
	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133	37	26	2
	92	1	-	-	-	1	-	-	-	-	2	-	-	-	133	31	23	2
	98	15	-	-	-	3	-	-	-	-	18	-	-	-	360	46	60	18
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+57%
'92	57%	00%	00%	- 1%
'98	13%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	199	Dec:	0%
	'92	465		14%
	'98	460		13%

Rhus trilobata trilobata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	1	-	-	2	-	-	-	40			2
M	82	-	1	-	-	-	-	-	-	-	1	-	-	-	66	47	41	1
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66	50	51	1
	98	8	-	-	1	-	-	-	-	-	9	-	-	-	180	49	93	9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	100%	00%	00%	+ 0%
'92	100%	00%	00%	+70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'92	66		-
	'98	220		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Yucca baccata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	33	42	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	40			-

Trend Study 30-13-98

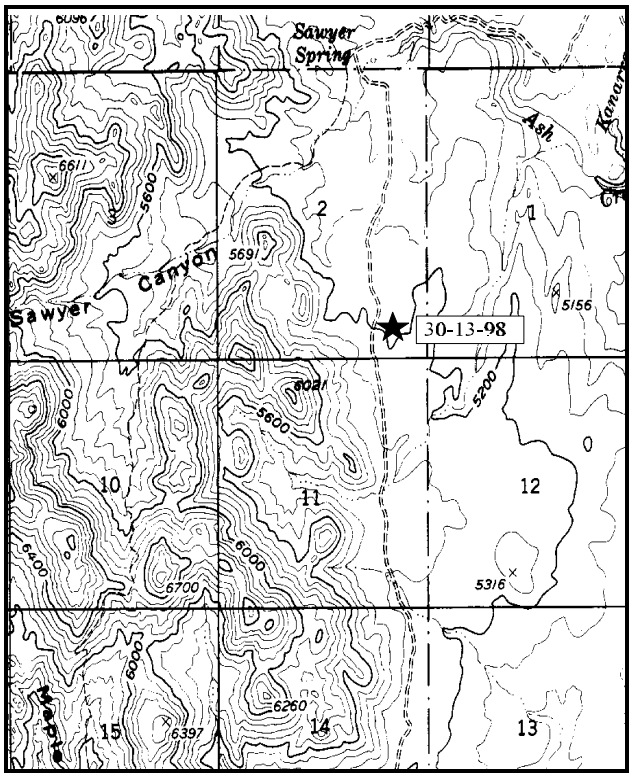
Study site name: Black Ridge . Range type: Chained, Reseeded P-J .

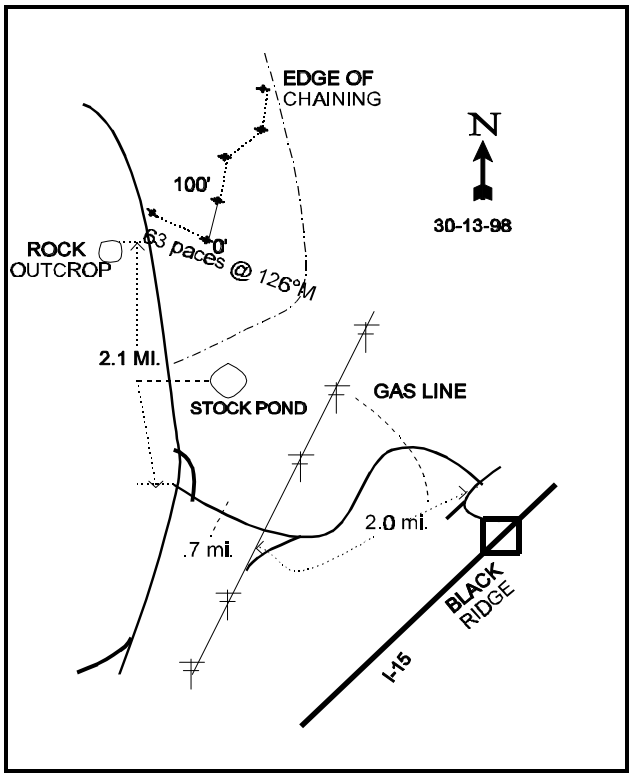
Compass azimuth: frequency baseline 2 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (15 & 84ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Traveling south on Freeway I-15 from Cedar City, take the Black Ridge exit (exit #36). Go west for a short distance to a frontage road. Turn north on the frontage road and then take the first left turn heading west. Travel approximately 2.0 miles on this road, disregarding minor turnoffs. At this point, you will come to an intersection at the power lines. Take the road to the right. 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 number 7003.





Map Name: New Harmony

Diagrammatic Sketch

Township 39S , Range 13W , Section 2

UTM 4143873.291 N, 298732.700 E

DISCUSSION

Trend Study No. 30-13 (50A-13)

The Black Ridge big game range trend study is located on a chained and seeded pinyon-juniper site slightly north of the Great Basin-Colorado River divide on Black Ridge. Elevation is approximately 5,200 feet, with a 8-10% slope and a north to northeast aspect. This area is critical winter range for deer, but currently receives little use because of low deer populations in the area. Cattle were observed in the area during the 1992 reading. About 40 cattle utilize this chaining between June 1st and September 30th on alternating years. Pellet group data taken on the site in 1998 estimate 21 deer days use/acre. No sign of cattle was encountered within the vicinity of the transect.

Soils are igneous in origin, dark-colored, shallow in places and very rocky. Surface temperatures would likely be high during the summer, especially on the south and west aspects. The soil is actually quite deep once you get past the rocks. Effective rooting depth (see methods) is estimated at 24 inches. Soil texture is a clay loam with a moderately acid pH (6.0). Phosphorus may be limiting to plant growth at just 4.2 ppm, when 10 ppm is considered to be the minimum for normal plant development. There is noticeable erosion as evidenced by the presence of active gullies and fairly extensive areas of rock and erosion pavement. Erosion appears to be controlled since the chaining treatment. Protective ground cover is abundant leaving little bare soil exposed.

During the 1982 reading, browse was not as abundant on the site. Mountain big sagebrush and Utah serviceberry were the most common at 599 and 333 plants/acre respectively. Mountain big sagebrush increased 94% by 1992 to 10,199 plants/acre. Seedlings were abundant with a biotic potential of 35% and young plants accounted for 61% of the population. The much larger sample used in 1998 estimated 6,080 plants/acre. The change in density would come mostly from the young age class which declined from 6,266 to 1,940 plants/acre. Density of mature plants remained comparable. Seedlings are still abundant, but many will likely not survive. Sagebrush on the site appears to by a hybrid between black sagebrush (*Artemisia nova*) and mountain big sagebrush (*A. tridentata vaseyana*). In 1992, both black and mountain big sagebrush were classified. These species have since been combined into mountain big sagebrush. It shows light to moderate use, good vigor, and low decadence.

Serviceberry has increased from 333 to 1,140 plants/acre between 1982 and 1998. Mature shrubs now average nearly 4 feet in height. Utilization is light to moderate. Another preferred species, antelope bitterbrush, also occurs in limited numbers. It shows moderate use. Small populations of Gambel and shrub-live oak also inhabit the site. The increaser, broom snakeweed, 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 is now mostly mature.

Juniper and pinyon trees are abundant. Point quarter data from 1992 estimated 238 juniper and 12 pinyon trees/acre. Over half of these were between 4 and 8 feet in height. Density strip data estimates similar tree densities between 1992 and 1998. Most of the mature junipers in 1998 were in the 8 to 12 foot tall range, with an overhead canopy cover estimated at 5%.

Seeded and native grasses are well established on the site. Crested wheatgrass dominates with lesser amounts of mutton bluegrass and prairie junegrass. Forbs are diverse, although not particularly numerous. Fourteen species of forbs were inventoried on the site during the 1992 reading. Yellow sweetclover was the only seeded forb encountered. The most abundant native perennials encountered in 1992 included showy goldeneye and sulfur eriogonum. Twelve additional annual and perennial forbs were encountered during the 1998 reading. Photos and quadrat frequency data from the 1982 reading suggest that grasses were less numerous but larger and more robust than those of 1992. Quadrat frequency of grasses increased significantly in 1992, but the grasses are smaller. Photos also suggest that juniper has increased significantly in size since

the first reading. Since this area only receives light cattle use, these changes in grass frequency and production are likely the result of drought combined with increased competition from shrubs and trees. Rain gauge data taken by the BLM (Laney 1996) indicate a normal average of almost 18 inches of precipitation annually. Total annual precipitation measured only 6.4 inches in 1984. From 1983 to 1992, annual precipitation was below average five of the nine years. Precipitation falling in the spring (March through May) is critical for cool season herbaceous species. The Black Ridge site receives on average, 6.36 inches of precipitation or 35% of the total annual precipitation during this period. The spring periods of 1984, 1985, and 1989 were particularly dry, averaging only 38% of normal. Spring precipitation was on average 81% of normal in 1986, 1990, and 1991. Spring precipitation was above normal in 1992.

1982 APPARENT TREND ASSESSMENT

Soil trend is likely slowly improving as the site becomes progressively more densely vegetated. There is soil movement and active gully formation, but this appears to be stabilizing. Vegetative trend is more difficult to gauge. The three key browse species appear to be expanding, but may be inhibited somewhat by the more rapid expansion and growth of crested wheatgrass and Utah juniper. The abundance of broom snakeweed should also be closely monitored.

1992 TREND ASSESSMENT

Soil trend is slightly down. Basal vegetative cover dropped 44% since 1982, while bare ground increased slightly. Litter cover also declined from 57% to 44%, likely due to the decrease in grass litter buildup. 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 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 size and vigor likely due to drought. If this trend continues it will result in a shrub and tree dominated system. Trend for herbaceous understory is therefore, slightly down.

TREND ASSESSMENT
soil - slightly down
browse - up
herbaceous understory - down slightly

1998 TREND ASSESSMENT

Trend for soil is stable since 1992. Percent bare ground declined slightly but litter cover is also reduced. Rock and pavement cover increased from 41% to 52%. However, soil erosion appears to be under control. Trend for the key browse species, mountain big sagebrush and serviceberry, appear stable. Density of sagebrush has declined due to a reduction in young plants which were very abundant in 1992. Density of mature plants has remained similar between readings. There are still ample seedlings and young to maintain the population. Utilization is mostly light and vigor good. Percent decadence has increased, but it is still relatively low at 11%. Density of serviceberry has increased, although much of the change would be due to the much larger sample used in 1998 now giving more accurate estimates for shrubs. Utilization is light, vigor good, and young plants account for 33% of the population. Broom snakeweed has increased 36% since 1992, but the current population is mostly mature. Juniper density is similar to 1992 estimates, while trees have greatly increased in size. Currently, overhead canopy cover averages 5%. Trend for the herbaceous understory is mixed. Sum of nested frequency of perennial grasses has remained steady, even though frequency of perennial forbs has increased. Overall, trend is considered stable.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 13

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	249	*192	59	91	71	5.53
G	Agropyron intermedium	3	3	-	2	1	.03
G	Bromus tectorum (a)	-	113	-	-	40	1.32
G	Elymus junceus	10	*3	1	7	1	.03
G	Koeleria cristata	26	*63	-	13	26	2.53
G	Poa fendleriana	47	58	6	21	22	2.14
G	Poa secunda	-	4	-	-	2	.06
G	Sitanion hystrix	32	*17	8	16	9	.33
G	Stipa columbiana	-	-	1	-	-	-
G	Vulpia octoflora (a)	-	11	-	-	5	.05
Total for Annual Grasses		0	124	0	0	45	1.37
Total for Perennial Grasses		367	340	75	150	132	10.67
Total for Grasses		367	464	75	150	177	12.05
F	Agoseris glauca	-	*18	-	-	10	.12
F	Antennaria rosea	3	-	-	1	-	-
F	Arabis spp.	2	4	-	1	3	.01
F	Artemesia biennis	1	-	-	1	-	-
F	Aster spp.	2	5	-	1	3	.04
F	Astragalus spp.	-	7	-	-	3	.09
F	Balsamorhiza hookeri	2	-	-	1	-	-
F	Castilleja linareaefolia	-	-	5	-	-	-
F	Calochortus nuttallii	-	*20	1	-	10	.05
F	Cirsium calcareum	4	*17	-	2	10	.49
F	Collinsia parviflora (a)	43	*17	-	20	11	.05
F	Crepis occidentalis	1	-	1	1	-	-
F	Draba spp. (a)	-	30	-	-	15	.15
F	Epilobium paniculatum (a)	-	29	-	-	12	.06
F	Erigeron pumilus	2	*34	-	1	15	.24
F	Eriogonum umbellatum	15	*40	-	8	17	.65
F	Lithospermum spp.	-	4	-	-	1	.03
F	Lomatium spp.	-	*7	-	-	4	.02

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Lupinus argenteus	-	*12	-	-	5	.19
F	Melilotus officinalis	28	*60	4	11	24	1.88
F	Microsteris gracilis (a)	-	13	-	-	8	.04
F	Papaver spp.	-	-	2	-	-	-
F	Phlox longifolia	-	6	-	-	2	.01
F	Polygonum douglasii (a)	-	14	-	-	7	.03
F	Ranunculus spp. (a)	-	54	-	-	20	.22
F	Spheralcea grossulariaefolia	-	-	3	-	-	-
F	Tragopogon dubius	1	-	-	1	-	-
F	Unknown forb-annual (a)	-	80	-	-	38	.56
F	Viguiera multiflora	35	*5	-	18	3	.18
F	Zigadenus paniculatus	-	3	-	-	2	.01
Total for Annual Forbs		43	183	0	20	91	0.90
Total for Perennial Forbs		96	296	16	47	132	4.27
Total for Forbs		139	479	16	67	223	5.17

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 13

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	5	1.08
B	Artemisia tridentata vaseyana	89	14.92
B	Chrysothamnus parryi howardi	1	-
B	Gutierrezia sarothrae	41	1.74
B	Juniperus osteosperma	14	3.59
B	Opuntia spp.	2	-
B	Purshia tridentata	1	.15
B	Quercus gambelii	3	1.41
B	Quercus turbinella	1	.38
Total for Browse		157	23.30

CANOPY COVER --
Herd unit 30 , Study no: 13

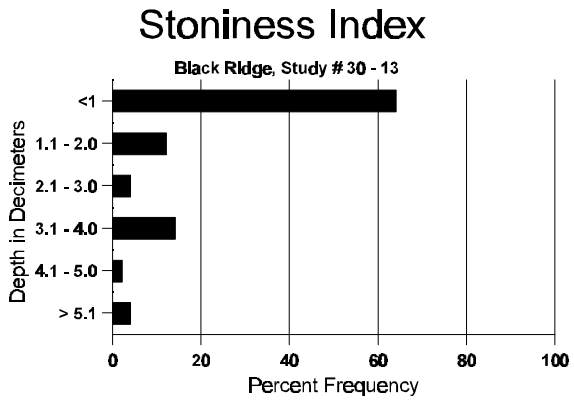
Species	Percent Cover '98
Juniperus osteosperma	5
Pinus monophylla	.60

BASIC COVER --
Herd unit 30 , Study no: 13

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	334	12.00	6.75	36.18
Rock	328	17.25	34.50	40.43
Pavement	238	5.25	6.00	11.23
Litter	383	57.00	44.00	39.61
Cryptogams	37	1.50	.75	.32
Bare Ground	202	7.00	8.75	6.98

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 13, Study Name: Black Ridge

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
24.2	44.8 (17.7)	6.0	32.0	33.4	34.6	2.1	4.2	76.8	.5



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 13

Type	Quadrat Frequency '98
Rabbit	12
Elk	1
Deer	17

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 13

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	1	-	-	18	-	-	-	-	-	19	-	-	-	380			19
M	82	4	1	-	-	-	-	-	-	-	4	1	-	-	333	11	18	5
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	37	1	-	-	-	-	-	-	-	38	-	-	-	760	41	45	38

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	20%	00%	00%	-60%
'92	00%	00%	00%	+88%
'98	02%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	333	Dec:	-
	'92	133		-
	'98	1140		-

Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	69	-	-	7	-	-	6	-	-	82	-	-	-	5466			82
	98	77	-	-	41	-	-	-	-	-	118	-	-	-	2360			118
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	88	3	-	1	-	-	2	-	-	94	-	-	-	6266			94
	98	93	1	-	3	-	-	-	-	-	96	-	1	-	1940			97
M	82	7	-	-	-	-	-	-	-	-	7	-	-	-	466	14	25	7
	92	44	7	-	6	-	-	-	-	-	57	-	-	-	3800	14	18	57
	98	137	31	-	3	3	-	-	-	-	167	-	7	-	3480	19	31	174
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	1	-	-	-	-	1	-	1	-	133			2
	98	28	2	-	3	-	-	-	-	-	21	-	-	12	660			33
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	200			10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+94%
'92	07%	00%	.65%	-40%
'98	12%	00%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	599	Dec:	0%
	'92	10199		1%
	'98	6080		11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus parryi howardi																		
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	100%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	0		0%
	'98	40		100%

Gutierrezia sarothrae																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	41	-	-	-	-	-	-	-	-	41	-	-	-	2733			41
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	98	23	-	-	2	-	-	-	-	-	25	-	-	-	500			25
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	19	-	-	6	-	-	-	-	-	25	-	-	-	1666	9	9	25
	98	133	-	-	-	-	-	-	-	-	133	-	-	-	2660	6	8	133
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	3	-	-	1	80			4
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	.61%

%Change

+36%

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	2066		0%
	'98	3240		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	82	10	-	-	-	-	-	-	-	-	8	2	-	-	666	47	27	10
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	200	30	62	3
	98	8	-	-	2	-	-	-	-	-	10	-	-	-	200	-	-	10
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-58%
'92	00%	00%	00%	- 4%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	799	Dec:	-
	'92	333		-
	'98	320		-

Opuntia spp.																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66	11	17	1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	3	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	132		-
	'98	40		-

Purshia tridentata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	1	-	-	-	-	1	-	-	-	20	12	100	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140	60	41	7
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	-
	'92	0		-
	'98	140		-

Quercus turbinella

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	10	-	-	-	-	-	-	-	-	10	-	-	-	200	61	28	10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	200		-

DISCUSSION

Trend Study No. 30-18 (50A-18)

*** This site was not read in 1998. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Grants Ranch Trail trend study is on deer summer range immediately adjacent to a permanent pellet group transect on the Grants Ranch-Comanche Creek trail. The study site is a gentle (5% to 10%) southeast slope at an elevation of 7,800 feet. The vegetative appearance is mixed mountain brush with a few scattered Colorado pinyon, Utah juniper, and curlleaf mountain mahogany trees. There is evidence of considerable summer deer use. Deer trails, beds, and numerous pellet groups were encountered during the 1992 reading. This area occurs on the 67,000 acre Pine Valley allotment which is grazed by 1,057 cattle from July 15 to October 15. The number of cattle were reduced by 15% in 1992. No livestock were encountered on the site during the 1992 reading. Since 1982, this area has experienced five of six years of drought. Precipitation in 1992 was considered good.

Soils are fairly deep but quite rocky and coarsely textured. Ground cover is principally litter, rock (i.e., boulders), cryptogams, and vegetative cover consisting primarily of the aerial portions of shrubs. Sheet erosion and gullying are noticeable in localized places, especially on the trail, but overall, soil condition appears stable.

Browse composition is dominated by low to medium height Gambel oak, underlain by smaller oaks, mountain snowberry, mountain big sagebrush, and an occasional antelope bitterbrush. These species furnish most of the available browse forage. Taller shrubs and trees are scattered throughout. Gambel oak has increased 72% from 5,266 plants/acre in 1982, to 18,865 by 1992. Reproductive potential is high with 48% of the population consisting of young plants. Utilization has increased from zero to 42% of oak displaying heavy hedging. Utah serviceberry has also increased in density. During the 1982 reading, only 200 plants/acre were estimated. By 1992, there were an estimated 5,799 plants/acre, a 97% increase. Utilization is light to moderate and vigor is good. Mountain big sagebrush has increased slightly, but the population is becoming increasingly decadent (0 to 24%). Utilization has become heavier. In 1982, no sagebrush was classified as heavily hedged. By 1992, 54% of the sagebrush encountered were classified as heavily hedged (> 60% of the stems browsed). No seedlings and few young plants were counted. Curlleaf mahogany has doubled in density since 1982. Several seedlings and young plants were encountered.

Understory grass and forb density is sparse, but there is an excellent mix of species. Of the perennial grasses, Letterman needlegrass, muttongrass, and needle-and-thread grass are most abundant. Utilization of grasses is uniformly light. Thirteen forb species were encountered. The most common and productive forbs are arrowleaf balsamroot, Phacelia sp., and Lupinus holosericeus. Forbs are perhaps the most utilized class of forage on the area. The more preferred and succulent species show generally light to moderate use. Arrowleaf balsamroot, Lupinus holosericeus, and redroot eriogonum seem especially preferred.

1982 APPARENT TREND ASSESSMENT

Soil trend is stable. A fair to good ground cover, in combination with gentle terrain, has limited soil loss. However, one place to watch carefully is the well-traveled trail in the area. It is currently the largest source of erosion on the site. Vegetative trend is stable, but could change. A key factor will be the growth pattern of oakbrush. If it should become excessively dominant the habitat could suffer. Canopy closure from pinyon-juniper is not an immediate threat.

1992 TREND ASSESSMENT

Soil trend has improved since 1982. Basal vegetative cover has increased by 63%, while bare ground has declined 91%, from 11% to only 1%. Trail maintenance and water bars are needed on the trial as it is still eroding. Due to the cutting of runoff water, the trial currently resembles a ditch. The key browse species have all increased. Oak has more than tripled in density while showing increasing utilization. Mountain big sagebrush has increased slightly, but shows signs of being crowded out of the site. Utah serviceberry has increased by 97% and has a dynamic reproductive potential. The overall browse trend has improved, but possibly at the expense of the understory. The herbaceous understory is diverse, but not abundant. Quadrat frequencies of grasses and forbs have remained basically unchanged since 1982. Trend for grasses and forbs is stable.

TREND ASSESSMENT
soil - improved
browse - up for taller species
herbaceous understory - stable

DISCUSSION

Trend Study No. 30-24 (50B-4)

*** This site was not read in 1998. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Paradise trend study is located in a sagebrush-grass type slightly west of Paradise Reservoir. Terrain is gentle (about 5% slope) and exposure is northerly at an elevation of 7,500 feet. The area is grazed by cattle during July 15-October 15. This also constitutes important fawn rearing habitat for deer. Surrounding range types are oakbrush, mountain brush, some scattered pinyon-juniper, and a few small aspen clones in the drainage channels. Year-round water is nearby.

Soil is relatively deep and compacted, but tends to be rocky on the surface. Texture is moderately coarse. The main source of hydrologic activity is a natural drainage and a few active gullies. Percent bare ground has decreased from 40% to 17%, while vegetative cover has increased from 5% to 13%. Litter has also increased from 54% to 65% with rock and pavement staying nearly the same.

Vegetative composition is relatively rich, although the number and density of increaser species is somewhat disturbing. The key browse species, mountain big sagebrush, comprised 40% of browse population in 1982 and now comprises only 23%. Sagebrush shows light utilization and the percent decadency of the population has decreased from 53% to 23%. Some of the seedlings encountered in 1982 have apparently survived and are rejuvenating the stand. Antelope bitterbrush has increased in density to 133 plants/acre from 66 plants/acre, but all mature plants are heavily hedged. Stickyleaf low rabbitbrush, an aggressive invader, is the most abundant browse species comprising 53% of the browse population. This population has increased from 6,399 plants/acre in 1982 to 7,266 plants/acre in 1992. Although the population has increased, so has the percent of decadent plants from 2% to 17%. This population should be used as an indicator of management. Parry's rabbitbrush was encountered in 1992. This is a moderately palatable plant with a density of 1,332 plants/acre. Greene's rabbitbrush has increased from 266 plants/acre to 399 plants/acre. Wood's rose increased from 266 plants/acre to 1,333 plants/acre.

As an important fawning area, grasses and especially forbs are the key species on this site. Quadrat frequencies are relatively high. Letterman needlegrass, mutton grass, and western wheatgrass have all increased. The slight increase in prairie junegrass is also an indicator of an increase in summer precipitation. Desirable grasses include three species of bluegrass (Poa sp.) and prairie junegrass, which must maintain themselves if a downward trend is to be avoided. Western wheatgrass showed the greatest increase of all the grasses, but is not as preferred by wildlife in the summer months. Among forbs, arrowleaf balsamroot is common, but like most other forbs, showed little evidence of use. More desirable forbs include: tapertip hawksbeard, redroot eriogonum, Utah deervetch, and Lewis flax. In addition to encountered grasses and forbs, there are also a number of annuals and perennials that were observed but not sampled. Prominent among these are basin wildrye, tarragon, and Wyoming painted cup. Utilization of forbs is uniformly light and overall vigor is high. Many of the species encountered are not very palatable to wildlife and most are increasers.

1982 APPARENT TREND ASSESSMENT

Soil trend is stable. There is only minimal soil movement even though the percentage (40%) of bare ground is high. Vegetative trend is stable to declining. Unsatisfactory signs include apparently expanding populations of stickyleaf low rabbitbrush, needlegrass species, and rock goldenrod. Mountain big sagebrush, the key species, is barely maintaining itself. Utilization by livestock or big game does not appear to be an overriding factor at this time.

1992 TREND ASSESSMENT

Rock and pavement cover is stable and abundant ground cover in the form of vegetation and litter is keeping the soil intact. Bare ground cover has dropped from 40% to 17% and it was noted that erosion seems to be more of a problem on the south facing hill opposite the study site. The populations of all browse species have increased. The increase in the rabbitbrush might be cause for concern, when the type of forbs that have also appeared are also considered.

TREND ASSESSMENT
soil - up
browse - slightly up
herbaceous understory - slightly up

Trend Study 30-26-98

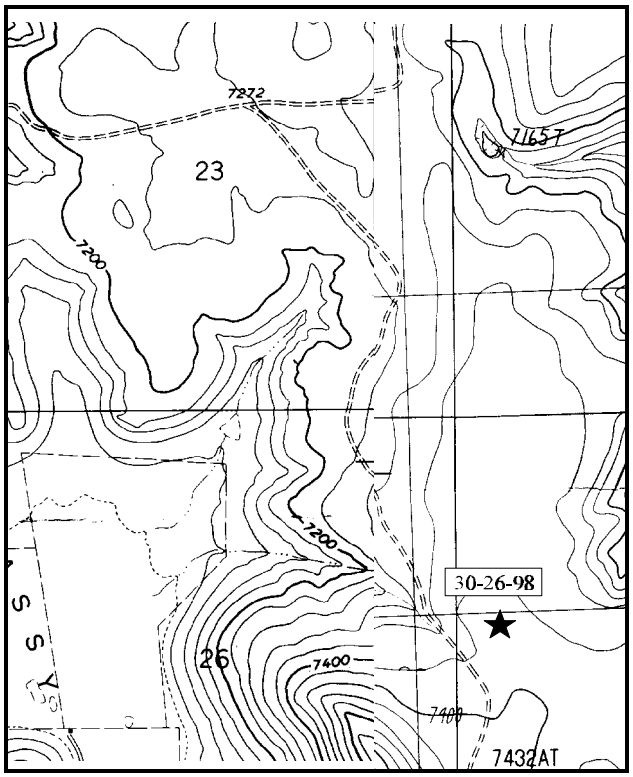
Study site name: Grassy Flat Ridge . Range type: Mountain Brush .

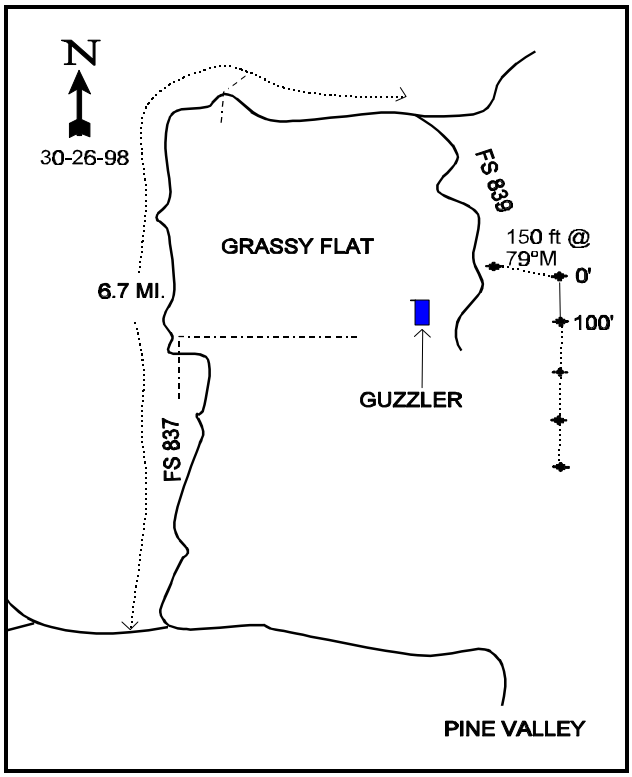
Compass azimuth: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (16 & 89ft), line 2 (39ft), line 3 (48ft), line 4 (63ft).

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 of the road. Go north on this road approximately 2.8 miles and turn left. From here continue on road for 3.9 miles to Forest Service road #839. Bear right (south) here and travel 1.5 miles to the guzzler on the right (west) and a witness post on the left (east). From the witness post the 0-foot stake is 150 feet away at an azimuth of 79°M. 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 . UTM 4147708.627 N, 279275.249 E

DISCUSSION

Trend Study No. 30-26 (50B-2)

The Grassy Flat Ridge trend study is on a relatively low elevation summer range near the summit of the ridge, lying between the South Fork of Pinto Creek and Grassy Flat. Terrain varies, but the site has a 5% slope to the west and an elevation of 7,200 feet. 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 guzzler. Pellet group data taken from the site on June 30, 1998 estimate moderate use by deer with 32 deer days use/acre. No livestock have been on the site yet this season, however they will be here later in the summer. Livestock grazing occurs from July 1-August 15 and is on a deferred rotation system.

Soils are igneous, coarse in texture, and very rocky over most of the area. Effective rooting depth (see methods) is estimated at almost 12 inches. Texture is a clay loam with a moderately acid pH (5.8). Phosphorus may be limiting at 7.2 ppm, when 10 ppm is considered a minimal value for normal plant development. Rock and pavement are abundant on the surface and have increased from 29% to 41% between 1982 and 1998. Erosion was noted as slight and the only active gullies occurred on the road.

The key browse species are mountain big sagebrush and antelope bitterbrush. Sagebrush currently (‘98) accounts for 54% of the browse cover, while bitterbrush provides an additional 24%. Density of big sagebrush was estimated at 2,333 plants/acre in 1982. No seedlings or young plants were encountered. The population increased 64% by 1992. Seedlings and young plants were very abundant with a biotic potential of 37%, and 56% of the population consisting of young plants. Density increased an additional 12% by 1998 to 7,260 plants/acre. Biotic potential is still high at 15% and young plants account for 43% of the population. Utilization has been mostly light to moderate over the years with a few individuals displaying heavy hedging. Vigor is good and percent decadence has remained low, currently at only 4%.

Antelope bitterbrush has increased slightly since 1982, but density has remained fairly stable since 1992. Utilization was mostly moderate in 1982, but extremely heavy in 1992 and 1998 with 82% and 83% of the bitterbrush showing heavy use. 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 percent decadence is currently (‘98) only 17%. Secondary browse species include: Utah serviceberry, dwarf rabbitbrush, and occasional individuals of Gambel oak and curlleaf mountain mahogany. Broom snakeweed, an invader/increaser, also occurs on the site in moderate numbers. Density increased from 1,332 plants/acre in 1982 to 5,199 by 1992. During the 1998 reading, density declined 48% to 2,720 plants/acre. Age class analysis indicates a stable to slightly increasing population. No seedlings were encountered, although 32% of the population consists of young plants.

Herbaceous quadrat frequency and sum of nested frequency is nearly equal between grasses and forbs with both increasing between 1982 and 1992. Four perennial grasses dominate the grass composition. These are: pubescent wheatgrass, mutton bluegrass, bottlebrush squirreltail, and Letterman needlegrass. 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, littleleaf pussytoes, and foothill deathcamas. Sulfur eriogonum and Eaton fleabane are also fairly common.

1982 APPARENT TREND ASSESSMENT

A best estimate of soil trend is slightly downward. Erosion and soil loss are not great, but only because of the gentle terrain. Ground cover is generally poor. Vegetative trend appears to also be declining. Both key species are barely holding their own in the face of a rapidly expanding broom snakeweed population. Grass density is good and may be a competitive influence on shrub reproduction. Forb composition is depleted and shows few signs of improvement.

1992 TREND ASSESSMENT

Erosion on the site is slight with an increase in rock and pavement cover and a decrease in bare ground. Ground cover is still poor, but has changed mostly from bare ground to mostly pavement and rock. Basal vegetative cover has increased from 7% to 10%, which is also indicated by the increase in quadrat frequency of forbs and grasses. The grass species are mostly palatable and the composition is good, while the forb species are mostly unpalatable and composition poor. 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.

TREND ASSESSMENT
soil - stable
browse - slightly up
herbaceous understory - slightly up, but the forbs are mostly increasers and the poor composition warrants close monitoring

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1992. Trend for the key browse species is mixed. Mountain big sagebrush displays a slightly upward trend due to a 12% increase in population density, good reproduction, normal vigor, and low percent decadence. Bitterbrush shows a stable to slightly downward trend due to continued extremely heavy use. This use is not only from deer. Cattle using the site will switch from grasses to bitterbrush late in the summer, especially during dry years when the perennial grasses dry out. The bitterbrush population has remained at similar density compared to 1992, but reproduction is limited with just enough young plants to replace decadent & dying plants. Trend for the herbaceous understory is slightly down. Sum of nested frequency of both grasses and forbs has declined slightly. Forb composition is still poor.

TREND ASSESSMENT
soil - stable
browse - up slightly for sagebrush and stable for bitterbrush
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 26

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	17	*5	12	9	3	.06
G	Agropyron smithii	110	*29	31	42	12	.21
G	Agropyron trichoporum	39	46	10	12	15	3.02
G	Bromus tectorum (a)	-	5	-	-	2	.15
G	Koeleria cristata	32	27	27	13	12	.74
G	Poa bulbosa	-	11	-	-	3	.33
G	Poa fendleriana	144	162	49	65	67	5.16
G	Poa secunda	44	*3	-	19	1	.00
G	Sitanion hystrix	153	138	47	67	62	2.67
G	Stipa lettermani	65	61	17	30	27	1.72

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
Total for Annual Grasses		0	5	0	0	2	0.15
Total for Perennial Grasses		604	482	193	257	202	13.94
Total for Grasses		604	487	193	257	204	14.09
F	Achillea millefolium	3	-	-	1	-	-
F	Agoseris glauca	24	*11	-	15	5	.05
F	Allium acuminatum	158	*267	48	62	90	2.50
F	Antennaria parvifolia	111	*38	19	51	16	.71
F	Arabis spp.	9	3	8	5	2	.01
F	Astragalus agrestis	10	13	-	7	4	.12
F	Astragalus argophyllus	1	*6	3	1	3	.04
F	Astragalus spp.	8	*-	6	4	-	-
F	Balsamorhiza sagittata	-	-	1	-	-	-
F	Calochortus nuttallii	11	12	15	6	6	.05
F	Cirsium spp.	5	7	-	2	3	.06
F	Collinsia parviflora (a)	-	61	-	-	22	.18
F	Crepis acuminata	-	3	-	-	2	.01
F	Epilobium paniculatum (a)	-	27	-	-	11	.10
F	Erigeron eatonii	56	*7	15	27	3	.21
F	Erigeron pumilus	4	*13	1	2	7	.06
F	Eriogonum umbellatum	76	*28	31	36	12	.41
F	Haplopappus spp.	1	-	14	1	-	-
F	Hymenoxys richardsonii	4	-	2	2	-	-
F	Lomatium spp.	1	6	2	1	2	.03
F	Lupinus argenteus	2	-	-	1	-	-
F	Machaeranthera canescens	3	-	-	1	-	-
F	Microsteris gracilis (a)	-	1	-	-	1	.00
F	Penstemon caespitosus	1	-	-	1	-	-
F	Phlox longifolia	7	6	2	4	2	.03
F	Polygonum douglasii (a)	-	77	-	-	32	.21
F	Sphaeralcea coccinea	3	1	1	2	1	.00
F	Tragopogon dubius	-	3	-	-	1	.00
F	Viguiera multiflora	1	-	-	1	-	-
F	Zigadenus paniculatus	93	*69	21	44	37	.67
Total for Annual Forbs		0	166	0	0	66	0.50
Total for Perennial Forbs		592	493	189	277	196	5.01
Total for Forbs		592	659	189	277	262	5.51

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 26

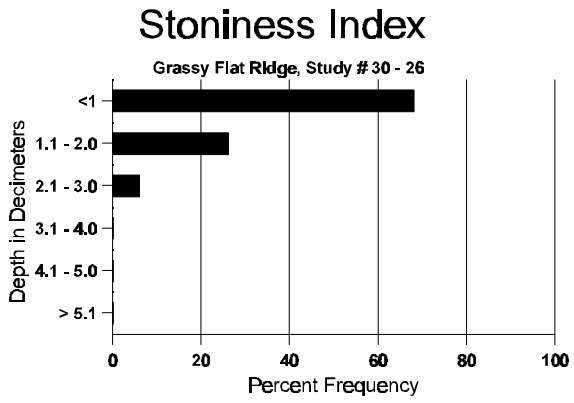
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	12	1.54
B	Artemisia tridentata vaseyana	93	9.15
B	Cercocarpus ledifolius	2	.15
B	Chrysothamnus depressus	29	.42
B	Gutierrezia sarothrae	45	.39
B	Opuntia spp.	17	.31
B	Pinus edulis	2	.38
B	Purshia tridentata	29	4.09
B	Quercus gambelii	5	.56
B	Tetradymia canescens	4	.03
Total for Browse		238	17.04

BASIC COVER --
Herd unit 30 , Study no: 26

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	342	7.00	9.75	37.62
Rock	311	27.75	28.75	35.28
Pavement	216	.75	17.75	5.62
Litter	369	31.00	25.00	29.13
Cryptogams	3	.75	0	.15
Bare Ground	264	32.75	18.75	19.05

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 26, Study Name: Grassy Flat Ridge

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.6	58.6 (13.8)	5.8	36.0	31.4	32.6	1.5	7.2	83.2	.5



PELLET GROUP FREQUENCY --

Herd unit 30 , Study no: 26

Type	Quadrat Frequency '98
Sheep	2
Rabbit	3
Deer	31
Cattle	4

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 26

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
M	82	-	3	-	-	-	-	-	-	-	-	3	-	-	200	20	24	3
	92	-	1	4	-	-	-	-	-	-	5	-	-	-	333	29	26	5
	98	4	5	2	-	1	3	-	-	3	17	1	-	-	360	38	40	18

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	100%	00%	00%	+40%
'92	20%	80%	00%	+12%
'98	32%	47%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	200	Dec:	-
	'92	333		-
	'98	380		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	35	-	1	9	-	-	3	8	-	56	-	-	-	3733			56
	98	70	-	-	-	-	-	-	-	-	70	-	-	-	1400			70
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	45	5	3	1	-	-	-	-	-	54	-	-	-	3600			54
	98	144	11	-	1	-	-	-	-	-	156	-	-	-	3120			156
M	82	33	-	-	-	-	-	-	-	-	27	6	-	-	2200	11	18	33
	92	11	13	3	1	-	-	-	-	-	26	2	-	-	1866	18	21	28
	98	128	58	-	5	-	2	-	-	-	188	2	3	-	3860	24	26	193
D	82	-	2	-	-	-	-	-	-	-	-	-	2	-	133			2
	92	8	3	2	-	-	1	-	-	-	10	-	4	-	933			14
	98	4	9	-	-	-	-	-	-	1	4	-	3	7	280			14
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	620			31

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	06%	00%	06%	+64%
'92	22%	09%	04%	+12%
'98	21%	.82%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	2333	Dec:	6%
	'92	6399		15%
	'98	7260		4%

Cercocarpus ledifolius																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	1	-	1	-	-	-	2	-	-	-	40	44	50	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	50%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus depressus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	3	-	-	2	-	-	6	-	-	-	400			6
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	9	1	2	13	-	-	-	-	-	25	-	-	-	1666			25
	98	16	-	-	-	-	-	1	-	-	17	-	-	-	340			17
M	82	15	-	-	-	-	-	-	-	-	15	-	-	-	1000	7	9	15
	92	3	7	5	11	-	-	-	-	-	26	-	-	-	1733	4	8	26
	98	50	13	-	1	-	-	-	-	-	64	-	-	-	1280	6	11	64
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	98	1	1	-	-	-	1	-	-	-	3	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+70%
'92	14%	13%	00%	-55%
'98	17%	01%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	1133	Dec:		0%
'92	3732			9%
'98	1680			4%

Gutierrezia sarothrae																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	3	-	-	1	-	-	7	-	-	-	466			7
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	19	-	-	-	-	-	-	-	-	19	-	-	-	1266			19
	92	16	-	-	5	-	-	-	-	-	21	-	-	-	1400			21
	98	44	-	-	-	-	-	-	-	-	44	-	-	-	880			44
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	9	10	1
	92	55	-	-	1	-	-	-	-	-	56	-	-	-	3733	12	7	56
	98	87	3	2	-	-	-	-	-	-	92	-	-	-	1840	7	6	92
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+74%
'92	00%	00%	00%	-48%
'98	02%	01%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	1332	Dec:	0%
'92	5199		1%
'98	2720		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200	6	15	3
	92	5	-	-	-	-	-	-	-	-	5	-	-	-	333	7	9	5
	98	13	-	-	3	-	-	-	-	-	16	-	-	-	320	7	20	16
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	-	-	1	-	66			1
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+50%
'92	00%	00%	17%	- 5%
'98	00%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	200	Dec:	0%
	'92	399		17%
	'98	380		11%

Pinus edulis

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	2	-	-	-	-	-	2	-	-	-	133			2
	98	-	1	-	-	1	1	-	-	-	3	-	-	-	60			3
M	82	1	7	-	-	-	-	-	-	-	8	-	-	-	533	16	22	8
	92	-	-	7	-	-	-	-	-	-	7	-	-	-	466	11	25	7
	98	1	-	7	1	1	4	-	-	12	26	-	-	-	520	12	34	26
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	2	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	2	-	-	3	1	-	-	3	-	-	3	120			6
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	88%	00%	00%	+27%
'92	00%	82%	00%	- 4%
'98	09%	83%	09%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	533	Dec:		0%
'92	732			18%
'98	700			17%

Quercus gambelii																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	9	5	-	-	-	-	-	-	-	14	-	-	-	280			14
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40	38	48	2
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	3	-	-	-	-	3	-	-	4	140			7
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	35%	00%	17%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	0%
'92	0		0%
'98	460		30%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	6	9	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:	-
'92	0		-
'98	100		-

Trend Study 30-29-98

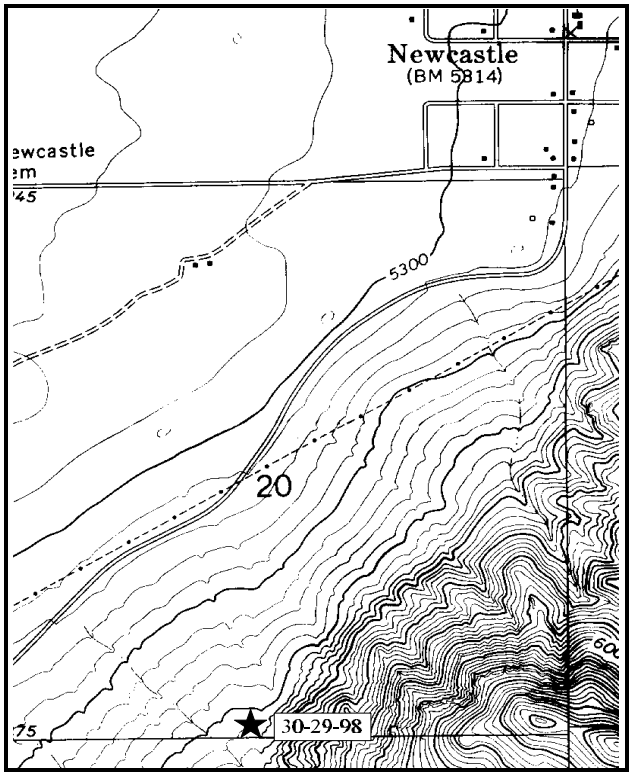
Study site name: Southwest of New Castle . Range type: Sagebrush-Grass .

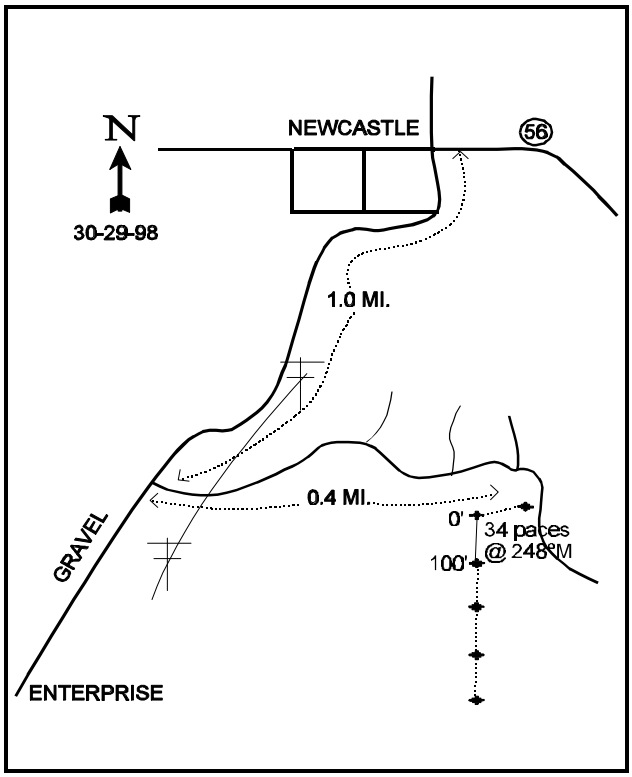
Compass azimuth: frequency baseline 176 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (12 & 92ft), line 2 (39ft), line 3 (50ft), line 4 (79ft).

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 (i.e., east) and travel 0.40 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°M 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 UTM 4169411.217 N, 274301.118 E

DISCUSSION

Trend Study No. 30-29 (50B-6)

The Southwest of Newcastle range study surveys severe winter range southwest of Newcastle. The site is an alluvial fan occupied by Wyoming big sagebrush underlain by a sparse herbaceous understory. The terrain slopes moderately (15% to 20%) to the west-northwest at an elevation of approximately 5,600 feet. Pellet group data taken on the site in 1998 estimate 68 deer days use/acre. Most of the deer pellet groups appeared to be from last winter. No sign of cattle grazing was noted.

Soil is alluvially deposited from basalt parent material. Effective rooting depth (see methods) is estimated at just over 15 inches. Soil texture is a sandy clay loam with a slightly acid pH (6.4). The surface is covered by gravel 1/4" to 2" in size with some larger rocks mixed in. Rock is also common throughout the profile. Bare ground cover mostly occurs in small interspaces associated with the rocky surface. Ground cover is composed mostly of shrub crowns and ephemeral litter from dead cheatgrass. Soil movement was wide spread in 1982 with several small rills and gullies present. Currently, erosion appears minimal.

Wyoming big sagebrush is the prominent key species. Its population had increased from 3,633 to 5,799 plants/acre between 1982 and 1992. However, density has declined to 4,860 plants/acre by 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. Density of mature sagebrush increased by 34%. Utilization was light in 1982, but heavy in 1992 with many plants displaying a clubbed growth form and stunted growth. Overall vigor was good in 1992, although some plants showed disease and insect infestation. During the 1998 reading, utilization was more moderate, yet heavy use was still noted on 20% of the sagebrush. Reproduction is currently (‘98) poor with a biotic potential of only 1%, with young plants making up only 2% of the population. Percent decadence has declined slightly since 1992, however the proportion of decadent shrubs classified as dying has increased from 18% to 38% (400 to 600 plants/acre). Dead plants are also common at an estimated 1,380 plants/acre in 1998, a ratio of dead to live plants of about 1:4.

The only other shrub of significance is stickyleaf rabbitbrush which currently (‘98) numbers 920 plants/acre. Broom snakeweed and pricklypear are both present in small quantities, but pose little threat to the community at this time. The much larger sample used in 1998, picked up a few green ephedra which provide some additional forage. Pinyon and juniper trees are increasing down slope from the tree dominated hills to the east. Point quarter data from 1998 estimate 26 singleleaf pinyon and 32 Utah juniper trees/acre. Average basal diameter was estimated at 2.3 inches for pinyon and 6.8 inches for juniper. Photo point comparisons suggest an increase in density and size of the trees, but no point quarter data is available from 1982 of 1992. The shrub density plots from earlier years were too small to properly sample pinyon and juniper densities.

Perennial grasses and forbs occur infrequently and are of little significance as a forage source. The two most abundant perennial grasses include, galleta grass and Sandberg bluegrass. Indian ricegrass and bottlebrush squirreltail are also fairly common. Cheatgrass brome was present in 1982 but not widespread. By 1998, it represents the most abundant grass on the site by providing 65% of the grass cover and 63% of the total herbaceous cover. Sixweeks fescue is also fairly abundant. Annual grasses and forbs were not included in previous samples so no comparisons can be made. Forbs are nearly nonexistent for all species, annual or perennial, combining to produce less than 1% cover in 1998.

1982 APPARENT TREND ASSESSMENT

Soil trend is stable to declining. Enough soil remains on the site to allow greater forage production than is currently available. The rate of erosion, while not rapid, is enough to result in a negative trend. Vegetative trend is stable. Browse production is adequate, but the depleted understory lessens the value of this community. This site has a better potential for rehabilitation than similar sites in Bullion Canyon and near Newcastle Reservoir.

1992 TREND ASSESSMENT

The percent of bare ground has decreased from 48% in 1982 to 8% in 1992. Rock and pavement have stayed nearly the same, while both vegetation and litter cover have greatly increased. Erosion appears to have slowed and is not as great as reported before. All grass species have increased, but are normally utilized more during the fall and spring than on deer winter range. Wyoming big sagebrush has increased, but shows signs of heavy use which may increase rate of decadency. Stickyleaf rabbitbrush is stable and doesn't appear to be increasing.

TREND ASSESSMENT
soil - up
browse - slightly up
herbaceous understory - slightly up

1998 TREND ASSESSMENT

Soil trend is down slightly. Percent bare ground has increased from 8% to 18%, while litter cover has declined and pavement cover has increased from 4% to 23%. The increase in pavement cover suggests surface soil movement has occurred since 1992. Trend for browse is down slightly. Density of Wyoming big sagebrush has declined 16% since 1992 due to a reduction in young and decadent plants. The number of mature plants increased from 2,100 to 3,160 plants/acre. Utilization is more moderate, but the proportion of sagebrush displaying poor vigor has increased from 9% to 15%. Percent decadence has declined slightly from 37% to 33%, however a greater number of decadent plants are classified as dying. Reproduction is currently poor. There are few seedlings, and young plants represent only 2% of the population which is not enough to replace the decadent/dying shrubs. Trend for the herbaceous understory is slightly down for grasses, although slightly up for forbs. Composition is poor however. Cheatgrass dominates the herbaceous understory by providing 63% of the total herbaceous cover and perennial forbs are lacking. Overall, trend is considered slightly down.

TREND ASSESSMENT
soil - down slightly
browse - down slightly
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 29

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	-	368	-	-	100	18.18
G	Hilaria jamesii	124	151	33	51	63	4.36
G	Oryzopsis hymenoides	26	30	9	11	13	1.47
G	Poa secunda	77	85	2	31	32	2.15
G	Sitanion hystrix	151	*36	47	65	20	1.02
G	Vulpia octoflora (a)	-	150	-	-	58	.98
Total for Annual Grasses		0	518	0	0	158	19.17
Total for Perennial Grasses		378	302	91	158	128	9.01
Total for Grasses		378	820	91	158	286	28.18

Type	Species	Nested Frequency ⍁92	⍁98	Quadrat Frequency '82	'92	'98	Average Cover % ⍁98
F	Arabis spp.	-	2	-	-	1	.03
F	Astragalus spp.	2	-	-	1	-	-
F	Castilleja linariaefolia	-	1	-	-	1	.03
F	Calochortus nuttallii	3	*16	-	2	8	.04
F	Collomia linearis (a)	-	3	-	-	1	.00
F	Cryptantha spp.	-	32	-	-	13	.19
F	Cymopterus spp.	-	9	-	-	4	.02
F	Descurainia pinnata (a)	-	24	-	-	16	.08
F	Draba spp. (a)	-	14	-	-	6	.05
F	Eriogonum cernuum (a)	-	2	-	-	1	.00
F	Eriogonum spp.	4	1	1	3	1	.03
F	Erigeron pumilus	3	7	6	1	4	.02
F	Gilia spp. (a)	-	49	-	-	24	.19
F	Lupinus argenteus	-	4	-	-	2	.01
F	Navarretia intertexta (a)	-	37	-	-	15	.07
F	Orthocarpus spp.	-	-	1	-	-	-
F	Phlox longifolia	14	22	-	8	11	.08
Total for Annual Forbs		0	129	0	0	63	0.42
Total for Perennial Forbs		26	94	8	15	45	0.44
Total for Forbs		26	223	8	15	108	0.87

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 29

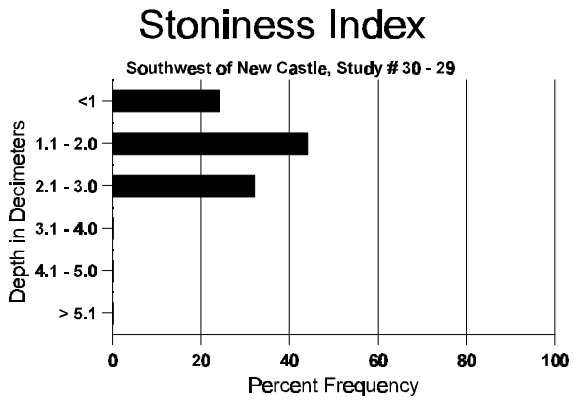
Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Artemisia tridentata wyomingensis	89	11.61
B	Chrysothamnus viscidiflorus	32	1.56
B	Ephedra nevadensis	3	.00
B	Gutierrezia sarothrae	1	.15
B	Juniperus osteosperma	2	-
B	Opuntia spp.	8	.91
B	Pinus monophylla	1	1.41
B	Sclerocactus	1	-
Total for Browse		137	15.65

BASIC COVER --
Herd unit 30 , Study no: 29

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	377	4.00	24.25	43.79
Rock	228	11.50	10.50	7.65
Pavement	334	0	3.75	22.60
Litter	379	36.50	54.00	30.99
Cryptogams	35	.25	0	.39
Bare Ground	284	47.75	7.50	18.28

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 29, Study Name: Southwest of New Castle

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.2	49.0 (16.8)	6.4	54.0	21.4	24.6	1.6	9.37	105.6	.6



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 29

Type	Quadrat Frequency '98
Rabbit	31
Deer	54

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 29

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	82	14	1	-	-	-	-	-	-	-	15	-	-	-	500			15
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	15	1	-	-	-	-	-	-	-	16	-	-	-	533			16
	92	12	18	16	-	-	-	-	-	-	45	1	-	-	1533			46
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	82	70	2	-	-	-	-	-	-	-	45	27	-	-	2400	20	33	72
	92	2	17	42	-	1	-	-	-	1	53	8	2	-	2100	17	22	63
	98	27	92	36	3	-	-	-	-	-	151	-	7	-	3160	16	24	158
D	82	21	-	-	-	-	-	-	-	-	2	17	2	-	700			21
	92	-	23	37	2	-	-	-	-	3	44	8	1	12	2166			65
	98	19	44	12	4	-	-	1	-	-	50	-	-	30	1600			80
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1380			69

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	03%	00%	02%	+37%
'92	34%	57%	09%	-16%
'98	56%	20%	15%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	3633	Dec:	19%
	'92	5799		37%
	'98	4860		33%

Chrysothamnus viscidiflorus																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	8	-	-	3	-	-	-	-	-	11	-	-	-	366	11	11	11
	98	37	-	-	6	-	-	-	-	-	43	-	-	-	860	12	18	43
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+49%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	466		-
	'98	920		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra nevadensis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	4	-	-	-	-	-	-	-	4	-	-	-	80	10	21	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	80%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	100		-

Gutierrezia sarothrae																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	7	6	-	-	-	-	-	-	-	13	-	-	-	433	8	7	13
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	46%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	433	Dec:	-
	'92	0		-
	'98	40		-

Juniperus osteosperma																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	17	1
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	14	2
	98	10	-	-	-	-	-	-	-	-	10	-	-	-	200	7	13	10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+50%
'92	00%	00%	00%	+70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	33	Dec:	-
	'92	66		-
	'98	220		-

Pinus monophylla																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

Sclerocactus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

Trend Study 30-35-98

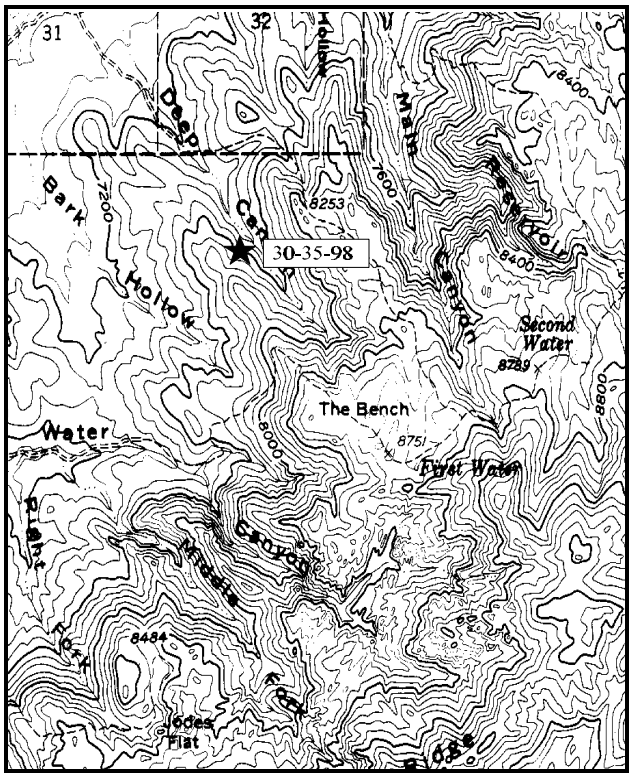
Study site name: Deep Canyon . Range type: Mountain Brush .

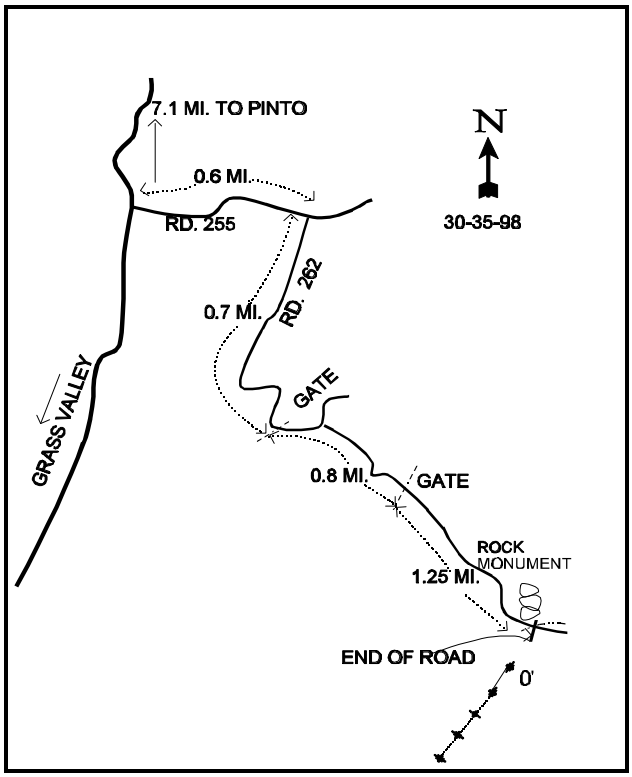
Compass azimuth: frequency baseline 199 degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (19 & 88ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Pinto, drive south 7.10 miles toward Grass Valley. Now turn left (i.e., east) on the road toward Whiterocks trail. Proceed on this road for 0.60 miles, at which point there will be an intersection. Go right (southeast) for 0.70 miles to a gate. Proceed through the gate for 0.80 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 rock monument on the right side of the road at the base of a twin trunked Pinus flexilis. There is also a witness post by the tree. From the witness post walk uphill 33 paces on an azimuth of 178 degrees true to the 0-foot baseline 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 UTM 4144653.112 N, 283077.880 E

DISCUSSION

Trend Study No. 30-35 (50B-12)

The Deep Canyon study is located on fawn rearing habitat in the Deep Creek drainage on the south side of Grass Valley. There is ample vegetation for browsing, escape, and thermal cover. A small stream is located approximately 1/4 mile away at the base of the hill. The study area is mixed mountain brush with a predominantly sagebrush and curlleaf mountain mahogany appearance. Elevation is approximately 7,300 feet on a steep slope which varies from 40% near the 0 foot stake, to 65% near the end of the baseline. Aspect is north-northeast. The study is on the USFS Pine Valley allotment and is grazed from July 15-October 15, although livestock don't appear to be using the steeper slopes. Pellet group data from 1998 (June 30,1998) estimate 40 deer and only 3 cow days use/acre. Cattle pats appear to be from last season.

Soils are shallow in places and rocky on the surface and within the profile. There is some exposed bedrock. Soil depth is variable, however it is actually moderately deep with an estimated effective rooting depth (see methods) of almost 16 inches. Texture is a sandy loam with a moderately acid pH (5.8). Soil movement is apparent, causing considerable pedestaling on the uphill side of shrubs and trees. Wildlife and livestock also trail across the slope causing abundant terracing. Ground cover is patchy with rock and pavement cover increasing from 11% in 1982, to 36% by 1998. The high rock cover tends to accelerate runoff, and herbaceous vegetation cover is not sufficient to hold the soil.

Browse composition is divided among several species. The taller growth forms include pinyon pine, curlleaf mountain mahogany, and a few mature Gambel oak. Lower growing, more available browse plants include: mountain big sagebrush, slenderbush eriogonum, mountain snowberry, young mahogany, young Gambel oak, and Utah serviceberry. Curlleaf mountain mahogany currently ('98) accounts for 35% of the browse cover on the site. They numbered 866 plants/acre in 1982, increasing to 1,199 by 1992. The larger sample taken in 1998 estimate a lower density of 420 plants/acre. Most plants are at least partly available to browsing, but 20% of the mature plants are tree-like and unavailable due to height. Overhead canopy cover averages 30%. Use of the available shrubs has been moderate to heavy with the heaviest use reported in 1992. Vigor remains normal and percent decadency is low at only 5% in 1998. Recruitment is good with high biotic potentials in 1992 (50%) and 1998 (48%) and nearly 1/3 of the population consisting of young plants.

The primary understory shrubs include: mountain big sagebrush, slenderbush eriogonum, and snowberry. Sagebrush currently provides 31% of the browse cover. The sagebrush population has increased from 1,266 plants/acre in 1982 to 3,500 by 1998. Use has been mostly light, vigor good, and percent decadency declining to only 9% in 1998. Age class composition would indicate an increasing population. 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, Parry rabbitbrush, and antelope bitterbrush.

The herbaceous understory is moderately abundant, yet provides irregular ground cover. Perennial grasses are diverse with mutton bluegrass and Letterman needlegrass combining to produce 76% of the grass cover in 1998. Blue grama and bottlebrush squirreltail 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 littleflower collinsia and false flax (Microsteris gracilis) dominate and account for 43% of the forb cover. The most common perennial forbs include: Eaton fleabane, redroot eriogonum, thickleaf peavine, and desert phlox.

1982 APPARENT TREND ASSESSMENT

Soil condition is only fair, but is not obviously deteriorating. Trend is stable to improving. Increaser grasses appear to be moving into previously barren areas and may eventually stabilize them. Vegetatively, there is a stable browse component and a vigorous forb understory. Overall vegetative trend is stable.

1992 TREND ASSESSMENT

Since 1982, bare ground has decreased and rock and pavement cover combined have increased. Some slight soil erosion was evident, but it was noted that vegetation and rocks have caused a terracing effect that may hold most of the soil in place. Vegetative cover is still low, but has doubled since 1982. Litter cover has increased slightly. Total forb quadrat frequency decreased with only a few select forbs increasing. Browse composition is good and has increased to a total of 12,125 browse plants/acre from the 6,197 plants/acre present in 1982.

TREND ASSESSMENT
soil - stable
browse - slightly up
herbaceous understory - slightly up

1998 TREND ASSESSMENT

Trend for soil is down slightly. Percent bare ground has increased slightly, while litter cover has declined from 46% to 32%. Pavement and rock cover have increased from 11% in 1982, to 29% in 1992, and 36% currently. This increase would suggest soil movement from the site leaving more rock and pavement exposed. Trend for browse is up slightly. Mountain big sagebrush is increasing, whereas other preferred species appear to have stable to slightly increasing populations. Use is lighter overall than what was reported in 1992, vigor is good and percent decadency is low. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses is slightly down with a significant decline in the nested frequency of mutton bluegrass. Sum of nested frequency for forbs has declined even more, with several forbs abundant in 1992 declining significantly in frequency.

TREND ASSESSMENT
soil - down slightly
browse - up slightly
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 35

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron trachycaulum	5	2	-	2	1	.18
G	Bouteloua gracilis	14	11	4	4	5	.83
G	Bromus tectorum (a)	-	8	-	-	3	.01
G	Carex spp.	3	-	1	1	-	-
G	Koeleria cristata	-	4	-	-	1	.15
G	Poa fendleriana	217	*152	50	81	60	3.85
G	Poa pratensis	-	-	-	-	-	.03

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Poa secunda	-	*34	-	-	12	.45
G	Sitanion hystrix	89	76	27	41	34	.71
G	Stipa columbiana	8	9	-	3	4	.24
G	Stipa comata	5	-	3	2	-	-
G	Stipa lettermani	137	141	36	56	56	4.42
Total for Annual Grasses		0	8	0	0	3	0.01
Total for Perennial Grasses		478	429	121	190	173	10.88
Total for Grasses		478	437	121	190	176	10.90
F	Agoseris glauca	-	*18	-	-	8	.06
F	Antennaria rosea	10	14	8	5	5	.60
F	Arabis spp.	9	12	-	5	5	.02
F	Astragalus argophyllus	13	*-	1	8	-	-
F	Astragalus spp.	7	2	6	3	2	.30
F	Balsamorhiza sagittata	-	3	-	-	1	.15
F	Calochortus nuttallii	-	1	1	-	1	.00
F	Collinsia parviflora (a)	-	152	-	-	53	2.54
F	Crepis acuminata	-	*25	2	-	10	.15
F	Epilobium paniculatum (a)	-	8	-	-	4	.02
F	Erigeron eatonii	91	82	27	48	41	1.14
F	Eriogonum racemosum	70	*19	28	29	10	.10
F	Eriogonum umbellatum	-	4	2	-	2	.03
F	Frasera speciosa	-	-	3	-	-	-
F	Galium boreale	-	*8	-	-	4	.07
F	Gilia latifolia	-	-	1	-	-	-
F	Hackelia patens	56	*18	32	27	9	.37
F	Heuchera parvifolia	2	-	2	1	-	-
F	Lathyrus brachycalyx	60	*21	34	27	9	.45
F	Lappula occidentalis (a)	-	29	-	-	14	.41
F	Lomatium spp.	-	4	-	-	2	.01
F	Lupinus argenteus	23	19	14	12	8	.55
F	Machaeranthera canescens	8	*-	14	6	-	.01
F	Microsteris gracilis (a)	-	95	-	-	34	1.41
F	Pedicularis centranthera	3	-	5	1	-	-
F	Petradoria pumila	9	18	8	4	9	.71
F	Phlox austromontana	79	63	28	32	24	1.04
F	Polygonum douglasii (a)	-	38	-	-	16	.08
F	Senecio multilobatus	3	-	11	3	-	-
F	Silene douglasii	8	*-	2	5	-	-
F	Taraxacum officinale	14	18	-	6	8	.13

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Unknown forb perennial	-	-	3	-	-	-
Total for Annual Forbs		0	322	0	0	121	4.47
Total for Perennial Forbs		465	349	232	222	158	5.96
Total for Forbs		465	671	232	222	279	10.44

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 35

Type	Species	Strip Frequency '98	Average Cover % '98
B	Abies concolor	2	-
B	Amelanchier utahensis	4	-
B	Artemisia tridentata vaseyana	75	6.40
B	Cercocarpus ledifolius	18	7.19
B	Chrysothamnus parryi	3	-
B	Eriogonum microthecum	75	4.66
B	Mahonia repens	2	.15
B	Opuntia spp.	11	.01
B	Pachistima myrsinites	4	.00
B	Pinus edulis	4	.15
B	Purshia tridentata	3	-
B	Quercus gambelii	7	.03
B	Symphoricarpos oreophilus	30	2.00
Total for Browse		238	20.61

CANOPY COVER --
Herd unit 30 , Study no: 35

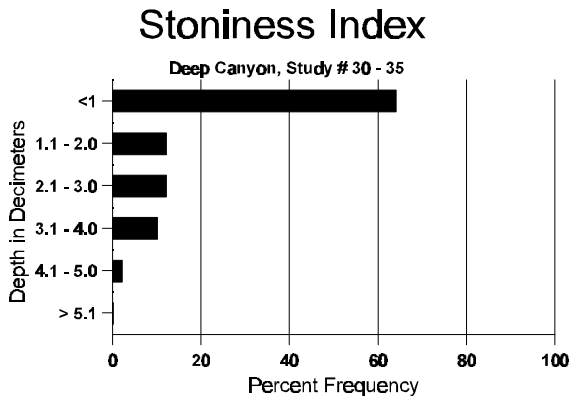
Species	Percent Cover '98
Cercocarpus ledifolius	30
Pinus edulis	1

BASIC COVER --
Herd unit 30 , Study no: 35

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	343	3.75	7.75	36.31
Rock	249	9.00	12.25	23.92
Pavement	243	1.50	17.00	11.67
Litter	373	44.50	46.00	31.70
Cryptogams	28	.25	.50	.47
Bare Ground	250	41.00	16.50	20.27

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 35, Study Name: Deep Canyon

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.5	51.4 (16.5)	5.8	68.0	17.4	14.6	3.35	12.1	163.2	.5



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 35

Type	Quadrat Frequency '98
Sheep	1
Rabbit	1
Deer	26
Cattle	4

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 35

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Abies concolor																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	- 9%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	66		-
	'98	60		-

Amelanchier utahensis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	1	-	-	-	-	-	-	2	-	-	-	40			2
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	1	-	-	-	-	-	2	-	-	-	40	26	21	2
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	20%	20%	20%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	0		0%
	'98	100		20%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	12	-	-	4	-	-	-	-	-	16	-	-	-	1066			16
	98	39	-	-	-	-	-	-	-	-	39	-	-	-	780			39
Y	82	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	14	1	-	1	-	-	3	-	-	16	2	1	-	1266			19
	98	40	2	-	-	-	-	-	-	-	42	-	-	-	840			42
M	82	9	-	-	-	-	-	-	-	-	9	-	-	-	600	19	27	9
	92	11	2	1	1	-	-	-	-	-	14	-	1	-	1000	20	26	15
	98	106	9	2	-	-	-	-	-	-	111	-	6	-	2340	22	30	117
D	82	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	2	4	-	-	-	-	-	-	-	5	-	1	-	400			6
	98	14	2	-	-	-	-	-	-	-	15	-	-	1	320			16
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+53%
'92	18%	03%	08%	+24%
'98	07%	01%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	1266	Dec:	26%
	'92	2666		15%
	'98	3500		9%

Cercocarpus ledifolius

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	98	9	1	-	-	-	-	-	-	-	10	-	-	-	200			10
Y	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	4	-	1	-	-	-	-	-	-	5	-	-	-	333			5
	98	4	1	-	-	-	-	-	-	-	5	-	-	-	100			5
M	82	6	4	-	-	-	-	-	-	-	8	2	-	-	666	40	42	10
	92	1	-	9	-	1	-	-	-	-	11	-	-	-	733	57	35	11
	98	2	3	2	5	-	-	-	3	-	15	-	-	-	300	102	101	15
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	1	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	31%	00%	00%	+28%
'92	11%	56%	00%	-65%
'98	24%	10%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	866	Dec:	0%
	'92	1199		11%
	'98	420		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus parryi																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	21	22	1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	1	-	-	-	-	-	-	-	4	-	-	-	80	6	7	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	100%	00%	+34%
'98	20%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	66	Dec:		-
'92	66			-
'98	100			-

Eriogonum microthecum																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	21	2	-	1	-	-	4	-	-	28	-	-	-	1866			28
	98	31	2	-	-	-	-	-	-	-	33	-	-	-	660			33
M	82	31	3	-	-	-	-	-	-	-	34	-	-	-	2266	9	18	34
	92	23	20	3	1	15	-	2	-	-	62	-	2	-	4266	7	8	64
	98	175	37	-	-	-	-	-	-	-	212	-	-	-	4240	7	12	212
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	1	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	09%	00%	00%	+63%
'92	41%	03%	02%	-21%
'98	16%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	2266	Dec:	0%
'92	6198		1%
'98	4920		0%

Mahonia repens																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180	5	8	9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	-
'92	0		-
'98	180		-

Opuntia spp.

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133	4	5	2
	92	3	-	-	1	-	-	-	-	-	4	-	-	-	266	7	9	4
	98	7	-	-	1	-	-	-	-	-	8	-	-	-	160	6	21	8
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	-	-	-	1	66			1
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+67%
'92	00%	00%	17%	-45%
'98	00%	00%	09%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	0%
	'92	398		17%
	'98	220		9%

Pachistima myrsinites

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100	5	4	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	120		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus edulis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	80		-

Purshia tridentata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	-	-	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	120		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	1	-	1	-	133			2
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	-	1	-	-	2	-	-	-	133			2
	98	17	-	-	-	-	-	1	-	-	18	-	-	-	360			18
M	82	-	-	9	-	-	-	-	-	-	9	-	-	-	600	12	5	9
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	59	61	5
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	100%	00%	-78%
'92	00%	00%	00%	+72%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	600	Dec:	0%
	'92	133		0%
	'98	480		4%

Symphoricarpos oreophilus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	6	-	-	2	-	1	-	-	-	9	-	-	-	600			9
	98	14	-	-	1	-	-	-	-	-	15	-	-	-	300			15
M	82	5	7	-	-	-	-	-	-	-	12	-	-	-	800	22	24	12
	92	4	-	1	-	-	5	-	-	-	10	-	-	-	666	20	26	10
	98	26	7	-	1	-	-	-	-	-	34	-	-	-	680	13	28	34
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	1	1	-	-	-	2	-	-	-	133			2
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	47%	00%	00%	+29%
'92	05%	38%	00%	-20%
'98	13%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	1000	Dec:	0%
	'92	1399		10%
	'98	1120		13%

Trend Study 30-37-98

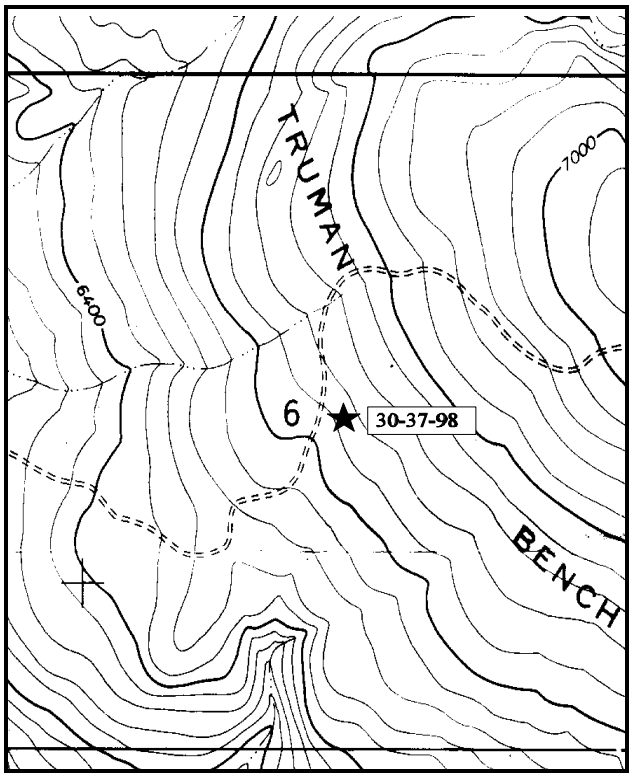
Study site name: Truman Bench . Range type: Sagebrush-Grass .

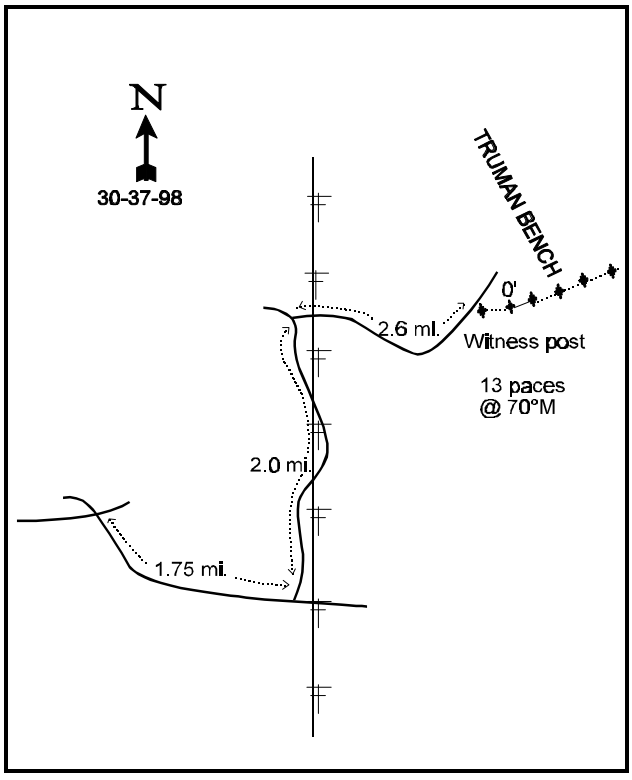
Compass azimuth: frequency baseline 80 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (14 & 86ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Veyo, 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 another fork. Take the left fork which passes under the powerline. Follow the powerline for approximately 2.0 miles. At this point the road comes to 'T'. Go right (east). Proceed on this road for 2.6 miles passing a Forest Service boundary fence and an old sheep pen on the right. Stay on the main road ignoring side roads. There is a witness post on the right side of the road. From the witness post the 0-foot stake is 13 paces at 70°M. The 0 foot baseline is found in a rock monument on the right side of the road and the stake is marked by browse tag #7011.





Map Name: Saddle Mountain Diagrammatic Sketch

Township 40S , Range 15W , Section 6 . UTM 4135406.965 N, 271861.498 E

DISCUSSION

Trend Study No. 30-37 (50B-14)

The Truman Bench trend study is within deer winter range on Truman Bench. Deer reportedly use the area in early spring, late fall, and during mild winters. The study site is on a 10% west facing slope with an elevation of 6,700 feet. The community type is sagebrush-grass with substantial components of antelope bitterbrush, Stansbury cliffrose, and Utah serviceberry. Utah juniper trees are sparsely scattered throughout the area at an estimated density of 38 trees/acre in 1998 using point quarter data. Average basal diameter is 5.6 inches. There has been no livestock grazing in this area since the 1960's. Deer days use/acre measured at a nearby pellet group transect has averaged 58 between 1982 and 1992, with a high of 79 in 1989-90, and a low of 30 in 1991-92 (Jense et al. 1992). Pellet group data from the site taken in 1998 estimate 38 deer days use/acre.

Soil on Truman Bench is very distinctive. The entire area is an old lava flow that has weathered to produce ground surface that is uniformly covered by fractured basalt rocks ranging from pavement size to as large as two feet in diameter. Soil depth is deep, however the estimated effective rooting depth (see methods) is 21 inches. Texture is a clay loam with a moderately acid pH (6.0). Phosphorus may be limiting at only 3.8 ppm when 10 ppm is thought to be the minimum for normal plant development. Soil drainage is very rapid and there is little evidence of erosion, but pedestaling was reported around some shrubs.

Browse composition is highly favorable with several preferred species present including: Utah serviceberry, mountain big sagebrush, Stansbury cliffrose, and antelope bitterbrush. Mountain big sagebrush is by far the most abundant shrub which currently (‘98) provides 50% of the total shrub cover. Density has declined from a high of 6,199 plants/acre estimated in 1982, to 5,866 by 1992, and 3,620 by 1998. Most of the decline between 1992 and 1998 is due to the much larger sample taken in 1998. The dead within the population can only explain 37% of the decrease. The much larger sample gives more accurate estimates for shrubs with discontinuous and/or clumped distributions. Utilization of the sagebrush was moderate to heavy in 1992, but is mostly light to moderate in 1998. Vigor remains normal and percent decadence relatively low at only 14%. Reproduction is good with good numbers of seedlings and young plants counted during each reading. Currently, dead plants number 820 plants/acre.

Cliffrose and bitterbrush have relatively small, but somewhat stable populations which received heavy use in 1992. Current use is more moderate, vigor normal, with no decadent plants sampled in 1998. Serviceberry follows a similar trend. Density has increased 98% since 1992, mostly due to the lengthening of the baseline in 1998 which provides a much better, more representative sample. Some Gambel oak was also picked up in the larger sample.

Herbaceous vegetation is sparse because of the poor surface soil and excessively rapid drainage, combined with high surface temperatures. Mutton bluegrass dominates the herbaceous understory by producing 92% of the grass cover and 74% of the total herbaceous cover. Bottlebrush squirreltail is also fairly common. Forbs are very diverse with 16 perennial species encountered in 1992, and 21 in 1998. All of the forbs found in 1998 combine to produce only 3.4% cover with Hood’s phlox providing 50% of that cover. The only other fairly common perennial species include: bull thistle, pale agoseris, and foothill deathcamas.

1982 APPARENT TREND ASSESSMENT

Over the short term, soil trend appears fairly stable. The broken rocky surface, more than any other factor, tends to prevent runoff. Over the very long term, soil is in a formation mode. That is to say that, as the parent rock weathers and is broken down by climatic and vegetative action, more "soil" will be created. This, in turn, should provide greater growth opportunities, especially for grasses and forbs. Vegetative trend is currently stable. If cattle grazing is restricted or excluded, a very slow improvement in herbaceous growth can be expected. The character of the soil is a paramount management factor on this site.

1992 TREND ASSESSMENT

No soil movement was noted with an improving soil trend on the site. The little soil that is there seems to be adequately covered by vegetation and litter. Most browse species on the site are good for wildlife use in the winter and are stable to slightly increasing. Two species that should be monitored for excessive increases are threadleaf snakeweed and dwarf rabbitbrush.

TREND ASSESSMENT
soil - up
browse - slightly up
herbaceous understory - up

1998 TREND ASSESSMENT

Trend for soil is stable with similar amounts of exposed bare ground compared to 1992. Percent litter cover did decline, while rock and pavement cover combined increased from 42% to 57%. Erosion does not appear to be a problem however. Trend for browse is stable for the preferred species, mountain big sagebrush, serviceberry, cliffrose, and bitterbrush. These shrubs generally show lighter use when compared to 1992. Vigor is good, percent decadence low, with adequate reproduction. Most of the changes in density are due to the larger sample used in 1998 which picked up more serviceberry and Gambel oak. Trend for the herbaceous understory is down slightly, due to a decline in the sum of nested frequency of grasses and forbs. Nested frequency of bottlebrush squirreltail and prairie Junegrass declined significantly since 1992, while the more common mutton bluegrass remained at a similar frequency.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - down slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 37

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	-	3	-	-	1	.00
G	Koeleria cristata	60	*19	3	24	9	.33
G	Poa fendleriana	207	231	50	76	86	12.77
G	Sitanion hystrix	171	*64	54	78	28	.76
G	Stipa comata	-	4	-	-	1	.03
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		438	321	107	178	125	13.91
Total for Grasses		438	321	107	178	125	13.91
F	Agoseris glauca	22	37	-	11	18	.25
F	Allium spp.	-	3	-	-	2	.01
F	Arabis spp.	6	-	2	3	-	-
F	Aster spp.	-	2	-	-	1	.00

Type	Species	Nested Frequency '92	'98	Quadrat Frequency '82	'92	'98	Average Cover % '98
F	Astragalus spp.	17	*3	7	10	2	.02
F	Castilleja chromosa	1	3	1	1	3	.02
F	Calochortus nuttallii	2	3	-	1	1	.00
F	Cirsium vulgare	27	17	1	10	8	.26
F	Comandra pallida	-	*10	-	-	5	.07
F	Collinsia parviflora (a)	-	25	-	-	13	.06
F	Cryptantha spp.	-	2	-	-	2	.01
F	Cymopterus spp.	-	1	-	-	1	.03
F	Draba spp. (a)	-	3	-	-	1	.00
F	Erodium cicutarium (a)	-	3	-	-	2	.01
F	Erigeron pumilus	19	*4	2	9	2	.01
F	Eriogonum umbellatum	7	9	3	3	5	.05
F	Ipomopsis aggregata	-	4	-	-	1	.00
F	Lomatium spp.	-	13	-	-	5	.02
F	Lotus utahensis	16	-	4	10	-	-
F	Lupinus argenteus	-	4	-	-	2	.01
F	Machaeranthera canescens	-	3	-	-	1	.00
F	Microsteris gracilis (a)	-	109	-	-	47	.38
F	Penstemon leonardi	78	*-	45	33	-	-
F	Penstemon palmeri	1	1	3	1	1	.15
F	Phlox hoodii	21	*40	10	11	17	1.70
F	Phlox longifolia	-	1	-	-	1	.00
F	Polygonum douglasii (a)	-	2	-	-	1	.00
F	Ranunculus spp.	-	3	-	-	2	.01
F	Senecio multilobatus	2	-	1	1	-	-
F	Trifolium spp.	1	-	-	1	-	-
F	Viguiera multiflora	1	-	-	1	-	-
F	Zigadenus paniculatus	3	*22	-	2	10	.26
Total for Annual Forbs		0	142	0	0	64	0.46
Total for Perennial Forbs		224	185	79	108	90	2.92
Total for Forbs		224	327	79	108	154	3.39

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 37

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	23	5.11
B	Artemisia tridentata vaseyana	82	14.47
B	Chrysothamnus depressus	46	2.17
B	Chrysothamnus parryi howardi	2	.30
B	Cowania mexicana stansburiana	6	2.75
B	Echinocereus spp.	1	-
B	Gutierrezia micorcephala	20	.04
B	Juniperus osteosperma	1	1.25
B	Opuntia spp.	4	.06
B	Purshia tridentata	14	2.01
B	Quercus gambelii	5	.56
Total for Browse		204	28.77

CANOPY COVER --
Herd unit 30 , Study no: 37

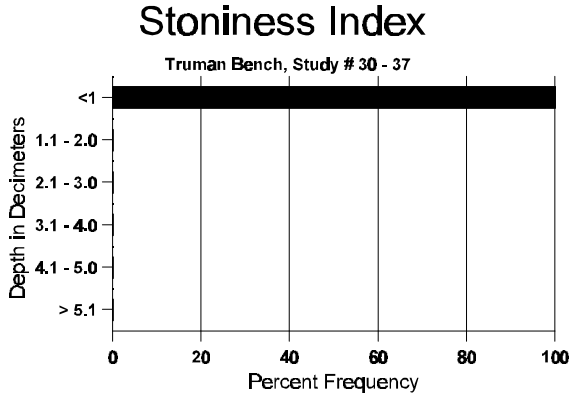
Species	Percent Cover '98
Juniperus osteosperma	1

BASIC COVER --
Herd unit 30 , Study no: 37

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	317	6.25	11.25	41.11
Rock	340	31.25	25.00	44.12
Pavement	223	16.75	16.75	12.56
Litter	359	41.75	42.50	29.03
Cryptogams	3	1.00	0	.00
Bare Ground	169	3.00	4.50	4.48

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 37, Study Name: Truman Bench

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
21.0	40.6 (17.7)	6.0	32.0	36.6	31.4	3.1	3.8	121.6	.5



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 37

Type	Quadrat Frequency '98
Rabbit	1
Elk	1
Deer	23

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 37

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	15	2	-	-	-	-	-	-	-	17	-	-	-	340			17
M	82	-	4	-	-	-	-	-	-	-	4	-	-	-	266	41	33	4
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	66	55	91	1
	98	114	44	12	3	-	-	-	-	-	173	-	-	-	3460	51	43	173
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	540			27

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	100%	00%	00%	-75%
'92	00%	100%	00%	+98%
'98	24%	06%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	266	Dec:	-
	'92	66		-
	'98	3800		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	98	114	-	-	-	-	-	-	-	-	114	-	-	-	2280			114
Y	82	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	92	3	7	5	1	1	1	3	-	-	21	-	-	-	1400			21
	98	23	2	-	1	-	-	-	-	-	26	-	-	-	520			26
M	82	85	-	-	-	-	-	-	-	-	85	-	-	-	5666	15	23	85
	92	10	16	12	2	4	4	3	-	-	50	1	-	-	3400	17	26	51
	98	68	51	3	5	2	-	-	-	-	125	4	-	-	2580	15	29	129
D	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	3	2	5	-	2	4	-	-	-	13	-	3	-	1066			16
	98	9	16	1	-	-	-	-	-	-	20	-	-	6	520			26
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	1	-	-	-	820			41

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	36%	35%	03%	- 5%
'98	39%	02%	03%	-38%

Total Plants/Acre (excluding Dead & Seedlings)				
'82	6199	Dec:		2%
'92	5866			18%
'98	3620			14%

Chrysothamnus depressus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	98	71	-	-	-	-	-	-	-	-	71	-	-	-	1420			71
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	6	-	-	3	-	-	9	-	-	18	-	-	-	1200	11	13	18
	98	279	-	-	-	-	-	-	-	-	279	-	-	-	5580	4	7	279
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+79%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	0%
'92	1466		14%
'98	7020		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus parryi howardi																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	-	1	-	-	20	20	46	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	40		-

Cowania mexicana stansburiana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	41	47	1
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	66	102	93	1
	98	2	4	1	-	1	-	-	-	-	8	-	-	-	160	50	52	8
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+50%
'92	00%	50%	00%	+27%
'98	67%	11%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	0%
	'92	132		50%
	'98	180		0%

Echinocereus spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	5	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia micorcephala																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200	8	13	3
	92	7	-	-	-	-	-	3	-	-	10	-	-	-	666	8	9	10
	98	42	-	-	4	-	-	-	-	-	46	-	-	-	920	4	6	46

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+70%
'92	00%	00%	00%	+33%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	200	Dec:		-
'92	666			-
'98	1000			-

Juniperus osteosperma																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	66	Dec:		-
'92	66			-
'98	20			-

Opuntia spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	5	12	4
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	20%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	0			0%
'98	100			20%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
M	82	8	-	-	-	-	-	-	-	-	8	-	-	-	533	35	43	8
	92	-	1	7	-	-	-	-	-	-	8	-	-	-	533	37	52	8
	98	2	7	5	-	-	1	-	-	-	15	-	-	-	300	28	54	15
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	3	-	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+33%
'92	17%	83%	00%	-57%
'98	47%	35%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	533	Dec:		0%
'92	799			25%
'98	340			0%

Quercus gambelii																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840	25	15	42

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	-
'92	0		-
'98	900		-

Trend Study 30-38-98

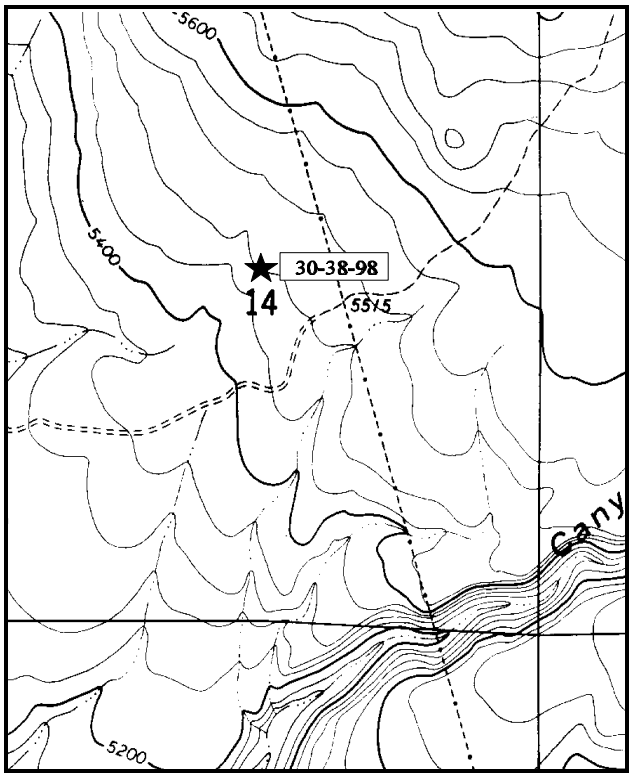
Study site name: Wide Canyon . Range type: Mountain Brush .

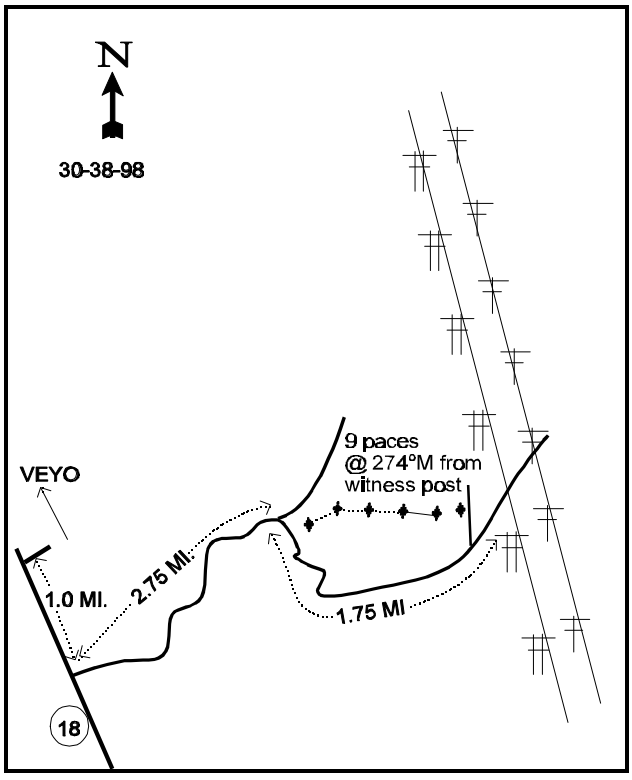
Compass azimuth: frequency baseline 276 M degrees. (Line 4 228°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (8 & 85ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Veyo, 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°M. 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 . UTM 4132031.477 N, 268400.893 E

DISCUSSION

Trend Study No. 30-38 (50B-15)

The Wide Canyon range study is located on deer winter range at 5,500 feet on the north side of Wide Canyon. The study site slopes gently (3-5%) to the southwest. Vegetational characteristics of the community are essentially two-tiered. There is a scattered overstory of Utah juniper and large tree-like Stansbury cliffrose underlain by a rather sparse cover of lower growing shrubs and a dense carpet of cheatgrass brome. Perennial grasses and forbs are nearly nonexistent. Deer days use/acre, estimated on a nearby pellet group transect, averaged 23 over the last ten years (1982-92), with a high of 39 in 1989-90, and a low of 14 in 1991-92. Pellet group data taken along the study site baseline in 1998 estimate a much higher level of use at 121 deer days use/acre. A few cattle pats were also encountered.

This study is located on the same lava flow on which the Truman Bench study resides, but approximately three miles further away and 1,200 feet lower in elevation. On this site, there are still 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 (see methods) is estimated at almost 17 inches. Soil texture is a clay loam with a slightly acid pH (6.5). Bare ground has increased slightly from 11% in 1982, to 15% in 1992 and 1998. There were a large number of lichens and moss on the ground during the 1992 reading. Erosion is not a problem on this site due to the level terrain, combined with adequate protective ground cover.

The key browse species are mountain big sagebrush and Stansbury cliffrose. Sagebrush currently ('98) accounts for 19% of the browse cover with a cover value of just over 4%. Density has increased from 799 plants/acre, to 1,599 in 1992, and 1,560 by 1998. These plants have displayed moderate to heavy use during past readings, but mostly light to moderate use in 1998. Reproduction was good in 1992 with excellent seed production. By 1998, recruitment is still adequate but seed production is poor. The cliffrose plants are principally large tree-like forms which are at least partially unavailable because of height. Utilization of the available portion is moderate to heavy. Since there are no dead plants sampled in 1998, the decline in density since 1992 is primarily due to the much larger sample giving more accurate population estimates. This sample better estimates shrub populations which often have aggregated and/or discontinuous populations. Green ephedra is also moderately abundant and provides additional forage for wintering deer.

The most abundant browse is broom snakeweed which currently provides ('98) 16% of the browse cover. The broom snakeweed population increased 16% from 3,265 plants/acre in 1982 to 3,899 plants/acre by 1992. Seedlings were very abundant in 1992 (30,033 plants/acre) due to the wet spring. Most of these plants did not survive, but the population did increase to 7,400 plants/acre by 1998. Currently, seedlings and young are found in small numbers with 93% of the population consisting of mature plants.

Large juniper trees are found throughout the site. They account for 40% of the total browse cover and have an estimated overhead canopy cover value of 17%. Point quarter data from 1998 estimate 34 juniper trees/acre with an average basal diameter of 12.4 inches.

The herbaceous understory is very poor and perennial grasses and forbs are quite rare. Cheatgrass brome is very abundant, but was not counted prior to the 1998 reading because it is an annual. During the 1998 reading, cheatgrass produced a cover value of 23% which made up 99% of the total grass cover. A few perennial grasses including galleta, Indian ricegrass, and bottlebrush squirreltail are occasionally found. Forbs combine to produce only 1.5% cover. The most common species are annuals.

1982 APPARENT TREND ASSESSMENT

Soil is a limiting factor on this site. Current soil condition is fair to poor and not noticeably improving. Although the rate of erosion is not great, it is probably enough to prevent any immediate improvement. Trend is therefore stable or declining. Vegetative trend is also stable or declining. The key browse species are rather static with little evidence of reproduction, but also little decadence. However, sagebrush vigor is below optimum. Broom snakeweed and cheatgrass brome are both overly abundant and show few signs of becoming less so.

1992 TREND ASSESSMENT

Vegetative basal cover has remained the same at 1%, which is extremely low. The vegetative cover would undoubtedly be higher if cheatgrass brome were counted. Rock and pavement combined have increased slightly from 32% cover to 39% cover. Litter cover has decreased from 55% to 41%. Overall, soil is not eroding and the changes in cover are slight, indicating a stable soil trend. Grass and forb species are slightly increasing and are not utilized much on this site. Browse density has increased by 24%, due mostly to broom snakeweed and mountain big sagebrush. The increase in mountain big sagebrush is encouraging, but the increase in broom snakeweed should be monitored. Broom snakeweed has the possibility of greatly expanding, depending on the survival rate of the seedlings. Browse trend is slightly up.

TREND ASSESSMENT
soil - stable
browse - slightly up
herbaceous understory - stable, but very poor

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1992. Trend for browse is down for mountain big sagebrush and stable for cliffrose. However, sagebrush makes up 19% of the browse cover, or more realistically, 80% of the preferred browse cover. Sagebrush remained at a similar density of about 1,560 plants/acre, but 43% of the sagebrush are dead. The dead are not counted in the population estimate. Utilization is lighter and reproduction appears adequate to maintain the population. Percent decadency has increased from 8% in 1982, to 19% in 1992, and 29% by 1998. In addition, 61% (280 plants/acre) of the decadent sagebrush were classified as dying. However, reproduction appears adequate to maintain the current population. A question arises, is this adequate? Density of cliffrose declined apparently due to the much larger sample used in 1998. Utilization is moderate to heavy on available plants, vigor is normal and there are currently no plants classified as decadent. Another negative aspect of the browse trend is the 47% increase in the density of broom snakeweed from 3,899 to 7,400 plants/acre. Most of the plants are mature (93%) indicating a possibly stabile population. Trend for the herbaceous understory 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.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - down and dominated by cheatgrass

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 38

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron spp.	9	-	-	3	-	-
G	Bromus tectorum (a)	-	348	-	-	98	23.06
G	Hilaria jamesii	-	3	5	-	3	.06
G	Oryzopsis hymenoides	-	2	-	-	1	.00
G	Poa fendleriana	13	*-	1	6	-	-
G	Poa secunda	22	*-	-	9	-	-
G	Sitanion hystrix	12	14	12	7	7	.11
G	Vulpia octoflora (a)	-	17	-	-	9	.09
Total for Annual Grasses		0	365	0	0	107	23.15
Total for Perennial Grasses		56	19	18	25	11	0.18
Total for Grasses		56	384	18	25	118	23.34
F	Agoseris glauca	3	-	-	2	-	-
F	Alyssum alyssoides (a)	-	2	-	-	1	.00
F	Calochortus nuttallii	9	9	-	3	5	.05
F	Draba spp. (a)	-	28	-	-	13	.16
F	Erodium cicutarium (a)	-	38	-	-	18	.39
F	Lupinus argenteus	-	2	-	-	2	.04
F	Microsteris gracilis (a)	-	65	-	-	26	.30
F	Plantago patagonica (a)	-	30	-	-	12	.47
F	Sphaeralcea grossulariaefolia	8	*-	2	4	-	-
F	Thysanocarpus curvipes	-	2	-	-	2	.03
F	Unknown forb-annual (a)	-	2	-	-	2	.03
Total for Annual Forbs		0	165	0	0	72	1.37
Total for Perennial Forbs		20	13	2	9	9	0.12
Total for Forbs		20	178	2	9	81	1.50

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 38

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	42	4.34
B	Cowania mexicana stansburiana	6	1.17
B	Ephedra viridis	21	4.46
B	Gutierrezia sarothrae	76	3.73
B	Juniperus osteosperma	5	9.19
B	Prunus fasciculata	1	.15
B	Yucca baccata	1	-
Total for Browse		152	23.05

CANOPY COVER --
Herd unit 30 , Study no: 38

Species	Percent Cover '98
Juniperus osteosperma	17

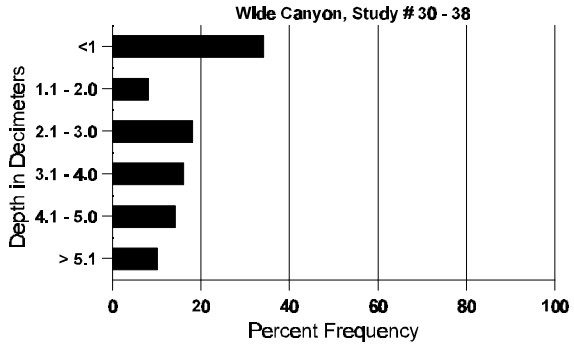
BASIC COVER --
Herd unit 30 , Study no: 38

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	361	1.00	.75	45.48
Rock	266	21.00	28.25	23.15
Pavement	194	11.00	10.75	6.17
Litter	381	55.00	41.00	44.79
Cryptogams	69	1.00	4.00	1.56
Bare Ground	243	11.25	15.25	14.72

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 38, Study Name: Wide Canyon

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
16.6	49.0 (17.7)	6.5	40.0	33.4	26.6	1.4	11.1	150.4	.6

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 38

Type	Quadrat Frequency '98
Rabbit	12
Deer	45

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 38

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	9	-	-	-	-	-	-	-	-	9	-	-	-	300			9
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	82	1	-	-	-	-	-	-	-	-	-	1	-	-	33			1
	92	2	18	-	-	2	-	-	-	-	21	1	-	-	733			22
	98	17	-	-	-	-	-	-	-	-	17	-	-	-	340			17
M	82	14	5	2	-	-	-	-	-	-	11	10	-	-	700	22	26	21
	92	3	10	4	-	-	-	-	-	-	17	-	-	-	566	19	23	17
	98	22	12	2	2	-	-	-	-	-	38	-	-	-	760	17	24	38
D	82	1	-	1	-	-	-	-	-	-	-	-	-	2	66			2
	92	2	1	2	2	2	-	-	-	-	6	-	3	-	300			9
	98	17	6	-	-	-	-	-	-	-	9	-	-	14	460			23
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1240			62

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	21%	13%	08%	+50%
'92	69%	13%	06%	- 2%
'98	23%	03%	18%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	799	Dec:	8%
	'92	1599		19%
	'98	1560		29%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cowania mexicana stansburiana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	1	-	-	-	-	-	-	-	4	-	-	-	133			4
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	1	1	1	-	-	-	-	-	5	-	1	-	200			6
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	4	7	2	-	1	-	-	-	-	14	-	-	-	466	32	31	14
	92	1	2	-	-	-	-	-	-	-	3	-	-	-	100	33	29	3
	98	-	2	2	-	-	-	-	1	-	5	-	-	-	100	85	85	5
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	3	-	-	-	5	-	-	-	166			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	57%	14%	00%	+ 0%
'92	21%	29%	07%	-74%
'98	33%	33%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	466	Dec:		0%
'92	466			36%
'98	120			0%

Ephedra viridis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	6	-	-	-	-	-	-	-	-	6	-	-	-	200	24	26	6
	92	3	3	-	-	-	-	-	-	-	6	-	-	-	200	24	36	6
	98	16	3	2	1	-	-	-	-	-	21	1	-	-	440	34	40	22
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+33%
'92	33%	00%	00%	+38%
'98	13%	08%	04%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	200	Dec:	0%
'92	300		0%
'98	480		4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	901	-	-	-	-	-	-	-	-	901	-	-	-	30033			901
	98	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
Y	82	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	92	14	-	-	-	-	-	-	-	-	14	-	-	-	466			14
	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	82	85	-	-	-	-	-	-	-	-	85	-	-	-	2833	8	9	85
	92	100	-	-	1	-	-	1	-	-	99	-	3	-	3400	13	12	102
	98	342	-	-	2	-	-	-	-	-	344	-	-	-	6880	8	10	344
D	82	5	-	-	-	-	-	-	-	-	-	-	-	5	166			5
	92	1	-	-	-	-	-	-	-	-	-	-	-	1	33			1
	98	13	-	-	-	-	-	-	-	-	7	-	-	6	260			13
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	05%	+16%
'92	00%	00%	03%	+47%
'98	00%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	3265	Dec:	5%
	'92	3899		1%
	'98	7400		4%

Juniperus osteosperma																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	2	-	-	2	-	-	-	66			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	-	-	-	-	1	-	5	-	-	-	100	-	-	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	+76%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	33	Dec:	-
	'92	33		-
	'98	140		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Prunus fasciculata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	25	59	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Yucca baccata																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	33	45	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	0			-
'98	20			-

Trend Study 30-40-98

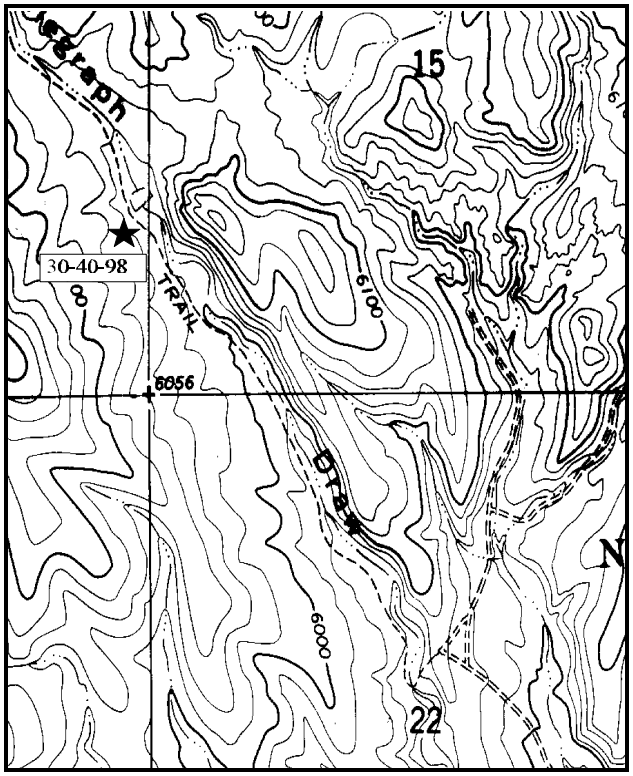
Study site name: Telegraph Draw . Range type: Chained, Reseeded P-J .

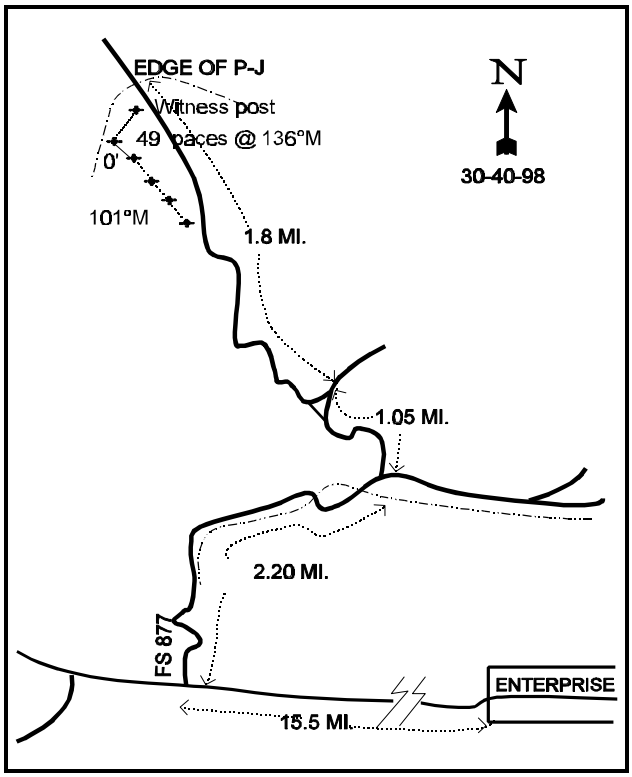
Compass azimuth: frequency baseline 101 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (14 & 81ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Center and Main in Enterprise, go west on the Shoal Creek road for 15.5 then turn right (north). Clover Valley road is 0.1 miles too far. Stay on the main road heading north for approximately 2.20 miles. At this point, there will be a fork in the road. Go to the left (i.e., north) 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 1.80 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 an azimuth of 154 degrees true. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.





Map Name: Mount Escalante

Diagrammatic Sketch

Township 36S , Range 19W , Section 16

UTM 4171913.568 N, 236959.122 E

DISCUSSION

Trend Study No. 30-40 (50B-3c)

The Telegraph Draw trend study is on winter range in Telegraph Draw. The area has been chained and seeded, however the long range success of the seeded species has been minimal and pinyon and juniper trees are still abundant. Elevation is approximately 6,080 feet with a 10% slope and southeast aspect. Vegetative cover on the study site is considerably improved over the surrounding pinyon-juniper woodland, but is still rather sparse and variably dispersed. The overall vegetative appearance is Wyoming big sagebrush 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. Use by either deer or horses appears light. Pellet group data taken on the site in 1998 estimate only 14 deer days use/acre. Days use/acre for wild horses is estimated at 22. Several wild horses were also seen near the site during the 1998 reading on May 29th.

Soil is relatively deep and rocky with an effective rooting depth (see methods) of 17 inches. Texture is a sandy clay with a moderately acid pH (5.6). The soil is sandy on the surface with a compacted clay layer encountered at a depth of 4 inches. Rocks, of a volcanic origin, are common on the surface. Some surface erosion has taken place, however active erosion has been greatly reduced from what occurs on untreated areas. Pinyon and juniper litter from downed and broken up trees is dispersed throughout. The association of litter and with the increased vegetation has tended to stabilize the site.

The key browse is a mixture of black sagebrush and Wyoming big sagebrush. During the 1982 reading, all sagebrush was classified as Wyoming big sagebrush, but in 1992 most of the sagebrush was identified as black sagebrush. Combined, the population nearly doubled from 6,166 plants/acre in 1982 to 11,830 by 1992. Sagebrush cover was estimated 15% in 1992. Wyoming big sagebrush and black sagebrush have expanding populations, but had only fair vigor due to an insect infestation in 1982. Combined sagebrush density declined to 4,560 plants/acre in 1998. Dead plants are rare suggesting that the change in density is mostly due to the much larger sample used in 1998 which better estimates shrub populations with clumped and/or discontinuous distributions. Overall, utilization is light to moderate, vigor good, and percent decadence low. Seedlings and young plants have been abundant during each reading. Biotic potential is currently high at 28% and 25% of the population consists of young plants.

Other preferred browse include a small population of antelope bitterbrush. Presumably, the bitterbrush were seeded after the chaining. These plants have shown moderate to heavy use, good vigor, and low decadence since 1982. Recruitment has steadily improved with increasing numbers of seedlings and young plants since 1992.

Increaser shrubs, including two species of rabbitbrush, and broom snakeweed are increasing on the site. In addition, pinyon and juniper trees have increased in density and stature. Point quarter data from 1998 estimate 160 singleleaf pinyon and 56 juniper trees/acre. Average basal diameter is 2.5 inches for pinyon and 3.6 inches for juniper. Shrub density strip data, which more effectively samples young and seedling trees, estimates a higher number of 380 pinyon and 140 juniper trees/acre.

The herbaceous understory is poor. Grasses are fairly diverse, yet they only produce 5% cover. Of that cover, cheatgrass provides 52% of the grass cover. The only common perennial grasses include: Indian ricegrass, mutton bluegrass, and bottlebrush squirreltail. Forbs outnumber grasses in abundance and species diversity. The principal species are desert phlox and rock goldenrod. Hooker balsamroot, bastard toadflax, and sulfur eriogonum are also fairly abundant. No seeded forbs were encountered or observed.

1982 APPARENT TREND ASSESSMENT

Overall, trend is improving. Considerable soil surface is exposed and potentially erodible, but much less so than in the surrounding pinyon-juniper woodland. Further stabilization, however is likely to be slow because of the amount of rock and pavement and the relatively poor grass cover. Vegetational trend is also improving, particularly with respect to the key species. Actual or potential deficiencies include (1) sparse grass density, (2) lack of seeded forbs, (3) scarcity of more preferred shrubs, and (4) the abundance of young pinyon and juniper trees.

1992 TREND ASSESSMENT

The soil trend appears to have improved since 1982. Basal vegetative cover has doubled since the last reading, while bare ground has decreased by 63%. However, combined rock and pavement cover have also doubled, indicating past surface erosion. Litter has remained stable. Total protective ground cover has increased from 73% to 90%. The trend for browse is also up. The key browse species, black sagebrush and Wyoming big sagebrush, have nearly doubled in density and have improved vigor. The herbaceous trend is stable. Grasses have increased slightly in quadrat frequency, while forbs have remained stable. Forbs are abundant and diverse but consist of poor forage species. No seeded forbs were encountered.

TREND ASSESSMENT
soil - improved
browse - up
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil is down, due to an increase in percent bare ground from 10% to 20%, and a decline in litter cover from 58% to 51%. Trend for browse stable. Black sagebrush and Wyoming big sagebrush show a major decline in density from 11,830 plants/acre to 4,560. However, due to the lack of dead plants, it appears that the change is due mostly to the much larger sample used in 1998. Utilization, vigor, and percent decadency are similar to 1992 levels. Reproduction is also excellent with abundant seedlings and young. Bitterbrush is increasing. It has moderate use, good vigor, and low decadence. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses and forbs has remained similar to 1992 levels. Composition is poor however, with cheatgrass providing 52% of the grass cover, and rock goldenrod and desert phlox providing 51% of the forb cover.

TREND ASSESSMENT
soil - down
browse - stable
herbaceous understory - stable, but poor

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 40

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	12	12	2	6	7	.11
G	Bromus tectorum (a)	-	163	-	-	62	2.52
G	Elymus junceus	9	*-	1	4	-	-
G	Hilaria jamesii	-	4	-	-	1	.03
G	Koeleria cristata	3	-	-	1	-	-
G	Oryzopsis hymenoides	5	*50	-	2	21	1.05
G	Poa fendleriana	2	*30	2	2	14	.47
G	Poa secunda	-	2	-	-	1	.00
G	Sitanion hystrix	65	*43	39	33	16	.57
G	Stipa comata	3	-	-	2	-	-
G	Stipa coronata depauperata	45	*5	13	22	2	.06
Total for Annual Grasses		0	163	0	0	62	2.52
Total for Perennial Grasses		144	146	57	72	62	2.30
Total for Grasses		144	309	57	72	124	4.83
F	Alyssum alyssoides (a)	-	1	-	-	1	.00
F	Allium spp.	-	1	-	-	1	.00
F	Antennaria parvifolia	-	-	3	-	-	-
F	Astragalus convallarius	-	-	1	-	-	-
F	Astragalus spp.	1	2	3	1	1	.03
F	Balsamorhiza hookeri	1	*23	-	1	8	.57
F	Chaenactis douglasii	5	*20	6	2	9	.09
F	Comandra pallida	9	*30	1	5	14	.24
F	Collinsia parviflora (a)	-	6	-	-	4	.02
F	Crepis acuminata	2	-	-	1	-	-
F	Dalea searlsiae	12	-	-	7	-	-
F	Eriogonum caespitosum	1	-	-	1	-	-
F	Eriogonum racemosum	-	-	2	-	-	-
F	Eriogonum cernuum (a)	-	5	-	-	3	.06
F	Erigeron spp.	-	3	-	-	2	.03
F	Eriogonum spp.	-	*7	-	-	4	.16
F	Eriogonum racemosum	8	9	-	4	5	.10
F	Eriogonum umbellatum	34	*39	9	13	19	.29
F	Gilia spp. (a)	-	6	-	-	3	.04
F	Hymenopappus filifolius	1	-	4	1	-	-
F	Ipomopsis aggregata	1	-	6	1	-	-
F	Lappula occidentalis (a)	-	12	-	-	6	.05
F	Lequerella rectipes	-	-	1	-	-	-
F	Lomatium spp.	-	4	-	-	2	.04

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Lotus utahensis	8	3	4	5	1	.03
F	Lupinus argenteus	17	4	5	7	2	.06
F	Machaeranthera canescens	5	-	-	2	-	-
F	Microsteris gracilis (a)	-	80	-	-	30	.20
F	Penstemon caespitosus	45	*-	45	21	-	-
F	Penstemon spp.	8	7	-	4	4	.07
F	Petradoria pumila	55	52	17	25	20	1.41
F	Phlox austromontana	63	76	24	27	37	1.62
F	Phlox longifolia	14	*6	-	8	2	.03
F	Senecio multilobatus	9	-	5	4	-	-
F	Sphaeralcea grossulariaefolia	1	-	6	1	-	-
F	Streptanthus cordatus	-	*30	7	-	15	.64
F	Trifolium spp.	22	*12	3	13	7	.06
Total for Annual Forbs		0	110	0	0	47	0.38
Total for Perennial Forbs		322	328	152	154	153	5.52
Total for Forbs		322	438	152	154	200	5.91

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 40

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	5	.30
B	Artemisia tridentata wyomingensis	78	14.31
B	Chrysothamnus depressus	33	.44
B	Chrysothamnus viscidiflorus	29	1.47
B	Gutierrezia sarothrae	20	.17
B	Juniperus osteosperma	7	2.04
B	Pinus monophylla	18	5.69
B	Polygala subspinosa subspinosa	0	-
B	Purshia tridentata	26	3.97
Total for Browse		216	28.41

CANOPY COVER --
Herd unit 30 , Study no: 40

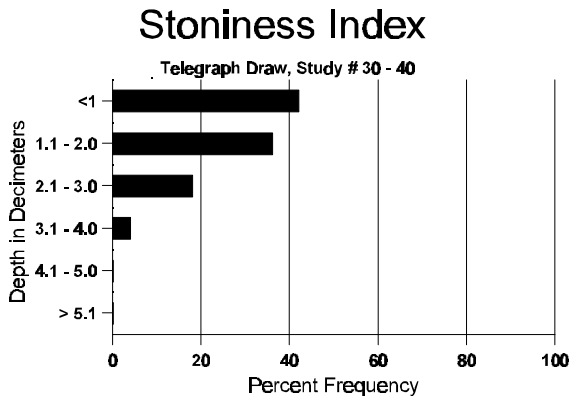
Species	Percent Cover '98
Juniperus osteosperma	1

BASIC COVER --
Herd unit 30 , Study no: 40

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	292	1.50	4.25	39.52
Rock	218	6.00	6.00	10.70
Pavement	257	7.75	22.25	13.13
Litter	379	56.50	58.00	51.14
Cryptogams	17	.25	0	.17
Bare Ground	244	27.25	9.50	20.32

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 40, Study Name: Telegraph Draw

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
16.9	43.6 (17.7)	5.6	46.0	17.4	36.6	2.4	3.8	310.4	.4



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 40

Type	Quadrat Frequency '98
Rabbit	8
Horse	3
Deer	9

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 40

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	21	-	-	-	-	-	3	-	-	23	1	-	-	800			24
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	87	27	-	2	-	-	2	-	-	117	-	1	-	3933			118
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	124	14	-	6	-	-	2	-	-	134	2	8	2	4866	10	12	146
	98	4	5	-	-	-	-	-	-	-	9	-	-	-	180	10	17	9
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	8	1	-	2	-	-	-	-	-	6	-	4	1	366			11
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	15%	00%	06%	-97%
'98	42%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	9165		4%
	'98	240		0%

Artemisia tridentata wyomingensis																		
S	82	14	-	-	-	-	-	-	-	-	14	-	-	-	466			14
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	36	-	-	17	-	-	5	-	-	57	1	-	-	1160			58
Y	82	99	-	-	-	-	-	-	-	-	85	14	-	-	3300			99
	92	16	2	1	3	1	-	-	-	-	23	-	-	-	766			23
	98	36	14	-	2	-	-	1	-	-	49	4	-	-	1060			53
M	82	72	11	3	-	-	-	-	-	-	23	63	-	-	2866	16	18	86
	92	28	11	6	4	-	-	1	-	-	49	-	1	-	1666	22	24	50
	98	96	41	3	14	-	-	1	-	-	155	-	-	-	3100	20	32	155
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	4	3	-	-	-	-	-	-	-	6	-	-	1	233			7
	98	3	5	-	-	-	-	-	-	-	5	-	-	3	160			8
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	06%	02%	00%	-57%
'92	21%	09%	03%	+38%
'98	28%	01%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	6166	Dec:	0%
	'92	2665		9%
	'98	4320		4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus depressus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	30	-	-	2	-	-	-	-	-	32	-	-	-	640			32
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	62	-	-	18	-	-	-	-	-	80	-	-	-	1600	4	6	80
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	-	-	-	-	-	-	-	-	-	3	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	03%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	0			0%
'98	2300			3%

Chrysothamnus viscidiflorus																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	48	-	-	4	-	-	-	-	-	51	1	-	-	1040	11	16	52
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	-	-	-	1	33			1
	98	3	-	-	-	-	-	-	-	-	2	-	-	1	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	25%
'98	00%	00%	01%

%Change

+90%

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	133			25%
'98	1360			4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	15	-	-	-	-	-	-	-	-	15	-	-	-	300			15
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33	6	4	1
	98	54	-	-	-	-	-	1	-	-	55	-	-	-	1100	6	10	55
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+95%
'98	00%	00%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	66		0%
	'98	1420		1%

Juniperus osteosperma																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	82	5	-	-	-	-	-	-	-	-	5	-	-	-	166	39	26	5
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33	81	54	1
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100	-	-	5
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-40%
'92	00%	00%	00%	+29%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	166	Dec:	-
	'92	99		-
	'98	140		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus monophylla																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	33			1
	98	1	-	-	1	-	-	1	-	-	3	-	-	-	60			3
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	2	-	-	-	-	-	8	-	-	-	266			8
	98	11	-	-	1	-	-	-	-	-	12	-	-	-	240			12
M	82	5	-	-	-	-	-	-	-	-	4	1	-	-	166	32	31	5
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33	110	74	1
	98	6	-	-	1	-	-	-	-	-	7	-	-	-	140	-	-	7
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	1	-	-	-	-	-	-	-	-	-	1	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+50%
'92	10%	00%	10%	+13%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	166	Dec:	0%
	'92	332		10%
	'98	380		0%

Polygala subspinosa subspinosa																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	8	2
	92	6	-	-	-	-	-	1	-	-	7	-	-	-	233	3	4	7
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+75%
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'92	266		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	-	1	-	-	2	-	-	-	66			2
	98	11	-	-	1	-	-	-	-	-	12	-	-	-	240			12
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	3	1	-	1	-	2	-	-	-	7	-	-	-	140			7
M	82	2	3	1	-	-	-	-	-	-	6	-	-	-	200	26	31	6
	92	3	1	1	2	-	-	-	-	-	7	-	-	-	233	34	43	7
	98	5	11	2	1	1	1	1	-	-	22	-	-	-	440	34	49	22
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	1	-	-	-	-	-	-	2	-	-	-	66			2
	98	-	2	-	-	-	-	-	-	-	2	-	-	-	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	50%	17%	00%	+40%
'92	10%	20%	00%	+46%
'98	48%	16%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	200	Dec:	0%
	'92	332		20%
	'98	620		6%

Trend Study 30-41-98

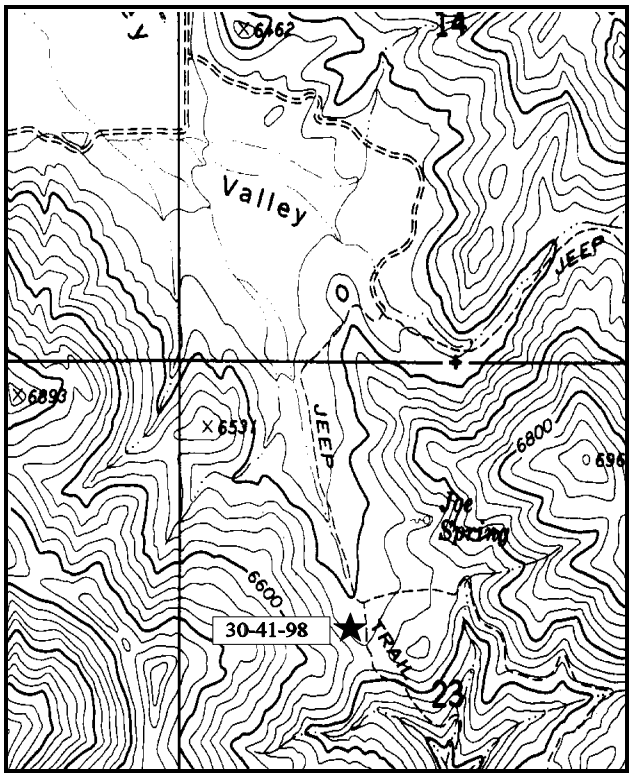
Study site name: Joe Spring . Range type: Mixed Mountain Brush .

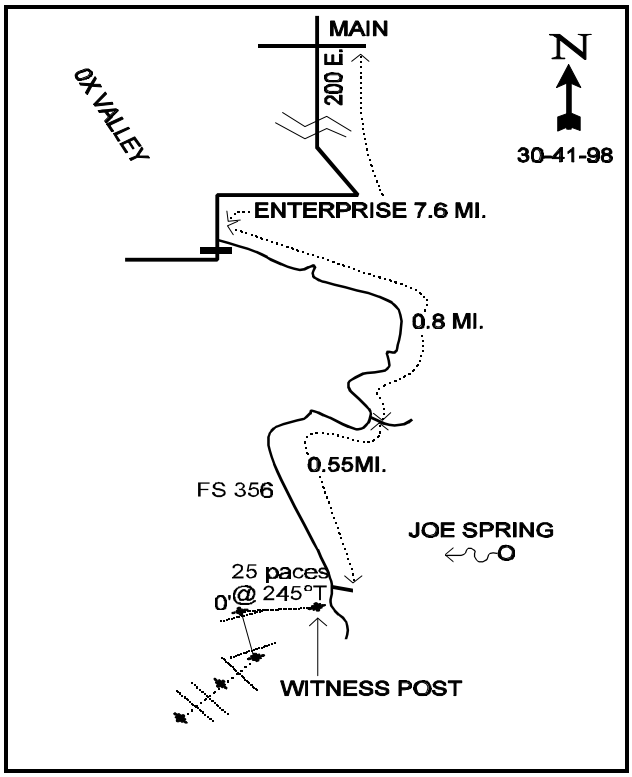
Compass azimuth: frequency baseline 152 degrees. (Lines 2 & 3 231°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (0 & 93ft), line 2 (71ft), line 3 (34 & 59ft).

LOCATION DESCRIPTION

From 200 East and Main in Enterprise, travel southwest 7.6 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 half-high marker post on the right side of the road. The 0-foot baseline is 25 paces at 245 degrees true and is marked by browse tag number 7015. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.





Map Name: Central West, Utah Diagrammatic Sketch

Township 38S , Range 17W , Section 23 UTM 4150193.730 N, 258751.651 E

DISCUSSION

Trend Study No. 30-41 (50B-4c)

The Joe Spring trend study is on deer summer range near Joe Spring at the south end of Ox Valley. Elevation at the site is approximately 6,400 feet with a 15% slope and east aspect. The range type is mixed mountain brush. The entire area surrounding Ox Valley receives heavy deer and cattle use. The allotment is grazed by 621 head of cattle each year from July 15-September 30. During study site establishment in 1982, cattle were in the area and several does with fawns also observed. Pellet group data from 1998 estimate 58 deer and 10 cow days use/acre. There is a water source and salt lick within ½ mile of the site.

Soils are coarse textured and rocky, but fairly deep. Effective rooting depth (see methods) is estimated at 18 inches. Texture is a sandy loam with a moderately acid pH (5.7). Ground cover from vegetation and litter is unevenly distributed, yet is an effective barrier to soil movement. Bare ground currently ('98) accounts for 21% of the ground surface and is largely the result of livestock trailing and some deer trails which terrace the slope. These are erosive surfaces which are not currently a serious problem.

Browse composition is diverse and overall productivity is high. The principal species include: mountain big sagebrush, true mountain mahogany, Gambel oak, Utah serviceberry, mountain snowberry, and a few less desirable shrubs. Utah serviceberry showed a decreased in density between 1982 and 1992. Percent decadency also increased and the proportion of individuals heavily hedged went up (33% to 43%). Gambel oak increased in density 43% between 1982 and 1992. During the 1998 reading, the study site baseline was extended from the original 100 ft to 300 ft in order to get a better sample. The original 3 circular shrub density plots were replaced with 5, 1/100th acre density strips. This much larger sample better estimates shrub densities which are very clumped on the Joe Spring site. As a result, density of many of the shrub species changed. Utah serviceberry density increased from 466 plants/acre estimated in 1992 to 4,640 in 1998. Due to the thick nature of the serviceberry on the site, stems were counted since individual plants were hard to distinguish. Serviceberry currently ('98) accounts for 27% of the browse cover. Utilization is more moderate, vigor good, and percent decadence low at only 6%. Reproduction is poor however.

Mountain big sagebrush has increased 40% in density to 2,220 plants/acre since 1992. It displays light to moderate use, normal vigor on most plants, and low percent decadence at 13%. Reproduction is good with increasing biotic potentials and improved proportions of young plants since 1982. The true mountain mahogany is 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.

Gambel oak appears to be increasing on the site with large numbers of seedlings and young counted in 1998. Utilization was reported heavy in 1992, but mostly light in 1998. Vigor was reduced in 29% of the plants, likely due to the late frosts from the spring of 1998. An increase in oak would be undesirable as it will come at the expense of other more desirable shrubs.

Grasses, although fairly diverse, are not very abundant. Nine perennial grass species were encountered in 1998, nevertheless only one, mutton bluegrass, is more than occasionally abundant. Cheatgrass brome 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. In 1998, cheatgrass dominated the herbaceous understory. It provides 68% of the grass cover and 30% of the total herbaceous cover.

Forbs are a key vegetative element. They are fairly diverse and abundant, but probably still below optimum for this type of site. The more important forbs include lupine, arrowleaf balsamroot, and redroot eriogonum.

Overall, utilization of forbs is moderate with slightly heavier use on lupine, redroot eriogonum, and American vetch. The annual forb, littleflower collinsia, is very abundant and growing in thick patches. It currently ('98) provides 28% of the forb cover. A native perennial forb, desert phlox, is also abundant, producing 28% of the forb cover.

1982 APPARENT TREND ASSESSMENT

Overall range trend is stable, even though utilization of the preferred browse species is relatively heavy. The rate of erosion is greater than it should be, yet is not currently a serious problem. Understory composition and density are fair but could be better.

1992 TREND ASSESSMENT

The soil trend has improved since 1982. Basal vegetative cover has more than doubled, while bare ground has decreased 30%. The browse trend is down due to significant decreases in density and increases in percent decadency of the two preferred browse species. Utah serviceberry decreased in density by 71% while the proportion of decadent and heavily hedged plants increased. Mountain mahogany saw a decrease in it's density of 35%, with a 63% increase in percent decadency. Quadrat frequency of perennial grasses remained basically unchanged. Cheatgrass brome appears to have increased, but was not included in the analysis because it is an annual. Quadrat frequency of forbs increased slightly. Trend for herbaceous understory is stable.

TREND ASSESSMENT
soil - up
browse - down
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1992. Litter cover declined from 67% in 1982 to 64% in 1992, and 47% by 1998. It appears that the difference is due to including dried up cheatgrass as litter in 1982 and 1992, instead of classifying it as vegetation cover. Trend for the key browse species, serviceberry, and mountain big sagebrush is up slightly. Utilization of serviceberry is more moderate and percent decadence has declined from 16% to 6%. Reproduction is poor however. Sagebrush displays improved vigor, lower decadence, and good reproduction. Only one mountain mahogany plant was sampled with the larger sample. 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 herbaceous understory is up. Sum of nested frequency of perennial grasses has remained similar, although frequency of perennial forbs has doubled.

TREND ASSESSMENT
soil - stable
browse - up slightly
herbaceous understory - up overall, stable for perennial grasses but up for forbs

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 41

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron intermedium	12	*1	17	4	1	.00
G	Agropyron smithii	16	6	-	5	4	.02
G	Agropyron spicatum	56	*11	-	19	5	.19
G	Bouteloua gracilis	10	-	14	4	-	-
G	Bromus carinatus	13	22	3	8	7	.37
G	Bromus tectorum (a)	-	285	-	-	91	12.32
G	Koeleria cristata	-	-	1	-	-	-
G	Oryzopsis hymenoides	2	-	2	1	-	-
G	Poa fendleriana	3	*85	4	1	37	4.46
G	Poa pratensis	-	8	-	-	2	.18
G	Sitanion hystrix	30	15	11	13	7	.63
G	Stipa comata	9	2	5	4	1	.03
Total for Annual Grasses		0	285	0	0	91	12.32
Total for Perennial Grasses		151	150	57	59	64	5.89
Total for Grasses		151	435	57	59	155	18.22
F	Agoseris glauca	-	*34	-	-	17	.29
F	Allium spp.	-	*57	-	-	22	.48
F	Arabis spp.	-	5	-	-	2	.16
F	Artemisia ludoviciana	30	*3	15	12	1	.00
F	Aster chilensis	-	*28	-	-	14	.09
F	Astragalus spp.	2	*13	14	1	7	.11
F	Balsamorhiza sagittata	3	*33	1	2	15	2.40
F	Calochortus nuttallii	-	8	-	-	6	.03
F	Comandra pallida	17	18	15	7	8	.16
F	Collinsia parviflora (a)	-	283	-	-	85	6.48
F	Crepis acuminata	-	*11	-	-	9	.27
F	Cymopterus spp.	-	*36	-	-	19	.32
F	Erigeron eatonii	11	15	4	6	7	.35
F	Erigeron spp.	-	*17	-	-	9	.17
F	Eriogonum racemosum	2	6	5	1	3	.21
F	Galium boreale	-	7	-	-	3	.01
F	Hackelia patens	-	*22	-	-	12	.30
F	Linum lewisii	-	2	-	-	1	.15
F	Lomatium spp.	-	1	-	-	1	.03
F	Lupinus argenteus	84	*30	36	43	16	1.29
F	Machaeranthera canescens	18	*3	13	7	1	.00
F	Microsteris gracilis (a)	-	25	-	-	12	.16
F	Penstemon spp.	-	4	-	-	2	.04

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Phlox austromontana	85	*124	11	33	46	6.40
F	Phacelia heterophylla	1	6	2	1	2	.79
F	Sphaeralcea grossulariaefolia	-	1	1	-	1	.03
F	Stephanomeria tenuifolia	-	*11	-	-	5	.12
F	Unknown forb-annual (a)	-	4	-	-	3	.09
F	Unknown forb-perennial	-	5	-	-	2	.03
F	Vicia americana	54	*101	12	28	41	2.21
Total for Annual Forbs		0	312	0	0	100	6.73
Total for Perennial Forbs		307	601	129	141	272	16.52
Total for Forbs		307	913	129	141	372	23.25

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 41

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	26	8.55
B	Artemisia tridentata vaseyana	61	10.19
B	Cercocarpus ledifolius	1	-
B	Cercocarpus montanus	1	-
B	Chrysothamnus depressus	3	.03
B	Chrysothamnus viscidiflorus viscidiflorus	26	1.43
B	Eriogonum microthecum	0	-
B	Opuntia spp.	1	.03
B	Quercus gambelii	34	10.28
B	Quercus turbinella	0	-
B	Ribes spp.	1	.38
B	Symphoricarpos oreophilus	3	.33
B	Tetradymia canescens	0	.03
Total for Browse		157	31.28

CANOPY COVER --
Herd unit 30 , Study no: 41

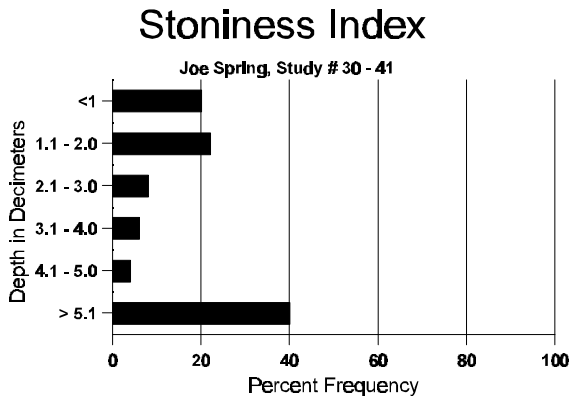
Species	Percent Cover '98
Quercus gambelii	11

BASIC COVER --
Herd unit 30 , Study no: 41

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	366	2.75	3.00	59.19
Rock	132	1.25	3.00	7.60
Pavement	173	.50	26.00	4.94
Litter	378	67.25	49.00	46.79
Cryptogams	-	0	0	0
Bare Ground	244	28.25	21.00	20.56

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 41, Study Name: Joe Spring

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
18.0	41.8 (16.7)	5.7	68.0	17.4	14.6	1.8	15.0	150.4	.4



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 41

Type	Quadrat Frequency '98
Rabbit	3
Deer	29
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 41

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	-	-	-	2	-	-	1	-	-	3	-	-	-	200			3
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	82	12	-	8	-	-	-	-	-	-	18	2	-	-	1333	46	11	20
	92	1	-	2	-	-	-	-	-	-	3	-	-	-	200	20	36	3
	98	74	48	27	-	66	-	-	-	-	210	5	-	-	4300	45	33	215
D	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	98	6	2	4	-	2	-	-	-	-	11	3	-	-	280			14
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	33%	00%	-71%
'92	00%	43%	00%	+90%
'98	51%	13%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	1599	Dec:		4%
'92	466			14%
'98	4640			6%

Artemisia tridentata vaseyana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	25	-	-	-	-	-	-	-	-	25	-	-	-	500			25
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	98	18	5	-	-	-	-	-	-	-	23	-	-	-	460			23
M	82	14	1	-	-	-	-	-	-	-	15	-	-	-	1000	24	32	15
	92	9	1	1	1	-	-	-	-	-	11	1	-	-	800	22	27	12
	98	48	15	5	2	4	-	-	-	-	74	-	-	-	1480	22	33	74
D	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	1	2	-	1	-	-	-	-	-	1	-	2	1	266			4
	98	6	8	-	-	-	-	-	-	-	10	1	-	3	280			14
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	420			21

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	05%	00%	00%	+ 5%
'92	15%	05%	15%	+40%
'98	29%	05%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	1266	Dec:		11%
'92	1332			20%
'98	2220			13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus ledifolius																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	66			-
'98	40			-

Cercocarpus montanus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	3	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	-	-	16	-	-	-	-	-	-	16	-	-	-	1066			16
	92	-	-	-	2	6	-	-	-	-	8	-	-	-	533			8
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	6	-	-	-	-	-	-	4	2	-	-	400	8	6	6
	92	-	-	1	-	-	1	-	-	-	2	-	-	-	133	6	7	2
	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	14	20	1
D	82	-	-	4	-	-	-	-	-	-	-	-	4	-	266			4
	92	-	-	7	-	-	-	-	-	-	4	-	-	3	466			7
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	100%	15%	-35%
'92	35%	53%	18%	-98%
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	1732	Dec:	15%
'92	1132		41%
'98	20		0%

Chrysothamnus depressus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	1	-	1	-	-	-	-	-	4	-	-	-	80	8	15	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	25%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	-
'92	0		-
'98	80		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	82	16	-	-	-	-	-	-	-	-	16	-	-	-	1066	15	29	16
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	34	-	2	2	-	-	1	-	-	39	-	-	-	780	14	24	39
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	04%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	1066	Dec:	0%
	'92	0		0%
	'98	960		4%

Eriogonum microthecum																		
M	82	4	-	-	-	-	-	-	-	-	-	4	-	-	266	5	15	4
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	9	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-75%
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	266	Dec:	-
	'92	66		-
	'98	0		-

Opuntia spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	10	-	-	10	2	-	-	800			12
	98	5	-	-	12	-	-	-	-	-	17	-	-	-	340			17
Y	82	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	92	-	-	7	-	-	-	4	-	-	4	7	-	-	733			11
	98	55	-	-	4	-	-	-	-	-	30	2	27	-	1180			59
M	82	4	2	5	-	-	-	-	-	-	11	-	-	-	733	47	23	11
	92	-	2	5	-	-	-	-	-	-	2	5	-	-	466	71	47	7
	98	154	13	-	1	-	-	-	-	-	131	-	37	-	3360	35	31	168
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	10	-	-	-	-	-	-	1	9	-	-	666			10
	98	15	2	-	-	-	-	-	2	-	11	-	-	8	380			19
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	13%	31%	00%	+43%
'92	07%	79%	00%	+62%
'98	06%	00%	29%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	1066	Dec:	0%
	'92	1865		36%
	'98	4920		8%

Quercus turbinella

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	20	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	0		-

Ribes spp.

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	57	58	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	2	-	-	5	-	-	-	333			5
	98	5	-	-	10	-	-	-	-	-	15	-	-	-	300			15
M	82	10	-	-	-	-	-	-	-	-	10	-	-	-	666	25	22	10
	92	1	2	-	-	-	-	-	-	-	3	-	-	-	200	19	29	3
	98	4	4	-	5	-	-	-	-	-	13	-	-	-	260	12	17	13
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-10%
'92	22%	00%	00%	- 7%
'98	14%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	666	Dec:	0%
	'92	599		11%
	'98	560		0%

Tetradymia canescens																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	12	15	1
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	66	11	14	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+67%
'92	33%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'92	199		-
	'98	0		-

Trend Study 30-42-98

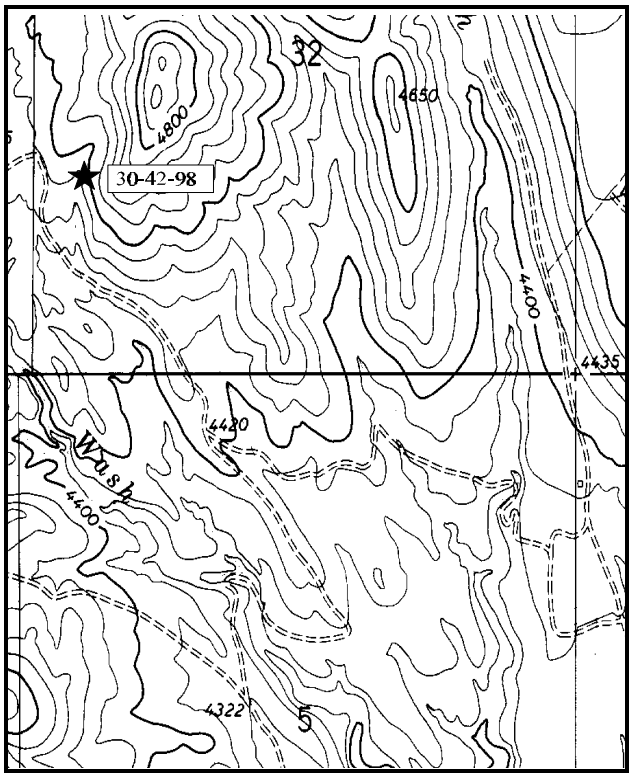
Study site name: Grapevine Spring . Range type: Sagebrush-Reseeded .

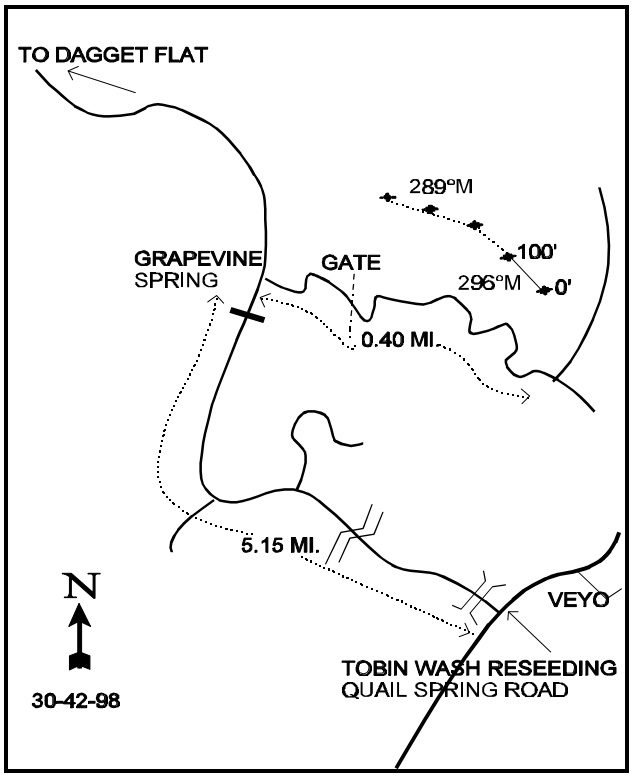
Compass azimuth: frequency baseline 296 M degrees. (Lines 3 & 4 289°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (10 & 92ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Veyo, proceed west on Gunlock Road 5.6 miles until you come to a sign saying Tobin Wash and with Eagle Mountain Ranch just off the road. Take the Goldstrike Road for 5.15 miles until you come 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 281 degrees true. 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, Utah Diagrammatic Sketch

Township 39S , Range 17W , Section 32 UTM 4137237.097 N, 252747.291 E

DISCUSSION

Trend Study No. 30-42 (50B-5c)

The Grapevine Spring trend study is within the critical deer winter range, one-half mile east of Grapevine Spring. The study is an old pinyon-Juniper chained area that currently supports a mixed browse stand. Elevation is 4,000 feet (the lowest of any site in the management unit) on a gentle 5% slope and a south to southeast aspect. Pellet group data from 1998 show a moderate level of deer use at 32 days use/acre. There was also a few cattle pats encountered (2 cow days use/acre).

Soils are shallow, moderately rocky, and generally lack effective cover. Effective rooting depth (see methods) was estimated at 14 inches in 1998. Soil texture is a sandy clay loam with a neutral pH (6.7). Phosphorus may be limiting to plant growth at 8.5 ppm, when 10 ppm is considered the minimum value for normal plant development. There is a considerable amount of pavement concentrated on the ground surface in the shrub interspaces. Litter consists largely of dead cheatgrass. Erosion is moderate, 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 key browse species is mountain big sagebrush with lesser amounts of desert ceanothus and Stansbury cliffrose. The population of big sagebrush has increased from 566 plants/acre in 1982 to 2,432 in 1992 and 4,380 by 1998. Seedling and young plants are numerous and vigor is good. Desert ceanothus increased 53% in density between 1982 and 1992, but estimates from 1998 are similar to 1982 levels. Stansbury cliffrose occurs in similar densities. Both species have good age structures and vigor. Utilization is currently ('98) light to moderate with heavier use reported in 1982 and 1992 for desert ceanothus. Other preferred browse species found on the site include a few scattered green ephedra.

The most abundant browse species in 1992 was the increaser broom snakeweed which had expanded from 8,799 plants/acre in 1982 to 11,933 by 1992. Seedlings and young were numerous, indicating an expanding population at that time. During the 1998 reading, population density actually declined 74% to 3,080 plants/acre. The majority of the change in density was due to the much larger sample used in 1998, but it is apparent from the number of dead plants counted that the population had really declined. Actually the number of dead plants in the population only accounts for about 6% of the decrease. Therefore, the change in density is mostly associated with the larger sampling design giving more accurate estimates for shrubs with discontinuous and/or clumped distributions. Currently, there are still high numbers of seedlings and young. Surviving pinyon and juniper trees are increasing in size on the site. Point quarter data from 1998 estimate 47 pinyon and 54 juniper trees/acre. Average basal diameter is 2.6 inches for pinyon and 3.1 inches for juniper. Overhead canopy cover is estimated at only 3%.

Grass composition consists of both native and seeded species which are not very vigorous and produce little available forage. The principal species, intermediate wheatgrass and bottlebrush squirreltail, had all sustained approximately 30% utilization during the 1982 reading. The annual grasses, cheatgrass brome and foxtail brome, provide 76% of the grass cover. Perennial forbs are sparse with relatively few species found more than occasionally. The most abundant species in 1998 was Searls prairie clover which provided 65% of the forb cover. Forb utilization is generally light.

1982 APPARENT TREND ASSESSMENT

Soil condition is poor, but not noticeably declining. There is a lot of bare ground and pavement, yet erosion has been limited somewhat by the gentle slope. Vegetation trend is stable to improving, if one uses the key species as the principal criteria. Mountain big sagebrush is expanding, but so also is broom snakeweed. Other browse species are relatively static. Perennial herbaceous cover is poor, but could be improved with time and grazing management.

1992 TREND ASSESSMENT

Basal vegetative cover increased from 1% to 3% since the last reading, while bare ground increased by 14%. Litter cover has declined from 60% to 49%. Protective ground cover has declined slightly from 82% to 79%. Trend for soil is stable to slightly declining. 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. Trend for the herbaceous understory is down with large decreases in quadrat frequencies of both grasses and forbs.

TREND ASSESSMENT
soil - stable to slightly declining
browse - up
herbaceous understory - down

1998 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in bare ground from 21% to 29% and a slight decline in litter cover. Erosion is still not a serious problem due to the gentle terrain. Trend for browse is up slightly. Mountain big sagebrush appears to be increasing with light to moderate use, good vigor and low decadence. It currently contributes 60% of the browse cover. Desert ceanothus and cliffrose have lower densities compared to 1992, but most of the difference is due to the larger sample used in 1998. Desert ceanothus displays less heavy use. Both desert ceanothus and cliffrose appear to have stable populations. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses increased slightly while nested frequency of perennial forbs increased 11 fold. Several new forb species were encountered in the larger sample.

TREND ASSESSMENT
soil - down slightly
browse - up slightly
herbaceous understory - up slightly, but poor

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 42

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	1	5	16	1	2	.15
G	Agropyron intermedium	40	*3	38	16	2	.01
G	Agropyron trachycaulum	-	7	1	-	2	.06
G	Bromus rubens (a)	-	11	-	-	5	.37
G	Bromus tectorum (a)	-	121	-	-	46	1.02
G	Oryzopsis hymenoides	3	-	2	1	-	-
G	Sitanion hystrix	67	*50	20	34	27	.96
G	Vulpia octoflora (a)	-	12	-	-	5	.02
Total for Annual Grasses		0	144	0	0	56	1.42
Total for Perennial Grasses		111	65	77	52	33	1.19
Total for Grasses		111	209	77	52	89	2.62

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Arabis holboellii	-	-	3	-	-	-
F	Castilleja linariaefolia	-	2	-	-	1	.00
F	Calochortus nuttallii	-	*15	-	-	7	.04
F	Comandra pallida	4	-	1	2	-	-
F	Cirsium spp.	-	1	-	-	1	.00
F	Cordylanthus parviflorus	11	-	3	4	-	-
F	Dalea searlsiae	-	*33	-	-	16	3.84
F	Draba spp. (a)	-	66	-	-	28	.48
F	Eriogonum spp.	3	-	-	1	-	-
F	Euphorbia spp.	-	*28	-	-	12	.28
F	Frasera albomarginata	-	*13	5	-	5	.25
F	Lomatium spp.	-	1	-	-	1	.00
F	Lotus plebeius	32	*34	21	15	18	.57
F	Medicago sativa	-	-	2	-	-	-
F	Microsteris gracilis (a)	-	3	-	-	1	.00
F	Penstemon spp.	-	6	12	-	2	.06
F	Phlox hoodii	6	9	-	5	4	.33
F	Sphaeralcea grossulariaefolia	1	-	-	1	-	-
F	Unknown forb-perennial	9	3	-	6	1	.00
F	Viguiera multiflora	-	5	-	-	3	.04
Total for Annual Forbs		11	69	0	4	29	0.49
Total for Perennial Forbs		55	150	47	30	71	5.45
Total for Forbs		66	219	47	34	100	5.94

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 42

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	82	20.35
B	Ceanothus greggii	9	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Cowania mexicana stansburiana	12	3.59
B	Ephedra viridis	0	.15
B	Eriodictyon angustifolium	6	-
B	Garrya flavescens	2	1.00
B	Gutierrezia sarothrae	45	2.53
B	Juniperus osteosperma	3	1.75
B	Opuntia spp.	0	-
B	Pinus monophylla	1	.53
B	Quercus turbinella	9	3.96
Total for Browse		169	33.90

CANOPY COVER --
Herd unit 30 , Study no: 42

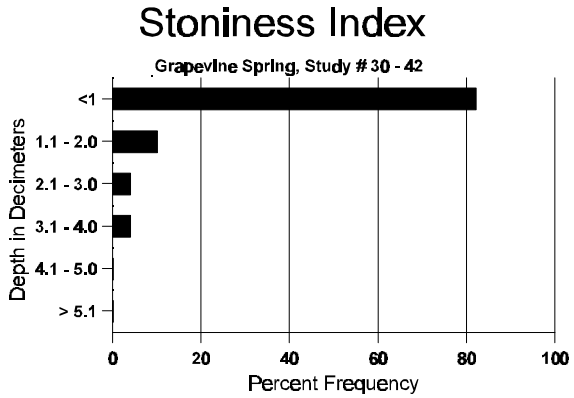
Species	Percent Cover '98
Juniperus osteosperma	2
Pinus monophylla	1

BASIC COVER --
Herd unit 30 , Study no: 42

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	241	1.00	3.00	39.41
Rock	239	1.50	3.00	7.40
Pavement	308	19.75	26.00	22.61
Litter	381	60.00	49.00	45.50
Cryptogams	14	0	0	.05
Bare Ground	283	17.75	21.00	28.76

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 42, Study Name: Grapevine Spring

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.3	55.2 (14.2)	6.7	48.0	25.4	26.6	1.8	8.5	108.8	.6



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 42

Type	Quadrat Frequency '98
Rabbit	17
Deer	22
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 42

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	200			6
	98	84	-	-	3	-	-	-	-	-	87	-	-	-	1740			87
Y	82	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	92	15	7	-	-	-	-	1	-	-	23	-	-	-	766			23
	98	30	-	-	7	-	-	1	-	-	38	-	-	-	760			38
M	82	9	-	-	-	-	-	-	-	-	9	-	-	-	300	15	20	9
	92	31	13	1	2	-	-	1	-	-	48	-	-	-	1600	26	32	48
	98	114	59	-	2	-	-	1	-	-	176	-	-	-	3520	22	33	176
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	5	-	-	-	-	-	-	-	-	1	-	1	3	100			5
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+77%
'92	27%	01%	00%	+44%
'98	27%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	566	Dec:	0%
	'92	2432		3%
	'98	4380		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ceanothus greggii																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	9	-	-	-	-	-	-	-	-	9	-	-	-	300			9
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	6	-	1	-	-	-	-	-	-	7	-	-	-	233	31	29	7
	92	3	2	-	-	-	3	1	-	-	9	-	-	-	300	26	40	9
	98	7	2	-	-	-	-	-	-	-	9	-	-	-	180	27	42	9
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	14%	00%	+53%
'92	13%	27%	00%	-52%
'98	17%	00%	08%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	233	Dec:		0%
'92	499			7%
'98	240			17%

Chrysothamnus viscidiflorus viscidiflorus																		
M	82	16	-	-	-	-	-	-	-	-	16	-	-	-	533	11	16	16
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	533	Dec:		-
'92	0			-
'98	0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cowania mexicana stansburiana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	6	4	-	-	-	-	-	-	-	10	-	-	-	333			10
	98	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
M	82	2	-	-	-	-	-	-	-	-	2	-	-	-	66	31	44	2
	92	3	2	-	-	-	-	-	-	-	3	2	-	-	166	61	66	5
	98	5	3	-	-	1	-	-	-	-	9	-	-	-	180	58	71	9
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+81%
'92	38%	06%	00%	-51%
'98	38%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	99	Dec:		0%
'92	532			6%
'98	260			0%

Ephedra viridis																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	42	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	-
'92	0		-
'98	0		-

Eriodictyon angustifolium																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66	20	22	2
	98	26	-	-	-	-	-	-	-	-	26	-	-	-	520	24	16	26
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	-	-	-	-	-	-	4	-	-	1	100			5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+90%
'98	00%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		0%
'92	66			0%
'98	640			16%

Garrya flavescens

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33	24	30	1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33	20	24	1
	98	1	-	-	-	-	1	-	-	-	1	1	-	-	40	22	31	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	+18%
'98	00%	50%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	33	Dec:	-
	'92	33		-
	'98	40		-

Gutierrezia sarothrae

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	54	-	-	16	-	-	-	-	-	70	-	-	-	2333			70
	98	44	-	-	-	-	-	-	-	-	44	-	-	-	880			44
Y	82	16	-	-	-	-	-	-	-	-	16	-	-	-	533			16
	92	24	-	-	3	-	-	-	-	-	27	-	-	-	900			27
	98	27	-	-	2	-	-	-	-	-	29	-	-	-	580			29
M	82	248	-	-	-	-	-	-	-	-	248	-	-	-	8266	12	12	248
	92	293	1	-	5	-	-	1	-	-	300	-	-	-	10000	10	12	300
	98	106	-	2	2	-	-	-	-	-	110	-	-	-	2200	8	10	110
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	28	-	-	2	-	-	1	-	-	29	-	2	-	1033			31
	98	15	-	-	-	-	-	-	-	-	4	-	-	11	300			15
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	500			25

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+26%
'92	.27%	00%	.55%	-74%
'98	00%	01%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	8799	Dec:	0%
	'92	11933		9%
	'98	3080		10%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	3	-	-	-	-	-	-	-	-	3	-	-	-	100	53	43	3
	92	2	2	-	-	-	-	-	-	-	2	2	-	-	133	73	58	4
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+33%
'92	33%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	-
	'92	199		-
	'98	60		-

Opuntia spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	13	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	0		-

Pinus monophylla																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	33		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus turbinella																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33	44	59	1
	92	-	2	-	-	-	-	-	-	-	2	-	-	-	66	51	49	2
	98	22	-	-	-	-	-	-	-	-	22	-	-	-	440	55	68	22
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+50%
'92	100%	00%	00%	+86%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	33	Dec:	-
	'92	66		-
	'98	460		-

Trend Study 30-45-98

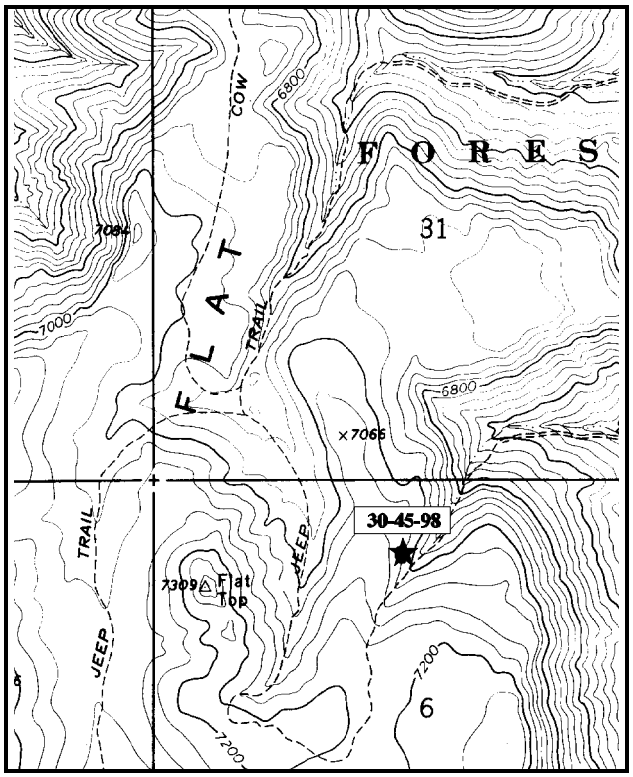
Study site name: Flat Top Mountain . Range type: Oakbrush .

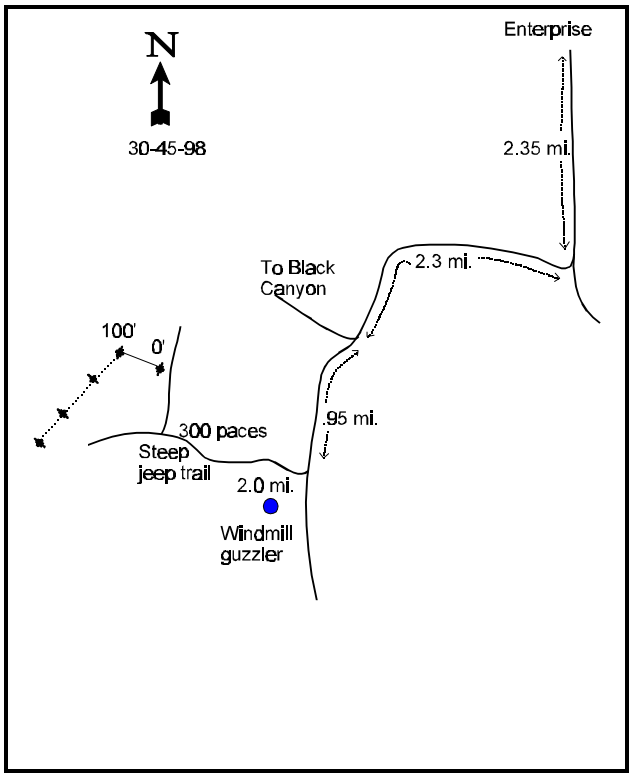
Compass azimuth: frequency baseline 285 M degrees. (Lines 2-4 220°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (0 & 92ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Enterprise, go south on 200 East for 2.35 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 for 2.0 miles until the road turns into a steep jeep trail. Approximately 300 paces up the road from where it first becomes steep and rough will be an intersection. Walk 10 paces down the road to the left (west). 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, Utah

Diagrammatic Sketch

Township 38 S , Range 17 W , Section 6 .

UTM 4155401.696 N, 252530.887 E

DISCUSSION

Trend Study No. 30-45 (50B-8c)

The Flat Top Mountain trend study is within deer summer range on the east side of Flat Top Mountain. The range type is dense oakbrush which varies in stature from 12 to 15 feet in some areas and waist high in others. The site has a northeast aspect and an elevation of about 6,400 feet. Slope varies from 25% at the bottom of the hill to 5% on the more level ridge top. Deer appeared to be utilizing the area in 1982 as pellet groups and bedding areas were abundant. Pellet group data taken on the site in 1998 estimate a moderate amount of deer use at 40 days use/acre.

Soil is derived from basalt parent material which is common on the soil surface, especially on the ridge top. Surface rock provided 10% cover in 1982, but the extended baseline used in 1998 estimated 22% rock cover. Soil depth is moderately deep with an estimated effective rooting depth (see methods) of 16 inches. Texture is a loam with a moderately acid pH (5.6). Soil temperature is very low averaging only 37° F at a depth of 16 inches. This low temperature is obviously effected by the high rock content of the soil combined with high moisture content. The site was read on May 27, 1998 and snow fell on much of this area on May 13th. Soil organic matter is high at 5.2%, which is the highest recorded on the unit. Soil erosion is not a problem on the site, however roads in the area are severely gullied.

The key browse species on the site is Gambel oak. It currently provides 65% of the browse cover with a total cover value of 12%. Oak varies in size from tall tree-like forms 12 to 15 feet in height, to lower growing forms that are only waist high. Density was estimated at 7,599 stems/acre in 1982. The oak was mostly light to moderately utilized, in good vigor, with no decadent plants sampled. The larger sample taken in 1998 estimated 6,760 stems/acre. Utilization is similar to 1982 levels, vigor is normal, and percent decadency low at 2%. Reproduction is good with 20% of the population consisting of young plants.

Understory shrubs include: Utah serviceberry, mountain big sagebrush, and snowberry. Serviceberry had a density of 800 plants/acre ('98). Mature plants average about 4 feet in height. They mostly have moderately hedged individuals, but they are in good vigor. Sagebrush is heavily utilized with a density of 780 plants/acre. Snowberry appears to be unutilized. There is also a few bitterbrush on the site that were not abundant enough to be adequately sampled. All plants were heavily hedged to the point of being mostly unavailable.

The herbaceous understory is dominated by forbs which currently provide 83% of the herbaceous cover. Grasses are represented by only one species, mutton bluegrass. Forbs are diverse and abundant with the primary species consisting of: arrowleaf balsamroot, western waterleaf, tuber starwort, and American vetch.

1982 APPARENT TREND ASSESSMENT

Range trend is stable on this site. Soil movement is minimal and there are few areas not covered by litter or vegetation. Vegetatively, the area appears static, although there may be a trend toward taller, more mature oak trees and increasing shade. This may prove detrimental in the long run to some of the secondary browse species and some forbs.

1998 TREND ASSESSMENT

Trend for soil is stable with little bare ground exposed. Litter cover declined from 81% to 59%, likely due to the larger sample used in 1998 sampling out of oak clones. Trend for browse appears stable with some of the changes in density due to the much larger sample. Utilization is heavier on understory shrubs, but similar on oak. Reproduction of the key species appears adequate to maintain their populations. Trend for the herbaceous understory is up slightly. Quadrat frequency of mutton bluegrass increased from 2% to 41%. Quadrat frequency of perennial forbs also increased.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - up slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 45

Type	Species	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '98	Average Cover % '98
G	Poa fendleriana	110	2	41	5.82
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		110	2	41	5.82
Total for Grasses		110	2	41	5.82
F	Achillea millefolium	-	3	-	-
F	Agoseris glauca	1	-	1	.00
F	Allium spp.	44	-	19	.46
F	Arabis spp.	1	-	1	.00
F	Artemisia ludoviciana	-	14	-	-
F	Aster spp.	49	-	16	1.05
F	Balsamorhiza sagittata	108	28	44	11.13
F	Calochortus nuttallii	1	-	1	.03
F	Collinsia parviflora (a)	1	-	1	.00
F	Crepis acuminata	1	-	1	.00
F	Cymopterus spp.	9	-	4	.22
F	Hydrophyllum occidentale	99	-	46	6.28
F	Helianthella uniflora	-	7	-	-
F	Lathyrus lanszwertii	-	15	-	-
F	Lithospermum ruderale	-	2	-	-
F	Lupinus argenteus	4	2	2	.15
F	Microsteris gracilis (a)	34	-	16	.15
F	Petradoria pumila	8	-	4	.21
F	Phlox austromontana	10	-	4	.45
F	Phlox longifolia	-	1	-	-
F	Senecio multilobatus	9	-	4	.24
F	Solidago sparsiflora	-	27	-	-
F	Stellaria jamesiana	191	47	68	6.17
F	Taraxacum officinale	3	-	1	.03
F	Vicia americana	77	36	34	1.09
F	Zigadenus paniculatus	6	-	2	.03
Total for Annual Forbs		35	0	17	0.15

Type	Species	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '98	Average Cover % '98
Total for Perennial Forbs		621	182	252	27.60
Total for Forbs		656	182	269	27.76

BROWSE TRENDS --
Herd unit 30 , Study no: 45

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	9	.19
B	Artemisia tridentata vaseyana	16	2.12
B	Chrysothamnus depressus	2	-
B	Chrysothamnus viscidiflorus	1	.03
B	Opuntia spp.	3	-
B	Prunus virginiana	0	-
B	Purshia tridentata	0	-
B	Quercus gambelii	67	11.91
B	Symphoricarpos oreophilus	14	4.13
Total for Browse		112	18.40

CANOPY COVER --
Herd unit 30 , Study no: 45

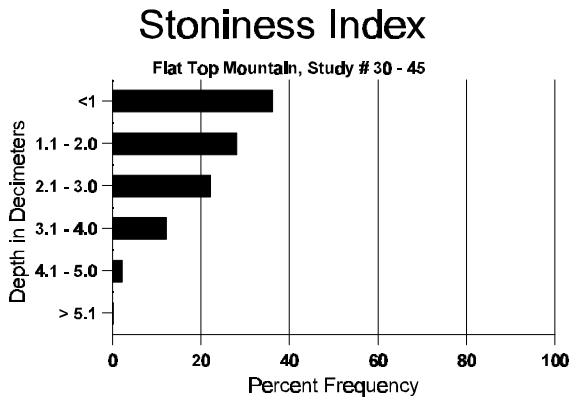
Species	Percent Cover '98
Quercus gambelii	9

BASIC COVER --
Herd unit 30 , Study no: 45

Cover Type	Nested Frequency '98	Average Cover % '82	Average Cover % '98
Vegetation	322	2.50	46.23
Rock	207	10.00	21.60
Pavement	94	0	2.88
Litter	378	80.50	58.93
Bare Ground	111	6.25	5.19

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 45, Study Name: Flat Top Mountain

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
16.3	37.0 (15.9)	5.6	38.0	37.4	24.5	5.2	52.1	435.2	.6



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 45

Type	Quadrat Frequency '98
Deer	17

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 45

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	4	-	-	-	-	-	9	-	-	-	180			9
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	12	-	2	-	-	-	-	-	14	-	-	-	280			14
M	82	3	-	-	-	-	-	-	-	-	2	1	-	-	200	10	10	3
	98	-	6	-	-	10	-	-	10	-	26	-	-	-	520	46	31	26
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+75%
'98	70%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'82	200		-
	'98	800		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	15	16	1
	98	1	14	17	-	-	4	-	-	1	37	-	-	-	740	13	27	37
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	1	-	-	-	-	-	-	-	-	-	1	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+92%
'98	36%	59%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	66	Dec:		0%
'98	780			3%

Chrysothamnus depressus																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	21	-	-	-	-	-	-	-	-	21	-	-	-	420			21
M	82	-	2	-	-	-	-	-	-	-	2	-	-	-	133	7	16	2
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	15	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	100%	00%	00%	+70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	133	Dec:		-
'98	440			-

Chrysothamnus viscidiflorus																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	20			-

Opuntia spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	-	-	-	-	-	-	1	-	3	-	80	8	17	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	75%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	80			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Prunus virginiana																		
M	82	16	-	-	-	-	-	-	-	-	16	-	-	-	1066	10	5	16
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)					
	'82	1066	Dec:		-
	'98	0			-

Purshia tridentata																		
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)					
	'82	0	Dec:		-
	'98	0			-

Quercus gambelii																		
S	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
Y	82	13	-	-	-	-	-	4	-	-	17	-	-	-	1133			17
	98	45	-	-	21	-	-	-	-	-	66	-	-	-	1320			66
M	82	56	34	5	-	-	-	2	-	-	75	22	-	-	6466	19	20	97
	98	109	70	-	66	-	-	-	21	-	266	-	-	-	5320	44	30	266
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	1	-	-	-	-	-	-	-	6	-	-	-	120			6
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	740			37

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	30%	04%	00%	-11%
'98	21%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)					
	'82	7599	Dec:		0%
	'98	6760			2%

Symphoricarpos oreophilus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	3	-	-	-	-	-	5	-	-	-	100			5
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	32	-	-	12	-	-	-	-	-	44	-	-	-	880	21	30	44

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)					
	'82	0	Dec:		-
	'98	980			-

Trend Study 30-46-98

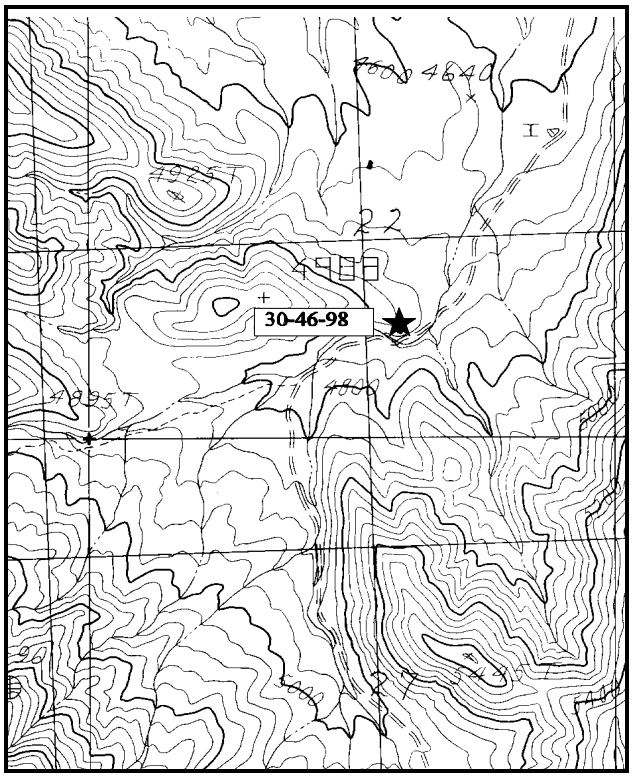
Study site name: Pahcoon Bench . Range type: Chained, Reseeded P-J .

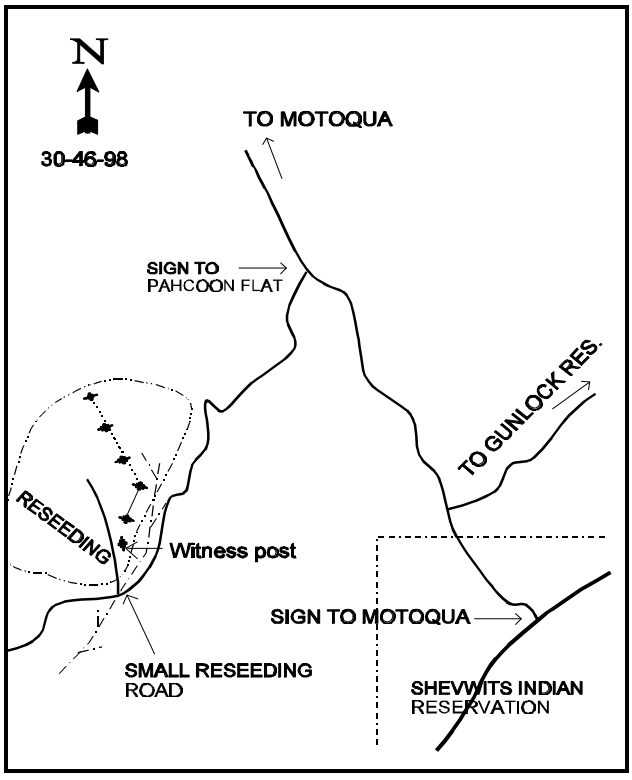
Compass azimuth: frequency baseline 22 M degrees. (Lines 2-4 336°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (18 & 96ft), line 2 (57ft), line 3 (20ft), line 4 (73ft).

LOCATION DESCRIPTION

Proceed past Shivwits approximately 1.0 mile and turn north on the Jackson Springs-Motoqua road. Proceed 6.0 miles on this road past a road towards Gunlock Reservoir until coming to a fork to the left towards Pahcoon Flat. Take the road towards Pahcoon Flat for 3.8 miles, traveling through a reseeding. At 3.8 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 form the witness post at 22°M. 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, Utah Diagrammatic Sketch

Township 41S , Range 18W , Section 22 UTM 4120818.542 N, 247205.810 E

DISCUSSION

Trend Study No. 30-46 (50B-9c)

The Pahcoon Bench trend study is on severe winter range on the east side of the Beaver Dam Mountains. The site is at 4,680-feet elevation, near the south end of Pahcoon Flat, on a 1979 chained and seeded pinyon-juniper woodland. The area is dry, yet has responded to treatment. Utilization of the area by cattle and wildlife appears light, even with a guzzler nearby. Pellet group data from 1998 estimate 20 deer and 13 cow days use/acre. Cattle pats appear to be from last fall or winter.

The soil is relatively shallow and moderately rocky. Effective rooting depth (see methods) is estimated at just over 10 inches. Soil texture is a loam with a neutral pH (7.0). Parent material is limestone, some of which has a white calcium carbonate coating. Active erosion is evident, but stabilized due to the minimal slope, the abundance of tree litter, the seeding, and the abundance of cheatgrass. A shallow drainage channel close to the study site shows signs of stabilization. Overall, protective ground cover has increased from 82% in 1982 to 93% by 1998.

Shrub composition is still developing. Key browse species consists of Mountain big sagebrush, with lesser amounts of antelope bitterbrush, and Stansbury cliffrose. Sagebrush is well established, but has 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 mostly from the much larger sample size utilized in 1998. The larger sample gives more accurate population estimates for shrubs that have discontinuous and/or clumped distributions. Reproduction has been good in the past with abundant seedlings and young plants sampled in 1982 and 1992. However, current recruitment is poor. Utilization has been light in the past, but some moderate use was reported in 1998. Vigor is normal on most plants and percent decadence has increased since 1982, although it is still low at only 15%.

Secondary browse species, antelope and desert bitterbrush, are also well established and contain healthy age class structures. Individuals are 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 are no dead plants within the population, therefore the changes in density are due to the much larger sample size used in 1998 and confusion between desert bitterbrush and cliffrose. The antelope bitterbrush displayed moderate to heavy use in 1998. Vigor is normal, but reproduction limited. Cliffrose has increased dramatically in size since 1992 according to photo point comparisons. Mature plants currently (‘98) average 5 feet in height with a crown diameter of 4 feet. Plants show moderate to heavy use, yet vigor is good and percent decadence low at 8%. Reproduction is also good with a biotic potential of 26%.

Threadleaf snakeweed is the most abundant shrub on the site. It has increased in density dramatically since 1982 when only 466 plants/acre were estimated. By 1992, there were an estimated 3,933 young and mature plants/acre, and an additional 7,933 seedlings/acre. During the 1998 reading, density increased 47% to 7,360 plants/acre. Age class distribution indicates a stable population with 97% of the plants being mature. Juniper trees are also found on the site in small numbers. Point quarter data from 1998 estimate 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 from the treatment. Average basal diameter of these trees is 7 inches.

Seeded grasses, crested and intermediate wheatgrass, have been fairly successful and appeared to be increasing in 1982. However, quadrat frequencies of perennial grasses remained stable by 1992, then declined in 1998. The annuals, cheatgrass and foxtail brome, are both quite common and have persisted even as perennials become more firmly established. It was noted in the 1982 report that these annual grasses were

expected to decline as seeded grasses became established. On examination of photos taken during both readings, it appears that the opposite is true. Cheatgrass appears to have increased in abundance creating a fire hazard on this site. Currently, these annuals account for 89% of the grass cover.

Forb composition is deficient with all species providing only 2% cover in 1998. The only forb included in the seed mixture was yellow sweetclover which is a short lived perennial. No sweet clover was encountered during any reading. Annual forbs such as *Draba*, storksbill, and *Microsteris gracilis*, dominate the forb composition by producing 95% of the forb cover. The most prominent perennial species is gooseberryleaf globemallow.

1982 APPARENT TREND ASSESSMENT

Soil trend is improving due to the seeding effort. Vegetational trend parameters indicate a rapidly expanding sagebrush population and fairly static populations of secondary shrubs. Increaser shrubs are present, but not currently abundant. A fair to good grass cover appears to be thickening. However, forbs are almost nonexistent and unless inter-seeded, will never be an important vegetation component.

1992 TREND ASSESSMENT

Soil conditions continue to improve. Basal vegetative cover increased by 67%, while bare ground declined by 33%. 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. Age class structure indicates possible further increases. Overall, the browse trend is stable. Herbaceous plants are dominated by seeded grasses and cheatgrass brome. Quadrat frequencies of perennial grasses have not changed since 1982, while cheatgrass appears to have increased creating a fire hazard on this site. Forbs are severely deficient. Only one forb, gooseberryleaf globemallow, was encountered either year. Trend for herbaceous understory is therefore stable to slightly declining and very poor condition.

TREND ASSESSMENT
soil - up
browse - stable
herbaceous understory - stable to slightly declining and very poor condition

1998 TREND ASSESSMENT

Trend for soil appears stable with similar ground cover characteristics compared to 1992. Litter cover declined from 71% to 56%, possibly due to classifying dried up cheatgrass as litter in 1982 and 1992. Percent bare ground remained similar. Trend for the key browse species, mountain big sagebrush, cliffrose, and bitterbrush, is mixed. Sagebrush density is declining, with cliffrose and bitterbrush appearing stable. There appears to have been an identification problem with desert bitterbrush and cliffrose in the past. Utilization of all shrubs has increased since 1992, but vigor remains normal and percent decadence low. Some of the changes in density are also due to the much larger sample used in 1998. Overall, the browse trend is considered down slightly. Trend for the herbaceous understory is down and in poor condition due to the dominance of annual cheatgrass and foxtail brome. Sum of nested frequency of perennial grasses has declined. Frequency of perennial forbs increased slightly, although forbs are still scarce. Nested frequency for intermediate wheatgrass declined significantly.

TREND ASSESSMENT
soil - stable
browse - down slightly
herbaceous understory - down and in poor condition

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 46

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	44	52	38	26	22	1.23
G	Agropyron intermedium	136	*78	49	56	32	1.87
G	Agropyron trachycaulum	-	1	-	-	1	.03
G	Bromus rubens (a)	-	169	-	-	65	4.65
G	Bromus tectorum (a)	-	366	-	-	97	29.75
G	Elymus junceus	3	-	1	1	-	-
G	Poa pratensis	4	-	-	1	-	-
G	Poa secunda	-	4	-	-	2	.01
G	Sitanion hystrix	-	1	-	-	1	.00
G	Sporobolus cryptandrus	4	-	1	2	-	-
G	Vulpia octoflora (a)	-	94	-	-	38	1.13
Total for Annual Grasses		0	629	0	0	200	35.54
Total for Perennial Grasses		191	136	89	86	58	3.14
Total for Grasses		191	765	89	86	258	38.68
F	Allium spp.	-	2	-	-	1	.01
F	Astragalus spp.	-	2	-	-	2	.01
F	Calochortus nuttallii	-	7	-	-	3	.01
F	Descurainia pinnata (a)	-	7	-	-	2	.01
F	Draba spp. (a)	-	102	-	-	41	.31
F	Erodium cicutarium (a)	-	28	-	-	10	.73
F	Gilia spp. (a)	-	3	-	-	1	.00
F	Lychnis drummondii	-	*8	-	-	5	.05
F	Microsteris gracilis (a)	-	154	-	-	58	.64
F	Plantago patagonica (a)	-	28	-	-	12	.13
F	Sphaeralcea grossulariaefolia	4	3	11	3	1	.00
Total for Annual Forbs		0	322	0	0	124	1.83
Total for Perennial Forbs		4	22	11	3	12	0.08
Total for Forbs		4	344	11	3	136	1.92

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 46

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia tridentata vaseyana	26	4.31
B	Chrysothamnus parryi howardi	-	.15
B	Cowania mexicana stansburiana	12	1.52
B	Ephedra viridis	1	.63
B	Gutierrezia micorcephala	69	6.17
B	Juniperus osteosperma	7	2.75
B	Opuntia spp.	3	.00
B	Prunus fasciculata	5	-
B	Purshia glandulosa	0	-
B	Purshia tridentata	3	1.48
B	Quercus turbinella	0	-
B	Yucca baccata baccata	0	-
Total for Browse		126	17.03

CANOPY COVER --
Herd unit 30 , Study no: 46

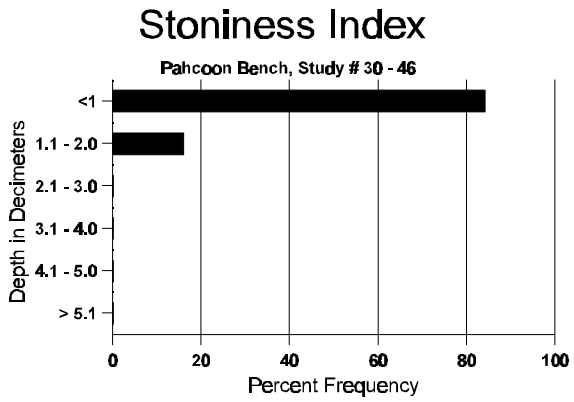
Species	Percent Cover '98
Cowania mexicana stansburiana	.80
Juniperus osteosperma	3
Pinus monophylla	.20

BASIC COVER --
Herd unit 30 , Study no: 46

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	389	1.50	5.50	53.28
Rock	224	5.75	7.25	10.22
Pavement	277	7.25	8.50	9.86
Litter	395	73.75	70.50	55.49
Cryptogams	108	0	0	1.21
Bare Ground	251	11.75	8.25	7.42

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 46, Study Name: Pahcoon Bench

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.3	50.4 (14.4)	7.0	48.0	33.4	18.6	2.6	12.6	108.8	.8



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 46

Type	Quadrat Frequency '98
Rabbit	34
Deer	33
Cattle	3

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 46

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	82	11	-	-	-	-	-	-	-	-	11	-	-	-	733			11
	92	100	-	-	4	-	-	-	-	-	104	-	-	-	6933			104
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	82	50	-	-	-	-	-	-	-	-	50	-	-	-	3333			50
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	23	-	-	-	-	-	-	-	-	23	-	-	-	1533	25	19	23
	92	47	-	-	1	-	-	-	-	-	48	-	-	-	3200	28	28	48
	98	27	6	-	-	-	-	-	-	-	33	-	-	-	660	28	36	33
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	3	2	-	1	-	-	-	-	-	5	-	-	1	120			6
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-30%
'92	00%	00%	00%	-76%
'98	20%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	4866	Dec:	0%
	'92	3400		6%
	'98	800		15%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cowania mexicana stansburiana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	28	28	1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66	57	44	1
	98	6	4	2	-	-	-	-	-	-	12	-	-	-	240	61	52	12
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	+75%
'98	31%	15%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	0%
	'92	66		0%
	'98	260		8%

Ephedra viridis																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	30	38	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia micorcephala																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	119	-	-	-	-	-	-	-	-	119	-	-	-	7933			119
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	82	7	-	-	-	-	-	-	-	-	7	-	-	-	466	13	11	7
	92	54	-	-	2	-	-	-	-	-	56	-	-	-	3733	14	15	56
	98	356	-	-	-	-	-	-	-	-	356	-	-	-	7120	9	12	356
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	-	-	-	4	80			4
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+88%
'98	00%	00%	01%	+47%

Total Plants/Acre (excluding Dead & Seedlings)				
'82	466	Dec:		0%
'92	3933			0%
'98	7360			1%

Juniperus osteosperma																		
S	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	1	-	-	3	-	-	-	60	-	-	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+53%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'92	66			-
'98	140			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	8	20	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:	-
'92	0		-
'98	60		-

Prunus fasciculata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	51	72	3
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	20%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	0%
'92	0		0%
'98	100		20%

Purshia glandulosa																		
Y	82	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	92	-	-	-	4	-	-	-	-	-	4	-	-	-	266			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	1	-	-	-	-	-	-	-	1	-	-	-	66	32	44	1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	25%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change
+ 0%

Total Plants/Acre (excluding Dead & Seedlings)			
'82	266	Dec:	-
'92	266		-
'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	4	2	-	-	-	-	-	-	-	6	-	-	-	400	34	50	6
	98	-	-	2	-	1	-	-	-	-	3	-	-	-	60	47	71	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	29%	00%	00%	-87%
'98	33%	67%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	466		-
	'98	60		-

Quercus turbinella																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	0		-

Yucca baccata baccata																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	1	1	-	-	-	-	-	-	-	2	-	-	-	133	7	10	2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	50%	00%	00%	+34%
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	-
	'92	200		-
	'98	0		-

Trend Study 30-47-98

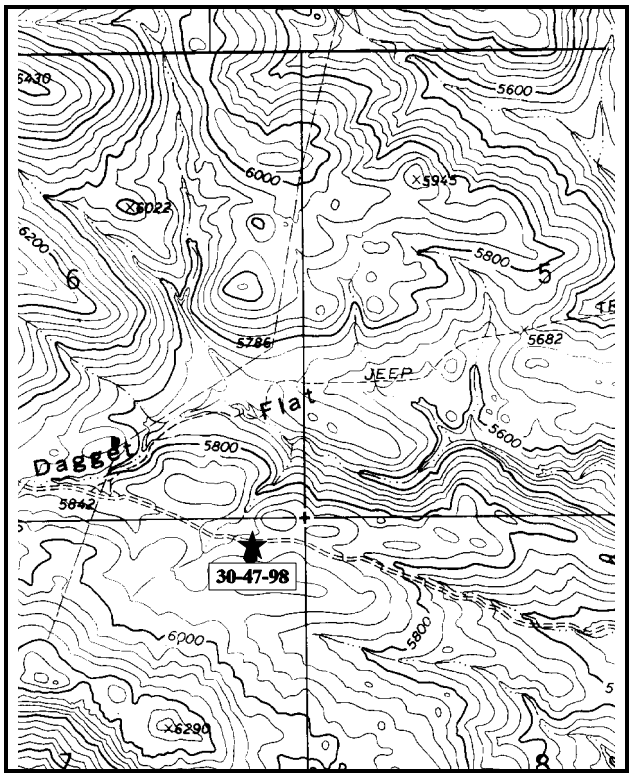
Study site name: Lost Peak . Range type: Oakbrush .

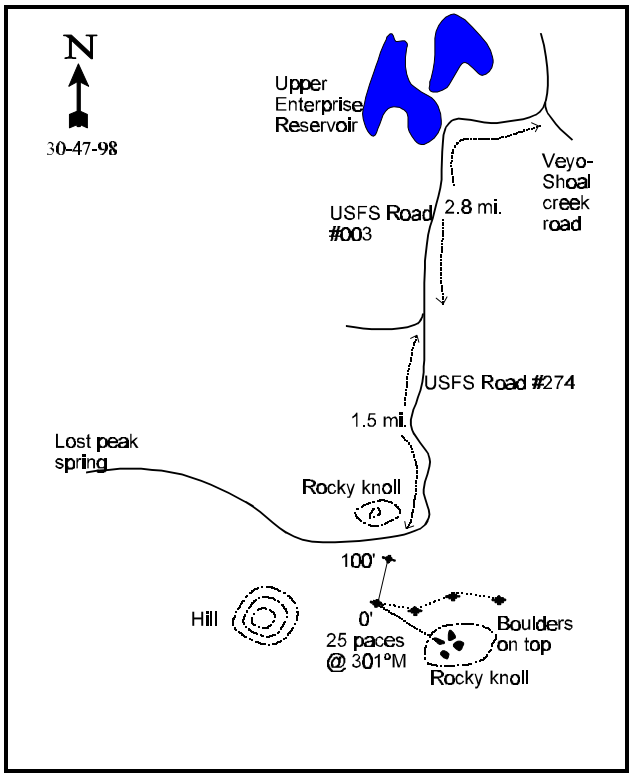
Compass azimuth: frequency baseline 14 M degrees. (Line 2 98°M, line 3 68°M, line 4 93°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (8 & 97ft), line 2 (38ft), line 3 (52ft), line 4 (69ft).

LOCATION DESCRIPTION

From Upper Enterprise Reservoir, take the Lost Creek Road towards Lost Peak Spring. This road is USFS Road # 003. Travel south for 2.8 miles to a fork. At the fork turn left on USFS Road #274. Continue 1.5 miles to a sharp turn to the right (west). On the south side of the road are a couple of small knolls. The farthest one to the east has a rock outcrop on top of it. From the rock outcrop, the 0-foot baseline stake is 25 paces away at 301 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.





Map name: Goldstrike, Utah

Diagrammatic Sketch

Township 38 S , Range 18 W , Section 20 .

UTM 4150242.988 N, 243855.263 E

DISCUSSION

Trend Study No. 30-47 (61C-10)

The Lost Peak trend study is the highest elevation summer range study on the west side of unit 30 at approximately 6,750 feet. The study samples mixed mountain brush range type, characterized as oakbrush intermixed with isolated patches of basin big sagebrush. The site consists of a saddle surrounded on 3 sides by rocky knolls. Deer use appeared heavy in 1982 with abundant pellet groups, heavy utilization of forage plants, and about 40 deer (primarily does and fawns) seen during study site establishment. Pellet group data from the site in 1998 estimate 40 deer and 10 cow days use/acre, with pellet groups concentrated in openings around thick oakbrush and serviceberry.

Soil at the site is moderately deep with an effective rooting depth (see methods) averaging 24 inches. Soil depth is more shallow near the rocky knolls where rock is more concentrated on the surface. Soil texture is a sandy loam with a strongly acid pH (5.3). Ground cover is principally litter from oak and serviceberry with bare ground concentrated in shrub interspaces. There is limited evidence of soil movement here.

Key browse species consist of Utah serviceberry and Gambel oakbrush. Density of serviceberry was estimated at only 266 plants/acre in 1982 because the density plots were concentrated in areas where oakbrush was dominant. A much larger sample was taken in 1998 with the original 100 foot baseline extended to 400 feet. More of the preferred serviceberry was sampled with the new layout. Due to the thick nature of the serviceberry, individual plants were impossible to differentiate so stems were counted. Current ('98) density is estimated at 11,980 stems/acre which provides 47% of the shrub cover. Use is moderate to heavy where available. Vigor is normal and few decadent plants were encountered. Gambel oak presently provides 25% of the browse cover with an estimated density of 6,560 stems/acre in 1998. Oak grows in thick clones with plants becoming unavailable due to height in some places. Most is lightly utilized with normal vigor and low percent decadence. Density has increased since 1982 primarily due to the larger sample used in 1998.

Important understory shrubs include: basin big sagebrush, mountain big sagebrush, currant, and snowberry. These shrubs grow in patches around oak and serviceberry thickets. They show mostly light use.

The herbaceous understory is fairly abundant with forbs providing 57% of the herbaceous cover. Five species of perennial grass provide a relatively sparse cover in shrub interspaces. The most abundant grass is annual cheatgrass which contributes 74% of the grass cover. The only common perennial grasses are mountain brome and mutton bluegrass. Perennial forbs are common and produce 49% of the herbaceous cover. Common species include: wild onion, arrowleaf balsamroot, silvery lupine, and American vetch.

1982 APPARENT TREND ASSESSMENT

Soil and vegetative trends are both stable. Although some barren places exist and soil movement is noticeable, there is not currently a serious problem. The browse component seems healthy, especially Gambel oak, and may be expanding at the expense of a somewhat depleted grass understory. Forb composition and numbers are fair, but may decline if the shrub component gains further dominance.

1998 TREND ASSESSMENT

Trend for soil is stable with similar amounts of bare ground compared to 1982. Litter and vegetative cover are abundant and adequately protect the ground surface from erosion. Trend for browse is up. The increase in density of key browse species is primarily due to the larger sample used in 1998. However, the biotic potentials and proportions of young plants for serviceberry and oak have increased dramatically indicating an expanding population. Serviceberry is the more preferred and displays moderate to heavy use, good vigor, and low decadence. Trend for the herbaceous understory is up. Quadrat frequency of perennial grasses and forbs has increased since 1982. Forbs are abundant and contain several preferred species.

TREND ASSESSMENT
soil - stable
browse - up
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 47

Type	Species	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '98	Average Cover % '98
G	Agropyron dasystachyum	32	1	12	.13
G	Agropyron intermedium	5	-	2	.06
G	Bromus carinatus	36	5	14	1.23
G	Bromus tectorum (a)	237	-	72	9.72
G	Poa fendleriana	48	3	18	2.00
G	Sitanion hystrix	4	8	2	.01
Total for Annual Grasses		237	0	72	9.72
Total for Perennial Grasses		125	17	48	3.44
Total for Grasses		362	17	120	13.16
F	Agoseris glauca	44	-	23	.49
F	Allium spp.	121	-	41	1.38
F	Arabis spp.	3	1	2	.03
F	Arenaria spp.	4	-	2	.18
F	Artemisia ludoviciana	43	24	16	.66
F	Aster spp.	1	-	1	.00
F	Astragalus spp.	4	2	2	.06
F	Astragalus utahensis	3	-	1	.03
F	Balsamorhiza sagittata	20	1	10	3.34
F	Collinsia parviflora (a)	92	-	38	1.56
F	Comandra pallida	-	1	-	-
F	Cymopterus spp.	10	-	5	.51
F	Delphinium nuttallianum	3	-	1	.00
F	Descurainia pinnata (a)	1	-	1	.00
F	Draba spp. (a)	2	-	1	.00
F	Epilobium paniculatum (a)	4	-	1	.15
F	Erigeron eatonii	4	1	2	.06
F	Eriogonum racemosum	2	-	1	.00
F	Fritillaria atropurpurea	3	-	1	.03
F	Galium boreale	13	-	6	.05
F	Hydrophyllum occidentale	14	-	6	.27
F	Lappula occidentalis (a)	4	-	2	.15

Type	Species	Nested Frequency '98	Quadrat Frequency '82	'98	Average Cover % '98
F	Lomatium spp.	6	-	2	.30
F	Lupinus argenteus	88	29	39	4.14
F	Microsteris gracilis (a)	66	-	26	.50
F	Penstemon spp.	2	-	1	.03
F	Phlox longifolia	23	29	9	.19
F	Polygonum douglasii (a)	4	-	1	.00
F	Senecio multilobatus	6	6	3	.06
F	Sphaeralcea coccinea	2	-	1	.03
F	Stellaria jamesiana	3	-	3	.01
F	Vicia americana	111	34	48	2.80
F	Viguiera multiflora	3	-	1	.00
Total for Annual Forbs		173	0	70	2.38
Total for Perennial Forbs		536	128	227	14.73
Total for Forbs		709	128	297	17.12

BROWSE TRENDS --
Herd unit 30 , Study no: 47

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	63	24.22
B	Artemisia tridentata tridentata	4	.56
B	Artemisia tridentata vaseyana	18	2.67
B	Chrysothamnus viscidiflorus	3	.03
B	Opuntia spp.	3	.30
B	Pinus monophylla	1	1.00
B	Quercus gambelii	50	12.69
B	Ribes spp.	6	1.72
B	Symphoricarpos oreophilus	23	8.35
B	Tetradymia canescens	0	-
Total for Browse		171	51.56

CANOPY COVER --
Herd unit 30 , Study no: 47

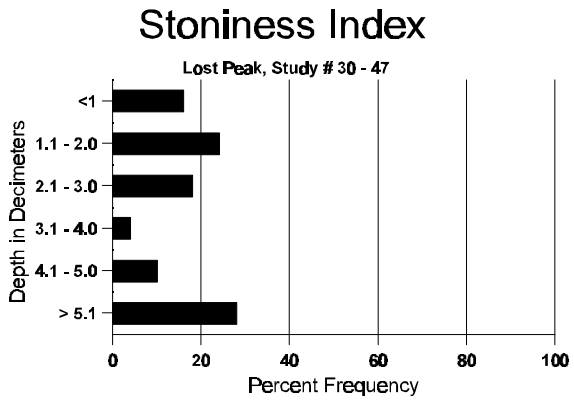
Species	Percent Cover '98
Pinus monophylla	.80
Quercus gambelii	2

BASIC COVER --
Herd unit 30 , Study no: 47

Cover Type	Nested Frequency '98	Average Cover % '82	'98
Vegetation	362	2.25	65.90
Rock	97	1.25	7.85
Pavement	39	0	.14
Litter	386	83.75	64.97
Cryptogams	-	.25	0
Bare Ground	128	12.50	13.34

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 47, Study Name: Lost Peak

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
24.0	44.6 (17.7)	5.3	72.0	13.4	14.6	2.4	13.9	169.6	.4



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 47

Type	Quadrat Frequency '98
Rabbit	2
Deer	23
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 47

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	14	-	-	41	-	-	-	-	-	55	-	-	-	1100			55
Y	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	5	-	-	151	-	-	-	-	-	156	-	-	-	3120			156
M	82	1	6	-	-	-	-	-	-	-	4	-	3	-	233	59	38	7
	98	32	236	107	2	34	5	4	-	-	420	-	-	-	8400	45	38	420
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	11	5	-	3	2	-	-	-	12	-	-	11	460			23
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	380			19

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	75%	00%	38%	+98%
'98	47%	20%	02%	

Total Plants/Acre (excluding Dead & Seedlings)	'82	266	Dec:	0%
*stems/acre counted in '98	'98	11980		4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	33	26	39	1
	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100	19	27	5
D	82	5	-	-	-	-	-	-	-	-	4	-	1	-	166			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	13%	-62%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'82	265	Dec:	63%
	'98	100		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	5	-	-	1	-	-	-	-	-	5	1	-	-	120			6
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	17	1	-	2	-	-	-	-	-	20	-	-	-	400	25	34	20
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	04%	00%	07%	

Total Plants/Acre (excluding Dead & Seedlings)	'82	0	Dec:	0%
	'98	560		7%

Chrysothamnus viscidiflorus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	14	29	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	80			-

Chrysothamnus viscidiflorus viscidiflorus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	2	1	-	-	-	-	-	-	-	3	-	-	-	100	12	12	3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	33%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	100	Dec:		-
'98	0			-

Opuntia spp.

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	1	-	-	-	-	-	3	-	2	-	100	7	19	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	40%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	100			-

Pinus monophylla

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	10	-	-	11	-	-	6	-	-	27	-	-	-	540			27
Y	82	-	-	-	-	-	-	4	-	-	4	-	-	-	133			4
	98	65	-	-	72	-	-	26	-	-	163	-	-	-	3260			163
M	82	56	7	5	-	-	-	-	-	-	68	-	-	-	2266	37	20	68
	98	109	16	-	14	-	-	7	6	-	136	-	16	-	3040	43	32	152
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	12	-	-	-	-	-	-	1	-	10	-	-	3	260			13
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	10%	07%	00%	+63%
'98	05%	00%	06%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	2399	Dec:		0%
'98	6560			4%

Ribes spp.																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	4	-	-	2	-	-	-	-	-	6	-	-	-	120	42	44	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	0	Dec:	-
'98	120		-

Ribes velutinum velutinum																		
D	82	-	1	-	-	-	-	-	-	-	-	-	-	1	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	100%	00%	100%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	33	Dec:	100%
'98	0		0%

Symphoricarpos oreophilus																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	1	-	-	3	-	-	6	-	-	-	120			6
M	82	17	-	-	-	-	-	-	-	-	17	-	-	-	566	21	13	17
	98	38	-	-	49	-	-	58	-	-	145	-	-	-	2900	21	44	145
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+81%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'82	566	Dec:	0%
'98	3040		1%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	11	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'82	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:	-
'98	0		-

Trend Study 30-52-98

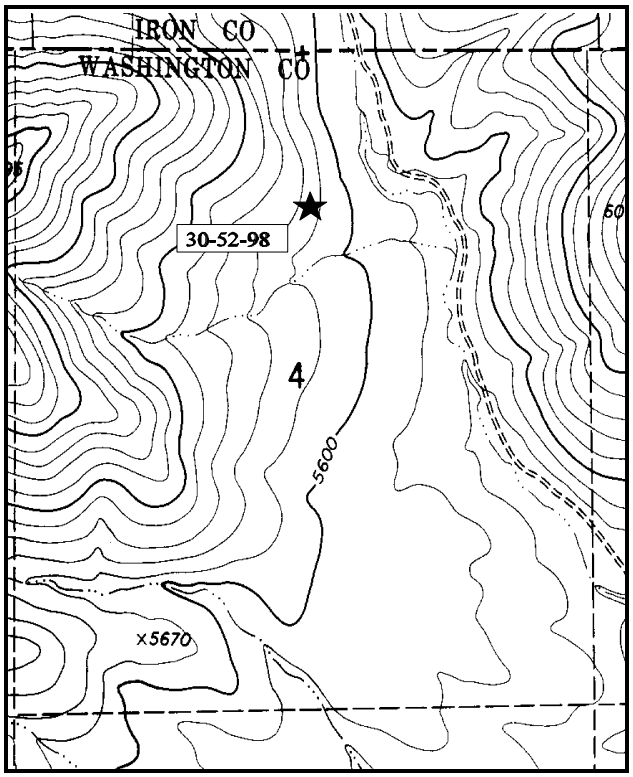
Study site name: Northwest of Enterprise . Range type: Sagebrush-Grass .

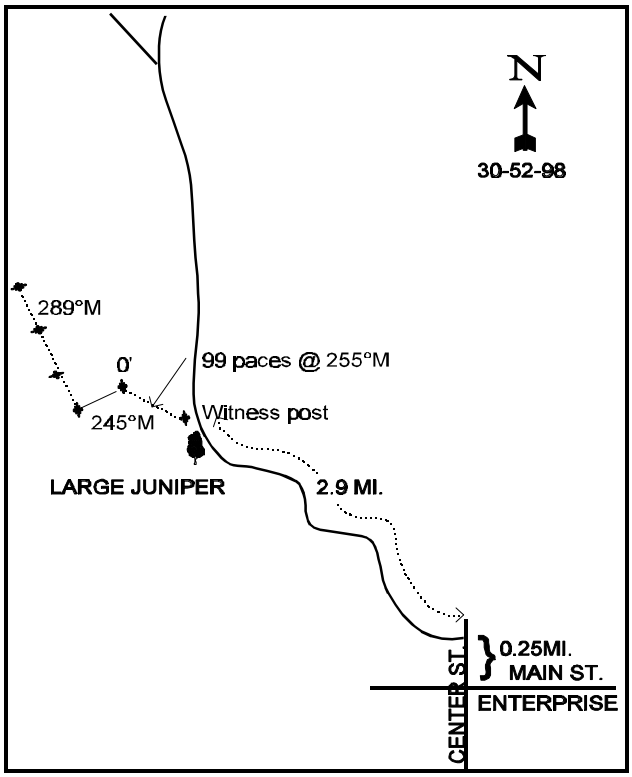
Compass azimuth: frequency baseline 245 M degrees. (Line 2-4 289°M)

Footmark (first frame placement) 5 feet. 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 Center Street for 0.25 miles. Turn left (i.e., west) and travel 2.90 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 away at an azimuth of 255 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.





Map Name: Hebron, Utah

Diagrammatic Sketch

Township 37 S , Range 17 W , Section 4

UTM 4165064.043 N, 256229.918 E

DISCUSSION

Trend Study No. 30-52 (50B-1c)

The "Northwest of Enterprise" trend study is on critical deer winter range northwest of Enterprise. Elevation is approximately 5,700 feet with a moderately steep slope (25%) and northeast aspect. The range type is Wyoming big sagebrush-grass. Little sign of deer was noted during the 1992 reading. Pellet group data from 1998 estimate 40 deer and 2 cow days use/acre. Site placement is questionable for sampling winter range. A short distance away to the north is a more preferred cliffrose and sagebrush type on a south exposure which would attract more deer during winter months.

Soils are relatively deep and rocky on the surface and within the profile. Effective rooting depth (see methods) is estimated at 19 inches. Rock and erosion pavement made up 26% of the ground cover in 1982, increasing to 42% in 1992, and 43% by 1998. 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 pedestaling and terracing of the slope, but current litter and vegetative cover seem to be sufficient to hold the soil in place.

The key browse species is Wyoming big sagebrush which currently ('98) comprises 55% of browse cover. The sight is composed of 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, however current use is more light to moderate. Percent decadence has increased from 23% in 1982 to 48% in 1998. Vigor is currently good on most plants, but 41% of the decadent sagebrush were classified as dying. Reproduction is poor with dead plants nearly as numerous as mature plants (1,180 vs 1,160 plants/acre).

Cliffrose provides some additional forage with an estimated 380 plants/acre in 1998. It has received moderate to heavy use, yet vigor is normal and reproduction is good. The only other browse species of significance is broom snakeweed. Normally, it acts as an increaser in response to grazing or disturbance. However, in this case it does not appear to be especially aggressive, as it has declined steadily in density since 1982. Juniper trees are scattered throughout the site. Point quarter data from 1998 estimate 20 trees/acre with an average basal diameter of 8 inches. Overhead canopy cover averages 8%, which means that it can be effecting the loss of productivity of the understory by as much as 30-40%.

Perennial grasses are abundant and diverse with muttongrass and Sandberg bluegrass being the most common. Annual cheatgrass is also present, providing 17% of the grass cover. Forbs are fairly diverse, yet no species is common. The 12 annual and perennial forbs encountered in 1998 provide less than 1% total cover. The most common species include: deervetch, longleaf phlox, and an astragalus.

1982 APPARENT TREND ASSESSMENT

This study is fairly typical of depleted Wyoming big sagebrush range. Most parameters indicate soil and vegetative trend are both declining. Erosion is extensive and increaser and/or invader plants occupy a prominent place in the plant composition. The key species, Wyoming big sagebrush, does not appear to be maintaining itself. Direct management action will likely be required to reverse the trend. Restrictions on animal use, while a viable option, are unlikely to quickly bring the site to a productive state.

1992 TREND ASSESSMENT

Basal vegetative cover has more than doubled since 1982, while percent bare ground had decreased by 38%. Protective ground cover has increased from 87% to 92%. All other observations point to an improving soil trend. The key browse species, Wyoming big sagebrush, has a low reproductive potential, no recruitment, density has declined by 42%, and percent decadency has increased. On the positive side, utilization is lighter and vigor has improved. Broom snakeweed had declined in density by 34%. Overall, the browse trend is

down. Sum of nested 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.

TREND ASSESSMENT
soil - improved
browse - down
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil is down slightly. Percent bare ground has increased from 8% to 13% and litter cover has declined from 46% to 38%. However, erosion is not currently the main problem. Trend for browse is down. Density of Wyoming big sagebrush has steadily declined since 1982 even though heavy utilization has declined since 1992. Percent decadence has remained high (48%), vigor is poor on 42% of the decadent plants, and reproduction is not sufficient to maintain the population. Cliffrose is also found on the site in small numbers. Density has increased from 133 plants/acre to 380. This increase in density from 1992 to 1998 is mostly due to the much larger sample taken in 1998. Reproduction is good. Utilization of this preferred shrub is moderate to heavy. Trend for the herbaceous understory is up for perennial grasses, but stable for forbs which only make up 4% of the herbaceous cover. Sum of nested frequency of perennial grasses has increased dramatically with a significant increase in the frequency of mutton and Sandberg bluegrass.

TREND ASSESSMENT
soil - down slightly
browse - down for Wyoming big sagebrush
herbaceous understory - up, but very few forbs

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 52

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	68	44	31	28	18	.55
G	Bromus tectorum (a)	-	261	-	-	88	3.09
G	Hilaria jamesii	55	81	32	21	34	1.78
G	Koeleria cristata	2	2	2	1	1	.03
G	Oryzopsis hymenoides	11	1	-	5	1	.00
G	Poa fendleriana	60	*101	28	29	42	5.88
G	Poa secunda	41	*215	-	17	79	5.57
G	Sitanion hystrix	54	54	50	24	23	.92
G	Unknown grass - perennial	3	-	-	1	-	-
G	Vulpia octoflora (a)	-	67	-	-	26	.30
Total for Annual Grasses		0	328	0	0	114	3.40
Total for Perennial Grasses		294	498	143	126	198	14.76
Total for Grasses		294	826	143	126	312	18.17

Type	Species	Nested Frequency '92	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '92	Quadrat Frequency '98	Average Cover % '98
F	Antennaria rosea	-	3	-	-	2	.03
F	Astragalus spp.	5	11	-	3	4	.19
F	Calochortus nuttallii	3	*16	1	1	7	.03
F	Chaenactis douglasii	-	-	1	-	-	-
F	Collinsia parviflora (a)	-	18	-	-	8	.04
F	Cymopterus spp.	-	*6	-	-	4	.07
F	Draba spp. (a)	-	20	-	-	10	.05
F	Erigeron pumilus	-	1	-	-	1	.03
F	Eriogonum umbellatum	2	-	-	1	-	-
F	Lotus plebeius	94	*39	35	40	20	.18
F	Machaeranthera canescens	3	-	-	1	-	-
F	Microsteris gracilis (a)	-	25	-	-	11	.05
F	Phlox longifolia	15	*32	-	8	16	.11
F	Plantago patagonica (a)	-	4	-	-	2	.01
F	Sisymbrium altissimum (a)	-	2	-	-	1	.00
Total for Annual Forbs		0	69	0	0	32	0.16
Total for Perennial Forbs		122	108	37	54	54	0.65
Total for Forbs		122	177	37	54	86	0.81

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 52

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	1	-
B	Artemisia tridentata wyomingensis	76	9.16
B	Chrysothamnus nauseosus	-	.38
B	Chrysothamnus viscidiflorus	14	.51
B	Cowania mexicana stansburiana	12	.49
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	54	1.14
B	Juniperus osteosperma	2	5.09
B	Purshia tridentata	1	-
Total for Browse		160	16.79

CANOPY COVER --
Herd unit 30 , Study no: 52

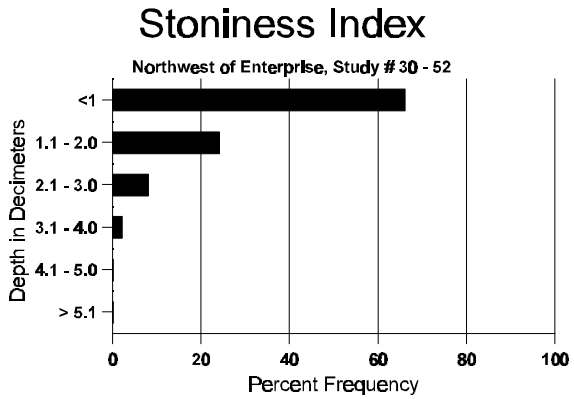
Species	Percent Cover '98
Juniperus osteosperma	8

BASIC COVER --
Herd unit 30 , Study no: 52

Cover Type	Nested Frequency '98	Average Cover % '82	'92	'98
Vegetation	356	1.50	4.25	38.27
Rock	335	20.25	30.50	36.20
Pavement	240	6.25	10.75	6.67
Litter	383	56.75	45.75	38.02
Cryptogams	111	2.25	.75	2.40
Bare Ground	263	13.00	7.50	13.41

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 52, Study Name: Northwest of Enterprise

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
18.9	48.0 (17.7)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 52

Type	Quadrat Frequency '98
Rabbit	10
Horse	1
Deer	16

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 52

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	0%
	'92	0		0%
	'98	20		100%

Artemisia tridentata wyomingensis																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	82	6	3	-	-	-	-	-	-	-	9	-	-	-	600			9
	92	2	1	-	-	-	-	-	-	-	3	-	-	-	200			3
	98	9	-	-	1	-	-	-	-	-	10	-	-	-	200			10
M	82	31	23	15	-	-	-	-	-	-	54	14	-	1	4600	22	23	69
	92	3	17	6	-	-	-	-	1	-	26	1	-	-	1800	24	24	27
	98	42	16	-	-	1	-	-	-	-	59	-	-	-	1180	19	28	59
D	82	8	7	8	-	-	-	-	-	-	-	-	1	22	1533			23
	92	9	18	2	-	-	-	-	-	-	25	3	1	-	1933			29
	98	49	13	-	-	-	-	-	-	-	36	-	-	26	1280			64
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1160			58

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	33%	23%	24%	-42%
'92	61%	14%	02%	-32%
'98	23%	00%	20%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	6733	Dec:	23%
	'92	3933		49%
	'98	2660		48%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	4	7	1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66	11	14	1
	98	28	-	-	-	-	-	-	-	-	28	-	-	-	560	11	18	28
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+ 0%
'92	00%	00%	00%	+92%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	0%
	'92	66		0%
	'98	800		3%

Cowania mexicana stansburiana																		
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	4	1	1	-	-	-	-	-	-	6	-	-	-	120			6
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	3	5	-	1	3	-	-	-	13	-	-	-	260	31	25	13

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	+65%
'98	26%	47%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	133		-
	'98	380		-

Ephedra viridis																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	1	-	2	-	-	-	-	-	3	-	-	-	200			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	1	1	-	-	-	-	-	-	-	2	-	-	-	133	11	6	2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32	51	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	50%	00%	00%	+34%
'92	33%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	133	Dec:	-
	'92	200		-
	'98	0		-

Gutierrezia sarothrae

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	82	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	27	-	-	-	-	-	-	-	-	27	-	-	-	540			27
M	82	99	-	-	-	-	-	-	-	-	85	14	-	-	6600	8	11	99
	92	82	-	-	-	-	-	-	-	-	82	-	-	-	5466	11	10	82
	98	162	-	-	7	-	-	-	-	-	169	-	-	-	3380	6	8	169
D	82	17	-	-	-	-	-	-	-	-	9	-	-	8	1133			17
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	7	-	-	-	-	-	-	-	-	2	-	-	5	140			7
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	06%	-34%
'92	00%	00%	00%	-26%
'98	00%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	8266	Dec:	14%
	'92	5466		0%
	'98	4060		3%

Juniperus osteosperma

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	-	-	-	1	-	-	-	-	-	1	-	-	-	66	67	131	1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	1	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'92	0		-
	'98	40		-

Purshia tridentata

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'92	00%	00%	00%	
'98	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'92	0		-
	'98	20		-

Trend Study 30-53-98

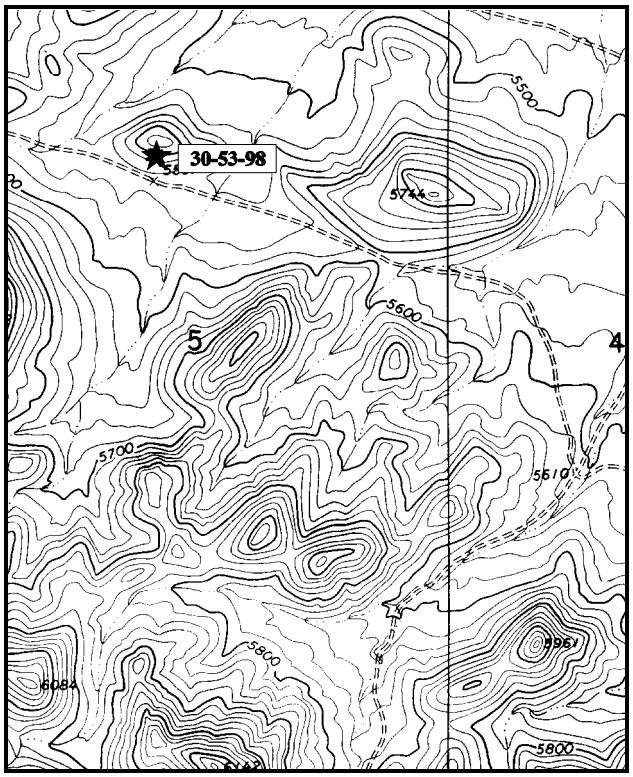
Study site name: Sevy Hollow . Range type: Sagebrush-Grass

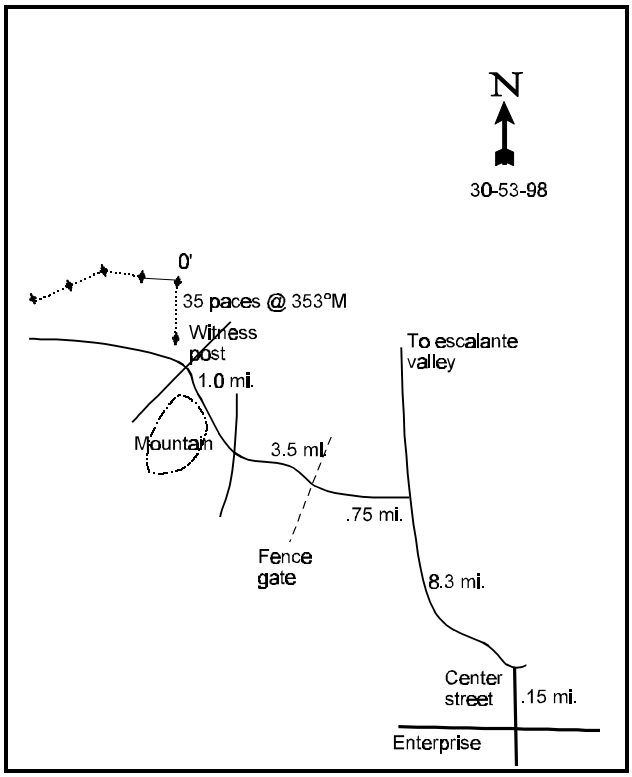
Compass azimuth: frequency baseline 282 M degrees. Lines 3-4 252 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (5 & 93ft), line 2 (28ft), line 3 (52ft), line 4 (72ft).

LOCATION DESCRIPTION

From the town of Enterprise, turn north on Center Street for 0.15 miles, turn left (northwest) for 8.3 miles. At this point, there will be a fork in the road. The main road will go to the right to Escalante Valley. Go to the left for 0.75 miles. You will come to a gate. Go through the gate and continue 3.5 miles through thick pinyon-juniper. You will come to and intersection, aat which point bear to the right on the road heading straight ahead (northwest) for 1.0 miles to another intersection and a witness post. From the witness post, the 0-foot baseline stake is 35 paces away at a bearing of 353 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot stake is marked with browse tag number 7012.





Map Name: Mount Escalante, Utah

Diagrammatic Sketch

Township 36 S , Range 18 W , Section 5

UTM 4175977.624 N, 245134.119 E

DISCUSSION

Trend Study No. 30-53 (61C-2)

The Sevy Hollow trend study is on the southeast exposure of a small knoll just west of Lower Sevy Hollow. Elevation is approximately 5,660 feet with a 20% to 25% slope. The site is a sagebrush-grass range type that appears to becoming negatively effected by increasing numbers of singleleaf pinyon and Utah juniper trees. The site is considered winter range for deer, but use is low. Pellet group data from 1998 estimate only 5 deer days use/acre. Wild horses are using the area and several animals were seen near the site in 1998. Pellet group data estimates 4 horse days use/acre. A few cattle pats were also encountered.

The soil is rocky and appears shallow, but effective rooting depth (see methods) is estimated at almost 22 inches. Soil texture is a sandy loam with a strongly acid pH (5.3). Rocks and pavement are common on the surface, accounting for half of the ground cover. Erosion is not currently a problem due to the high amount of protective ground cover and armored surface of rock cover.

Aside from the pinyon and juniper trees, browse composition is limited to Wyoming big sagebrush, broom snakeweed, narrowleaf low rabbitbrush, and prickly pear. Wyoming big sagebrush currently ('98) provides 64% of the browse cover. Age structure composition indicates that a problem exists. No young or seedling plants were encountered in 1982 or 1998, and an increasing proportion of the population is decadent (35% to 46%). Density has also declined from 5,133 to 4,680 plants/acre since 1982. Utilization was moderate in 1982, but since then it has mostly been classified as light in 1998. Dead plants, first included in 1998, are numerous at 1,340 plants/acre.

Broom snakeweed was numerous in 1982 at 3,933 plants/acre. It has since declined by 92%, density is only 320 plants/acre. The only other fairly common shrub is narrowleaf low rabbitbrush which had a density of 533 plants/acre in 1982, declining to 300 plants/acre by 1998. Pinyon and juniper trees are scattered throughout the site. Point quarter data estimates 83 singleleaf pinyon and 51 Utah juniper trees/acre. Average basal diameter is 3 inches for pinyon and 4.4 inches for juniper. Overhead canopy cover of pinyon on the site averages 7%. This amount of cover would mean that production of the understory could be decreased by as much as 30% to 40%.

The herbaceous understory is poor with cheatgrass providing 57% of the grass cover, and 55% of the total herbaceous cover in 1998. The only common perennial grass is Galleta. Perennial forbs are rare with only one species, longleaf phlox, encountered in 1982. During the 1998 reading, 3 annual and 4 perennial forbs were found, but these produce less than 1% cover. The only common species is the annual wooly plantain.

1982 APPARENT TREND ASSESSMENT

Soil trend is declining. Erosion is rapid and no stabilization is apparent. Vegetational trend is also down. The key browse species has generally poor vigor, moderate to high hedging levels, and a disturbing level of decadence in the population. Undesirable increaser shrubs are currently abundant, although they do not appear to be rapidly increasing. Annual grasses are the dominant understory component. Finally, singleleaf pinyon and Utah juniper are both increasing. Relatively few plants were encountered on the density plots but a large number of seedling and young were observed in the general area.

1998 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground has declined slightly, but rock and pavement cover combined has increased from 46% to 50%. There is little bare ground exposed and erosion does not appear to be a serious problem. Trend for browse is down for Wyoming big sagebrush. Density has declined slightly, percent decadence has increased from 35% to 46%, and reproduction is non-existent. In addition, 21% of the

decadent plants are classified as dying. Trend for the herbaceous understory is stable, but poor. Sum of quadrat frequencies of perennial grasses and forbs has remained similar. Cheatgrass, an annual, is the most abundant grass and dominates the herbaceous component. Unfortunately, annuals were not included in past readings so no comparisons can be made.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - stable, but in poor condition

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 53

Type	Species	Nested Frequency '98	Quadrat Frequency '82	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	341	-	100	7.13
G	Hilaria jamesii	163	47	66	4.94
G	Muhlenbergia montana	3	-	1	.03
G	Oryzopsis hymenoides	-	3	-	-
G	Poa secunda	-	-	-	.00
G	Sitanion hystrix	26	27	15	.26
G	Vulpia octoflora (a)	21	-	13	.06
Total for Annual Grasses		362	0	113	7.19
Total for Perennial Grasses		192	77	82	5.23
Total for Grasses		554	77	195	12.43
F	Agoseris glauca	1	-	1	.00
F	Astragalus spp.	2	-	1	.00
F	Draba spp. (a)	13	-	7	.03
F	Eriogonum cernuum (a)	1	-	1	.00
F	Erigeron spp.	1	33	1	.03
F	Phlox longifolia	6	1	3	.01
F	Plantago patagonica (a)	81	-	34	.49
Total for Annual Forbs		95	0	42	0.53
Total for Perennial Forbs		10	34	6	0.05
Total for Forbs		105	34	48	0.58

BROWSE TRENDS --
Herd unit 30 , Study no: 53

Type	Species	Strip Frequency ‘98	Average Cover % ‘98
B	Artemisia tridentata wyomingensis	92	16.92
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus stenophyllus	13	.18
B	Echinocereus spp.	1	.04
B	Gutierrezia sarothrae	11	.06
B	Juniperus osteosperma	1	.06
B	Leptodactylon pungens	0	-
B	Pinus monophylla	8	9.33
Total for Browse		126	26.60

CANOPY COVER --
Herd unit 30 , Study no: 53

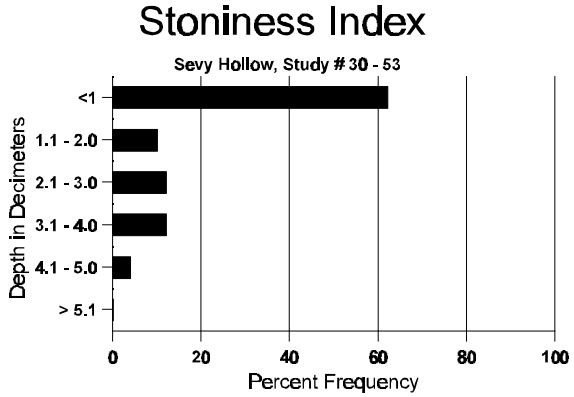
Species	Percent Cover ‘98
Pinus monophylla	7

BASIC COVER --
Herd unit 30 , Study no: 53

Cover Type	Nested Frequency ‘98	Average Cover % '82	'98
Vegetation	348	1.75	39.05
Rock	319	19.50	31.10
Pavement	298	26.00	19.30
Litter	383	38.25	37.24
Cryptogams	144	8.25	1.75
Bare Ground	185	6.25	4.38

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 53, Study Name: Sevy Hollow

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
21.8	47.7 (17.7)	5.3	72.0	13.4	14.6	2.4	13.9	169.6	.4



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 53

Type	Quadrat Frequency '98
Rabbit	8
Horse	1
Deer	5
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 53

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
M	82	6	44	-	-	-	-	-	-	-	50	-	-	-	3333	17	22	50
	98	103	18	2	4	-	-	-	-	-	127	-	-	-	2540	17	25	127
D	82	-	27	-	-	-	-	-	-	-	11	2	14	-	1800			27
	98	93	12	-	2	-	-	-	-	-	85	-	-	22	2140			107
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1340			67

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	92%	00%	18%	- 9%
'98	13%	.85%	09%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	5133	Dec:	35%
	'98	4680		46%

Chrysothamnus nauseosus																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	27	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
M	82	7	1	-	-	-	-	-	-	-	8	-	-	-	533	11	13	8
	98	8	-	-	1	-	-	-	-	-	9	-	-	-	180	7	12	9
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	7	-	-	-	-	-	-	-	-	1	-	-	6	140			7
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	13%	00%	00%	-40%
'98	00%	00%	38%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	533	Dec:		0%
'98	320			44%

Echinocereus spp.																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	5	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	0	Dec:		-
'98	20			-

Gutierrezia sarothrae																		
Y	82	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	82	57	-	-	-	-	-	-	-	-	57	-	-	-	3800	8	8	57
	98	14	-	-	-	-	-	-	-	-	14	-	-	-	280	5	7	14
D	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-92%
'98	00%	00%	06%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	3933	Dec:		0%
'98	320			13%

Juniperus osteosperma																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	69	28	1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	-70%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'82	66	Dec:		-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Leptodactylon pungens																		
M	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	11	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	0	Dec:	-
	'98	0		-

Pinus monophylla																		
Y	82	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	6	-	-	1	-	-	-	-	-	6	-	-	1	140			7
M	82	1	-	-	-	-	-	-	-	-	1	-	-	-	66	51	45	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'82	00%	00%	00%	+59%
'98	00%	00%	13%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'82	66	Dec:	-
	'98	160		-

Trend Study 30-54-98

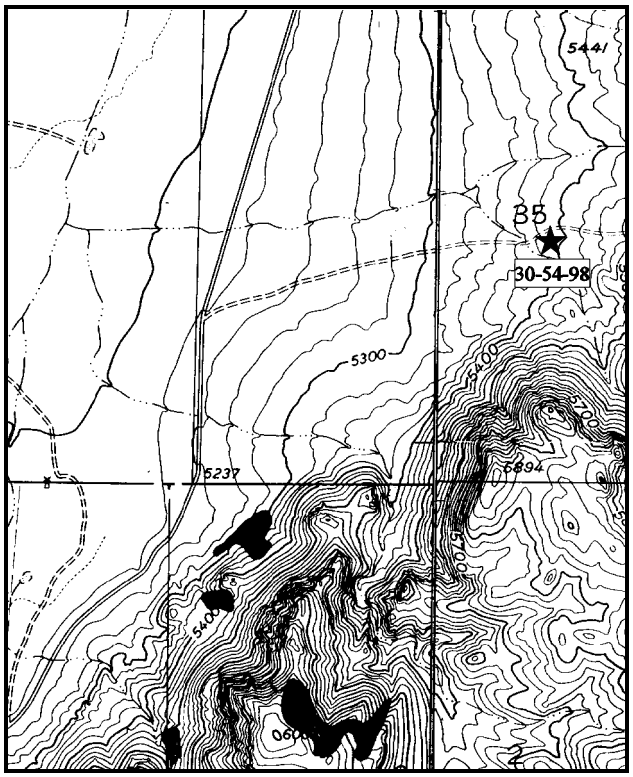
Study site name: Bullion Canyon . Range type: Wyoming Sagebrush .

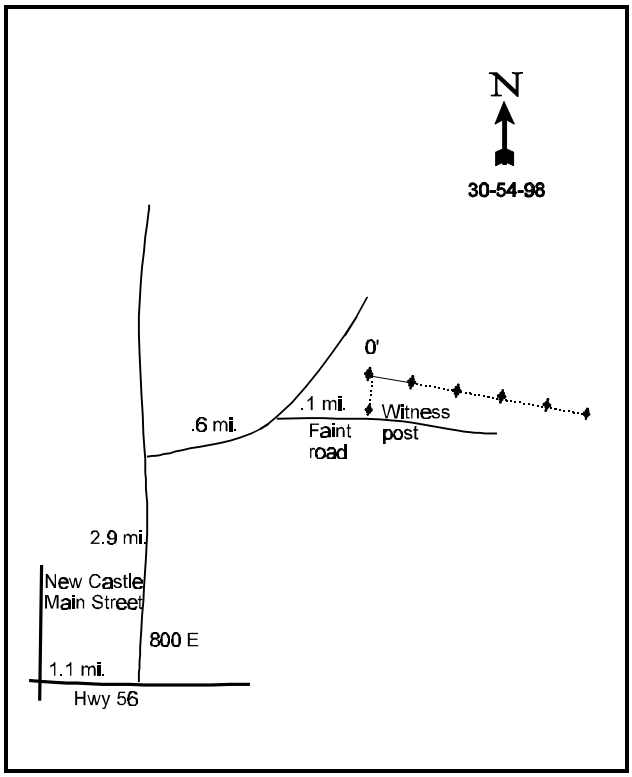
Compass bearing : frequency baseline 97 M degrees.

Footmark (first frame placement) 5 feet. 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 and drove 2.9 miles to a right turn (.3 miles past a gate). Go 0.6 miles to a fork. Take the faint road to the right and go 0.1 miles to a witness post on the left side of the road. The 0-foot stake is 37 degrees magnetic from the witness post.





Map name: Silver Peak

Diagrammatic Sketch

Township 35S , Range 15W, Section 35

UTM 4176790.416 N, 280124.502 E

DISCUSSION

Trend Study No. 30-54

The Bullion Canyon trend study is near the mouth of Bullion Canyon. It was established in 1998 and samples a sagebrush-grass range type within a scattered population of juniper trees. Slope varies from 5% to 10% near the bottom of the hill, to 25% at the end of the baseline. Aspect is to the west and elevation is approximately 5,400 feet. Agricultural fields are located in the valley bottom about 1½ miles to the west. Pellet group data from 1998 estimate moderate deer use at 23 deer days use/acre. 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.

Soil on the site is moderately deep with an effective rooting depth (see methods) estimated at 19 inches. Rock and gravel are abundant on the surface and within the profile. Soil texture is a loam with a neutral pH (7.0). Phosphorus may be limiting to plant growth at 6.4 ppm, when 10 ppm is considered a minimum value for normal plant development. Protective ground cover consists mostly of rock and pavement cover and sagebrush crowns. Litter cover is lacking and percent bare ground is relatively high at 20%. 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 key browse species consist of a combination of black sagebrush and Wyoming big sagebrush. These species appear to be hybridizing, with many shrubs displaying phenotypes of both black and Wyoming big sagebrush. Wyoming big sagebrush is more numerous at a density of 6,240 plants/acre, which provide 74% of the shrub cover on the site. These plants display moderate to heavy use, mostly good vigor, and low percent decadence at 17%. Black sagebrush has a density of only 180 plants/acre. Use is light to moderate. Reproduction of sagebrush appears adequate to maintain the population.

Other preferred species found on the site in small numbers include: fourwing saltbush, green ephedra, and rubber rabbitbrush. Fourwing is scattered over the site, although it occurs in a dense patch near the baseline. Use is moderate and vigor poor on 1/3 of the plants sampled. Percent decadence is also high at 43%. The green ephedra shows heavy use with a percent decadence of 34%. Ninety percent (180 plants/acre) of the decadent plants were classified as dying.

Increaser shrubs include narrowleaf low rabbitbrush and broom snakeweed. Snakeweed is the most abundant increaser with an estimated density of 1,360 plants/acre. Age class distribution indicates a slightly expanding population. Singleleaf pinyon and Utah juniper trees are scattered over the site. Point quarter data estimates 21 pinyon and 96 juniper trees/acre. Average basal diameter is 1.6 inches for pinyon and 1.9 inches for juniper. Many of the larger, older trees appear highlined.

The herbaceous understory is poor. Grasses are dominated by the annual cheatgrass which provides 72% of the herbaceous cover. Perennial species are rare with only the warm season grass galleta occurring more that occasionally. Forbs are diverse, but the 16 annual and perennial species encountered produce less than 1% cover. The most common species is longleaf phlox.

1998 APPARENT TREND ASSESSMENT

The soil trend appears stable but in poor condition. There is a considerable amount of protective ground cover, although most of this comes from rock and pavement. The presence of this type of ground cover can accelerate runoff on moderate slopes. The site is terraced and erosion currently appears localized. Trend for browse appears to be slightly downward for the key species, Wyoming big sagebrush, which makes up 74% of the browse cover. Use is moderate and reproduction does not appear to be adequate to maintain the population as indicated by the percent dead in the population and those decadent plants classified as dying.

The more preferred, but less abundant fourwing saltbush and green ephedra appear to be declining due to heavy use and poor reproduction. The herbaceous understory is poor with cheatgrass providing almost three-fourths of the herbaceous cover. Several desirable perennial grasses are present, but in small numbers. The forb composition is very diverse for this type of site, although all species are rare. The herbaceous trend will likely not improve in the future due to the dominance of cheatgrass, combined with the extreme rockiness of the soil surface. Pavement and rock are dark in color which can greatly elevate soil surface temperatures and decrease soil moisture during the summer.

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 54

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	1	1	.03
G	Bromus tectorum (a)	404	94	12.57
G	Carex spp.	1	1	.00
G	Hilaria jamesii	112	43	2.07
G	Oryzopsis hymenoides	46	20	.95
G	Poa secunda	22	10	.46
G	Sitanion hystrix	40	21	.38
G	Vulpia octoflora (a)	2	1	.00
Total for Annual Grasses		406	95	12.57
Total for Perennial Grasses		222	96	3.91
Total for Grasses		628	191	16.48
F	Allium spp.	2	1	.00
F	Arabis spp.	4	1	.00
F	Astragalus spp.	5	3	.01
F	Castilleja chromosa	8	4	.09
F	Calochortus nuttallii	5	2	.01
F	Cirsium spp.	8	3	.04
F	Cryptantha spp.	15	7	.03
F	Cymopterus spp.	17	9	.07
F	Descurainia pinnata (a)	13	7	.06
F	Draba spp. (a)	24	12	.11
F	Eriogonum spp.	8	2	.06
F	Gilia spp. (a)	10	7	.06
F	Penstemon spp.	2	2	.01
F	Phlox longifolia	48	22	.23
F	Senecio multilobatus	1	1	.03
F	Streptanthus cordatus	9	5	.07
Total for Annual Forbs		47	26	0.23

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
Total for Perennial Forbs		132	62	0.68
Total for Forbs		179	88	0.91

BROWSE TRENDS --
Herd unit 30 , Study no: 54

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	10	1.87
B	Artemisia tridentata wyomingensis	88	17.67
B	Atriplex canescens	6	.97
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus stenophyllus	32	.98
B	Echinocereus spp.	3	-
B	Ephedra viridis	7	.45
B	Gutierrezia sarothrae	18	.49
B	Juniperus osteosperma	7	1.44
B	Opuntia spp.	4	-
B	Sclerocactus	1	-
Total for Browse		176	23.89

CANOPY COVER --
Herd unit 30 , Study no: 54

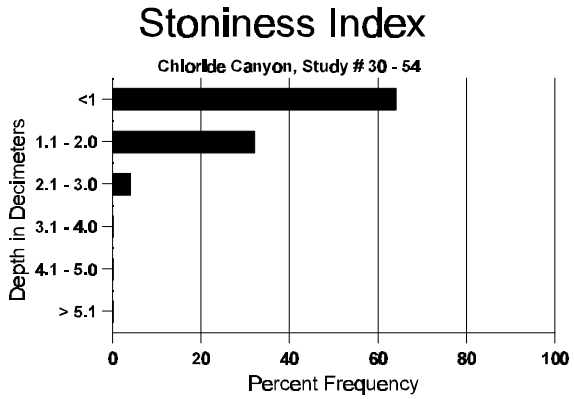
Species	Percent Cover '98
Abies concolor	1
Juniperus osteosperma	2

BASIC COVER --
Herd unit 30 , Study no: 54

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	433	33.48
Rock	340	14.30
Pavement	452	33.29
Litter	437	12.42
Cryptogams	56	.63
Bare Ground	393	20.05

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 54, Study Name: Chloride Canyon

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
19.0	45.6 (18.3)	7.0	46.0	29.4	24.6	1.7	6.4	160.0	.6



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 54

Type	Quadrat Frequency '98
Rabbit	9
Deer	24

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 54

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	14	7	-	-	-	-	-	-	-	20	-	1	-	420	8	15	21
D	98	4	-	-	-	-	-	-	-	-	1	-	-	3	80			4
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'98	26%	00%	15%	

Total Plants/Acre (excluding Dead & Seedlings) '98 540 Dec: 15%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	98	26	14	1	-	-	-	-	-	-	41	-	-	-	820			41
M	98	35	147	19	1	-	-	-	-	-	202	-	-	-	4040	14	25	202
D	98	17	26	8	-	-	-	-	-	-	23	-	-	28	1020			51
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	520			26
% Plants Showing '98		Moderate Use 64%				Heavy Use 10%				Poor Vigor 10%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		5880	Dec:		17%
Atriplex canescens																		
M	98	-	2	-	-	2	-	-	-	-	4	-	-	-	80	21	27	4
D	98	1	1	-	-	1	-	-	-	-	1	-	-	2	60			3
% Plants Showing '98		Moderate Use 86%				Heavy Use 00%				Poor Vigor 29%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		140	Dec:		43%
Chrysothamnus nauseosus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	18	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Chrysothamnus viscidiflorus stenophyllus																		
S	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	36	1	-	3	-	-	1	-	-	40	-	-	1	820	10	13	41
D	98	4	-	-	-	-	-	-	-	-	2	-	-	2	80			4
% Plants Showing '98		Moderate Use 02%				Heavy Use 00%				Poor Vigor 06%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		960	Dec:		8%
Echinocereus spp.																		
M	98	2	-	-	-	-	-	1	-	-	3	-	-	-	60	3	3	3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra viridis																		
Y	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	1	2	15	-	-	-	-	-	-	18	-	-	-	360	16	16	18
D	98	-	1	9	-	-	-	-	-	-	1	-	-	9	200			10
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 14%			Heavy Use 83%				Poor Vigor 31%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		580	Dec:		34%
Gutierrezia sarothrae																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	21	-	-	-	-	-	-	-	-	21	-	-	-	420			21
M	98	46	-	-	-	-	-	-	-	-	46	-	-	-	920	6	6	46
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 01%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1360	Dec:		1%
Juniperus osteosperma																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		140	Dec:		-
Opuntia spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	7	2
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		50%
Sclerocactus																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

Trend Study 30-55-98

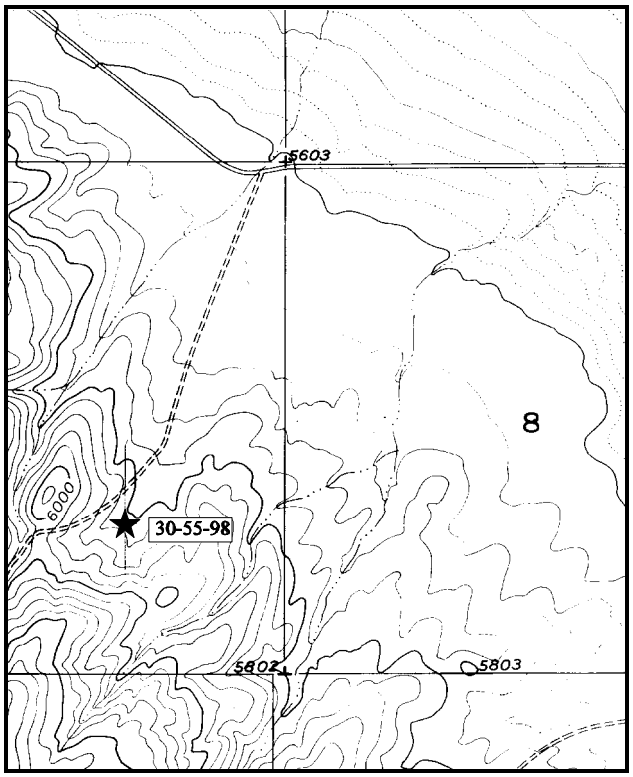
Study site name: Quichapa Canyon Range type: Mountain Brush .

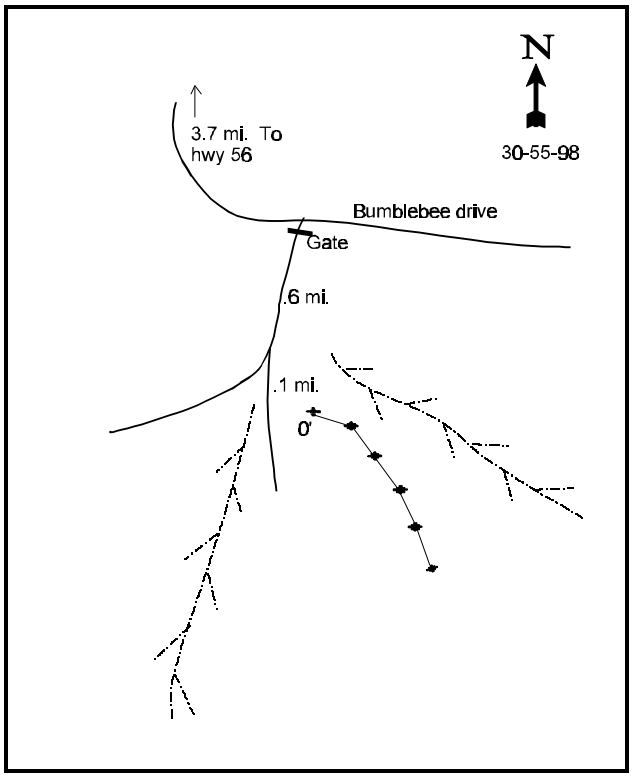
Compass bearing: frequency baseline 103 M degrees. Lines 2-3 142 °M, line 4 156°M, line 5 153°M.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Take exit 51 and follow the Road west 4.1 miles to a left turn. Take this turn and go through the gate. Travel .6 miles to a fork. Take the left fork for 0.1 miles to a witness post on the left side of the road. The 0-foot stake is 5 paces away at 77° magnetic. The study is marked by half high fenceposts. The 0-foot stake has browse tag # 498 attatched.





Map name: Kannarraville Diagrammatic Sketch

Township 37S , Range 12W , Section 7 UTM 4162671.532 N, 302366.051 E

DISCUSSION

Trend Study No. 30-55

The Quichapa Canyon site is a new trend study established in 1998 to monitor deer winter range on the northeast side of unit 30. The study samples a northwest facing ridge at an elevation of about 5,800 feet with a slope of 28%. The site is a mountain brush type with a juniper overstory. Water is available about 1/4 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 estimate 41 deer days use/acre. Several deer were seen near the site during study establishment and fresh pellet groups were also observed. Sheep have also recently used the site this year and a sheep camp is located ½ mile to the northeast. Some cow sign was also observed in low numbers.

Soil at the site is relatively shallow with an effective rooting depth (see methods) of just over 14 inches. It has a sandy loam type texture on the surface with clay concentrated in lower horizons. Rock and pavement is common on the surface and within the profile. Erosion appears to be occurring due to poor protective ground cover combined with the steep terrain.

Utah juniper is abundant on the site with smaller numbers of pinyon pine. Point quarter data estimate 163 juniper and 23 pinyon trees/acre. Average basal diameter is 6.4 inches for juniper and 7.2 inches for pinyon. These trees provide 37% of the browse cover. Key understory species consist of Utah serviceberry, mountain big sagebrush, and antelope bitterbrush. Serviceberry accounts for 26% of the browse cover with an estimated population of 1,240 plants/acre. Mature plants average nearly 4 feet in height. They are heavily utilized with 44% of the population consisting of decadent plants. Reproduction is good, but 59% (320 plants/acre) of the decadent serviceberry were classified as dying. Currently, there are not enough young plants to replace them.

Mountain big sagebrush provides 30% of the shrub cover with an estimated density of 2,180 plants/acre. Use of the sagebrush is mostly light to moderate. Vigor is normal on most plants and percent decadence is at 25%. Bitterbrush occurs in small numbers of about 300 plants/acre. It displays extreme hedging with most individuals sampled being classified as unavailable due to hedging. There is no sign of reproduction, although vigor is normal on most plants and percent decadency is only 13%. There are also small numbers of black sagebrush, true mountain mahogany, and Gambel oak which provide some additional forage.

The herbaceous understory is very poor. Cheatgrass is the only common herbaceous species. It provides 72% of the grass cover and 66% of the total herbaceous cover. Bottlebrush squirreltail is the only common perennial grass on the site with several other perennial species occurring less frequently. Forbs are diverse with 19 species encountered. However, none are very abundant with all of these forbs combining to produce less than 1% cover. The most abundant species are small annuals.

1998 APPARENT TREND ASSESSMENT

The soil is in poor condition with inadequate protective ground cover and abundant bare soil exposed. Erosion is occurring which further degrades the site potential. This trend will continue unless more herbaceous vegetation becomes established. Trend for browse appears to be going down due to extremely heavy use, poor vigor, high decadence, and poor reproduction for most preferred species. In addition, juniper and to a lesser extent pinyon appear to be increasing which will further reduce the shrub and herbaceous understory. The herbaceous understory is poor with most of the grass cover composed of cheatgrass. Perennial species are present but in small numbers. The forb component is very diverse but depleted.

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 55

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	371	96	7.05
G	Oryzopsis hymenoides	8	4	.21
G	Poa bulbosa	2	1	.00
G	Poa fendleriana	31	15	.68
G	Poa secunda	3	1	.03
G	Sitanion hystrix	79	33	1.86
G	Vulpia octoflora (a)	4	2	.01
Total for Annual Grasses		375	98	7.06
Total for Perennial Grasses		123	54	2.80
Total for Grasses		498	152	9.86
F	Agoseris glauca	6	2	.01
F	Allium spp.	2	1	.00
F	Astragalus convallarius	2	1	.15
F	Astragalus spp.	8	5	.02
F	Castilleja chromosa	3	1	.00
F	Calochortus nuttallii	4	3	.01
F	Chaenactis douglasii	9	4	.02
F	Collinsia parviflora (a)	61	25	.15
F	Cymopterus spp.	-	-	.00
F	Descurainia pinnata (a)	3	2	.01
F	Draba spp. (a)	13	6	.03
F	Lomatium spp.	3	1	.00
F	Microsteris gracilis (a)	73	35	.17
F	Orobanche fasciculata	2	1	.00
F	Penstemon spp.	2	1	.00
F	Phlox longifolia	19	10	.05
F	Stellaria jamesiana	1	1	.03
F	Trifolium spp.	18	7	.03
F	Zigadenus paniculatus	3	1	.03
Total for Annual Forbs		150	68	0.36
Total for Perennial Forbs		82	39	0.39
Total for Forbs		232	107	0.76

BROWSE TRENDS --
Herd unit 30 , Study no: 55

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	37	5.16
B	Artemisia nova	0	-
B	Artemisia tridentata vaseyana	69	5.85
B	Cercocarpus montanus	0	-
B	Juniperus osteosperma	8	7.06
B	Opuntia spp.	1	-
B	Pinus edulis	2	.15
B	Purshia tridentata	11	1.41
B	Quercus gambelii	5	.03
Total for Browse		133	19.68

CANOPY COVER --
Herd unit 30 , Study no: 55

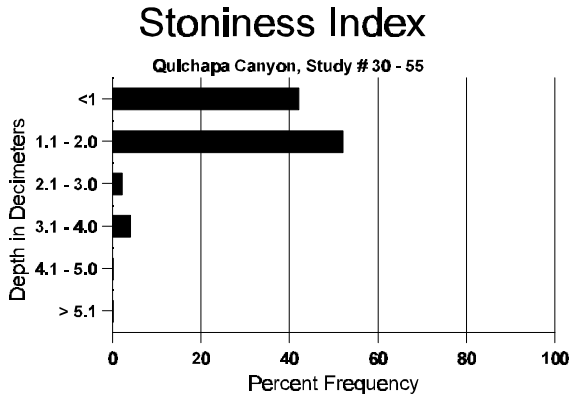
Species	Percent Cover '98
Juniperus osteosperma	10
Quercus gambelii	1

BASIC COVER --
Herd unit 30 , Study no: 55

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	398	30.07
Rock	302	11.87
Pavement	352	17.17
Litter	475	39.04
Cryptogams	10	.22
Bare Ground	343	27.82

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 55, Study Name: Quichapa Canyon

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.3	54.8 (14.2)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 55

Type	Quadrat Frequency '98
Sheep	2
Rabbit	30
Deer	35

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 55

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	98	1	-	-	16	-	-	1	2	-	20	-	-	-	400			20
Y	98	1	3	-	7	-	-	2	-	-	13	-	-	-	260			13
M	98	-	3	6	1	1	5	1	-	5	22	-	-	-	440	45	42	22
D	98	1	3	7	-	7	8	-	-	1	11	-	-	16	540			27
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12
% Plants Showing '98				Moderate Use 27%			Heavy Use 52%			Poor Vigor 26%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1240	Dec:		44%
Artemisia nova																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	17	0
D	98	4	-	-	-	-	-	-	-	-	1	-	-	3	80			4
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 75%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	98	7	1	-	4	-	-	-	-	-	12	-	-	-	240			12
M	98	55	11	-	2	2	-	-	-	-	70	-	-	-	1400	21	28	70
D	98	17	4	-	-	-	1	1	-	-	17	-	-	6	460			23
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	480			24
% Plants Showing '98		Moderate Use 17%			Heavy Use .95%			Poor Vigor 06%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		2100	Dec:		22%
Cercocarpus montanus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	44	52	0
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	2	-	-	2	-	-	1	-	-	5	-	-	-	100			5
M	98	2	-	-	-	-	-	-	1	-	3	-	-	-	60	-	-	3
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	12	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Pinus edulis																		
S	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Purshia tridentata																		
M	98	-	-	-	-	-	3	-	1	9	13	-	-	-	260	20	34	13
D	98	-	-	-	-	-	-	-	-	2	-	-	-	2	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 93%			Poor Vigor 13%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		300	Dec:		13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	-	-	-	2	-	-	-	4	-	6	-	-	-	120			6
M	98	1	-	-	-	-	1	-	-	-	1	-	1	-	40	31	30	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'98	00%	13%	13%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	160	Dec:	-

Trend Study 30-56-98

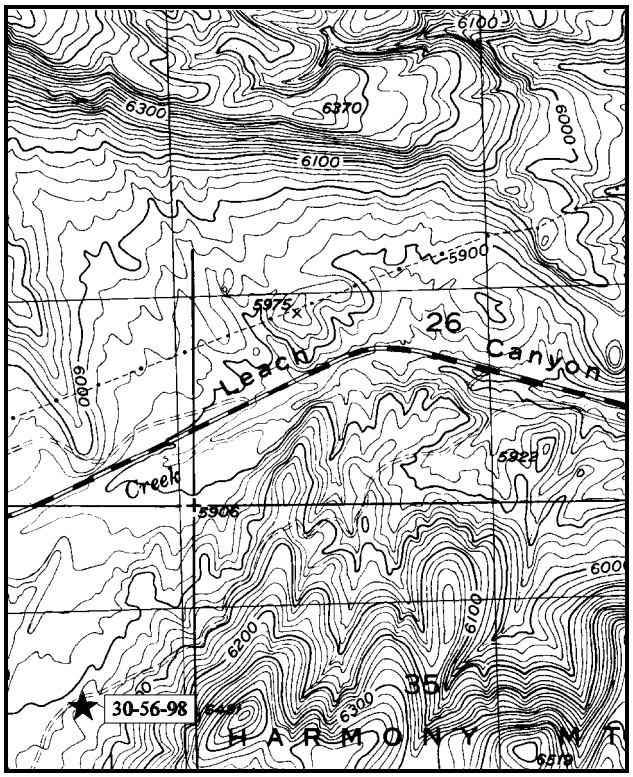
Study site name: Woolsey Reseed . Range type: Chained, Reseeded P-J .

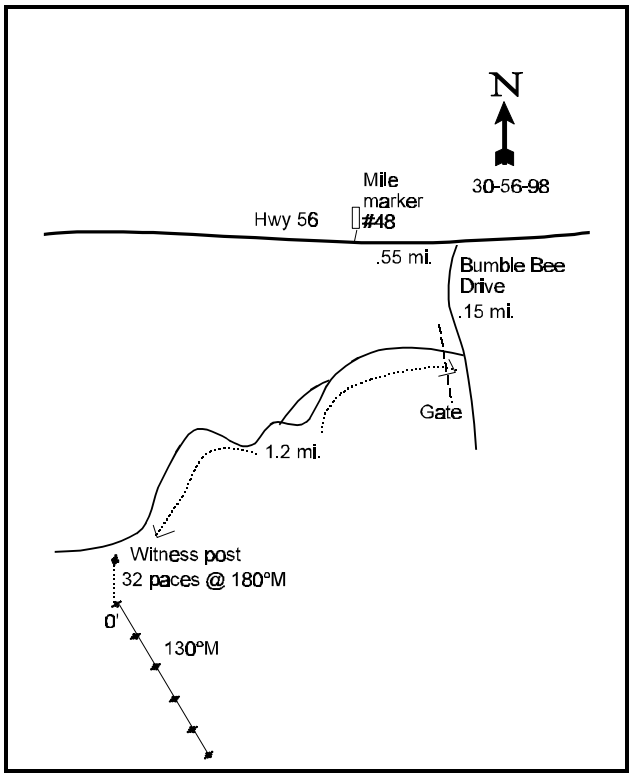
Compass bearing: frequency baseline 130 M degrees.

Footmark (first frame placement) 5 feet. 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 and 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)-foot stake has browse tag # 95 attached.





Map Name: Desert Mound

Diagrammatic Sketch

Township 36S , Range 13W , Section 34

UTM 4166684.374 N, 297670.511 E

DISCUSSION

Trend Study No. 30-56

The Woolsey Seeding is a new trend study established in 1998 located on the Woolsey reseed. It samples a chained and seeded pinyon and juniper site that is considered important deer winter range. The site has an aspect to the west-northwest and a slope from 10% to 15%. Elevation is approximately 5,740 feet. The land is administered by the BLM. 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 from the site estimate 37 deer and 55 cow days use/acre. Escape cover for deer is abundant in the form of large serviceberry and unchained pinyon and juniper trees about 500 feet to the east.

Soil on the site is moderately deep and rocky on the surface and through the profile. Effective rooting depth (see methods) is estimated at 16 inches. Soil texture is a clay loam with a neutral pH (7.0). Phosphorus may be limiting to plant growth with only 6.1 ppm found in the soil sample, when 10 ppm is considered a minimum value for normal plant development. 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 site supports low densities of Utah serviceberry, dwarf rabbitbrush, Parry rabbitbrush, cliffrose, and antelope bitterbrush. Most of these were not adequately sampled because they occur in such limited numbers. Cliffrose and bitterbrush are heavily hedged with serviceberry moderately utilized. Some of the true mountain mahogany and curlleaf mountain mahogany are also heavily hedged. Juniper trees have been released by the chaining. Young trees in the 4 to 6 foot class are fairly abundant. Point quarter data estimate there are 59 Utah juniper and 28 singleleaf pinyon trees/acre. Average basal diameter is 2 inches for each species. Pinyon and juniper provide nearly 4% cover which accounts for 53% of the shrub cover. Overhead canopy cover is almost 3% for juniper and pinyon.

Seeded grasses dominate the site. Crested wheatgrass, intermediate wheatgrass, and Russian wildrye are abundant and provide 96% of the grass cover, or 93% of the herbaceous cover. Three native perennial grasses are also present in small numbers as is the annual, cheatgrass. The forb component is diverse with 15 species encountered. However, all species occur rarely and all forbs combined produce only about 1% cover.

1998 APPARENT TREND ASSESSMENT

The soil appears stable due to the abundant protective ground cover consisting primarily of perennial herbaceous vegetation and litter from the chaining. There is a variety of browse species on the site, although none are very abundant. The most preferred species are being the most heavily utilized. Trend appears stable, but management strategies to increase the shrub component on the site would be desirable for deer winter range improvement. The herbaceous understory is abundant and well established. However, composition could be better as three seeded grasses dominate and forbs are limited.

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 56

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron cristatum	190	58	8.09
G	Agropyron intermedium	287	76	13.56
G	Bromus tectorum (a)	75	28	.75
G	Elymus junceus	110	43	4.10
G	Oryzopsis hymenoides	-	-	.03
G	Poa secunda	4	2	.01
G	Sitanion hystrix	3	1	.15
Total for Annual Grasses		75	28	0.75
Total for Perennial Grasses		594	180	25.96
Total for Grasses		669	208	26.71
F	Astragalus spp.	5	3	.09
F	Cymopterus spp.	7	4	.09
F	Dalea flavescens	5	2	.30
F	Descurainia pinnata (a)	5	3	.01
F	Draba spp. (a)	11	6	.03
F	Eriogonum umbellatum	3	1	.03
F	Lappula occidentalis (a)	3	2	.01
F	Lesquerella spp.	4	4	.07
F	Lotus utahensis	2	1	.03
F	Lupinus argenteus	3	1	.00
F	Microsteris gracilis (a)	21	10	.05
F	Penstemon spp.	4	1	.00
F	Petradoria pumila	9	2	.18
F	Phlox hoodii	5	3	.04
F	Streptanthus cordatus	2	2	.01
Total for Annual Forbs		40	21	0.10
Total for Perennial Forbs		49	24	0.85
Total for Forbs		89	45	0.96

BROWSE TRENDS --
Herd unit 30 , Study no: 56

Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	2	.85
B	Artemisia tridentata vaseyana	1	-
B	Cercocarpus montanus	1	-
B	Chrysothamnus depressus	18	.55
B	Chrysothamnus parryi howardi	8	1.56
B	Cowania mexicana stansburiana	0	-
B	Eriogonum microthecum	3	.03
B	Gutierrezia sarothrae	20	.45
B	Juniperus osteosperma	4	1.94
B	Pinus monophylla	3	1.97
B	Purshia tridentata	0	.03
B	Ribes spp.	1	-
Total for Browse		61	7.40

CANOPY COVER --
Herd unit 30 , Study no: 56

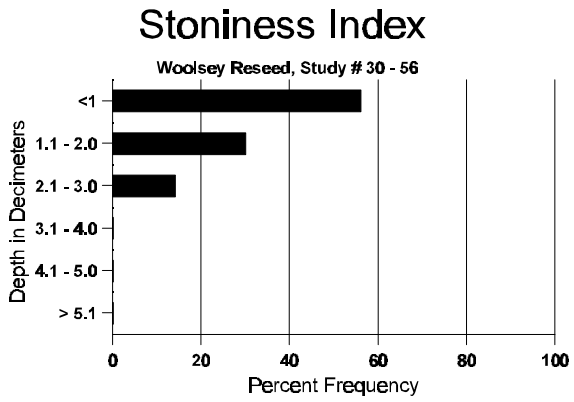
Species	Percent Cover '98
Juniperus osteosperma	.60
Pinus monophylla	2

BASIC COVER --
Herd unit 30 , Study no: 56

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	420	39.56
Rock	212	5.94
Pavement	338	9.63
Litter	486	52.22
Cryptogams	20	.24
Bare Ground	326	18.28

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 56, Study Name: Woolsey Reseed

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
16.1	51.6 (16.3)	7.0	38.0	25.4	36.6	3.5	6.1	118.4	.7



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 56

Type	Quadrat Frequency '98
Rabbit	25
Deer	24
Cattle	11

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 56

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	98	-	2	-	-	-	-	-	-	-	2	-	-	-	40	37	51	2
% Plants Showing '98		Moderate Use 100%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)										'98	40	Dec:		-				
Artemisia tridentata vaseyana																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)										'98	20	Dec:		-				
Cercocarpus montanus																		
M	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	50	54	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 100%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)										'98	20	Dec:		-				

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus depressus																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	98	25	-	-	1	-	-	-	-	-	26	-	-	-	520	4	6	26
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		620	Dec:		-
Chrysothamnus parryi howardi																		
Y	98	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	6	3	-	-	-	-	-	-	-	9	-	-	-	180	34	43	9
D	98	2	2	-	-	-	-	-	-	-	2	-	-	2	80			4
% Plants Showing '98		Moderate Use 40%				Heavy Use 00%					Poor Vigor 13%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		300	Dec:		27%
Cowania mexicana stansburiana																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	62	66	0
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Eriogonum microthecum																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	11	2
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Gutierrezia sarothrae																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	56	-	-	-	-	-	-	-	-	56	-	-	-	1120	7	10	56
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1180	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		100	Dec:		-
Pinus monophylla																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Purshia tridentata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	33	70	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Ribes spp.																		
M	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	-	-	4
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%					Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		-

Trend Study 30-57-98

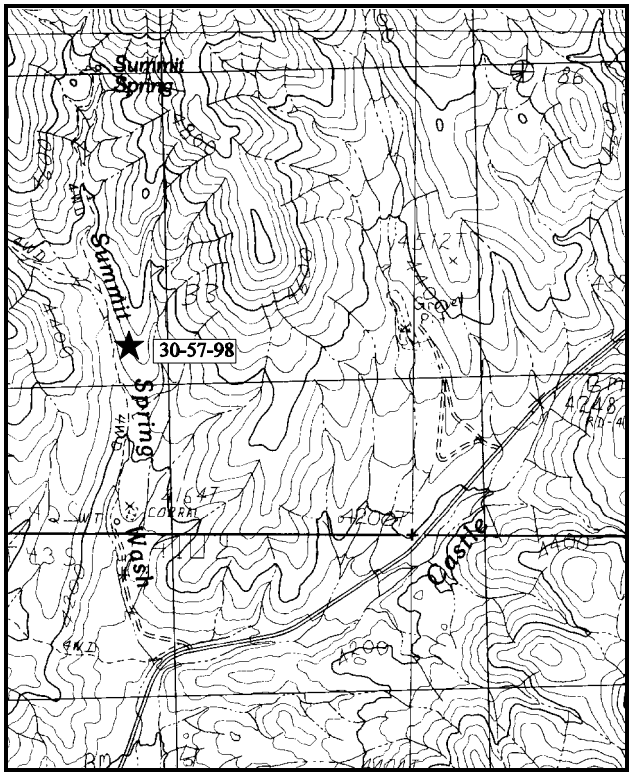
Study site name: Summit Spring . Range type: Desert Shrub .

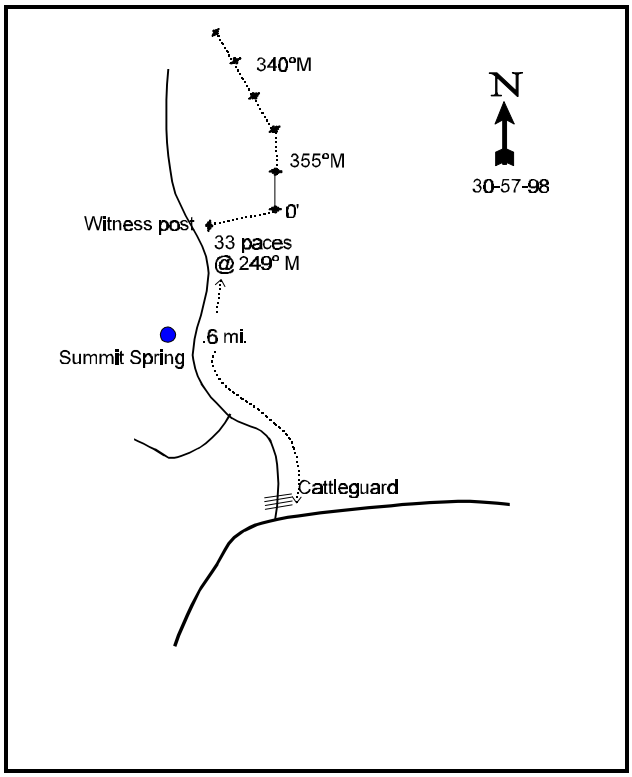
Compass bearing: frequency baseline 355 M degrees. Lines 3-5 340 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From 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 witness post on the right (east) side of the road. The 0-foot stake is 33 paces from the witness post at a bearing of 249 degrees magnetic. The 0-foot stake has browse tag 494 attached.





Map Name Jarvis Peak

Diagrammatic Sketch

Township 42S , Range 18W , Section 33

UTM 4108116.846 N, 244863.897 E

DISCUSSION

Trend Study No. 30-57

The Summit Spring trend study site was established in 1998. The site was placed about ½ mile south of Summit Spring. It samples winter range on the south west side of the unit. The site is placed along a ridge which supports a desert shrub community. Slope is 40% with a west, southwest aspect and an elevation of about 4,100 feet. The area is grazed by cattle, and cattle were present near the site during study site establishment on June 2nd. A cattle watering trough, which is apparently fed by a pipe from nearby Summit Spring, is found about 1/4 of a mile to the south. Pellet group data estimate a high level of deer use at 61 days use/acre. Cow use was estimated at 4 day use/acre. Cattle use is higher on the more level areas and along the ridge top.

Soil on the site is relatively shallow and very rocky. Effective rooting depth (see methods) is estimated at nearly 14 inches. Soil texture is a sandy loam with a neutral pH (6.9). Rock and pavement are concentrated on the surface and account for 54% of the ground cover. Some erosion is apparent due to the steep slope.

The site supports 11 shrub species, including the more preferred cliffrose and green ephedra. Blackbrush, slenderbush eriogonum, and desert almond also provide some browse. Cliffrose provides 27% of the browse cover with an estimated density of 220 plants/acre. Mature plants are large, averaging nearly 4 feet in height with a crown diameter of over 5 feet. They display light to moderate use and good vigor. Green ephedra density is approximately 680 plants/acre. They are light to moderately utilized. Other browse species show mostly light use, good vigor, and low decadence.

Undesirable shrubs found on the site include threadleaf snakeweed, Mohave desertrue (turpentine bush), and datil yucca (banana yucca). Snakeweed is the most abundant with a density of 1,720 plants/acre. Age class distribution would indicate a stable population however.

The herbaceous understory is very poor and depleted. Cheatgrass totally dominates the understory providing 99% of the grass cover and 79% of the herbaceous cover. No perennial grasses were encountered on the site, but some Indian ricegrass was observed growing under the protection of shrubs. The forb component is also poor with storksbill providing 99% of the forb cover. Other forbs are rare and only three perennial species were found. Perennial grass and forb cover provide less than 1/4 of 1% cover. The only forage source for deer or cattle would have to come from the shrubs.

1998 APPARENT TREND ASSESSMENT

The soil condition is poor. Rock and pavement provides most of the ground cover. Erosion is apparent, yet not severe. Shrubs are diverse and moderately abundant. Preferred species appear stable with light to moderate use, good vigor, and low decadence. However, reproduction is limited on most species. The herbaceous understory is very poor and totally dominated by cheatgrass and storksbill. Perennial species are rare.

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 57

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	432	99	21.97
G	Oryzopsis hymenoides	-	-	.00
G	Vulpia octoflora (a)	4	1	.00
Total for Annual Grasses		436	100	21.98
Total for Perennial Grasses		0	0	0.00
Total for Grasses		436	100	21.98
F	Aster spp.	6	3	.04
F	Cryptantha spp.	3	1	.00
F	Draba spp. (a)	8	3	.04
F	Erodium cicutarium (a)	164	63	5.59
F	Microsteris gracilis (a)	2	1	.00
F	Plantago patagonica (a)	10	5	.05
F	Salvia columbariae	5	2	.19
Total for Annual Forbs		184	72	5.68
Total for Perennial Forbs		14	6	0.23
Total for Forbs		198	78	5.92

BROWSE TRENDS --
Herd unit 30 , Study no: 57

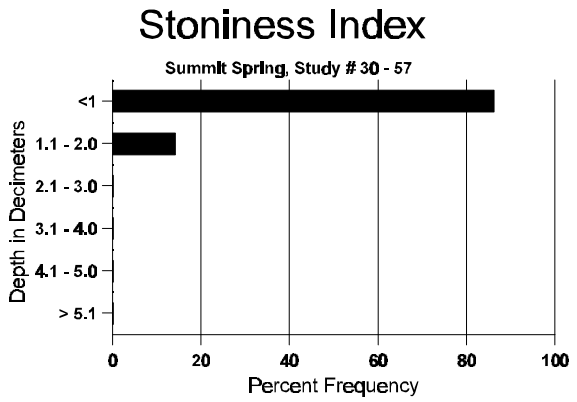
Type	Species	Strip Frequency '98	Average Cover % '98
B	Cowania mexicana stansburiana	8	5.73
B	Coleogyne ramosissima	11	-
B	Echinocereus engelmanii	1	.03
B	Ephedra viridis	17	.65
B	Eriogonum microthecum	0	.03
B	Gutierrezia micorcephala	44	3.47
B	Haplopappus linearifolius	25	4.05
B	Opuntia spp.	1	.00
B	Prunus fasciculata	5	4.85
B	Thamnosma montana	21	.50
B	Yucca baccata baccata	12	2.24
Total for Browse		145	21.59

BASIC COVER --
Herd unit 30 , Study no: 57

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	446	45.40
Rock	279	19.40
Pavement	397	34.65
Litter	454	27.13
Bare Ground	238	6.44

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 57, Study Name: Summit Spring

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.9	64.0 (15.9)	6.9	66.0	21.4	12.6	.7	10.4	83.2	.5



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 57

Type	Quadrat Frequency '98
Rabbit	5
Deer	28
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 57

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cowania mexicana stansburiana																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	6	4	-	-	-	-	-	-	-	10	-	-	-	200	47	64	10
% Plants Showing '98				Moderate Use 36%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		220	Dec:		-
Coleogyne ramosissima																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	11	1	-	-	-	-	-	-	-	12	-	-	-	240	27	46	12
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 08%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		240	Dec:		-
Echinocereus engelmanii																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	11	9	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Ephedra viridis																		
Y	98	6	3	-	1	-	-	-	-	-	10	-	-	-	200			10
M	98	15	6	-	-	-	-	-	-	-	21	-	-	-	420	21	29	21
D	98	2	1	-	-	-	-	-	-	-	1	-	-	2	60			3
% Plants Showing '98				Moderate Use 29%			Heavy Use 00%				Poor Vigor 06%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		680	Dec:		9%
Eriogonum microthecum																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	27	0
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia micorcephala																		
S	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	98	66	-	-	1	-	-	-	-	-	67	-	-	-	1340	16	19	67
D	98	12	-	-	1	-	-	-	-	-	3	-	-	10	260			13
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	420			21
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 11%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1740	Dec:		15%
Haplopappus linearifolius																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	98	23	-	-	-	-	-	-	-	-	23	-	-	-	460	22	31	23
D	98	11	-	-	-	-	-	-	-	-	9	-	-	2	220			11
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 05%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		780	Dec:		28%
Opuntia spp.																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	12	0
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Prunus fasciculata																		
S	98	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
M	98	8	1	-	-	-	-	-	-	-	9	-	-	-	180	45	67	9
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 11%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Thamnosma montana																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	18	2	-	1	-	-	-	-	-	20	-	1	-	420	16	34	21
D	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 13%			Heavy Use 00%			Poor Vigor 04%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		480	Dec:		4%
Yucca baccata baccata																		
M	98	32	-	-	-	-	-	-	-	-	32	-	-	-	640	31	39	32
D	98	4	-	-	1	-	-	-	-	-	2	-	-	3	100			5
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 08%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		740	Dec:		14%

Trend Study 30-58-98

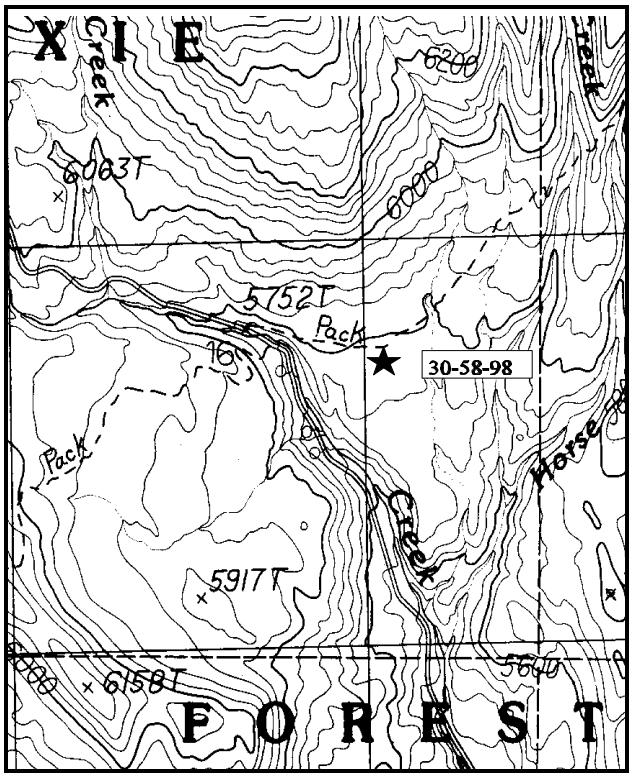
Study site name: Spirit Creek South Burned . Range type: Burn .

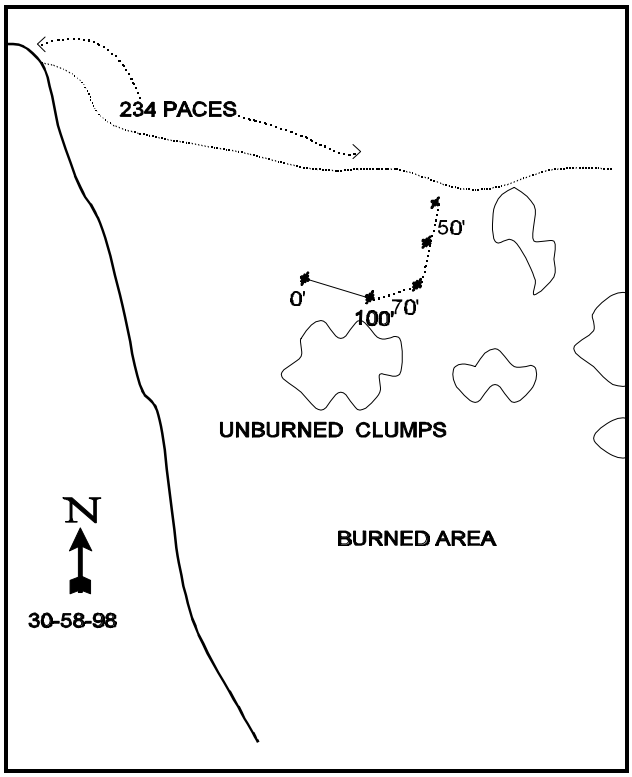
Compass azimuth: frequency baseline 111 M degrees. (Line 2 94°M, line 3 &4 15°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

Traveling south on I-15 from Cedar City, take the first Leeds exit. Travel northwest on the Leeds Creek Road for 3.25 miles. Stay to the right at the fork and proceed about 4 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°) of the trail. This is the 0-foot baseline stake. All stakes are 4 foot tall green fence posts.





Map Name: Signal Peak

Diagrammatic Sketch

Township 40S , Range 14W , Section 16

UTM 4131707.538 N, 285032.527 E

DISCUSSION

Trend Study No. 30-58 (50A-26)

The Spirit Creek South Burn trend site consists of a nearly level grass meadow surrounded by Gambel and shrub-live oak. The site has an elevation of 5,800 feet, slope of 4-5%, and a south to southeast aspect. The site, which was previously a mountain big sagebrush flat, was burned in June 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 estimate a high level of use at 76 deer days use/acre. Some of the deer pellet groups were fresh when the study was read in 1998 on June 4th. No cattle grazing occurs in this area.

Soil is a moderately deep sandy loam with little rock on the surface or within the profile. Effective rooting depth (see methods) is estimated at over 27 inches. The soil has a slightly acid 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 vegetative cover was less than one percent. Bare ground covered 94% of the ground surface, while litter left after the fire, averaged only 6%. The site was read again in September of 1987. Basal vegetative cover increased to 10%, litter increased to 16%, while 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 vegetative cover averaged 23%, while bare ground continued to decline significantly. Litter cover rose to 49%. Protective ground cover has continued to improve. By 1998, percent bare ground had declined to 18%, while litter cover increased to 68%.

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 seedling sagebrush per acre on the site. Desert ceanothus and broom snakeweed seedlings also appeared in small numbers. Oak increased along the frequency base line, 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. Utilization of browse in all years was light. 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 consist of old burned stems. Utilization of the sagebrush is mostly light with some moderate use. Vigor is good on all except decadent sagebrush. Density of Gambel oak increased due to the larger sample where it grows in vigorous scattered clones. Mature plants average nearly 4 feet in height.

The site is currently dominated by seeded grasses and alfalfa. However, during the 1986 reading, no seeded species had established. Bottlebrush squirreltail and mutton grass 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 being the most common. Seeded forbs, yellow sweetclover 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 is also fairly abundant. Two species, orchard and mutton grass, 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. They account for 24% and 11% of the grass cover respectively. Annual cheatgrass was also encountered in 1998. Previous readings did not include annuals in their samples. Currently, cheatgrass provides only 5% of the grass cover, although it has a quadrat frequency of 65%.

Overall, quadrat frequency of forbs have declined since 1987. Seeded forbs have all disappeared with the exception of alfalfa which has increased. During the 1998 reading, alfalfa accounted for 82% of the forb cover. It declined significantly in nested frequency between 1987 and 1992, but has since remained stable. Forb diversity and abundance is likely hindered by the abundance of aggressive exotic grasses seeded onto the site. These grasses will limit future shrub recruitment (Monsen et al. 1995, Walker et al. 1995).

1992 TREND ASSESSMENT

Soil conditions have improved dramatically since the burn. Basal vegetative cover has increased every year, while bare ground has declined. Litter cover has increased from 6% to 49%. Browse are not abundant on the site, but some sagebrush has become re-established 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. One area of concern is the lack of forbs on the site which are important for spring and summer forge for deer (Valentine 1990).

TREND ASSESSMENT
soil - improved
browse - up, but poor composition, however not important for summer/fawning area
herbaceous understory - stable, but poor forb diversity and abundance

1998 TREND ASSESSMENT

Trend for soil continues to improve with percent bare ground declining from 28% to 18% and litter cover increasing from 49% to 68%. Erosion does not appear to be a problem on this site. Trend for browse appears to be up slightly. Density of mountain big sagebrush has increased and broom snakeweed density has declined 55%. Use of the limited sagebrush is not as heavy as reported in 1992. Trend for the herbaceous understory is mixed. Trend for grasses is up with a significant increase in the nested frequency of intermediate wheatgrass and smooth brome. Sum of nested frequency of forbs has declined slightly. The most abundant forb, alfalfa, has remained stable however. Trend is considered up slightly, yet the forb composition is poor.

TREND ASSESSMENT
soil - up
browse - up slightly, but limited in number
herbaceous understory - up slightly, but poor forb diversity and abundance

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 58

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %
		'86	'87	'92	'98	'86	'87	'92	'98	'98
G	Agropyron cristatum	-	187	223	203	-	73	91	79	9.51
G	Agropyron intermedium	$_{a}$-	$_{b}$163	$_{c}$268	$_{d}$299	-	65	92	93	22.76
G	Bromus inermis	$_{a}$-	$_{b}$33	$_{b}$62	$_{c}$166	-	19	28	69	4.42
G	Bromus tectorum (a)	-	-	-	197	-	-	-	65	1.82
G	Dactylis glomerata	$_{a}$-	$_{b}$19	$_{a}$-	$_{a}$-	-	10	-	-	-
G	Festuca ovina	$_{a}$-	$_{b}$15	$_{a}$2	$_{a}$5	-	8	1	2	.18
G	Poa fendleriana	$_{ab}$2	$_{b}$14	$_{a}$-	$_{ab}$2	1	7	-	1	.15
G	Poa pratensis	-	-	-	-	-	-	-	-	.00
G	Sitanion hystrix	5	10	2	1	3	5	2	1	.03
G	Vulpia octoflora (a)	-	-	-	36	-	-	-	15	.40
Total for Annual Grasses		0	0	0	233	0	0	0	80	2.22
Total for Perennial Grasses		7	441	557	676	4	187	214	245	37.07
Total for Grasses		7	441	557	909	4	187	214	325	39.30
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$-	9	-	-	-	4	.04
F	Chenopodium spp. (a)	3	-	2	-	1	-	1	-	-
F	Crepis acuminata	-	-	1	-	-	-	1	-	-
F	Cymopterus spp.	-	-	-	5	-	-	-	3	.02
F	Draba spp. (a)	-	-	-	22	-	-	-	9	.09
F	Erigeron spp.	-	-	3	-	-	-	1	-	-
F	Euphorbia spp.	17	16	23	9	7	8	9	3	.06
F	Lotus utahensis	6	12	6	6	3	6	4	3	.33
F	Melilotus officinalis	$_{a}$-	$_{b}$24	$_{a}$-	$_{a}$-	-	13	-	-	-
F	Medicago sativa	$_{a}$-	$_{c}$88	$_{b}$41	$_{b}$40	-	45	25	17	7.13
F	Microsteris gracilis (a)	-	-	-	183	-	-	-	76	1.00
F	Nicotiana attenuata (a)	-	39	-	-	-	21	-	-	-
F	Penstemon leonardi	-	2	-	-	-	1	-	-	-
F	Physalis spp.	$_{a}$-	$_{b}$5	$_{a}$-	$_{a}$-	-	4	-	-	-
F	Sanguisorba minor	-	2	-	-	-	2	-	-	-
F	Sphaeralcea grossulariaefolia	-	3	-	-	-	1	-	-	-
F	Unknown forb-perennial	-	-	6	-	-	-	2	-	-
Total for Annual Forbs		3	39	2	205	1	21	1	85	1.09
Total for Perennial Forbs		23	152	80	69	10	80	42	30	7.59
Total for Forbs		26	191	82	274	11	101	43	115	8.69

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 58

Type	Species	Strip Frequency ⍰98	Average Cover % ⍰98
B	Arctostaphylos patula	2	.03
B	Artemisia tridentata vaseyana	13	.45
B	Ceanothus greggii	0	-
B	Eriodictyon angustifolium	0	-
B	Gutierrezia sarothrae	3	.15
B	Opuntia spp.	2	.30
B	Quercus gambelii	27	5.15
B	Quercus turbinella	4	.03
Total for Browse		51	6.11

CANOPY COVER --
Herd unit 30 , Study no: 58

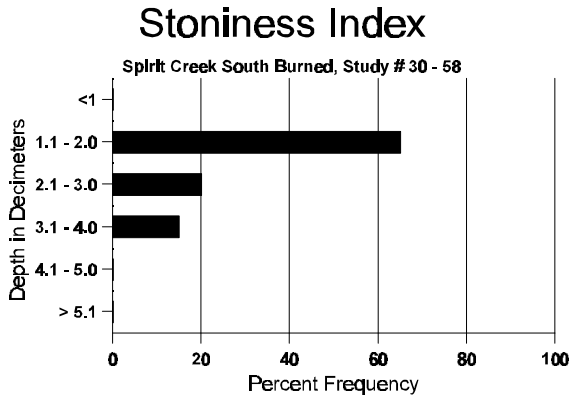
Species	Percent Cover ⍰98
Quercus gambelii	1

BASIC COVER --
Herd unit 30 , Study no: 58

Cover Type	Nested Frequency ⍰98	Average Cover % '86	'87	'92	'98
Vegetation	378	.25	9.75	22.50	55.70
Rock	9	0	0	0	.02
Pavement	72	0	.25	.75	.51
Litter	400	5.50	15.75	48.50	68.34
Cryptogams	60	0	0	0	.46
Bare Ground	214	94.25	74.25	28.25	18.20

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 58, Study Name: Spirit Creek South Burned

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
27.4	42.8 (17.7)	6.1	64.0	21.4	14.6	1.8	15.2	176.0	.7



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 58

Type	Quadrat Frequency '98
Rabbit	1
Deer	55

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 58

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Arctostaphylos patula																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	1	-	-	-	-	-	-	-	2	-	-	-	40	14	19	2
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'86	00%	00%	00%
'87	00%	00%	00%
'92	00%	00%	00%
'98	50%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	0		-
	'92	0		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	13	-	-	-	-	-	-	-	-	13	-	-	-	433			13
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	3	1	-	-	-	-	-	-	-	4	-	-	-	133			4
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	7	2	-	1	-	-	-	-	-	10	-	-	-	200	17	24	10
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	98	3	1	-	-	-	-	-	-	-	1	-	-	3	80			4
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1880			94

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	20%	20%	00%	+51%
'98	18%	00%	18%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	0%
	'87	0		0%
	'92	166		20%
	'98	340		24%

Ceanothus greggii																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	0		-
	'92	0		-
	'98	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriodictyon angustifolium																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	13	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'86	00%	00%	00%
'87	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'86	0		-
'87	0		-
'92	0		-
'98	0		-

Gutierrezia sarothrae																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	10	-	-	-	-	-	-	-	-	9	-	1	-	333	9	7	10
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	133	10	15	4
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	6	12	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	09%	-27%
'92	00%	00%	00%	-55%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'86	0		-
'87	366		-
'92	266		-
'98	120		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	1	-	-	-	-	-	-	-	-	-	-	1	-	33	6	9	1
	98	-	2	-	-	-	-	-	-	-	-	-	-	2	40	8	22	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	-50%
'92	00%	00%	100%	+18%
'98	100%	00%	100%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'86	0		-
	'87	66		-
	'92	33		-
	'98	40		-

Quercus gambelii																		
S	86	98	8	-	-	-	-	-	-	-	104	-	2	-	3533			106
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	18	1	-	-	-	-	-	-	-	16	3	-	-	633			19
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	30	-	-	-	-	-	-	-	-	30	-	-	-	600			30
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	44	5	-	13	-	-	-	-	-	62	-	-	-	1240	45	48	62
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	05%	00%	00%	
'92	00%	00%	00%	
'98	05%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'86	0		0%
	'87	633		0%
	'92	0		0%
	'98	2000		8%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus turbinella																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	50	59	1
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'86	00%	00%	00%
'87	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	50%

Total Plants/Acre (excluding Dead & Seedlings)			%Change	
	'86	0	Dec:	0%
	'87	0		0%
	'92	0		0%
	'98	80		50%

Trend Study 30-59-98

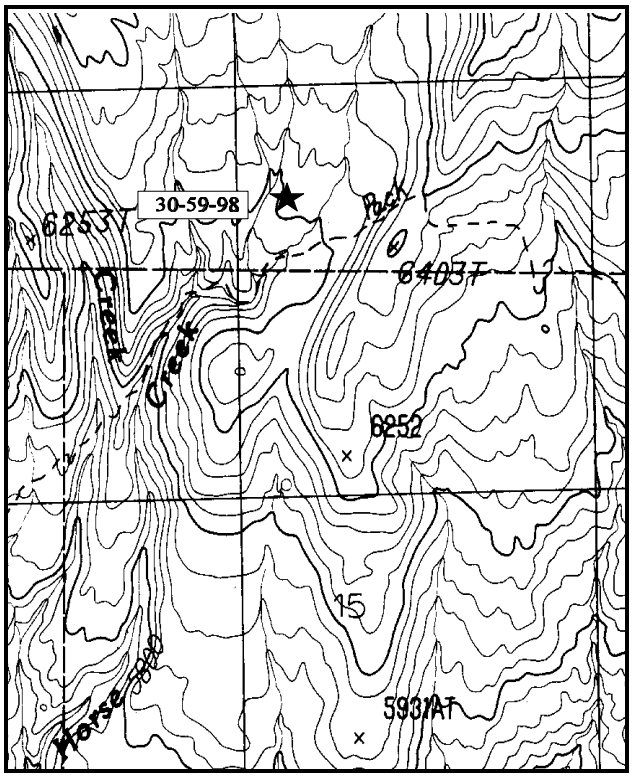
Study site name: Upper Horse Creek . Range type: Burn .

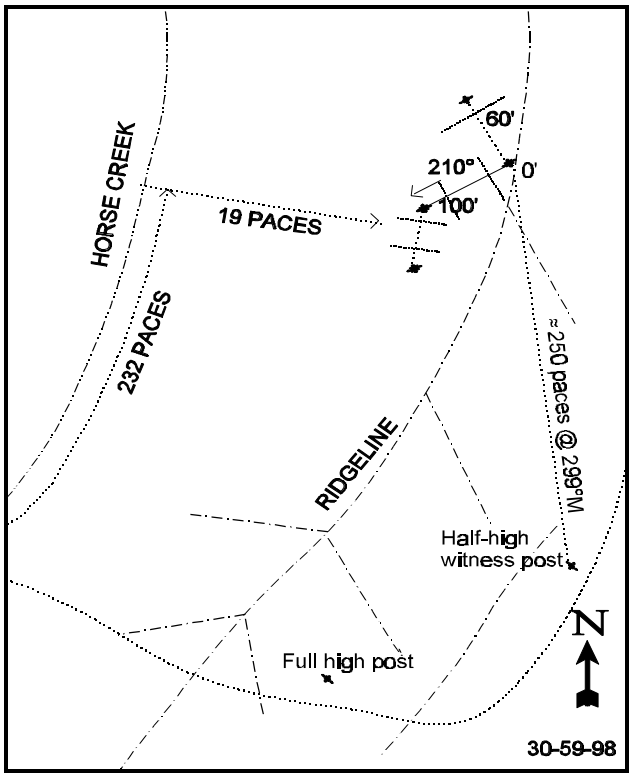
Compass azimuth: frequency baseline 210 M degrees. (Line 2 193°, line 3 290°)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

From Oak Grove campground travel back down the road about 2 miles to the Jones Hollow trail head on the northeast side of the road (it is blocked off by boulders). Park here and hike up the trail about 3/4 of a mile to Spirit Creek. Cross the creek and continue northeast for approximately 1/4 of a mile to horse creek. Follow the trail along the north side of the east fork of Horse Creek upstream to a half-high witness post. Walk approximately 250 paces at 299°M to the base of the ridge where there is a green fence post marking the 0-foot end of the frequency baseline. All transect stakes are 1½ foot tall green steel fence posts. The baseline starts on top of the ridge.





Map Name: Signal Peak Diagrammatic Sketch

Township 40S , Range 14W , Section 10 UTM 4132876.911 N, 286202.829 E

DISCUSSION

Trend Study No. 30-59 (50A-30)

The Upper Horse Creek study samples a burned curlleaf mountain mahogany site. Elevation is approximately 6,200 feet with a southeast aspect and slope of 5% to 8%. The site was previously dominated by large mature curlleaf mountain mahogany trees with an oak understory. A wildfire burned the area in June of 1986 which killed all the mahogany. Deer use this area in the summer and year-long during mild winters. Nearby Horse Creek provides year-round water. Pellet group data from 1998 estimate 31 deer days use/acre. Counts may have been under estimated due to the difficulty in seeing pellet groups in the thick herbaceous vegetation.

The soil is moderately deep, but very rocky with abundant large rocks on the surface and within the profile. These rocks are large and appear to be granite. Effective rooting depth (see methods) is estimated at nearly 19 inches. Soil texture is a sandy loam with a moderately acid pH (6.0). Erosion increased immediately after the fire and continued in 1987. Basal vegetative cover was less than 1% in 1986. Bare ground averaged 19% while litter remaining after the fire covered 50% of the ground surface. Basal vegetative cover increased to 5% by 1987, but bare ground increased to 45% and litter declined to 21%. Soil movement, active gullies, and other signs of erosion were reported during both years. By 1992, conditions had improved. Basal vegetative cover increased to 14%, litter increased to 48%, and bare ground declined to 12%. No signs of erosion were noticeable. During the 1998 reading, conditions improved slightly with percent bare ground declining slightly. Litter cover increased from 48% to 57% and rock cover declined from 25% to 16%. There are currently no signs of erosion on the site, although there is a gully nearby which shows some signs of activity during high runoff events.

Curlleaf mountain mahogany was eliminated after the fire, but Utah serviceberry, Gambel oak, and a Gambel-shrub live oak hybrid, sprouted profusely. During the 1986 reading, there were an estimated 2,600 serviceberry and 3,499 oak seedlings per acre. The only other browse found included a small number of yellowleaf silktassel seedlings and an unidentified browse. By 1987, population densities of serviceberry increased to 4,333 young and 400 seedlings per acre. Oak densities declined to 1,532 young and seedlings per acre. Desert ceanothus was encountered in 1987 with an estimated density of 600 plants/acre. Between 1987 and 1992, serviceberry densities declined by 54% to 1,999 plants/acre. Gambel oak declined from 833 to 166 plants/acre, while the oak hybrid decreased from 533 to 433 plants/acre. Reproductive potentials of all species have declined. Desert ceanothus density remained fairly constant with an estimate of 566 plants/acre. A much larger sample was used in 1998 which better estimates shrub populations which often have discontinuous and/or aggregated distributions. As a result, some of the population density changes may be due to the change in sample size. Currently, density of serviceberry is estimated at 560 plants/acre. Density of desert ceanothus also declined from 566 to 180 plants/acre. Since there are no dead or decadent plants for either species, the change in density is due to the increased sample. More Gambel oak was encountered in the larger sample. Density increased 93%, from 166 to 2,320 plants/acre. Mature plants averaging nearly 4 feet in height represent 68% of the population. No seedlings were encountered, yet young plants are fairly abundant.

Utilization of serviceberry was moderate in 1987 and 1992, while browsing on oak has been light. Use of desert ceanothus was mostly light with some plants displaying moderate to heavy use in 1992. Utilization of browse was mostly light in 1998, but some moderate and heavy use was noted on serviceberry and desert ceanothus. Vigor is good on most shrubs, but reproduction is poor for serviceberry and desert ceanothus. No oak seedlings were found in 1998, although young plants account for 27% of the population.

During the first reading in September of 1986, no perennial grasses were encountered, while only two forbs were found. Since then, seeded exotic grasses consisting of crested and intermediate wheatgrass, smooth brome, and alfalfa dominate the understory and provide intense competition to shrub recruitment. However, this is not very important on a summer range. Cheatgrass brome is also well established. It currently

provides 28% of the grass cover. The forb component is dominated by the seeded alfalfa which currently ('98) provides 76% of the forb cover. The only other fairly abundant forb is wormwood. Alfalfa was heavily utilized in 1992, but appeared unutilized as of June 4th, 1998.

1992 TREND ASSESSMENT

Soil conditions have improved since 1986 and 1987. Basal vegetative cover has increased from less than zero to 14% by 1992. Litter cover has increased to 48%, while bare ground has declined to only 12%. Key browse species increased dramatically after the burn, then declined in density between 1987 and 1992. All species currently display reduced reproductive potentials. It appears that competition from the herbaceous understory and the moderate to heavy wildlife use are effectively controlling shrub recruitment. But again, not important on this summer range. Trend for browse is slightly down since 1987. Seeded exotic grasses, crested wheatgrass, intermediate wheatgrass, and the seeded forb alfalfa dominate the site. Nested frequencies of these plants have increased steadily since the fire. On the downward side, cheatgrass brome is also well established. Overall, trend for herbaceous understory is up.

TREND ASSESSMENT
soil - improved
browse - slightly down
herbaceous understory - up

1998 TREND ASSESSMENT

Trend for soil is up slightly with a slight decline in percent bare ground and an increase in litter cover from 48% to 57%. Currently, there is no problem with erosion on the site. Trend for browse appears stable. The changes in density appear to be due to the larger sample. Use of the browse is mostly light and recruitment adequate to maintain populations at current levels. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Nested frequency of smooth brome increased significantly, while frequency of crested wheatgrass and intermediate wheatgrass remained similar. Eleven new perennial forb species were encountered in the new sample. The dominant forb, alfalfa, remained at a similar frequency compared to 1987 and 1992.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - up slightly

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 59

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %
		'86	'87	'92	'98	'86	'87	'92	'98	'98
G	Agropyron cristatum	a-	b26	c80	c62	-	11	28	27	2.00
G	Agropyron intermedium	a-	b45	c179	c191	-	21	61	60	11.51
G	Agropyron smithii	-	-	-	4	-	-	-	1	.03
G	Bromus inermis	a-	a4	a4	b33	-	1	2	12	1.17
G	Bromus tectorum (a)	-	-	-	159	-	-	-	52	6.13
G	Carex spp.	-	-	-	2	-	-	-	1	.15
G	Dactylis glomerata	-	3	-	3	-	1	-	1	.15

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %
		'86	'87	'92	'98	'86	'87	'92	'98	98
G	Festuca ovina	-	-	-	3	-	-	-	1	.03
G	Leucopoa kingii	-	2	-	-	-	1	-	-	-
G	Poa fendleriana	-	-	4	2	-	-	1	2	.09
G	Sitanion hystrix	-	-	1	3	-	-	1	2	.06
G	Sporobolus cryptandrus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$23	-	-	-	11	.84
Total for Annual Grasses		0	0	0	159	0	0	0	52	6.13
Total for Perennial Grasses		0	80	268	326	0	35	93	118	16.06
Total for Grasses		0	80	268	485	0	35	93	170	22.20
F	Agoseris glauca	-	-	-	2	-	-	-	1	.03
F	Allium spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$17	-	-	-	6	.05
F	Artemisia dracunculus	$_{a}$-	$_{a}$-	$_{ab}$2	$_{b}$25	-	-	1	11	1.39
F	Artemisia ludoviciana	-	-	4	7	-	-	1	2	.30
F	Collomia linearis (a)	-	-	-	2	-	-	-	2	.01
F	Crepis acuminata	-	-	3	1	-	-	1	1	.03
F	Cryptantha spp.	-	-	-	4	-	-	-	1	.00
F	Delphinium nuttallianum	-	-	-	3	-	-	-	1	.00
F	Dichelostemma pulchellum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$12	-	-	-	6	.05
F	Dracocephalum parviflorum	-	-	7	-	-	-	3	-	-
F	Epilobium paniculatum (a)	-	-	-	3	-	-	-	1	.00
F	Erodium cicutarium (a)	-	5	-	-	-	2	-	-	-
F	Erigeron spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$14	-	-	-	6	.08
F	Eriogonum racemosum	-	-	-	2	-	-	-	1	.03
F	Gilia spp. (a)	-	-	-	3	-	-	-	2	.01
F	Lappula occidentalis (a)	-	-	-	9	-	-	-	4	.04
F	Lupinus argenteus	-	-	-	-	-	-	-	-	.03
F	Machaeranthera canescens	-	-	8	7	-	-	3	3	.04
F	Medicago sativa	-	74	85	71	-	36	36	27	10.00
F	Microsteris gracilis (a)	-	-	-	69	-	-	-	31	.42
F	Nicotiana attenuata (a)	-	2	-	-	-	1	-	-	-
F	Polygonum douglasii (a)	-	-	-	1	-	-	-	1	.00
F	Senecio multilobatus	-	1	3	-	-	1	1	-	-
F	Sphaeralcea grossulariaefolia	$_{a}$4	$_{ab}$17	$_{b}$29	$_{a}$11	2	8	14	5	.37
F	Taraxacum officinale	-	-	1	-	-	-	1	-	-
F	Tragopogon dubius	-	-	-	1	-	-	-	1	.00
F	Trifolium spp.	-	1	-	-	-	1	-	-	-
F	Unknown forb-annual (a)	-	4	-	-	-	2	-	-	-
F	Unknown forb-perennial	2	-	-	-	1	-	-	-	-
F	Verbascum thapsus	-	-	3	-	-	-	1	-	-
F	Viguiera multiflora	-	-	-	5	-	-	-	3	.18

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %
		'86	'87	'92	'98	'86	'87	'92	'98	'98
Total for Annual Forbs		0	11	0	87	0	5	0	41	0.50
Total for Perennial Forbs		6	93	145	182	3	46	62	75	12.62
Total for Forbs		6	104	145	269	3	51	62	116	13.12

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 59

Type	Species	Strip Frequency '98	Average Cover % '98
B	Acer grandidentatum	0	-
B	Amelanchier utahensis	21	2.63
B	Arctostaphylos patula	0	-
B	Artemisia tridentata vaseyana	1	.03
B	Ceanothus greggii	9	2.13
B	Cercocarpus ledifolius	1	.15
B	Clematis columbiana	2	-
B	Garrya flavescens	6	1.61
B	Opuntia spp.	1	.15
B	Quercus gambelii	31	7.34
B	Quercus gambelii-turbinella hybrid	0	-
B	Ribes spp.	0	-
B	Symphoricarpos oreophilus	0	-
Total for Browse		72	14.05

CANOPY COVER --
Herd unit 30 , Study no: 59

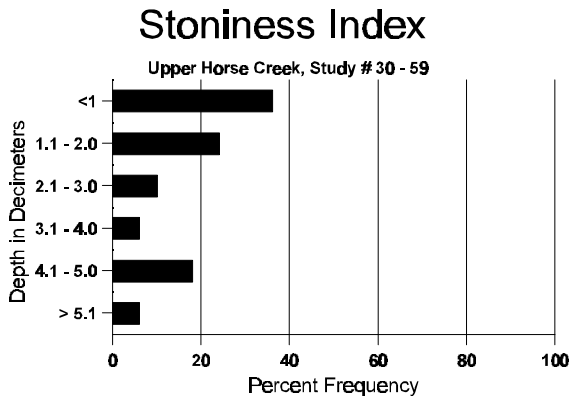
Species	Percent Cover '98
Acer grandidentatum	2
Quercus gambelii	2

BASIC COVER --
Herd unit 30 , Study no: 59

Cover Type	Nested Frequency '98	Average Cover % '86	'87	'92	'98
Vegetation	353	0	5.00	13.75	48.02
Rock	166	25.75	25.75	24.75	16.25
Pavement	50	5.00	4.00	1.75	.84
Litter	383	50.00	20.75	48.25	57.31
Cryptogams	7	0	0	0	.04
Bare Ground	137	19.25	44.50	11.50	10.26

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 59, Study Name: Upper Horse Creek

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
18.5	45.3 (17.7)	6.0	72.0	17.4	10.6	2.1	16.2	86.4	.5



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 59

Type	Quadrat Frequency '98
Deer	18

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 59

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Acer grandidentatum																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	136	142	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
	'86	0	-
	'87	0	-
	'92	0	-
	'98	0	-

Amelanchier utahensis																		
S	86	78	-	-	-	-	-	-	-	-	78	-	-	-	2600			78
	87	12	-	-	-	-	-	-	-	-	12	-	-	-	400			12
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	80	50	-	-	-	-	-	-	-	130	-	-	-	4333			130
	92	9	11	-	3	-	-	-	-	-	23	-	-	-	766			23
	98	13	-	-	-	-	-	-	-	-	12	1	-	-	260			13
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	11	22	3	1	-	-	-	-	-	36	-	1	-	1233	26	25	37
	98	11	2	2	-	-	-	-	-	-	15	-	-	-	300	33	31	15

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	38%	00%	00%	-54%
'92	55%	05%	02%	-72%
'98	07%	07%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
	'86	0	-
	'87	4333	-
	'92	1999	-
	'98	560	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Arctostaphylos patula																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	22	45	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	100%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		-
'87	0			-
'92	33			-
'98	0			-

Artemisia tridentata vaseyana																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	22	39	1
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		-
'87	0			-
'92	0			-
'98	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ceanothus greggii																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	18	-	-	-	-	-	-	-	-	18	-	-	-	600			18
	92	-	-	-	-	-	-	2	-	-	2	-	-	-	66			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	7	3	3	2	-	-	-	-	-	14	1	-	-	500	11	18	15
	98	7	2	-	-	-	-	-	-	-	9	-	-	-	180	23	44	9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	- 6%
'92	18%	18%	00%	-68%
'98	22%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	600		-
	'92	566		-
	'98	180		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus ledifolius																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	1	-	-	-	-	-	-	-	2	-	-	-	66			2
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	44	30	0
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	50%	00%	00%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	0		-
	'92	66		-
	'98	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Clematis columbiana																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	35	25	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		-
'87	0			-
'92	0			-
'98	60			-

Garrya flavescens																		
S	86	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	87	7	-	-	-	-	-	-	-	-	6	1	-	-	233			7
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	6	1	-	-	-	6	1	-	-	233	12	11	7
	98	7	-	-	2	-	-	-	-	-	8	-	1	-	180	29	49	9
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	-12%
'92	86%	14%	00%	- 6%
'98	00%	00%	09%	

Total Plants/Acre (excluding Dead & Seedlings)			
'86	0	Dec:	0%
'87	266		0%
'92	233		0%
'98	220		9%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	1	-	-	-	-	-	-	-	-	-	-	1	-	33	7	13	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	12	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	+ 0%
'92	00%	00%	100%	-39%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'86	0		-
	'87	33		-
	'92	33		-
	'98	20		-

Quercus gambelii																		
S	86	53	-	-	-	-	-	-	-	-	53	-	-	-	1766			53
	87	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	92	4	-	-	-	-	-	-	-	-	1	-	3	-	133			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	25	-	-	-	-	-	-	-	-	19	6	-	-	833			25
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	31	-	-	-	-	-	-	-	-	31	-	-	-	620			31
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	3	1	-	-	-	-	-	-	-	4	-	-	-	133	50	43	4
	98	74	1	-	4	-	-	-	-	-	79	-	-	-	1580	44	45	79
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	6	-	-	-	-	-	-	-	-	-	1	5	-	120			6
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	400			20

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	-80%
'92	20%	00%	00%	+93%
'98	.86%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'86	0		0%
	'87	833		0%
	'92	166		0%
	'98	2320		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii-turbinella hybrid																		
S	86	52	-	-	-	-	-	-	-	-	52	-	-	-	1733			52
	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	16	-	-	-	-	-	-	-	-	16	-	-	-	533			16
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	12	-	-	-	-	-	12	-	-	-	400	63	47	12
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	-19%
'92	08%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		-
'87	533			-
'92	433			-
'98	0			-

Ribes spp.																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	59	46	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'86	0	Dec:	-
'87	0		-
'92	0		-
'98	0		-

Symphoricarpos oreophilus																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	30	56	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'86	0	Dec:	-
'87	0		-
'92	0		-
'98	0		-

Trend Study 30-60-98

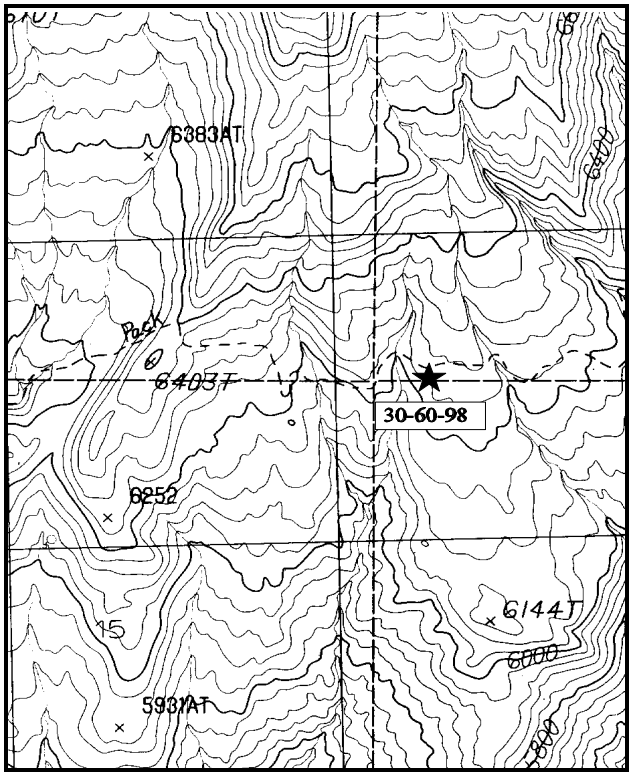
Study site name: Jones Hollow I . Range type: Burn .

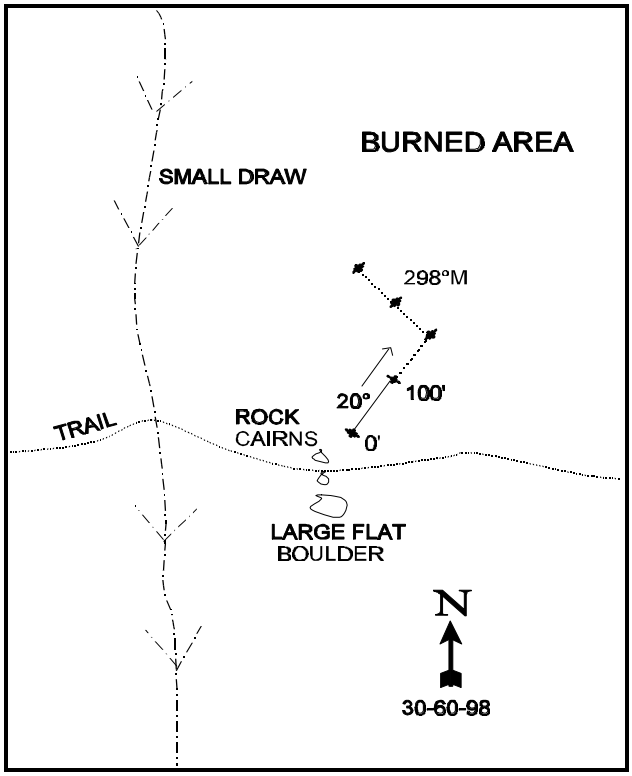
Compass azimuth: frequency baseline 20 M degrees. (Lines 3 & 4 298°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Oak Grove campground travel back down the road about 2 miles to the Jones hollow trail head on the northeast side of the road (it is blocked off by boulders). Park here and hike up the trail about 3/4 of a mile to Spirit Creek. Cross the creek and continue northeast for approximately 1/4 of a mile to horse creek. Continue to where the trail goes to the right and goes out of a small wash. From here follow the trail for 937 paces (close to 1 mile) over several hills and creek crossings until you get on top of a relatively flat, rocky table. Rock cairns mark the transect site along the trail. Also, right across the trail from where the transect starts is a seasonal pool. The frequency baseline begins on the north (left) site of the trial and is marked by a 1½ tall, green fence post with browse tag #7860 attached. All transect stakes are 1½ foot tall green fence posts.





Map Name: Signal Peak

Diagrammatic Sketch

Township 40S , Range 14W , Section 11

UTM 4132577.295 N, 287381.180 E

DISCUSSION

Trend Study No. 30-60 (50A-31)

The Jones Hollow trend study is on mixed mountain brush, on a nearly level southwest facing slope on the east side of the Pine Valley Mountains. Elevation is approximately 6,200 feet. The entire area was burned by a wild fire in early June of 1986. Unlike the Upper Horse Creek site, this area received very little seed after the fire. Deer utilize this during the summers and year-round during mild winters, but at a lower intensity than Upper Horse Creek or Spirit Creek. Pellet group data from 1998 estimate only 17 deer days use/acre. Two antler sheds were also found in 1998.

Soils are coarse, sandy, shallow, and loosely compacted with large amounts of granite rock boulders on the surface and in the profile. Effective rooting depth (see methods) is estimated at almost 15 inches. Soil texture is a sandy loam with a slightly acid pH (6.1). Even with the slight slope, erosion has been a problem due to the lack of protective herbaceous cover. Large bare areas occur between oak clones and the bases of grasses are pedestaled. However, conditions have improved steadily since the fire. Bare ground, which occupied 71% of the ground surface in 1986, and 63% in 1987, declined to 22% by 1998. Basal vegetative cover increased from 2% in 1986 to 5% by 1992. Litter cover has also steadily increased from 12% in 1986 to 56% by 1998. Rock and pavement cover combined have remained fairly constant.

Browse is diverse with ten species occurring on the site. The key species consist of Utah serviceberry, Gambel oak, and shrub-live oak. Other species which occur in small numbers included greenleaf manzanita, mountain big sagebrush, desert ceanothus, narrowleaf yerba-santa, opuntia, and yellowleaf silktassel. Serviceberry, resprouting after the fire, had an estimated density of 10,533 seedlings and young per acre in 1986. It's density declined, but appeared to stabilize in 1992. Currently ('98), there are an estimated 1,520 plants/acre. Reproductive potential and proportion of young plants in the population have steadily declined since 1986, but current recruitment is sufficient to maintain the population at current levels. Utilization has been light to moderate since 1986.

Gambel and shrub-live oak, also resprouting after the fire, have declined steadily on the density plots between 1986 and 1992 as part of a natural thinning process. The much larger sample used in 1998 picked up more Gambel and shrub-live oak with estimated densities of 3,920 and 1,480 plants/acre respectively. Mature oak now averages five feet in height, creating thick clones which are mostly unavailable to wildlife. Oak is lightly utilized in all years and is in generally good vigor. Preferred understory shrubs consisting of mountain big sagebrush and desert ceanothus, provide additional forage. These shrubs occur in low numbers, and receive moderate use.

The herbaceous understory on this site is sparse when compared to the other burn sites. All grasses combined produce less than 1% cover with the annual, cheatgrass, providing 49% of that cover. Smooth brome, intermediate wheatgrass and bottlebrush squirreltail are the most abundant perennial grasses on the site but they occur rarely. None have a quadrat frequency of more than 6%. Forbs are more diverse and abundant with American vetch being the most numerous as it provides 69% of the forb cover. Wild onion and blue dicks (*Dichelostemma pulchellum*) are also fairly common. Sum of nested frequency for grasses has remained relatively stable since 1987, while frequency of forbs has increased with each reading.

1992 TREND ASSESSMENT

Since the burn, soil conditions have improved. Basal vegetative cover has increased from 2% to 5% since 1987, while bare ground has steadily decreased. Litter cover is increasing. Some erosion is still occurring on the site, but it is not significant. It will likely continue until the herbaceous understory becomes more extensively established. Trend for soil is up. There is a good mix of browse on the site. The key species,

Utah serviceberry and Gambel oak, increased dramatically right after the burn, then declined as natural thinning occurred. Currently, both appear to have healthy populations with adequate reproductive potentials. Trend for browse is stable. The herbaceous understory is deficient on this site. Sum of nested frequency for all grasses combined came to only 69 in 1992. Forbs are more common, but still deficient. Nested and quadrat frequencies for both forbs and grasses have increased steadily since 1986. Trend for herbaceous understory is up, but deficient.

TREND ASSESSMENT
soil - improved
browse - stable
herbaceous understory - up, but deficient

1998 TREND ASSESSMENT

Trend for soil is up slightly. Protective ground cover continues to increase and percent bare ground continues to decline. Unfortunately, the herbaceous understory is poor, with the bulk of the vegetative cover coming from shrubs. There is some localized erosion occurring but it is minimized by the level terrain. Trend for the key browse species, serviceberry and Gambel oak, is stable. Serviceberry appears to have a stable population with steadily declining biotic potentials since the fire. The proportion of young plants has also decreased as the population becomes more mature. Utilization is light to moderate, vigor normal on most plants, and percent decadency low at only 7%. Gambel oak has increased in density from 1,000 to 3,920 stems/acre. This change is mostly due to the much larger sample used in 1998. Biotic potential and the proportion of young plants in the population has remained stable. Oak appears unutilized, in good vigor, with low decadence. Important understory shrubs, mountain big sagebrush and desert ceanothus, occur in small numbers, although they appear to be increasing. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has declined slightly, while frequency of perennial forbs has increased slightly. Composition and abundance of grasses is poor. All grasses produce less than 1% cover with annual cheatgrass providing 49% of that cover.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - stable, but grasses are deficient

HERBACEOUS TRENDS --
Herd unit 30 , Study no: 60

Type	Species	Nested Frequency '86	'87	'92	'98	Quadrat Frequency '86	'87	'92	'98	Average Cover % '98
G	Agropyron cristatum	a-	b16	b11	a-	-	8	6	-	-
G	Agropyron intermedium	a-	ab1	bc12	c15	-	1	4	5	.07
G	Bromus inermis	-	11	31	19	-	6	10	6	.13
G	Bromus tectorum (a)	-	-	-	74	-	-	-	30	.35
G	Dactylis glomerata	-	6	5	3	-	2	2	1	.03
G	Festuca ovina	-	-	6	-	-	-	3	-	-
G	Poa fendleriana	-	-	4	2	-	-	2	2	.04
G	Poa secunda	a-	b9	a-	a-	-	4	-	-	-
G	Sitanion hystrix	a-	a-	a-	b11	-	-	-	5	.10

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %
		'86	'87	'92	'98	'86	'87	'92	'98	98
G	Unknown grass - perennial	$_{b}$7	$_{a}$-	$_{a}$-	$_{a}$-	4	-	-	-	-
Total for Annual Grasses		0	0	0	74	0	0	0	30	0.34
Total for Perennial Grasses		7	43	69	50	4	21	27	19	0.37
Total for Grasses		7	43	69	124	4	21	27	49	0.72
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$8	$_{ab}$4	-	-	4	2	.01
F	Allium spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$68	-	-	-	28	.26
F	Arabis spp.	-	-	1	3	-	-	1	1	.00
F	Arabis holboellii	-	6	-	-	-	2	-	-	-
F	Astragalus straturensis	-	2	-	3	-	1	-	1	.03
F	Calochortus nuttallii	-	-	4	3	-	-	1	2	.01
F	Chaenactis douglasii	-	-	-	1	-	-	-	1	.00
F	Chenopodium fremontii (a)	-	5	-	-	-	4	-	-	-
F	Collomia grandiflora (a)	-	1	-	-	-	1	-	-	-
F	Cymopterus spp.	-	-	-	2	-	-	-	1	.03
F	Dichelostemma pulchellum	$_{a}$-	$_{a}$2	$_{b}$24	$_{b}$40	-	1	12	14	.70
F	Epilobium paniculatum (a)	-	-	-	1	-	-	-	1	.00
F	Eriogonum racemosum	-	-	-	1	-	-	-	1	.03
F	Gilia spp. (a)	-	-	-	2	-	-	-	2	.01
F	Lotus utahensis	-	-	2	-	-	-	1	-	-
F	Melilotus officinalis	-	1	-	-	-	1	-	-	-
F	Medicago sativa	-	12	-	-	-	5	-	-	-
F	Microsteris gracilis (a)	-	-	-	55	-	-	-	22	.13
F	Nicotiana attenuata (a)	-	3	-	-	-	1	-	-	-
F	Penstemon eatoni	-	2	3	-	-	1	1	-	-
F	Senecio multilobatus	$_{a}$-	$_{a}$-	$_{b}$7	$_{ab}$1	-	-	4	1	.00
F	Sphaeralcea grossulariaefolia	$_{a}$-	$_{b}$13	$_{b}$14	$_{a}$-	-	8	7	-	-
F	Streptanthus cordatus	-	3	1	4	-	1	1	2	.06
F	Unknown forb-perennial	3	-	-	4	1	-	-	2	.16
F	Vicia americana	$_{a}$37	$_{ab}$54	$_{c}$106	$_{bc}$92	17	26	42	35	3.34
F	Zigadenus paniculatus	-	-	-	5	-	-	-	2	.03
Total for Annual Forbs		0	9	0	58	0	6	0	25	0.15
Total for Perennial Forbs		40	95	170	231	18	46	74	93	4.69
Total for Forbs		40	104	170	289	18	52	74	118	4.84

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 30 , Study no: 60

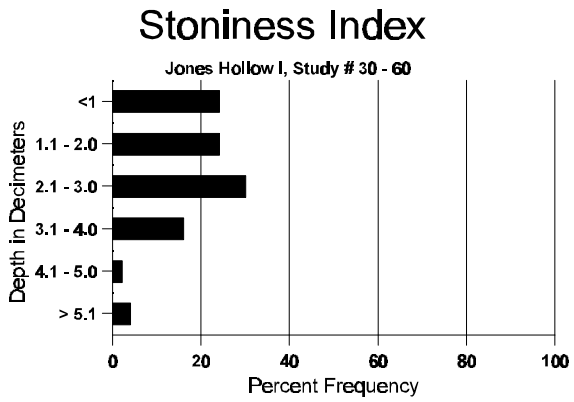
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	31	9.75
B	Arctostaphylos patula	18	3.46
B	Artemisia tridentata vaseyana	12	.51
B	Ceanothus greggii	25	5.67
B	Eriodictyon angustifolium	18	.18
B	Garrya flavescens	13	2.80
B	Gutierrezia sarothrae	4	.21
B	Opuntia spp.	3	.00
B	Quercus gambelii	27	11.30
B	Quercus gambelii-turbinella hybrid	0	-
B	Quercus turbinella	11	7.74
B	Unknown browse	0	-
Total for Browse		162	41.65

BASIC COVER --
Herd unit 30 , Study no: 60

Cover Type	Nested Frequency '98	Average Cover % '86	'87	'92	'98
Vegetation	272	2.00	1.50	5.25	47.57
Rock	109	9.50	9.75	6.00	7.06
Pavement	142	5.25	9.50	15.50	8.32
Litter	381	12.25	16.00	50.25	55.54
Cryptogams	3	0	0	0	.03
Bare Ground	173	71.00	63.25	23.00	21.59

SOIL ANALYSIS DATA --
Herd Unit 30, Study # 60, Study Name: Jones Hollow 1

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.5	48.6 (16.1)	6.1	68.0	17.4	14.6	1.5	10.2	99.2	.7



PELLET GROUP FREQUENCY --
Herd unit 30 , Study no: 60

Type	Quadrat Frequency 98
Rabbit	4
Deer	13

BROWSE CHARACTERISTICS --
Herd unit 30 , Study no: 60

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	86	132	-	-	-	-	-	-	-	-	127	-	5	-	4400			132
	87	21	-	-	-	-	-	-	-	-	20	1	-	-	700			21
	92	12	-	-	2	-	-	-	-	-	14	-	-	-	466			14
	98	3	-	-	3	-	-	3	-	-	9	-	-	-	180			9
Y	86	184	-	-	-	-	-	-	-	-	155	-	29	-	6133			184
	87	74	10	3	-	-	-	-	-	-	87	-	-	-	2900			87
	92	20	-	-	1	-	-	-	-	-	20	1	-	-	700			21
	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	13	-	-	-	-	-	-	-	-	13	-	-	-	433	40	49	13
	98	47	16	1	3	-	-	-	-	-	67	-	-	-	1340	39	47	67
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	1	-	-	-	-	-	-	-	1	-	3	1	100			5
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	16%	-53%
'87	11%	03%	00%	-61%
'92	00%	00%	00%	+25%
'98	22%	01%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	6133	Dec:	0%
	'87	2900		0%
	'92	1133		0%
	'98	1520		7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Arctostaphylos patula																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	2	-	-	2	-	-	-	40			2
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	7	-	-	2	-	-	-	-	-	9	-	-	-	300			9
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	24	-	-	-	-	-	-	-	-	24	-	-	-	480	25	43	24

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	+40%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	0		-
	'92	300		-
	'98	500		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	1	-	-	-	-	-	2	-	-	-	66			2
	98	3	-	-	1	-	-	-	-	-	3	1	-	-	80			4
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	2	-	-	-	-	-	-	-	-	2	-	-	-	66	17	18	2
	98	8	1	-	3	-	-	-	-	-	12	-	-	-	240	22	31	12
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	200			10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	+48%
'98	06%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		0%
'87	0			0%
'92	165			20%
'98	320			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ceanothus greggii																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	46	-	-	-	-	-	-	-	-	46	-	-	-	1533			46
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	24	7	-	3	-	-	-	-	-	34	-	-	-	680	22	34	34

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	+76%
'98	21%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
	'86	0	-
	'87	0	-
	'92	166	-
	'98	680	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriodictyon angustifolium																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	10	-	-	-	-	-	-	-	-	10	-	-	-	333			10
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	21	-	-	-	-	-	-	-	-	21	-	-	-	700			21
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	200			6
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	19	-	-	-	-	-	-	-	-	19	-	-	-	633	14	11	19
	98	21	-	-	1	-	-	-	-	-	15	2	4	1	440	25	24	22
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	1	1	-	-	-	-	-	-	-	2	1	60			3
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	+16%
'92	00%	00%	00%	-40%
'98	00%	04%	32%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		0%
'87	700			0%
'92	833			0%
'98	500			12%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Garrya flavescens																		
S	86	35	-	-	-	-	-	-	-	-	35	-	-	-	1166			35
	87	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	56	-	-	-	-	-	-	-	-	56	-	-	-	1866			56
	87	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	3	-	-	-	-	-	3	-	-	-	60			3
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	2	-	-	1	-	-	-	-	-	3	-	-	-	100	60	56	3
	98	10	-	-	3	-	-	-	-	-	11	-	1	1	260	38	47	13
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	2	-	-	-	-	-	-	-	-	-	2	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	-86%
'87	00%	00%	00%	-62%
'92	00%	00%	00%	+72%
'98	00%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	1866	Dec:		0%
'87	266			0%
'92	100			0%
'98	360			11%

Gutierrezia sarothrae

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	12	-	-	-	-	-	-	-	-	12	-	-	-	240	5	6	12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'86	0	Dec:	-
'87	0		-
'92	0		-
'98	240		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	7	16	3
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	0%
	'87	0		0%
	'92	0		0%
	'98	80		25%

Quercus gambelii																		
S	86	55	-	-	-	-	-	-	-	-	55	-	-	-	1833			55
	87	9	-	-	-	-	-	-	-	-	9	-	-	-	300			9
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	86	179	-	-	-	-	-	-	-	-	179	-	-	-	5966			179
	87	93	-	-	-	-	-	-	-	-	45	48	-	-	3100			93
	92	3	-	-	3	-	-	-	-	-	6	-	-	-	200			6
	98	36	-	-	17	-	-	-	-	-	53	-	-	-	1060			53
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	18	-	-	6	-	-	-	-	-	24	-	-	-	800	64	51	24
	98	135	-	-	4	-	-	-	-	-	139	-	-	-	2780	52	30	139
D	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	4	-	-	-	-	-	-	-	-	3	1	-	-	80			4
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	600			30

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	-48%
'87	00%	00%	00%	-68%
'92	00%	00%	00%	+74%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	5966	Dec:	0%
	'87	3100		0%
	'92	1000		0%
	'98	3920		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii-turbinella hybrid																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	13	-	-	-	-	-	-	-	-	13	-	-	-	433			13
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'86	0	Dec:		-
'87	433			-
'92	0			-
'98	0			-

Quercus turbinella																		
S	86	15	-	-	-	-	-	-	-	-	9	-	6	-	500			15
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	-	-	-	-	1	-	-	-	33			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	86	77	-	-	-	-	-	-	-	-	47	-	30	-	2566			77
	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	66	-	-	-	-	-	-	-	-	66	-	-	-	1320	67	62	66
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	39%	-99%
'87	00%	00%	00%	
'92	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'86	2566	Dec:	-
'87	33		-
'92	0		-
'98	1480		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Unknown browse																		
S	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	87	15	-	-	-	-	-	-	-	-	15	-	-	-	500			15
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'86	00%	00%	00%
'87	00%	00%	00%
'92	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'87	0		-
	'92	0		-
	'98	0		-

SUMMARY

DEER HERD UNIT 30 - PINE VALLEY

Trend study sites on unit 30 - Pine Valley can be divided into 3 major categories. Eight sites sample summer range, 4 sites are placed on areas of important fawning habitat and the other 14 sample winter range. Of the 14 winter range sites, only 4 display a downward or slightly downward trend for soil, 3 sites have downward or slightly downward herbaceous trends, and 4 sites display downward or slightly downward browse trends. Of these winter range sites, Southwest of New Castle (#29), shows slightly downward trends in all areas. The Pahcoon Bench site (#46) has a slightly downward browse trend and a downward herbaceous trend due to the abundance of cheatgrass in the understory. Northwest of Enterprise (#52) displays a slightly downward soil trend and a downward browse trend.

The sites placed on important fawning habitat all show stable to upward trends except for Deep Canyon (#35). It displays a slightly downward soil and herbaceous understory trend. Summer range sites all show stable to upward soil and browse trends with two sites, Harmony Mtn Summit (#5) and Grassy Flat Ridge (#26), showing slightly downward herbaceous trends. All other summer range sites have stable to upward herbaceous trends. A summary table of trends is found below.

Site	1992			1998		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & Forbs
30-3 Upper Broad Hollow	+	-	0	0	0	+
30-5 Harmony Mtn Summit	+	+	+	0	0	-
30-9 Upper Lime Spring	0	+	0	0	0	0
30-12 Pintura Bench	-	-	-	0	+	-
30-13 Black Ridge	-	+	-	0	0	0
30-18 Grant's Ranch Trail	+	+	0	NR	NR	NR
30-24 Paradise	+	+	+	NR	NR	NR
30-26 Grassy Flat Ridge	0	+	+	0	+	-
30-29 Southwest of New Castle	+	+	+	-	-	-
30-35 Deep Cayon	0	+	+	-	+	-
30-37 Truman Bench	+	+	+	0	0	-
30-38 Wide Canyon	0	+	0	0	-	-
30-40 Telegraph Draw	+	+	0	-	0	0
30-41 Joe Spring	+	-	0	0	+	+
30-42 Grapevine Spring	0/-	+	-	-	+	+
30-45 Flat Top Mountain	NR	NR	NR	0	0	+
30-46 Pahcoon Bench	+	0	0/-	0	-	-

30-47 Lost Peak	NR	NR	NR	0	+	+
30-52 Northwest of Enterprise	+	-	0	-	-	+
30-53 Sevy Hollow	NR	NR	NR	0	-	0
30-54 Bullion Canyon	Established in 1998					
30-55 Quichapa Canyon	Established in 1998					
30-57 Woosley Reseed	Established in 1998					
30-58 Spirit Creek South Burn	+	+	0	+	+	+
30-59 Upper Horse Creek	+	-	+	+	0	+
30-60 Jones Hollow	+	0	+	+	0	0

(+) = upward trend, (-) = downward trend, (0) = stable trend, (0/-) = stable to slightly down, (NR) = not read

DISCONTINUED TREND STUDIES UNIT 30 (50A)

DISCUSSION

Trend Study No. 50A-2

***This site was not read in 1998 and has been discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

This study is located immediately west of the town of New Harmony and is typical of the critical deer winter range in this area. Vegetatively, the site is dominated by juniper-pinyon on about a 10% slope with an easterly aspect. Elevation is 5,560 feet. The study site is approximately one-half mile above the deer proof fence surrounding New Harmony and is a known winter concentration area.

Soils are derived from igneous and metamorphic rock. They are shallow, rocky, and alluvially deposited with an apparent hardpan several inches below the surface. Ground cover is poor, but perhaps slightly better than in Lower Broad Hollow. Erosion and soil loss were occurring at an accelerated rate in 1982, but seem to have subsided since the last reading due to an increase in protective ground cover. Basal vegetative cover has doubled since 1982 and bare ground has decreased by 52% (21% to 10%). Even with this increase in basal cover, it is still very low at only 2%. Rock and pavement cover combined have more than doubled indicating past soil loss.

Vegetative overstory is composed of nearly equal amounts of Utah juniper and singleleaf pinyon pine. Combined tree density was estimated using the point quarter method at 324 trees/acre. Fifty percent of the pinyon were classified as seedlings and appear to be on the increase. Eighty percent of the juniper sampled were composed of trees greater than eight feet in height. No seedlings and few young were counted. Understory vegetation is dominated by shrub live oak. Density of oak has declined from 10,332 to 2,499 stems/acre, a 76% decrease. The remaining browse composition includes a number of desirable species, including true mountain mahogany, Utah serviceberry, and desert ceanothus. All are currently in fair to good vigor and moderately hedged, although they are only occasionally abundant and do not appear to be increasing. Utah serviceberry is the second most abundant browse species. It has declined slightly in density since 1982, while percent decadence has increased from zero to 43%. Serviceberry still has a good reproductive potential. Mountain mahogany was not encountered on the density plots during the 1992 reading. Other shrubs of lesser importance and/or desirability which occur on or near the site include; manzanita, pricklypear, and occasional individuals of antelope bitterbrush, Stansbury cliffrose, and Gambel oak. Use of all browse is light to moderate.

Herbaceous understory is badly depleted. Only two perennial grasses were encountered during the 1992 reading. These included mutton grass and bottlebrush squirreltail. Overall, perennial grasses were found in only 20% of the quadrats. Perennial forbs are more numerous but still deficient. They include heartleaf twistflower, Utah deervetch, lobeleaf groundsel, longleaf phlox, and bastard toadflax. Grasses and forbs are currently of little importance. Two annual forbs are of particular note. Annual lupine and a small annual milkvetch (Astragalus sp.) are both very abundant, but likely are of small importance to deer. Other annuals consist of cheatgrass brome, tansy mustard, autumn willoweed, and Microsteris gracilis.

1982 APPARENT TREND ASSESSMENT

Soil condition is poor and declining. Vegetative cover is limited mostly to shrub or tree crowns and litter occurs only under tree or shrub canopies. Erosion has been heavy, leaving much exposed rock. Vegetative trend is stable to declining. With two exceptions, most vegetative parameters are fairly static. An encouraging sign is that 33% of the encountered Utah serviceberry plants were in either the young or seedling age-classes. However, of much greater importance is the apparent expansion of an already dominant shrub

live oak population. This species has an age structure composed of 7% seedlings, 49% young, 42% mature, and only 2% decadent plants.

1992 TREND ASSESSMENT

Basal vegetative cover has increased from 1% to 2%, while bare ground has declined from 21% to 10%, a 52% decrease. Litter has remained basically unchanged. Rock and pavement cover have increased 54%, while cryptogamic cover has declined 71%. Overall, protective ground cover has risen from 80% to 90% since the last reading, but this is mostly from increases in rock and pavement cover. The soil trend has improved slightly since 1982, but the site is still in poor condition. Increased amounts of rock and pavement will help protect the soil from rain drop impact, but they may also negatively impact herbaceous plants and shrub seedlings due to increased soil temperatures. Trend for browse is down. Utah serviceberry has declined slightly since 1982, while percent decadence has increased from zero to 43%. The percent decadency of desert ceanothus has increased from zero to 60%. Shrub live-oak, the most abundant shrub, has shown a 76% decrease in density along with an increase in percent decadency. Some of these changes may be the result of increased density and dominance of pinyon and juniper trees which have increased 50% and 33% respectively since 1982. The herbaceous understory is sparse, but has improved since the last reading. Quadrat frequency for perennial grasses have improved slightly while species diversity has declined. Quadrat frequency and diversity of forbs have improved. Trend for herbaceous understory is up slightly, although still in very poor condition.

TREND ASSESSMENT
soil - up slightly, but in poor condition
browse - down
herbaceous understory - up slightly, but in poor condition

DISCUSSION

Trend Study No. 50A-10

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

This study occurs on the important fawn rearing areas near Bumblebee Spring. The predominate range type in this area is oakbrush. The study site is on a north-east aspect with a steep 30% slope at an elevation of 7,720 feet. Several does and a few buck mule deer were seen near the site. Water is available at the nearby Bumblebee spring. Oak provides excellent cover for deer and fawns. However, due to the thick brush, game trails provide the only means of travel through the area.

Soils are fine textured with some surface rock. The parent material is limestone. The actual study site has a nearly continuous canopy cover from Gambel oak, but little basal cover. Litter is abundant and prevents serious erosion. Southern and western slopes and ridge lines near the study site have much less cover and are eroded to a considerable degree.

Vegetative overstory is generally less than 6 feet in height and is composed principally of Gambel oak with lesser amounts of Utah serviceberry and bigtooth maple. Total browse density is high with Gambel oak accounting for 84% of the total browse composition in 1982, which is down to 65% in 1992. Oak has declined in density by 34% since 1982, while mature plants have nearly doubled in height and crown measurements. The population is composed largely of seedlings and young sprouts that are have good vigor and are essentially unutilized. Similar situations exist for most other browse species. Typical understory shrubs include Woods rose, mountain snowberry, black sagebrush, and mountain big sagebrush. The overall impression one gains from inspecting this site is that the browse component is excessively thick and dominant.

Grasses and forbs, in contrast on southern or western exposures, in this area are diverse and productive. However, if the shrub component continues to thicken, they will become less so. Ten grass species were encountered on the frequency study. Sedge was the most common with lesser amounts of Letterman needlegrass, subalpine needlegrass, Canada bluegrass, mountain brome, crested wheatgrass, and Kentucky bluegrass.

Forbs are both abundant and diverse. The more common species have at least intermediate value. Important forbs include thickleaf peavine, American vetch, Eaton fleabane daisy, redroot eriogonum, western waterleaf, tailcup lupine, and Nelson larkspur.

1982 APPARENT TREND ASSESSMENT

In this area, exposure makes a great difference in range condition. Southern and western exposures are in poorer condition and are dominated by manzanita. The study site, on a northeastern exposure, is in fair to good condition. Soils are stable but have high potential erodibility. As habitat, the vegetation is rather low growing and hence provides only minimum cover. Total forage production is high but dominated by browse, especially Gambel oak. A moderate herbaceous understory is present, but can be expected to decline if oak continues to thicken and gain height. However, it may be that the site potential will not permit higher growth or that the browse component may be self-thinning.

1992 TREND ASSESSMENT

Basal vegetative cover has increased from 1% in 1982 to 9% by 1992, a 89% increase. Bare ground has declined by 53%. There are still some bare areas and trails between shrub canopies which show erosion.

Overall the soil trend has improved. The browse on the site is dominated by Gambel oak which has declined 34% in density since 1982. Currently there is an estimated 17,399 stems/acre of oak, the majority of which are seedlings and young. Mature plants have shown significant increases in height and crown measurements since the last reading. Some insect damage was noted in 1992, but the oak here are in much better condition than the oak on the surrounding areas. The thick nature of the oak makes travel through the area possible only on game trails. A prescribed burn would benefit this area. Utah serviceberry has increased 40% in density and bigtooth maple has shown up in the density plots with an estimated 2,599 plants/acre, indicating a possible successional change is taking place on this site. Overall the browse trend is stable. The herbaceous trend is up slightly due to increased quadrat frequencies of grasses and forbs.

TREND ASSESSMENT
soil - improved
browse - stable
herbaceous understory - up slightly

DISCUSSION

Trend Study No. 50A-16

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Upper Leads Creek trend study is on low summer or high winter range near the base of the steep escarpment at the head of Leeds Creek. Elevation of the study is 7,000 feet. This entire area is characterized by exceptionally dense, and in places, nearly impenetrable mountain brush. The study area is on a 20% slope with a south aspect. Immediately above, the slope becomes increasingly steeper and within a short distance becomes steep and rocky enough to present a barrier to deer movement. A large wildfire burned the area in June of 1986. The Dixie National Forest seeded the burn in early July.

Soils are extremely rocky and moderately shallow. Rock cover increased from 17% in 1982 to 36% after the fire in 1986. Bare soil increased from only 3% in 1982 to a high of 41% in 1987. By 1992, bare ground decreased to near preburn conditions (4%). Basal vegetative cover has remained low, while aerial cover from mature shrubs has come back. Litter cover has increased significantly since the burn. Before the burn, erosion was generally low. However, there were some large gullies in the area that originated on the steep and more barren slopes above. Erosion was considered moderate after the fire. Plant roots were exposed, soil movement was detectable, and small gullies appeared. Currently erosion is not a problem. The abundant litter and shrub canopy cover seem to adequately protect the soil.

Before the burn, key browse species included Gambel oak and Utah serviceberry. Gambel oak had a density of 3,000 stems/acre, while serviceberry's density was at 400 plants/acre. These two shrubs comprised 76% of the total browse density estimated at 4,300 plants/acre. This fairly low density does not really characterize the extremely thickness of the browse growing on this site. Most plants are mature, very bushy, often with intertwining branches, making travel through the area difficult. Deer also would have trouble navigating the area and forage availability would be somewhat limited. Utilization of all browse species was very light. A large wildfire burned 10,000 acres on the east side of the Pine Valley mountains in early June of 1986. After the fire, sprouting Gambel oak was estimated at 16,566 stems/acre. An additional 9,100 individuals/acre were classified as seedlings. Shrub live-oak, also sprouting, increased from 333 stems/acre in 1982 to 4,433 seedlings and young by 1986. Serviceberry had an estimated density of 1,199 seedlings and young per acre by 1986. A year after the fire there were an estimated 1,100 serviceberry, 766 shrub live oak, and 3,300 Gambel oak per acre. All were lightly utilized and in good vigor. By 1992, serviceberry had declined to 399 plants/acre, 75% classified as young. Gambel oak increased 28% to 4,566 stems/acre while shrub live-oak declined to 400 stems/acre. Mature Gambel oak trees currently average just over five feet in height with a crown of about four feet, making much of the oak unavailable to browsing. Desert ceanothus appeared on the site by 1992 with an estimated density of 2,066 plants/acre. All browse are lightly utilized and in good vigor.

Before the burn, the dense shrub canopy severely inhibited herbaceous growth. A few scattered grasses and forbs were found in canopy openings. Species include muttongrass, sedge, mountain brome, bastard toadflax, lobeleaf groundsel and Utah deervetch, all of which are ungrazed. The Forest Service seeded several introduced and native grasses and forbs in early July of 1986. During the reading in September, no perennial grasses were encountered. The only forbs found included bastard toadflax and Utah deervetch. One year later several seeded and native grasses were established. The seeding would have been much more successful if it had been done later in the fall of 1986, with better opportunities for stratification and germination. Orchard grass and smooth brome were the most common seeded grasses. Ten species of forbs were counted, but no seeded forbs occurred. Nested and quadrat frequencies of grasses and forbs continued to increase between 1987 and 1992. Smooth brome, big mountain brome, and mutton grass were the most common. Eleven forb species were encountered with lobeleaf groundsel, rockcress, sego lily, Utah deervetch, and redroot eriogonum being the most common. Overall, forbs and grasses are still deficient on the site, although

composition and diversity have improved dramatically since the burn. Further increases in the shrub canopy will eventually reverse this trend.

1982 APPARENT TREND ASSESSMENT

Current soil and vegetative trend are both stable, however habitat conditions for deer are well below optimum. It is difficult to envision that the shrubs could become more dense than they already are. It is equally unlikely that any natural thinning will occur without some external influence, such as fire. Excessive shrub density, which limits herbaceous growth and deer access, is a serious problem on this area. Thinning, either by fire or mechanical means, is definitely recommended. However, either method would have to be repeated at fairly frequent intervals to maintain a desired condition. The principal shrubs are all species that sprout profusely following fire or top removal. Herbicides could be tried, but likely would be less satisfactory.

1992 TREND ASSESSMENT

Soil conditions deteriorated immediately after the burn. Basal vegetative cover only declined slightly, but bare ground increased to 33% in 1986 and 41% by 1987. Rock cover nearly doubled while litter cover declined 67%. The extended drought accelerated these downward trends. By 1992, basal vegetative cover equals preburn estimates, rock cover is still high at 33%, bare ground has declined to 4%, and litter cover has rebounded to 55%. Erosion is not currently a problem on this site. Trend for soil is up. Browse was overly mature before the burn and nearly inaccessible to deer. After the burn, sprouting oak and serviceberry came back well. By 1992, oak was dominant with an estimated density of 4,566 stems/acre. Serviceberry has declined from a high of 1,100 plants/acre in 1987 to only 399 in 1992. Desert ceanothus has returned to the site and is the second most abundant shrub with an estimated 2,066 plants/acre. Overall, the browse density and composition has improved, but continued increases in browse size will eventually make much of the forage unavailable to deer. Browse trend is up. The herbaceous understory was nearly nonexistent before the fire. By 1987, several seeded and native grasses and forbs were established. Since then, nested and quadrat frequencies have continued to increase. This trend will inevitably reverse itself as the browse component becomes more dense. Continued use of fire or herbicides will be needed in the future. Trend for herbaceous understory is up.

TREND ASSESSMENT
soil - up
browse - up
herbaceous understory - up

DISCUSSION

Trend Study No. 50A-19

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Big Water Reservoir trend study is located about 200 feet east-northeast of the dam at Big Water Reservoir. The range type is mixed mountain brush and is considered to be within the deer summer range of the Pine Valley Mountains. The site is also within the "roadless" area and can be reached only by foot or horseback. Mountain brush and oakbrush types similar to this one are widely used as fawn rearing habitat throughout the entire area. The Big Water site was specifically chosen by the district conservation officer to sample this kind of habitat. Elevation is approximately 7,900 feet and slope varies from 55% to 65%. Aspect is south to southwest.

Soils are rather shallow, coarse, and rocky but have a relatively high organic content in the upper horizon. Below about the six-inch depth, however, soil material is relatively undifferentiated and there appears to be no clearly defined B horizon. Soil movement is obvious, but is not greatly accelerated. Lichen lines on exposed rocks for instance, do not normally extend to the soil surface and there are plant roots exposed. Exposed bare ground covers an estimated 15% of the ground surface in 1982.

The principal browse species are Gambel oak, Utah serviceberry, mountain big sagebrush, curlleaf mountain mahogany, and Oregon hollygrape. Lesser quantities of antelope bitterbrush, stickyleaf low rabbitbrush, and woods rose can also be found.

Gambel oak is the most abundant browse on the site with an estimated density of 5,666 stems/acre in 1982, declining to 4,866 by 1992. Two thirds of the oak consist of young plants. Mature plants measured about 2½ by 1½ feet in 1982. During the 1992 reading, oak averaged 5½ by 2 feet making an increasing amount of the oak unavailable to browsing. Mature Utah service berry and curlleaf mountain mahogany have also exhibited similar increases in size. Utah serviceberry declined in density by 51%, while the percentage of heavily utilized plants increased from zero to 13%. Mountain big sagebrush has declined from 1,299 to 532 plants/acre since 1982. Percent decadency has increased from 3% to 30% as more sagebrush are shaded out.

Grass and forb diversity and density are both below optimum for this kind of site. Only three perennial grasses, muttongrass, bottlebrush squirreltail, and fringed brome were encountered. Among annual grasses, cheatgrass brome is present, but not overly abundant. Forb composition is only slightly more diverse. Ten species were encountered on the density and frequency plots during the 1992 reading. The most abundant forbs include Solidago sparsiflora, thistle (Cirsium spp.), Utah milkvetch, and arrowleaf balsamroot. Most forbs are at least moderately desirable as forage.

1982 APPARENT TREND ASSESSMENT

Both soil and vegetative trend appear stable, however the relative deficiency of understory grasses and forbs, the amount of rock and bare ground exposed, and steep slope all contribute to a loss of soil that over an extended period may exceed the rate of soil formation. The browse component seems adequate, but herbaceous composition should be better.

1992 TREND ASSESSMENT

Soil movement still occurs on isolated bare areas, but erosion as a whole is not a serious problem. Basal vegetative cover increased by 75% since 1982, while bare ground declined slightly. However, rock and pavement cover combined, doubled while litter cover declined from 62% to 51%. Cryptogamic cover

declined by 80% (5% to 1%). The soil trend overall is thought to be stable. Key browse species, with the exception of curlleaf mahogany, have declined in density. Mountain big sagebrush has declined by 59%, while percent decadency has increased from 3% to 31%. Utah serviceberry, curlleaf mahogany, and Gambel oak have all increased in size making more browse unavailable to deer. Continued increases in size of the larger browse species will continue to negatively impact sagebrush, rabbitbrush, and other non-shade tolerant species. Browse trend is down. Herbaceous understory is lacking on this site. Quadrat frequencies for forbs and grasses have remained basically unchanged since 1982. Trend for herbaceous understory is stable but poor.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - stable, but poor

DISCUSSION

Trend Study No. 50A-21

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

This study is located on an open west to northwest facing hillside with a 25% to 30% slope. Elevation is 7,900 to 8,000 feet. The study is located on a summer range concentration area for deer. Many fawns have been observed and captured here and there is evidence (i.e., pellet groups, forage utilization levels) of a high degree of deer use. Cattle use was reported during the 1982 reading, but no recent livestock use was evident during the 1992 reading. This area occurs on the 67,000 acre Pine Valley Allotment which is grazed annually from July 15 to October 15. With the extended drought, numbers of cattle were reduced by 35% in 1990, 25% in 1991, and 15% in 1992. Curlleaf mountain mahogany gives the site its vegetative appearance, however the trees are widely spaced and generally tall enough to be unavailable to deer. Aside from mahogany and a few scattered junipers, the remaining shrubs are very low-growing and provide little of the cover normally so important on quality fawning habitat.

Soils are course, rocky, and shallow. Considerable bare ground (32%) was encountered during the 1982 reading. Vegetative basal cover was low and ongoing soil erosion was moderate to heavy. Many plants were pedestaled and lichen lines on rocks were well above the soil surface. Since then, basal vegetative cover has more than doubled while bare ground decreased by 53%. Some soil movement still occurs in isolated areas, but conditions have improved since 1982.

Key browse on the site consist of scattered tall curlleaf mountain mahogany and Gambel oak with an understory of low growing Parry rabbitbrush, dwarf rabbitbrush, and mountain rabbitbrush. Gambel oak is the most common browse with an estimated density of 8,265 stems/acre in 1992. A majority of the population consists of seedling and young plants indicating a healthy increasing age structure. Utilization of oak has been heavy. In 1982, 55% of the oak displayed heavy hedging (>60% of twigs browsed). This heavy use likely kept oak from increasing significantly in density between 1982 and 1992. Due to heavy browsing, mature oak measured under one foot in height in 1982. Utilization was also reported heavy during the 1992 reading. Forty-four percent of the oak sampled displayed heavy use. Mature plants are fewer in number and average nearly eight feet in height, making mature plants mostly unavailable to browsing. Percent decadency has increased from 10% in 1982 to 57% in 1992. Understory shrubs also show heavy use. Dwarf rabbitbrush has decreased from 1,200 to 732 plants/acre, while the proportion of heavily hedged plants increased from 28% to 73%. Percent decadency has also increased. Parry rabbitbrush wasn't identified in 1982 and was likely included with dwarf or mountain low rabbitbrush. During the 1992 reading, 43% of the Parry rabbitbrush encountered were heavily hedged. Mountain low rabbitbrush decreased in density 32% since 1982, while the proportion of heavily hedged plants rose from zero to 67%. It was reported during the 1992 reading that some of this use was caused by rabbits.

Grasses and forbs dominate the site. Nine species of grasses were encountered, with bottlebrush squirreltail, letterman needlegrass, and muttongrass, being the most abundant. Forbs are also diverse and abundant. Nineteen species of forbs were sampled during the 1992 reading. Arrowleaf balsamroot is by far the most abundant with a quadrat frequency of 48% in 1982, increasing to 78% by 1992. Other important forbs include redroot eriogonum, clover, and Utah deervetch.

1982 APPARENT TREND ASSESSMENT

Soil trend when evaluated from a comparison of rates of soil formation and soil loss is probably downward. There is inadequate vegetative cover to prevent widespread soil movement. Soil loss, in turn, tends to inhibit or prevent establishment of a dense, herbaceous cover. Conversely, without good herbaceous cover, erosion

will continue on the site. Vegetatively, the area is heavily impacted by deer (forbs and browse) and livestock (grasses) use. Such use is well documented by the abundance of pellet groups, the level of utilization, and highlining of mahogany and juniper. Gambel oak, which is the likely key browse species for this area is highly vigorous and shows little evidence of decline. Herbaceous composition includes some aggressive increasers, but also some highly palatable species. For the present, vegetative trend can be considered stable or perhaps slightly downward.

1992 TREND ASSESSMENT

Soil conditions have improved since 1982 due to increases in herbaceous vegetation cover. Basal vegetation cover has increased by 67%, while bare ground has declined by 53%. Key browse on the site have overall, declined in density, increased in decadency, and are increasingly heavily browsed. Trend for browse is down. Quadrat frequencies for grasses and forbs have increased significantly since 1982, indicating an upward trend. Improved soil and herbaceous trends are likely the result of grazing reductions and above normal amounts of precipitation this spring.

TREND ASSESSMENT
soil - improved
browse - down
herbaceous understory - up

DISCUSSION

Trend Study No. 50B-3

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The New Castle Reservoir trend study monitors critical deer winter range located west of Newcastle Reservoir. The study site is on a moderately steep (40%) south facing hillside dominated by a sagebrush-grass community, interspersed with scattered green ephedra, Colorado pinyon, and an occasional large Stansbury cliffrose. Elevation of the site is 5,600 feet.

Soils are derived from basalt. Soil depth is relatively shallow and texture is coarse and well drained. There is a general lack of perennial herbaceous cover leading to a lack of litter. Since 1982, percent cover for rock and pavement combined has increased from 47% to 63%. The increase in rock and pavement and plant pedestaling would indicate erosion is taking place. Soil and climatic conditions will make seedling establishment difficult.

The key browse species, Wyoming big sagebrush, a relatively palatable plant accounts for 36% of total browse density. Currently this population is static, but 26% of the plants are now decadent compared to 11% of the plants in 1982. Age class distribution indicates mature plants are the most prevalent. There is nearly an equal number of young and seedling plants combined as there is decadent plants. Vigor has improved and so has utilization which is now light to moderate. Green ephedra, an important secondary species, also appears to be a stable population and is less heavily hedged than Wyoming big sagebrush. The principal invader/increaser shrub is narrowleaf low rabbitbrush. Of 93 individuals encountered in 1992, none showed any use as compared to 58% of the 71 individuals encountered in 1982, which were in either form class 2 or 3, indicating moderate to heavy use. Even though narrowleaf low rabbitbrush had relatively low vigor and few young or seedling plants in 1992, the population increased by 24%.

Perennial grasses are moderately abundant, but consists primarily of increasers such as bottlebrush squirreltail and galleta grass. Muttongrass, bottlebrush squirreltail, and Indian ricegrass are occasional residents and appear to have stable populations. Cheatgrass brome is on the site, but was not recorded under the monitoring methods utilized before July of 1992. By comparing pictures between years, the cheatgrass brome doesn't appear to be increasing and seems to only grow primarily under the crowns of the Wyoming big sagebrush.

Several new forbs were encountered in 1992, although they are very sparse and are not a significant forage source or soil protection factor. Low fleabane daisy, globemallow, Douglas chaenactis, and an Astragalus sp. were the only perennial forbs encountered.

1982 APPARENT TREND ASSESSMENT

Soil conditions are poor and probably getting worse. Much soil has already been lost, leaving large expanses of pavement and rock. Surface soil temperatures are likely quite high and drainage is so rapid that seedling establishment is almost certainly very difficult. Vegetational trend is harder to assess, but in view of soil conditions, it must also be down.

1992 TREND ASSESSMENT

Since the 1982 reading, the soil condition has appeared to decline with pedestaling around the plants. Rock and pavement cover combined have increased from 47% to 63%. The Wyoming big sagebrush population is stable to improving, which is evidenced by abundant seedlings and better form and vigor. The narrowleaf low rabbitbrush population should be monitored for possibly further increase. Herbaceous trend is slightly up

with the increase of vegetative cover.

TREND ASSESSMENT
soil - slightly down
browse - stable
herbaceous understory - slightly up

DISCUSSION

Trend Study No. 50B-7

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Swett Hills trend study is located on critical deer winter range on the east side of the Swett Hills. The study is near the north end of a small north-south oriented cove or alluvial plain that separates Swett Hills and the Eightmile Hills. Terrain is gentle with a slight southeast aspect and a slope of 5%-10% . Site elevation is 5,750 feet. The range type is sagebrush-grass with a moderate density of pinyon and juniper trees. The site is located in an old chaining (probably only one-way) where many of the junipers survived the treatment. The site is an ecotone and may eventually be encroached by pinyon and juniper.

Soils are moderately deep and very rocky with a caliche layer that may restrict rooting depth of some species. Ground cover is limited to shrub crowns, rock, and pavement. Dead cheatgrass comprises the bulk of litter cover and offers minimal soil protection. Rock and pavement cover combined have increased from 15% to 36% cover, while bare ground decreased from 44% cover to 31%.

The key browse species, Wyoming big sagebrush, accounts for 80% of total shrub density in 1992, an increase from 74% in 1982. Although the Wyoming big sagebrush population has increased, so has percent decadency, from 2% to 33%. Those with poor vigor has increased from 2% to 26%, most classified as chlorotic or dying. The amount of use has shifted from moderate to heavy. Palatable forage from other species is limited to an occasional mature Stansbury cliffrose, which has decreased in density since 1982 from 66 plants/acre to 33 plants/acre. Utilization of available portions of Stansbury cliffrose is heavy. A concern is the increase of broom snakeweed, although the number of seedlings decreased and percent decadence has increased. The number of juniper trees is staying constant, and doesn't appear to be encroaching at this time.

Forbs and grasses are scarce and are not an critical component for a winter range. Species composition of both groups consists principally of increasers.

1982 APPARENT TREND ASSESSMENT

Soil trend is declining as evidenced by the amount of bare ground, erosion pavement, and surface rock. Erosion is not dramatic, but is wide spread. Small gullies and rills are present everywhere. Vegetation trend is stable over the short term, but probably down in the long term. The key browse species seems stable for the moment, but eventually will be adversely impacted by increasing amounts of broom snakeweed and encroaching Junipers.

1992 TREND ASSESSMENT

Bare ground has decreased and rock and pavement have increased indicating some erosion and a downward trend. Vegetation is still stable with poor composition and producing very little protective ground cover. Wyoming big sagebrush increased in density by 16% and percent decadency also increased. It appears to be stable to slightly increasing, but again may be impacted by an increase of broom snakeweed.

TREND ASSESSMENT
soil - slightly down due to erosion
browse - slightly up
herbaceous understory - stable

DISCUSSION

Trend Study No. 50B-8

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Oak Spring trend study samples deer winter range southwest of Oak Springs on Iron Mountain. The study area is within a Utah juniper type on a northeast facing 10%-20% slope at an elevation of 6,520 feet.

Soils are shallow and rocky with a hard pan at several inches below the surface. Tree interspaces are occupied mainly by bare ground or erosion pavement. Like many juniper or pinyon types, this area has a fair aerial vegetative cover, but generally poor basal cover (herbaceous cover), as a result soil loss has occurred with rock and pavement now protecting the soil.

Browse composition consists of both desirable and undesirable species. The more preferred include Stansbury cliffrose, antelope bitterbrush, Wyoming big sagebrush, and true mountain mahogany. These species account for 29% of total browse density. All of the species mentioned are important and should be considered in any management plan. Currently these species are stable and show an increase in amount of hedging. Shrubs of intermediate desirability, which include white rubber rabbitbrush and a shrubby eriogonum, comprised 16% of browse density in 1982. They were not encountered in 1992. The remaining 71% of browse population consists of undesirable species, such as golden pricklypear, broom snakeweed, echinocactus, and an overstory juniper and pinyon. Golden pricklypear has an increased population of nearly 200 plants/acre, but does not appear to be a major threat to the community, although it is abundant. Further increase of this species should be discouraged.

Grasses are sparse and hence are of small importance. Three species, bottlebrush squirreltail, purple three-awn, and muttongrass were sampled.

Forbs are scattered, but more abundant than grasses. Composition consists largely of annuals and low value perennials. Among perennial forbs, mat penstemon is by far the most abundant. Annual forbs are fairly common and the most notable is owlclover (Orthocarpus spp.). Utilization of forbs is uniformly light.

1982 APPARENT TREND ASSESSMENT

Soil trend is declining. Protective ground cover is simply inadequate to prevent serious soil loss from high intensity summer storms. Vegetative trend is stable with a low level of production. Browse composition is dominated by undesirable species which, however do not show obvious signs of increase. Wyoming big sagebrush, one of the better shrubs, may be declining. Understory production is negligible. This area could be greatly improved by chaining and seeding.

1992 TREND ASSESSMENT

Soil is still on a downward trend as evidenced by a decrease in bare ground contributing to a corresponding increase in rock and pavement. Vegetative trend is stable and still at a low rate of production and probably always will be if the site is left alone. The most abundant browse species are undesirable and increasing slightly. The Wyoming big sagebrush population is stable but at a very low density.

TREND ASSESSMENT
soil - continuing downward
browse - stable, but key browse is at a very low density
herbaceous understory - stable, but poor with very low numbers

DISCUSSION

Trend Study No. 50B-9

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Whiterocks Reservoir trend study is located on deer summer range slightly southeast of Whiterocks Reservoir. The study is on a low ridge with minimal slope (5%) and an elevation of 8,300 feet. The range type is sagebrush-grass or low sagebrush with a fairly abundant herbaceous understory. Livestock graze the allotment from July 15-October 15.

Even though the soils are exceptionally rocky, they support good plant growth. Many plants can be found growing in rock crevices or depressions where a few inches of soil is present. Erosion was reported minimal on the study site, but there are some gullies on the nearby slopes. Soil formation may exceed soil loss as weathering and breakup of surface rock appear to be occurring at a rapid rate.

Vegetation on the site is dominated by mountain big sagebrush which comprises 47% of the browse population. This population has increased by 58% since 1982. There are nearly as many seedlings present (6,933 plants/acre) as there was young, mature, and decadent combined. Other important shrubs include mountain low rabbitbrush and slender buckwheat. Slender buckwheat increased in density from only 466 plants/acre in 1982 to 3,199 plants/acre in 1992. The palatable mountain low rabbitbrush increased from 1,933 plants/acre to 2,466 plants/acre. A misidentification of Chrysothamnus nauseosus may have occurred in 1982 and might have been combined with Chrysothamnus parryi nevadensis. The occurrence of the Chrysothamnus spp. may indicate heavy grazing in the past. All browse species were light to moderately hedged and in good vigor.

Grasses and forbs are both very abundant and diverse and are equally important to deer, as browse. Ten grasses and 27 forbs were encountered. Among grasses, the most abundant are Letterman needlegrass, mutton grass, Kentucky bluegrass, western wheatgrass, and blue grama. Overall grass composition is dominated by increasers. Utilization of grasses is light, with prairie junegrass receiving perhaps the greatest attention.

Forb composition includes a small variety of succulent species that receive moderate use. The more abundant forbs include desert phlox, Eaton fleabane, Lupinus holosericeus, redroot eriogonum, and pale stickseed. Few annual forbs were identified, but there are a number of perennial or biennial increasers. Aster sp., Machaeranthera sp., mountain dandelion, rock goldenrod, rose pussytoes, common dandelion, and owlclover are all in this category. Several of these species have increased in the past, but appear stable now.

1982 APPARENT TREND ASSESSMENT

Soil and vegetative trend are essentially stable. There is little obvious evidence that drastic vegetational changes are occurring. However, the abundance of increaser species, especially stickyleaf low rabbitbrush, needlegrass species, blue grama, and forbs, such as rock goldenrod should be closely monitored.

1992 TREND ASSESSMENT

Soil appears to be stable and improving with minimal erosion reported. There is very little bare ground exposed and interspaces are covered by litter (54%) and vegetation (24%). Grass and forb quadrat frequency has stayed nearly the same for most species. Browse has increased on the site, but doesn't seem to be effecting the forbs or grasses. The key browse species is mountain big sagebrush which has a population that has the potential to continue expanding.

TREND ASSESSMENT
soil - slightly up
browse - up
herbaceous understory - up

DISCUSSION

Trend Study No. 50B-11

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The "West of Long Flat" range trend study is within deer summer range located approximately one-half mile west of Long Flat and close to the Whiterocks-Rencher Peak trail. The general vicinity of the study area is characterized by diverse, broken terrain with many small swales and drainages separated by low lying, rocky ridges and hills. The swales are narrow and contain sagebrush-grass and occasional aspen clones. Higher ground is occupied by mixed curlleaf mountain mahogany and Gambel oak. This area is excellent habitat and several does and fawns were observed using it. A spring is also located near the study site. The actual study is on a small ridge with a slight east-northeast aspect. Slope is 10% or less and an elevation of 8,100 feet. Cattle are allotted to the area from July 15-October 15.

Soils are relatively shallow, relatively coarse and interspersed with large expanses of slickrock and exposed boulders. Erosion is slight with good litter cover, although rock and pavement combined have increased from 20% to 38% cover.

Browse composition consists of a variety of generally favorable species. Most conspicuous, although not most abundant, is curlleaf mountain mahogany. This species, because of its tree-like growth form, provides relatively little forage, but has high value as cover. The principal forage shrubs in order of abundance are Gambel oak, mountain big sagebrush, black sagebrush, and mountain snowberry. Oak is the most important and is the only one of the three to show much evidence of use. Gambel oak has expanded its population since 1982 from 6,399 stems/acre to 13,065 stems/acre. In 1982, black sagebrush may have been misidentified in 1982 and combined with mountain big sagebrush. The sagebrush population collectively is slightly increasing and shows good vigor and light utilization.

Grasses and forbs are moderately abundant and diverse. Important grasses include bottlebrush squirreltail, muttongrass, and Letterman needlegrass. Utilization is light overall with muttongrass receiving the greatest use.

Forbs are especially important on fawn rearing habitat and the site has a good variety. The more important species include arrowleaf balsamroot, Leonard penstemon, redroot eriogonum, and sandwort. Almost all forbs show evidence of at least light utilization. However, Leonard penstemon is most preferred as it shows occasional heavy use.

1982 APPARENT TREND ASSESSMENT

Overall range trend is stable. Soil loss is occurring, but at a relatively slow rate. The plant community should not be seriously affected. With respect to vegetation, the most striking feature is the preponderance of young Gambel oak. If these mature to become large tree-like forms, the basic character of the site will be altered. However, it may be that site conditions and animal use will preclude the growth of tree-like forms. Grass and forb composition and density, while adequate, are perhaps slightly below optimum.

1992 TREND ASSESSMENT

Some soil loss has occurred since the last reading as evidenced by the increase in rock and pavement. Litter cover is improving and should help decrease erosion. The Gambel oak population more than doubled and has the potential to keep increasing. While most grass and forb quadrat frequencies increased, the amount of vegetative cover decreased slightly and composition is probably still below optimum.

TREND ASSESSMENT
soil - slightly down due to erosion
browse - stable
herbaceous understory - stable

DISCUSSION

Trend Study No. 50B-13

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Atchinson Mountain range trend study is located on low summer or transitional range at 6,700 feet elevation. The range type is sagebrush-grass on a 10% north-northwest slope. The surrounding hills are covered with Gambel oak and Utah serviceberry. Water can be found in a creek 1/4 of a mile to the southwest. The area is within the Dixie National Forest and is grazed by 100 head of cattle from August 1-October 15.

Soils are well drained, rocky and of moderate depth. Soil movement and erosion is minimal. A few small gullies are present, but are not enlarging much due to the gentle terrain. Ground cover is composed primarily of litter (62%), and there is now only 11% bare ground as compared to 22% exposed bare soil in 1982.

The key browse species is mountain big sagebrush which had been identified as basin big sagebrush in 1982. The mountain big sagebrush has a population that is light to moderately utilized and shows good vigor. Most plants are vigorous with 15% being classified as chlorotic or dying, however these plants were also classified as decadent. Approximately 33% of the encountered plants were decadent with few seedlings and no young identified. The population has increased from 1,733 plants/acre in 1982 to 2,199 plants/acre in 1992. The most abundant shrub on the site was stickyleaf low rabbitbrush with a density of 3,998 plants/acre and an age structure that is more typical of an expanding population. Other shrubs include antelope bitterbrush and the increaser broom snakeweed. The broom snakeweed density increased from no plants to 2,798 plants/acre and should be closely monitored.

The principal grasses are western wheatgrass, an unidentified Agropyron sp., and bottlebrush squirreltail. All are moderately aggressive increasers of fair to good forage value. Other grasses of more occasional occurrence include subalpine needlegrass, Letterman needlegrass, and prairie junegrass. Although not counted or recorded on the plots, cheatgrass brome was observed in patches.

The most conspicuous forbs were Lupinus holosericeus and arrowleaf balsamroot, both of which are large succulent species. There are a few undesirable increasers and annuals, but a high proportion are desirable forage plants. Redroot eriogonum and bastard toadflax showed light use by livestock this spring.

1982 APPARENT TREND ASSESSMENT

Judging from the apparent trend evaluation, soil trend is declining. Dispersion of ground cover is variable and there is obvious sheet and gully erosion. Vegetative trend may also be declining. The most obvious clues are the age, form, and vigor distribution of the key species, the relative abundance of stickyleaf low rabbitbrush and broom snakeweed, and species composition among grasses.

1992 TREND ASSESSMENT

Soil trend is improving with the increase of vegetative cover and the decrease in bare ground cover. Rock and pavement cover have increased from 5% to 9% and it was reported that evidence of past soil erosion was slight. Grass and forb quadrat frequency totals increased which coincides with the increase on vegetative cover. Density for all browse species increased which might be considered bad because the three browse species are increaser/invaders. The stickyleaf low rabbitbrush and broom snakeweed populations need to be monitored for increase. The increase in mountain big sagebrush is good and it should be able to sustain itself.

TREND ASSESSMENT
soil - up
browse - slightly down, due to increases in increaser/invader species
herbaceous understory - slightly up

DISCUSSION

Trend Study No. 50B-16

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The West Valley range trend study is located on a key summer deer range in West Valley. The site has at an elevation of 9,200 feet and is one of several dry meadows or parks located near the head of the Left Fork of the Santa Clara River. Dry meadows in this area are rather small (20 to 40 acres) and normally surrounded by a narrow band of aspen, backed by an almost limitless acreage of rather sterile dark timber. Deer use the meadows extensively for foraging. Many deer beds and pellet groups were observed in the West Valley. This site is on an area of the Pine Valley Mountains that has not been grazed by livestock since the 1960's. Meadow areas, such as West, North, South, and Whipple valleys, are undoubtedly at least locally important to deer and possibly elk in the future. This area has had an increase in recreational horse use also (Russle 1996).

Soils are the result of sedimentation from the surrounding higher country. Characteristically, soils are moderately deep, relatively fine textured, and contain abundant organic matter. Fertility and water holding capacity is high. Erosion is nearly nonexistent because of the dense vegetative and litter cover and lack of slope.

Vegetatively, West Valley is a grass-forb meadow. No browse species were encountered, although in a few localized spots, limited numbers of shrubby cinquefoil were observed. Herbaceous growth is very lush with grasses and forbs in nearly equal abundance. On the lower portions of the valley (i.e., close to the drainage channel), the range type is more of a wet meadow. Here sedges, rushes, and water-loving grasses, such as redtop (Agrostis alba) and tufted hairgrass (Deschampsia caespitosa), are dominant. The site is actually a drier area and these species are much less abundant. The principal species include Kentucky bluegrass, subalpine needlegrass, and slender wheatgrass. Annual grasses did not occur on the study site, however some rather large patches of annual bluegrass (Poa annua) were observed nearby. Grass species show evidence of light grazing by wildlife. Forbs are only slightly more abundant than grasses. The more common species include slender cinquefoil, clover, fleabane daisy, and western yarrow. Most species on the site are undesirable increasers and should be indicators of trend. The undesirable species have mostly decreased, most noticeably orange sneezeweed, western yarrow, rosy pussytoes, and fleabane daisy. Mountain bluebell and American bistort showed a considerable degree of grazing with American bistort appearing especially preferred.

1982 APPARENT TREND ASSESSMENT

Current soil and vegetative condition is good. With respect to trend, soil seems stable or even improving. Vegetation trend depends upon a perceived management objective which should probably center on the relative abundance of desirable grasses and forbs. If more forbs are desired, the trend may be slightly down because the grass component is highly vigorous and probably has a competitive edge at this point.

1992 TREND ASSESSMENT

Bare ground increased from 4% to 7%, while vegetative cover slightly decreased from 24% to 20% cover. The extended drought could easily explain these slight downward trends. The soil trend is stable with no erosion reported on the site, due to thick grass and forb cover and negligible slope. Total grass and forb quadrat frequency decreased overall although several species such as Stipa columbiana, Stipa lettermani, Mertensia ciliata, Solidago parryi, and Taraxacum officinale increased. Herbaceous understory is stable.

TREND ASSESSMENT
soil - stable
browse - none
herbaceous understory - stable

DISCUSSION

Trend Study No. 50B-7c

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Motoqua trend study is located on winter range in the lower portion of the East Fork of Beaver Dam Wash. Elevation is approximately 4,040 feet with a slope of 10% and westerly aspect. The range type is southern desert shrub and is totally shrub dominated. Perennial herbs are nearly nonexistent. Deer use appears light and cattle grazing is evident.

Soils, typical of black brush communities in this area, are very shallow, rocky, and appear heavily eroded. Erosion pavement occupies half of the ground surface. Exposed soil covered 14% of the ground surface in 1982. It is now down to 4% in 1992. Rock cover increased from 3% to 15%. Litter cover (34%) is composed almost entirely of ephemeral annual grasses, such as cheatgrass and foxtail brome. Basal vegetative cover increased from less than 1% in 1982 to 4% in 1992.

The key browse species include blackbrush with lesser amounts of desert bitterbrush. Blackbrush is the most numerous species and has increased from 1,866 plants/acre in 1982 to 2,133 by 1992. Desert bitterbrush consists of scattered, five foot high, mostly decadent plants with an estimated density of 433 plants/acre in 1982, now up to 566 in 1992. Percent decadency of bitterbrush has increased from 8% to 77%. Utilization of both species is light to moderate, but blackbrush often appears hedged, at least partly, because of its normal growth habit. Percent decadenty has increased from 21% in 1982, to 28% in 1992. Overall vigor has improved since 1982 when 54% of the blackbrush sampled displayed poor vigor. During the 1992 reading, only 3% of the blackbrush displayed poor vigor, likely due to the above normal precipitation this past year. On nearby burned areas, desert bitterbrush predominates as blackbrush is well-known as intolerant of fire. This differential response to fire may have management implications. Other browse in the area includes green ephedra, Mohave desert rue, and datil yucca. The latter two are essentially worthless as forage plants.

Herbaceous plants are nearly absent from the site, which is typical of blackbrush dominated communities. Bottlebrush squirreltail was the only perennial grass encountered or observed and it was rare. Annual brome grasses are present, but not abundant. Annual or perennial forbs are few. None were encountered on the study plots during the 1982 reading. In 1992, a few individuals of gooseberryleaf globemallow and an Astragalus sp. were encountered.

1982 APPARENT TREND ASSESSMENT

This site is typical of blackbrush dominated areas in this part of the state. Soils are shallow and covered with rocks and pavement. Perennial herbaceous vegetation is usually scarce. On this site, soil movement is noticeable and plants appear pedestaled. Pavement covers half of the ground surface. Percent bare ground is fairly low for a site like this at 14%. The shrub component seems stable, barring fire or some other extraordinary influence.

1992 TREND ASSESSMENT

Soil conditions have improved slightly since 1982. Basal vegetative cover has increased from less than one percent to four percent, while bare ground dropped from 14% to 4%. Pavement cover remained the same while rock cover increased from 3% to 15%. Some soil movement is still occurring, overall protective ground cover has increased from 86% to 96% which should provide increased protection of the soil and reduce the amount of erosion occurring. Soil trend is slightly up, but still in poor condition. Key browse on the site have increased in density and show improved vigor. Trend for browse is up. Herbaceous vegetation

is severly deficient and of no consequence on this site. Bottlebrush squirreltail, the only perennial grass encountered, occured in only 2% of quadrats. The two forbs sampled had a combined quadrat frequency of only 12%. Trend for these few species is up slightly from 1982.

TREND ASSESSMENT
soil - slightly improved, but still poor condition
browse - up for blackbrush
herbaceous understory - nearly non existent, but slightly up

DISCUSSION

Trend Study No. 50B-12c

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Rattlesnake Spring range trend study is located near Rattlesnake Spring, a year-round water source. Deer and cattle tend to concentrate in this area during the summer. Cattle stay mostly in the canyon bottom, while deer use the slopes to a greater extent. Seven hundred and thirty-two head of cattle are allotted to the area from August 20-November 15. Deer are known to use the area for fawn rearing. Elevation is approximately 6,400 feet with a slope of less than 20% and a northerly aspect. The range type is oakbrush interspersed with mountain big sagebrush openings.

Soil is gravelly, well drained, and shows moderate to high erosion, especially on the upper part of the site. Ground cover is composed principally of litter. Open exposed areas of bare ground in between oak clones show the most erosion.

The key browse species are Gambel oak, Utah serviceberry, and mountain big sagebrush. Gambel oak, the most abundant shrub, has exploded in density from 7,265 stems/acre in 1982 to 17,599 stems/acre by 1992. Reproductive potenital remains high. Utilization is light to moderate and vigor is good. Black sagebrush was encountered in 1992, but not mentioned in the 1982 report. This would indicate a possible misidentification with mountain big sagebrush. Combined, the sagebrush increased in density from 2,132 to 3,731 plants/acre. Utilization of sagebrush has increased since 1982. Currently 24% of the plants sampled displayed heavy hedging (>60% of twigs browsed). Vigor is good. Utah serviceberry increased in density by 46% since 1982. Age class distribution indicates continued growth. Fifteen percent of the serviceberry were heavily hedged and vigor has improved since the last reading. Other browse on the site include snowberry, woods rose, rabbit brush, and an Eriogonum.

A good variety of grasses occur on the site, yet none are very dense. Total grass production from perennials is low. Bulbous bluegrass (Poa bulbosa), a short lived perennial, is the most numerous grass followed by intermediate wheatgrass, a seeded species. Muttongrass and bottlebrush squirreltail are also fairly common. These species all exhibited moderate to high levels of use in 1982. Utilization of grasses and forbs were not noted during the 1992 reading. Annual cheatgrass brome is also fairly abundant on this site within the shrub interspaces.

Forbs are diverse, but not abundant. Fourteen species were encountered in 1992. The most abundant included Louisiana sage, thickleaf peavine, and a Trifolium species. Forbs, especially the more palatable species, such as showy goldeneye, redroot eriogonum, and Eaton penstemon, were moderately grazed in 1982.

1982 APPARENT TREND ASSESSMENT

Range trend is stable. There are some small gullies and evidence of sheet erosion, but the rate of soil formation appears at least equal to the rate of loss. However, ground cover could be better in the shrub interspaces. Grazing pressure from cattle and to some extent deer have tended to depress perennial grasses and helped allow the invasion of cheatgrass. The browse component is productive and vigorous and is in little danger of declining. Perennial forbs and grasses occur at less than optimum densities, with vigor, especially of grasses, being depressed.

1992 TREND ASSESSMENT

Erosion is still a problem on this site even though basal vegetative cover increased from 1% to 4% and bare ground decreased from 14% to 5%. Rill erosion, soil pedestaling around plants, and exposed plant roots are evident mostly in the unvegetated shrub interspaces. However, total protective ground cover has increased from 86% to 95% indicating improved conditions. Browse densities have increased for the key species. Vigor has improved for serviceberry, but utilization is heavier on serviceberry and sagebrush. Oak has shown a dramatic increase and possesses a dynamic reproductive potential indicating further growth. Continued increases in oak density will likely have a negative impact on other browse species and herbaceous plants. The herbaceous understory is diverse, but not abundant. Quadrat frequencies of grasses and forbs have increased since 1982 indicating a slightly upward trend.

TREND ASSESSMENT
soil - improved, but still in poor condition
browse - up
herbaceous understory - up slightly, but poor production

DISCUSSION

Trend Study No. 50B-14c

*** This site was not read in 1998 and is being discontinued. Only text from the 1992 "Utah Big Game Range Trend Studies" report has been included. Consult the 1992 report for maps and data tables.

The Pinnacles range trend study is in Burnt Canyon near the Pinnacles rock outcrop at an elevation of 5,720 feet. It lies on a 25% slope with a north aspect. The area is nominally deer summer range, but elevations are relatively low and during light winters deer would occupy the area. The range type is mixed mountain brush with Utah serviceberry the dominant overstory plant. Signs of deer and cattle use were evident during the 1992 survey. Grazing by 471 head of cattle is alternated each year from spring to fall.

Soil is coarse, rocky, and well drained. Surface rocks are large. Erosion and soil loss are minimal, even though there are many bare areas in the shrub interspaces. Litter cover is high and is largely composed of dead cheatgrass brome and oak leaves.

Browse on this site are very abundant and thick with an overall estimated density of 12,264 plants/acre in 1982 and 15,530 in 1992. Travel through the area is possible only on game trails. The key browse species is Utah serviceberry, which comprised 90% of browse composition in 1982 and 71% in 1992. Outside the immediate study site, serviceberry is somewhat less dominant. Numerous seedlings and young were counted in 1992, a large percentage of which were judged unavailable to deer because they occurred within a dense clump of some other shrub, usually another serviceberry. Mature serviceberry, which averaged 2½ by 1½ feet in 1982, have increased significantly in size. They now average nearly 6 feet in height with a crown of 3 feet which effectively limits the amount of forage available to deer. Utilization is light to moderate with a few individuals exhibiting heavy use. Juniper rust was a factor affecting overall vigor in 1982, when 75% of the shrubs sampled were infected. This disease, also called Cedar-apple rust, was very widespread on this herd unit in 1982, but does not seem to be a serious fatality factor. During the 1992 reading, no serviceberry displayed juniper rust. The incidence of infection obviously fluctuates greatly between years. Other shrubs, in their approximate order of abundance are Gambel oak, mountain big sagebrush, curlleaf mountain mahogany, and desert gooseberry. Gambel oak has increased from 400 to 2,866 stems/acre since 1982. Seventy two percent of the population consist of young plants. Mature individuals have more than doubled in height since the last reading. Continued increases in size of the major browse species will make even more forage unavailable to deer.

Herbaceous composition is poor and dominated by cheatgrass brome. The only perennial grasses encountered were bottlebrush squirreltail, muttongrass, and mountain brome, all of which were strictly occasional in their occurrence. Forbs are slightly more diverse. Ten perennial species provide a minimal amount of forage.

1982 APPARENT TREND ASSESSMENT

Soil trend is satisfactory. Although basal vegetative cover is slight, aerial shrub cover is quite dense and provides protection from raindrop impact. High intensity storms will cause some soil loss. However, the current situation appears stable. The vegetative trend points toward an increasingly dense shrub canopy dominated by Utah serviceberry. This species appears to be expanding its current dominance of the site. Herbaceous understory is badly depleted and shows no sign of recovery or increase.

1992 TREND ASSESSMENT

Protective ground cover has improved slightly since 1982 (91% to 93%). Erosion is still occurring on some open areas, but overall it is minimal. Trend for soil is up slightly. Browse on the site is abundant, thick, and increasing, making much of the forage unavailable. The thick nature of the browse makes travel through the

area difficult except on trails. This study should be moved up slope where browse is more accessible and more likely utilized. Overall browse trend is up. The herbaceous understory is deficient and composed mostly of cheatgrass brome. Quadrat frequencies have increased slightly for grasses and forbs indicating a slightly upward trend. Herbaceous understory will continue to be deficient unless the site experiences some sort of disturbance like fire which would benefit the area.

TREND ASSESSMENT
soil - stable to slightly up
browse - up, but becoming more unavailable
herbaceous understory - slightly up, but poor composition

WILDLIFE MANAGEMENT UNIT 27R AND 29R SPECIAL STUDIES (KANAB EXCLOSURES)

There were a number of exclosures, four-way and two-way, that were relocated and repaired by the BLM from the Kanab district. They requested that permanent range trend transects be located within each of the treatments (total exclosure, livestock exclosure and outside the exclosure) in order to quantify the differences. During the 1998 field season, two, two-way exclosures and three, four-way exclosures were visited and permanent trend transects were established and read.

Trend Study 27R-1-98

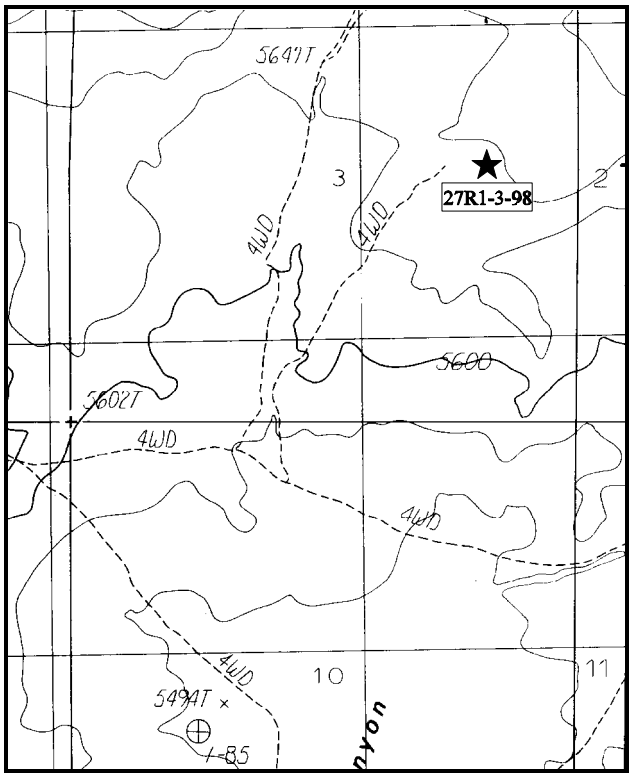
Study site name: John R. Flat Total Exclosure . Range type: Mixed Brush .

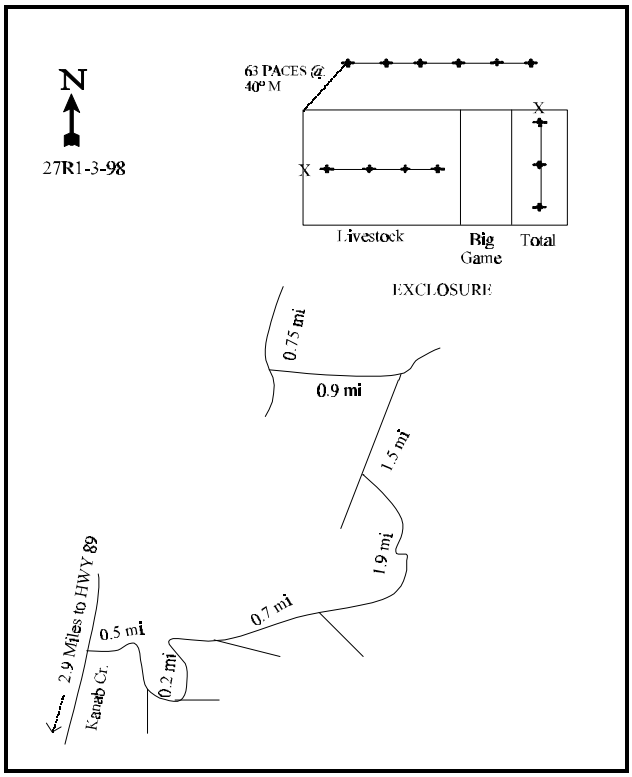
Compass bearing: frequency baseline 351° M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (34ft, 59ft, & 95 ft), line 2 (34ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. The total exclosure is the section farthest to the east. The baseline runs north through the exclosure and has browse tag #114 attached to the 0 foot stake.





Map Name: White Tower

Diagrammatic Sketch

Township 42S , Range 6W , Section 3

UTM 4116533.463 N, 366419.009 E

DISCUSSION

Trend Study No. 27R-1

The John R. Flat exclosure study is new, with this transect being placed within the "total exclosure." This exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. In 1998, permanent trend studies were established outside the exclosure, inside the livestock proof portion of the exclosure, and inside the big game/livestock proof portion of the exclosure. This portion of the study samples the area inside the big game/livestock proof section of the exclosure. The "total exclosure" area within the big game/livestock exclosure is almost half an acre in size. Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been fully maintained. Repairs were made to the exclosure in the summer of 1998, which included repairing the fence and removing debris and/or trees, near or on the fence line. There were no big game or livestock pellet groups sampled in the big game/livestock proof portion of the exclosure, but some rabbit pellet groups were observed.

Soil textural analysis indicates it to be a sandy soil with a strongly acidic pH (5.4). Average effective rooting depth (see methods) is estimated to be 33 inches with an average soil temperature of 71°F measured at a depth of 18 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 6.8 ppm respectively, and may limit plant development. No rocks or pavement were encountered on the soil surface or within the soil profile. Much of the protective ground cover on this sites comes from litter and cryptogams. Only 2% of the vegetative cover is contributed by herbaceous understory species. Percent bare ground cover is high (42%) and some soil pedestaling was noted around shrubs. There is little erosion apparent at this time, due to the soil texture and the levelness of the site.

The browse species contribute to 98% of the vegetative cover on the site. Antelope bitterbrush, basin big sagebrush, and sand sagebrush are the most abundant browse species. Antelope bitterbrush has an estimated density of 940 plants/acre, most of which (89%) are classified as mature. Young plants make up the other 11% of the population. Average cover for antelope bitterbrush is nearly 12%. This appears to be a healthy population with no dead or decadent plants encountered. Basin big sagebrush has an estimated density of 920 plants/acre. Currently, 22% of the population is classified as decadent with 50% of these classified as dying. One seedling was encountered and 13% of the population were classified as young. Average cover for basin big sagebrush is 7%. The dead to live ratio (1:1.7) could greatly increase in the future considering the number of decadent plants that are classified as dying. Currently, 37% of the population is dead.

Sand sagebrush has an estimated density of 840 plants/acre, most of which (76%) are classified as mature. Average cover for sand sagebrush is 5%. Many seedlings, 500 plants/acre, were encountered in 1998. The population appears to be expanding as the abundance of seedlings is more than adequate to replace the few decadent and dead plants within the population. Other species scattered throughout the site include: low rabbitbrush, buckwheat, skunk bush sumac, and yucca.

The herbaceous understory is very sparse. Total cover from the grasses and forbs totals to less than one percent cover. Only one grass and six forb species were encountered in 1998. Blue grama only occurred in six of the 100 quadrats. The forbs are dominated by an annual mustard. A perennial primrose and scarlet globemallow were also encountered, but infrequently.

1998 APPARENT TREND ASSESSMENT

Although some shrubs showed pedestaling, current erosion is not readily apparent. The antelope bitterbrush population appears to be stable and healthy with no decadent or dead plants sampled. However, the basin big sagebrush population exhibits many decadent, dying, and dead plants. As there is no browsing inside the exclosure, this condition is most likely due to climatic variables, extended drought and/or with winter injury.

The herbaceous understory is nearly non-existent with only one grass and six forb species encountered in 1998.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 1

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	11	6	.08
Total for Annual Grasses		0	0	0
Total for Perennial Grasses		11	6	0.07
Total for Grasses		11	6	0.07
F	Chaenactis douglasii	2	1	.00
F	Descurainia spp. (a)	28	10	.32
F	Eriogonum cernuum (a)	2	1	.00
F	Euphorbia parryi	1	1	.00
F	Oenothera spp.	8	3	.18
F	Sphaeralcea coccinea	6	2	.01
Total for Annual Forbs		30	11	0.32
Total for Perennial Forbs		17	7	0.20
Total for Forbs		47	18	0.53

BROWSE TRENDS --
Herd unit 27R, Study no: 1

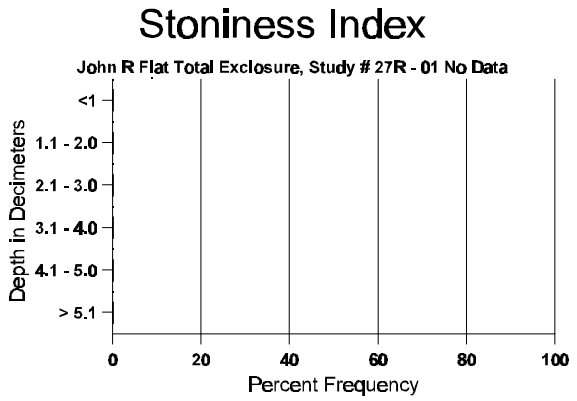
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	31	5.39
B	Artemisia tridentata tridentata	38	6.66
B	Chrysothamnus viscidiflorus	5	1.42
B	Eriogonum spp.	2	.03
B	Juniperus osteosperma	-	.03
B	Purshia tridentata	38	12.23
B	Rhus trilobata trilobata	0	.03
B	Yucca spp.	0	-
Total for Browse		114	25.80

BASIC COVER --
Herd unit 27R, Study no: 1

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	105	28.59
Litter	466	41.92
Cryptogams	174	7.93
Bare Ground	344	41.73

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 01, Study Name: John R. Flat Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
32.7	71.0 (17.7)	5.49	90.2	4.0	5.8	.4	6.8	3.2	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 1

Type	Quadrat Frequency '98
Rabbit	8

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	23	-	-	2	-	-	-	-	-	25	-	-	-	500			25
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	32	-	-	-	-	-	-	-	-	31	-	-	-	640	36	47	32
D	98	9	-	-	-	-	-	-	-	-	3	-	-	6	180			9
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 14%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		840	Dec:		21%
Artemisia tridentata tridentata																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	29	-	-	1	-	-	-	-	-	30	-	-	-	600	44	54	30
D	98	10	-	-	-	-	-	-	-	-	5	-	-	5	200			10
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	540			27
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 11%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		920	Dec:		22%
Chrysothamnus viscidiflorus																		
M	98	6	-	-	-	-	-	-	-	-	4	-	-	-	120	41	56	6
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		25%
Eriogonum spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	24	41	2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Purshia tridentata																		
Y	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
M	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840	32	59	42
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		940	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	27	0

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20	29	0

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Trend Study 27R-2-98

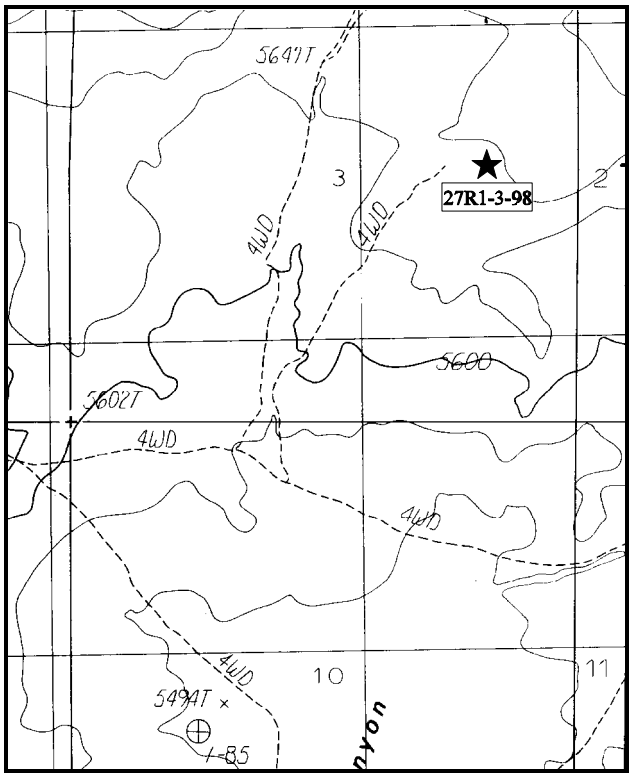
Study site name: John R. Flat Livestock Exclosure . Range type: Mixed Brush .

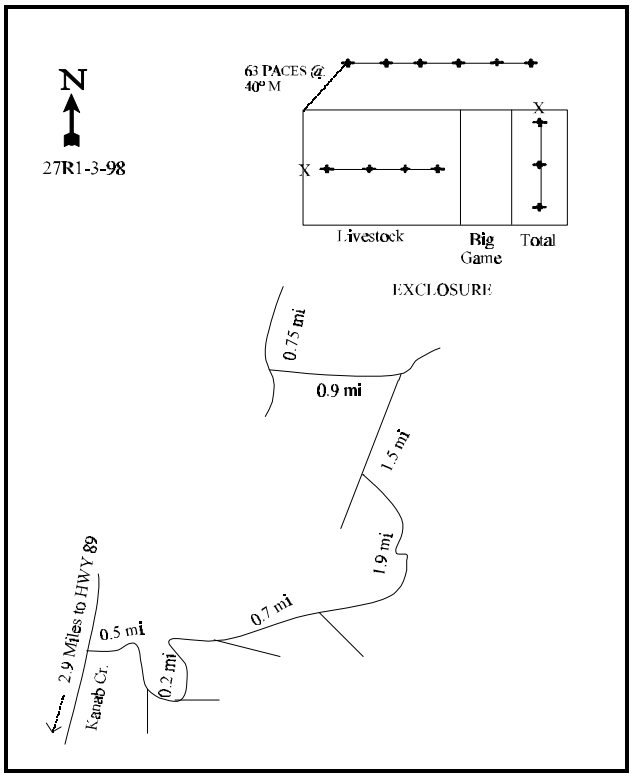
Compass bearing: frequency baseline 0 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34 ft & 71ft).

LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. The livestock exclosure is nearest the road (lower fence), and the baseline runs down the middle of the exclosure starting at the east side near the taller fence marking the big game exclosure. Count down to the 11th post in from either side to the 0 foot stake.





Map Name: White Tower

Diagrammatic Sketch

Township 42S , Range 6W , Section 3

UTM 4116566.954 N, 366374.242 E

DISCUSSION

Trend Study No. 27R-2

The is another new trend study placed within the livestock exclosure at John R Flat. The exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. In 1998, permanent trend studies were established outside the exclosure, within the livestock proof portion of the exclosure, and within the big game/livestock proof portion of the exclosure. This study samples the area inside the livestock proof portion of the exclosure. The area within the livestock exclosure is almost 1.4 acres (approximately 60,000 ft^2). Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been maintained for many years. Repairs were made to the exclosure in the summer of 1998, this included repairing the fence and removing debris and/or trees along the fence line. A pellet group transect shows abundant deer sign within the livestock exclosure with an estimated 114 deer days use/acre. Additionally, some rabbit pellet groups were observed.

Soil textural analysis indicates it to be a sand soil with a strongly acidic pH (5.4). Average effective rooting depth (see methods) was estimated to be 27 inches with an average soil temperature of 72°F at 18 inches. Both potassium and phosphorous measurements were low, 6.4 ppm and 7.7 ppm respectively, and may limit plant development. No rocks or pavement were encountered on the soil surface or within the soil profile. The soil appeared to be more compacted underneath the shrubs than in the bare interspaces. Much of the protective ground cover on this sites comes from litter and cryptogams. Only 6% of the vegetative cover is contributed by herbaceous understory species. Although percent bare ground cover is high (42%), due to the soil texture and the lack of slope, there is little erosion apparent at this time.

The browse species provide 94% of the vegetative cover on the site. Antelope bitterbrush, basin big sagebrush, and sand sagebrush are the most abundant browse species. Basin big sagebrush has an estimated density of 4,380 plants/acre. This appears to be a more stable population than the “total” exclosure with more young individuals encountered (1,920 plants/acre) than mature plants (1,860 plants/acre). The biotic potential is fairly good at this time with an estimated 180 seedling plants/acre. Currently, 14% of the population were classified as decadent and 50% of these classified as dying. Average cover for basin big sagebrush is 10%. The dead to live ratio is currently 1:3.8, or 21% of the population is dead. Utilization is light with only 5% of the population exhibiting poor vigor.

Antelope bitterbrush has an estimated density of 980 plants/acre. Mature plants make up 61% of the population, while young plants make up 37% of the population. Average cover for antelope bitterbrush is 5%. Utilization is light and the plants exhibit good vigor leader growth of about 6-8 inches this year. This appears to be a healthy population with only one decadent plant and no dead ones encountered. Sand sagebrush has an estimated density of 480 plants/acre, most of which (75%) were classified as mature. Average cover for sand sagebrush is 1.5%. Biotic potential is high with an estimated 100 seedling plants/acre encountered in 1998. This abundance of seedlings is adequate to replace the few decadent and dead plants lost from the population. Point-center quarter data estimated 27 juniper trees/acre. Other species scattered throughout the site include: a low elevation form of mountain big sagebrush, rubber rabbitbrush, skunk bush sumac, green ephedra, and yucca.

The herbaceous understory is sparse, as indicated by a total cover of just over 1%. Three grass and 7 forb species were encountered in 1998. Blue grama was the most abundant, but it was only found in 4 quadrats. Other grasses include purple threeawn and six weeks fescue. The forbs were dominated by the annual nodding eriogonum. Most other forb species were only encountered in one quadrat.

1998 APPARENT TREND ASSESSMENT

Although there is little protective ground cover provided by herbaceous species at this time, there is currently little erosion apparent on the site. The basin big sagebrush population appears to be stable at this time with many healthy, young plants encountered. The antelope bitterbrush population also appears to be stable and healthy with only one decadent plant sampled and no dead plants found. Utilization of basin big sagebrush and Antelope bitterbrush is light with few plants exhibiting poor vigor. The herbaceous understory is nearly non-existent with only 2 grass and 7 forb species encountered.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 2

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	3	2	.18
G	Bouteloua gracilis	11	4	.33
G	Vulpia octoflora (a)	2	1	.00
Total for Annual Grasses		2	1	0.00
Total for Perennial Grasses		14	6	0.51
Total for Grasses		16	7	0.51
F	Artemisia dracunculus	2	1	.03
F	Draba spp. (a)	2	1	.00
F	Eriogonum cernuum (a)	132	51	.66
F	Euphorbia albomarginata	10	4	.02
F	Gilia spp. (a)	1	1	.00
F	Oenothera spp.	1	1	.00
F	Sphaeralcea grossulariaefolia	1	1	.03
Total for Annual Forbs		135	53	0.67
Total for Perennial Forbs		14	7	0.08
Total for Forbs		149	60	0.75

BROWSE TRENDS --
Herd unit 27R, Study no: 2

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	18	1.50
B	Artemisia tridentata tridentata	74	10.03
B	Artemisia tridentata wyomingensis	1	-
B	Chrysothamnus nauseosus	3	.15
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	1	3.12
B	Purshia tridentata	38	5.48
B	Rhus trilobata trilobata	0	-
B	Yucca spp.	1	.38
Total for Browse		136	20.67

CANOPY COVER --
Herd unit 27R, Study no: 2

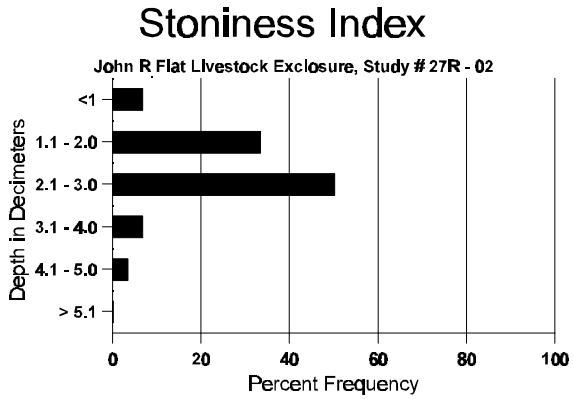
Species	Percent Cover '98
Juniperus osteosperma	5
Purshia tridentata	1

BASIC COVER --
Herd unit 27R, Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	202	22.86
Litter	480	47.95
Cryptogams	112	4.34
Bare Ground	380	42.29

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 02, Study Name: John R. Flat Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
26.8	72.0 (17.7)	5.4	90.2	4.0	5.8	.6	7.7	6.4	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 2

Type	Quadrat Frequency '98
Rabbit	9
Elk	5
Deer	46

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	16	1	-	1	-	-	-	-	-	18	-	-	-	360	27	29	18
D	98	5	-	-	-	-	-	-	-	-	4	-	-	1	100			5
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98				Moderate Use 04%			Heavy Use 00%			Poor Vigor 04%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		480	Dec:		21%
Artemisia tridentata tridentata																		
S	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	98	69	19	-	6	-	-	2	-	-	96	-	-	-	1920			96
M	98	49	32	3	8	1	-	-	-	-	93	-	-	-	1860	33	37	93
D	98	15	1	-	9	2	2	1	-	-	20	-	-	10	600			30
X	98	1	-	-	-	-	-	-	-	-	1	-	-	-	1160			58
% Plants Showing '98				Moderate Use 25%			Heavy Use 02%			Poor Vigor 05%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		4380	Dec:		14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Chrysothamnus nauseosus																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	32	45	1
D	98	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 50%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		75%
Ephedra viridis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	45	83	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	10	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
Y	98	13	1	-	3	1	-	-	-	-	18	-	-	-	360			18
M	98	18	7	-	2	3	-	-	-	-	28	2	-	-	600	36	50	30
D	98	-	-	-	-	1	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 27%			Heavy Use 00%			Poor Vigor 02%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		980	Dec:		2%
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	87	132	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Yucca spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	46	41	1

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	20	Dec:	-

Trend Study 27R-3-98

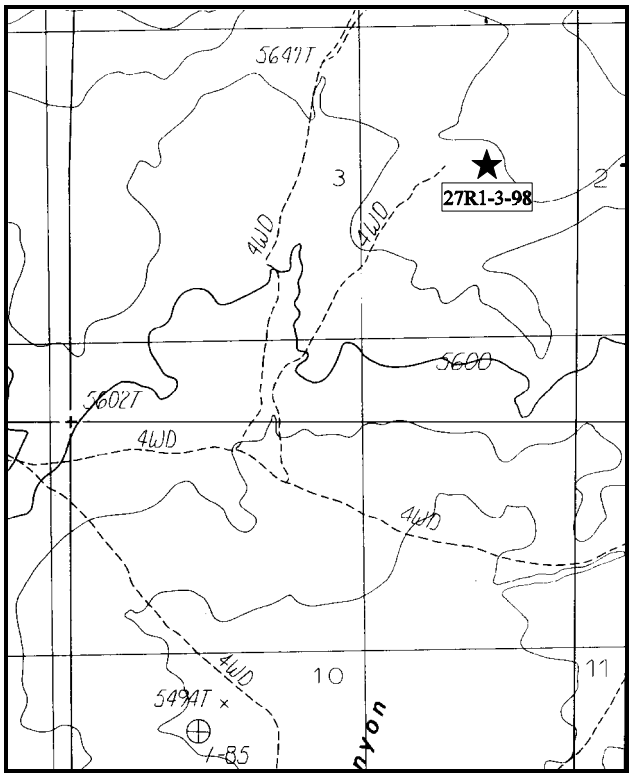
Study site name: John R. Flat Outside . Range type: Mixed Brush .

Compass bearing: frequency baseline 100°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1(11 ft) , line 2(34 ft) , line 3(59 ft) , line 4(71 ft) , line 5(95 ft).

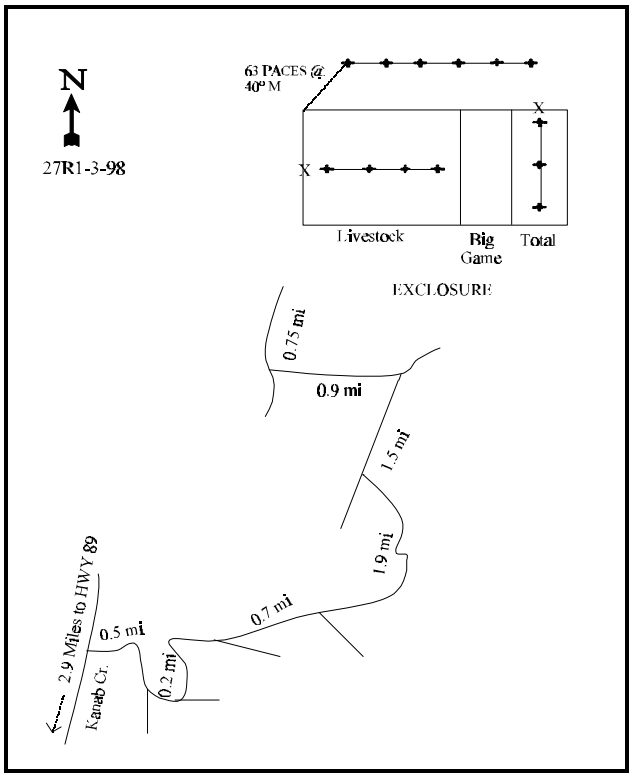
LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. From the northwest corner of the exclosure, walk 63 paces at an azimuth of 40° M to the 0 foot stake of the baseline. The baseline runs at 100°M.



Map Name: White Tower

Township 42S , Range 6W , Section 3



Diagrammatic Sketch

UTM NO GPS

DISCUSSION

Trend Study No. 27R-3

This is a new trend study placed outside the exclosure at the John R. Flat exclosure. The exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. Permanent trend studies were established outside the exclosure, within the livestock proof portion of the exclosure, and within the big game/livestock proof portion of the exclosure in 1998. This transect is located outside of the exclosure. Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been maintained for many years. Repairs were made to the exclosure in the summer of 1998, this included repairing the fence and removing debris and/or trees along the fence line. A pellet group transect showed abundant deer and rabbit sign with an estimated 34 deer days use/acre.

Soil textural analysis indicates it to be a sand soil with a moderately acidic pH (5.6). Average effective rooting depth (see methods) is estimated to be 29 inches with an average soil temperature of 73°F at 18 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 5.1 ppm respectively, and may limit plant development. Rocks and pavement were rarely encountered on the soil surface and not encountered within the soil profile. Percent bare ground cover is high (61%) and some soil pedestaling was noted around shrubs. There is little erosion apparent at this time due to the soil texture and the levelness of the site.

The browse species provide 62% of the vegetative cover on the site. Basin big sagebrush, sand sagebrush, and antelope bitterbrush are the most abundant browse species. Basin big sagebrush has an estimated density of 1,540 plants/acre. This appears to be a declining population with 53% of the population classified as decadent and a dead to live ratio of 1:1. Currently, 37% of the decadent plants are classified as dying. No seedlings were found, therefore biotic potential in 1998 was zero. Young plants make up 10% of the population and mature plants make up 36% of the population. Average cover for basin big sagebrush is 4%. Utilization is light to moderate and 19% of the population exhibit poor vigor. Use is significantly higher than that in the livestock proof portion of the exclosure.

Sand sagebrush has an estimated density of 380 plants/acre, most of which (79%) are classified as mature. Average cover for sand sagebrush is 1%. This appears to a stable population as the number of seedlings is adequate to replace the few decadent and dead plants that are being lost. Antelope bitterbrush has an estimated density of 240 plants/acre. Mature plants make up 50% of the population and young plants make up the other 50% of the population. Average cover for antelope bitterbrush is nearly 2%. Utilization is light and the plants exhibit good vigor this year. This appears to be a stable, healthy population with no decadent or dead plants encountered. Point-center quarter data estimates 27 juniper trees/acre. Other species scattered throughout the site include: rubber rabbitbrush, skunk bush sumac, green ephedra, buckwheat, broom snakeweed, prickly pear cactus, and yucca.

The herbaceous understory provides 38% of the vegetative cover, or a total of just over 5% cover. Grasses provide 64% of the herbaceous understory cover. Blue grama is the most abundant grass providing about 2% cover. Other perennial grasses include: sand dropseed, Indian ricegrass, and sandhill muhly. Six weeks fescue, an annual, was encountered but provides much less than 1% cover. The forbs were dominated by the annual nodding eriogonum. Tarragon is the most abundant perennial forb found in 11 quadrats.

1998 APPARENT TREND ASSESSMENT

Although some pedestaling was noted around some of the shrubs, there is currently no serious erosion apparent on the site. The basin big sagebrush population appears to be declining at this time with 53% of the population classified as decadent, a dead to live ratio of 1:1, and no seedling plants encountered. The antelope bitterbrush population appears to be stable and healthy with only no decadent or dead plants

encountered. Utilization of antelope bitterbrush is light with all exhibiting good vigor. The herbaceous understory cover is poor and provides little protective ground cover.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	37	16	1.95
G	Muhlenbergia pungens	8	3	.78
G	Oryzopsis hymenoides	6	3	.06
G	Sporobolus cryptandrus	20	8	.40
G	Vulpia octoflora (a)	25	10	.05
Total for Annual Grasses		25	10	0.05
Total for Perennial Grasses		71	30	3.21
Total for Grasses		96	40	3.25
F	Artemisia dracunculus	17	11	.77
F	Chaenactis douglasii	13	6	.36
F	Eriogonum cernuum (a)	115	49	.53
F	Euphorbia parryi	6	3	.04
F	Gilia spp. (a)	5	3	.04
F	Machaeranthera canescens	-	-	.00
F	Oenothera pallida	4	2	.04
F	Sphaeralcea parvifolia	1	1	.00
Total for Annual Forbs		120	52	0.57
Total for Perennial Forbs		41	23	1.22
Total for Forbs		161	75	1.79

BROWSE TRENDS --
Herd unit 27R, Study no: 3

Type	Species	Average Cover % '98
B	Artemisia filifolia	.75
B	Artemisia tridentata tridentata	3.83
B	Chrysothamnus nauseosus	.73
B	Ephedra viridis	.58
B	Eriogonum spp.	.03
B	Gutierrezia sarothrae	-
B	Juniperus osteosperma	.15
B	Opuntia spp.	-
B	Purshia tridentata	2.19
B	Rhus trilobata trilobata	-
B	Yucca spp.	-
Total for Browse		8.29

CANOPY COVER --
Herd unit 27R, Study no: 3

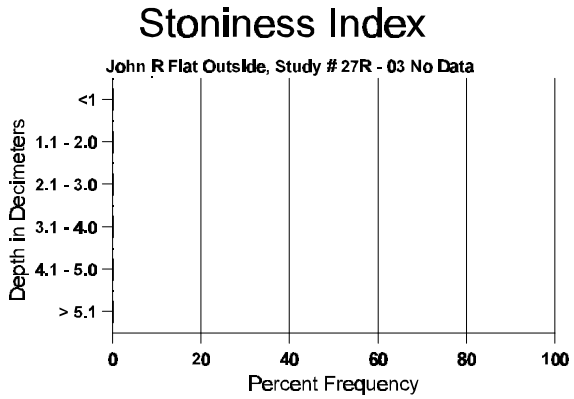
Species	Percent Cover '98
Juniperus osteosperma	2

BASIC COVER --
Herd unit 27R, Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	211	14.82
Rock	1	.00
Pavement	2	.00
Litter	459	28.68
Cryptogams	128	6.28
Bare Ground	439	60.68

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 03, Study Name: John R. Flat Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
29.4	72.6 (17.7)	5.6	92.2	2.0	5.84	.5	5.1	3.2	.2



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 3

Type	Quadrat Frequency '98
Rabbit	17
Elk	1
Deer	33

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	14	-	-	1	-	-	-	-	-	15	-	-	-	300	22	22	15
D	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 05%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		380	Dec:		11%
Artemisia tridentata tridentata																		
Y	98	6	1	1	-	-	-	-	-	-	8	-	-	-	160			8
M	98	8	14	4	2	-	-	-	-	-	28	-	-	-	560	27	35	28
D	98	16	18	1	3	2	1	-	-	-	26	-	-	15	820			41
X	98	1	-	-	-	-	-	-	-	-	1	-	-	-	1480			74
% Plants Showing '98				Moderate Use 45%			Heavy Use 09%			Poor Vigor 19%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1540	Dec:		53%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	6	-	-	1	-	-	-	-	-	7	-	-	-	140	29	41	7
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		200	Dec:		20%
Ephedra viridis																		
S	98	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
Y	98	-	1	-	-	4	-	-	-	-	5	-	-	-	100			5
M	98	2	1	-	-	-	-	-	-	-	3	-	-	-	60	44	63	3
% Plants Showing '98		Moderate Use 75%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		-
Eriogonum spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	13	22	2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Gutierrezia sarothrae																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	8	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	13	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
Y	98	4	-	-	-	2	-	-	-	-	6	-	-	-	120			6
M	98	5	1	-	-	-	-	-	-	-	6	-	-	-	120	40	65	6
% Plants Showing '98		Moderate Use 25%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		240	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	30	0

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	30	25	0

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

JOHN R. FLAT EXCLOSURE COMPARISON SUMMARY

Total Exclosure 27R-1, Livestock Exclosure 27R-2, and Outside 27R-3

1998 Comparisons

Ground cover characteristics differ between outside and inside the exclosure. Percent bare ground cover is highest outside of the exclosure (61%) and almost the same in both the livestock and total exclosure (42%). Vegetation cover is greatest in the total exclosure (29%), dropping down slightly in the livestock exclosure (23%), and at its lowest value outside the exclosure (15%). Litter cover is highest in the livestock and total exclosures and again the lowest outside.

Soil characteristics are very similar between all treatments. Soils are a moderately deep with very sandy textures and understandably low organic matter content. Although the pH inside the exclosure is classified as strongly acidic and outside the exclosure the pH is classified as moderately acidic, there is not that large of a difference between the two, 5.4 inside and 5.6 outside. Very little erosion is occurring on any of the sites due to the soil texture and the levelness of the site. Phosphorous and potassium levels are low for all sites and may limit plant development. Soil temperatures differ by only 1.6°F (71.0-72.6) between all sites.

Basin big sagebrush density is similar between the total exclosure (920 plants/acre) and outside the exclosure (1,540 plants/acre). The livestock exclosure has a higher density with an estimated 4,380 plants/acre where 45% of the plants are classified as young. The sagebrush stand outside the exclosure is the least healthy with 53% of the population classified as decadent. The total exclosure has decadency rate of 22% and the livestock exclosure has a decadency rate of 14%. Those with poor vigor follow the same pattern, with the highest outside the exclosure, and the lowest in the livestock exclosure. Utilization is light to moderate outside and mostly light in the livestock exclosure (45% vs 25% for those with moderate use). However, deer days use/acre is highest in the livestock exclosure compared to the outside (114 ddu/acre vs 33 ddu/acre) where the sagebrush is in the best condition. Because of the relatively high number of dead plants and decadent sagebrush plants in the total exclosure, this would indicate that other “effects” are causing the downward trends for sagebrush. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

The bitterbrush populations are similar over all grazing effects. No seedlings were encountered on any treatment. However, the outside and the livestock exclosure had more young plants relative to the total exclosure. Utilization is light on the outside and within the livestock exclosure. Sand sagebrush density is highest in the total exclosure (840 plants/acre) and similar in the livestock (480 plants/acre) and outside (380 plants/acre). These plants exhibit no utilization and are comprised of mostly mature plants.

Outside the exclosure had the highest herbaceous understory cover (5%), followed by the livestock exclosure (1.25%), and then the total exclosure (0.6%). Herbaceous understory species richness is highest outside with 13 species encountered. The livestock exclosure has 10 species and the total exclosure has 7 species. Annual species dominate in the livestock exclosure while perennial species dominate outside. Perennial and annual are of nearly equal abundance in the total exclosure.

Grass species account for 64% of the herbaceous understory cover outside, 40% in the livestock exclosure, and 12% inside the “total” exclosure. Blue grama is present on all sites. Six weeks fescue is present in the

livestock exclosure and outside. Sandhill muhly, Indian ricegrass, and sand dropseed are only present in the outside. Forbs are dominated by annuals on all sites; nodding eriogonum outside and in the livestock exclosure, and Descurainia sp. in the total exclosure.

Trend Study 27R-4-98

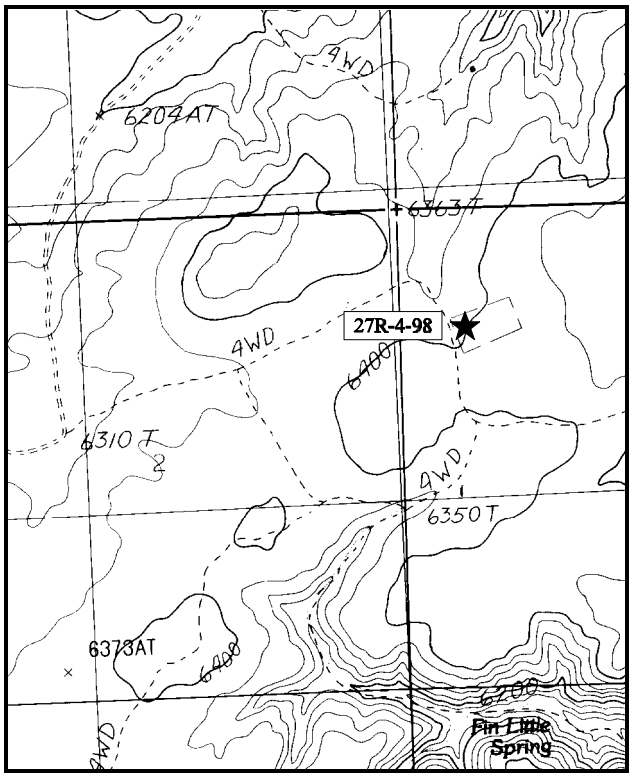
Study site name: Nephi Pasture Total Exclosure . Range type: Mixed Brush .

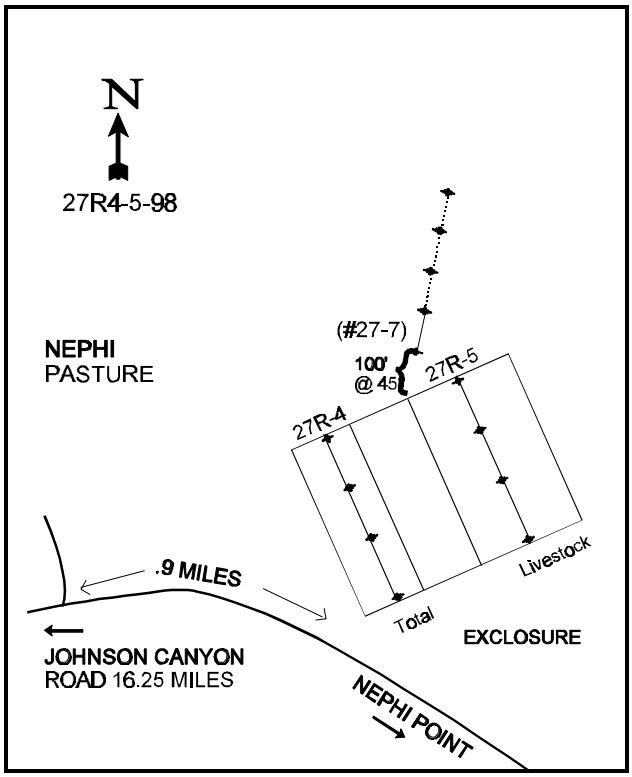
Compass bearing: frequency baseline 142°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34 ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, take US 9 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 27-6-97 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 exclosure. From the northwest corner of the exclosure, count up five posts to the 0 foot baseline on the inside of the exclosure. The baseline runs at an azimuth of 142° M.





Map Name: Nephi Point

Diagrammatic Sketch

Township 42S , Range 4W , Section 1

UTM 4116576.213 N, 394201.102 E

DISCUSSION

Trend Study No. 27R-4

This is a new study placed within the Nephi Pasture total exclosure. The Nephi exclosure is a 3 way (total, livestock, and open grazing effects) exclosure established in the 1960's. Trend study 27R-5 samples the livestock exclosure and study 27-7 is an existing trend study established in 1987, sampling outside of the exclosure. The area supports a mixed shrub community with a scattered overstory of pinyon and juniper trees. Slope is 13% with a northwest aspect. Elevation is approximately 6,400 feet. Deer generally utilize the area at high levels during the winter. They have also gotten into the total exclosure, due to a hole in the fence and moderately hedged many of the preferred shrubs.

Soil in the exclosure is a fairly deep sandy loam with a moderately acid pH (5.9). Effective rooting depth (see methods) is estimated at almost 23 inches. Phosphorus and potassium appear to be limiting to plant growth at just 8.2 ppm and 25.6 ppm respectively. Values higher than 10 ppm for phosphorus and 70 ppm for potassium are considered minimal for normal plant development. There is virtually no rock or pavement on the surface or within the soil profile. Some soil pedestaling is evident, but there is very little erosion occurring inside of the exclosure.

The total exclosure supports a moderately dense stand of basin big sagebrush which provides half of the shrub cover on the site. Antelope bitterbrush is also fairly abundant, providing an additional 38% of the shrub cover. Serviceberry is found inside the total exclosure but at far lower numbers compared to the livestock exclosure and outside. The sagebrush displays light to moderate use due to the poorly maintained fence. Density is estimated at 2,820 plants/acre, 64% of which are decadent. Dead plants are numerous and account for 42% of the population. In addition, 72% of the decadent sagebrush appear to by dying indicating the possibility of 1,300 additional plants being eliminated from the population in the near future. Reproduction is poor with no seedlings sampled and young plants account for only 12% of the population. This would not be enough to maintain the population at current levels. Taking these factors into account, it appears that the sagebrush population is in a state of serious decline.

Bitterbrush, meanwhile, appears to have a stable population of approximately 920 plants/acre. Use is light to moderate, vigor good, and percent decadence low at only 2%. No seedlings were encountered, but 20% of the population consists of young plants. Serviceberry has a population of only 80 plants/acre. They show no use, good vigor, and low decadence at 25%. There is a moderately dense stand of broom snakeweed. It has an estimated population density of 1,580 plants/acre. However, 92% of the plants are mature and the population appears stable.

The herbaceous understory is moderately abundant, providing 17% cover. There are 7 perennial grasses found in the total exclosure, however annuals, cheatgrass and six weeks fescue, dominate by providing 72% of the grass cover. In fact, cheatgrass is most abundant inside of the total exclosure compared to the livestock exclosure and outside. The most common perennial grass is needle-and-thread which occurs in low numbers outside of the total exclosure. Western wheatgrass and Sandberg bluegrass are also fairly common. Forb diversity and abundance are similar, when compared to the livestock exclosure. Bastard toadflax and wooly plantain are the most abundant species.

1998 APPARENT TREND ASSESSMENT

The soil appears to be stable with limited erosion occurring. Ground cover characteristics differ slightly compared to the livestock exclosure. Percent vegetative cover is 41% compared to 47% in the livestock exclosure. Litter cover is much lower at 43% in the total exclosure compared to 67% in the livestock exclosure. However, percent bare ground is similar at 23%. Trend for the key browse species, basin big sagebrush, appears to be declining. Percent decadence is high at 64% with 72% (1,300 plants/acre) of the

decadent sagebrush classified as dying. Reproduction is poor with no seedlings found and only 12% (340 plants/acre) of the population consisting of young plants. Even though this is suppose to be a total exclosure, the fence is not well maintained. The deer have light to moderate use on some of the sagebrush and bitterbrush. This use does not appear to be the cause for the poor condition of sagebrush however. Use is higher in the livestock exclosure, but the sagebrush there are much healthier. Trend for bitterbrush and serviceberry in the total exclosure appear stable. The herbaceous understory is similar in composition and abundance to the livestock exclosure, although annual grasses are more abundant providing 72% of the grass cover. The only fairly common perennial grass is needle-and-thread, which is found in low numbers in the livestock exclosure and outside. Forb composition is similar to the livestock exclosure with bastard toadflax and wooly plantain being the most abundant.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 4

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	56	20	.76
G	Agropyron spicatum	2	1	.03
G	Bromus tectorum (a)	321	79	7.44
G	Oryzopsis hymenoides	3	2	.18
G	Poa secunda	37	16	.43
G	Sitanion hystrix	8	3	.04
G	Sporobolus cryptandrus	3	2	.06
G	Stipa comata	60	18	1.92
G	Vulpia octoflora (a)	144	46	1.41
Total for Annual Grasses		465	125	8.85
Total for Perennial Grasses		169	62	3.44
Total for Grasses		634	187	12.29
F	Comandra pallida	167	61	3.32
F	Descurainia pinnata (a)	11	3	.07
F	Eriogonum cernuum (a)	5	2	.03
F	Erigeron spp.	6	2	.06
F	Lupinus spp.	5	2	.18
F	Microsteris gracilis (a)	6	2	.03
F	Phlox austromontana	4	1	.03
F	Plantago patagonica (a)	66	21	.76
F	Polygonum douglasii (a)	3	1	.00
F	Sphaeralcea coccinea	1	1	.00
Total for Annual Forbs		91	29	0.90
Total for Perennial Forbs		183	67	3.60
Total for Forbs		274	96	4.51

BROWSE TRENDS --
Herd unit 27R, Study no: 4

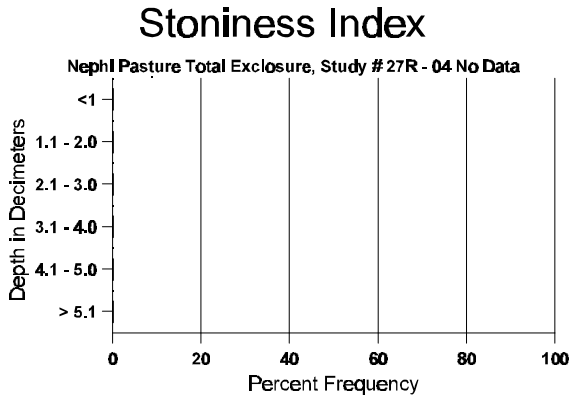
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	4	1.03
B	Artemisia tridentata tridentata	73	10.35
B	Cercocarpus montanus	0	-
B	Gutierrezia sarothrae	35	1.42
B	Juniperus osteosperma	2	-
B	Opuntia spp.	1	.03
B	Purshia tridentata	30	7.90
Total for Browse		145	20.73

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

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	431	41.18
Pavement	8	.01
Litter	478	41.79
Cryptogams	225	11.46
Bare Ground	270	23.23

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 04, Study Name: Nephi Pasture Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
22.7	68.8 (17.7)	5.9	74.2	18.0	7.8	.7	8.2	25.6	.4



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 4

Type	Quadrat Frequency '98
Rabbit	14
Elk	1
Deer	22

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	88	103	2
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		25%
Artemisia tridentata tridentata																		
Y	98	15	-	-	2	-	-	-	-	-	17	-	-	-	340			17
M	98	28	5	-	1	-	-	-	-	-	34	-	-	-	680	32	37	34
D	98	50	40	-	-	-	-	-	-	-	25	-	-	65	1800			90
X	98	6	-	-	-	-	-	-	-	-	8	-	-	-	2020			101
% Plants Showing '98				Moderate Use 32%			Heavy Use 00%				Poor Vigor 46%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2820	Dec:		64%
Cercocarpus montanus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	49	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
Y	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
M	98	65	-	-	8	-	-	-	-	-	73	-	-	-	1460	10	11	73
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 03%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1580	Dec:		3%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
Y	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Opuntia spp.																		
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 100%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Purshia tridentata																		
Y	98	6	1	-	2	-	-	-	-	-	9	-	-	-	180			9
M	98	23	12	-	1	-	-	-	-	-	36	-	-	-	720	35	51	36
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98				Moderate Use 28%			Heavy Use 00%				Poor Vigor 02%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		920	Dec:		2%

Trend Study 27R-5-98

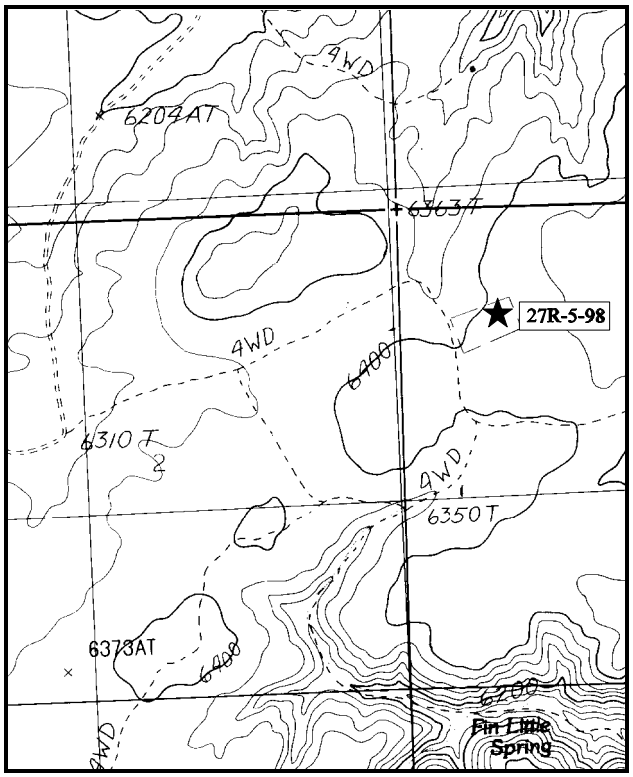
Study site name: Nephi Pasture Livestock Exclosure. Range type: Mixed Brush .

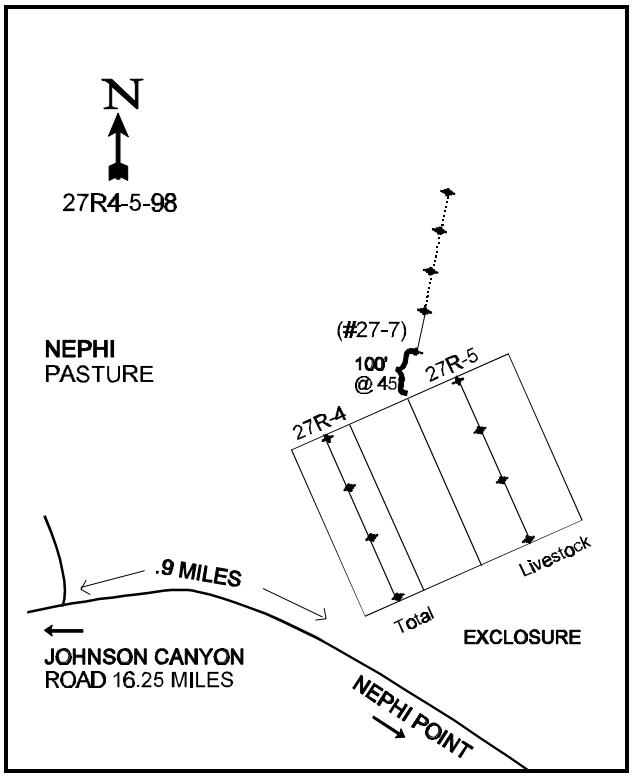
Compass bearing: frequency baseline 147°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, take US 9 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 52-6-87 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 exclosure. Walk east along the fence on the north side of the exclosure to the beginning of the livestock exclosure (lower fence). From here, walk down to the midpoint of the fenceposts. The baseline starts on the inside of the livestock exclosure at the midpoint, and runs at an azimuth of 147° M.





Map Name: Nephi Point

Diagrammatic Sketch

Township 42S , Range 4W , Section 1

UTM 4116617.355 N,394320.115 E

DISCUSSION

Trend Study No. 27R-5

This is a new trend study placed within the Nephi Pasture livestock exclosure. It is within 300 feet of the Nephi Pasture Exclosure trend study 27-7, which samples outside of the exclosure. The livestock exclosure is approximately 200 feet by 300 ft in size, about 1.4 acres. Slope varies from 5% to 10% with a northwest aspect. Elevation is about 6,400 feet. Deer utilize this exclosure heavily with deer days use/acre estimated at 111. All pellet groups appeared to be from the previous winter.

Soil in the livestock exclosure is very similar to the outside. Effective rooting depth (see methods) is estimated at just over 20 inches with a compacted layer encountered at that depth. Soil texture is a sand with a moderately acid pH (5.8). Phosphorus and potassium may be limiting to plant development and growth at 6.9 ppm and 12.8 ppm respectively. Minimum values for phosphorus are 10 ppm and 70 ppm for potassium. Rock and pavement are rare on the surface and within the profile. Erosion appears minimal.

The livestock exclosure supports nearly twice as much shrub cover as what is found outside (27% vs 15%). Key species include: basin big sagebrush, Utah serviceberry, and antelope bitterbrush. Sagebrush is most abundant, providing 40% of the browse cover, while serviceberry and bitterbrush account for respectively 24% and 20%. Density of sagebrush is estimated at 3,340 plants/acre, 43% of which are mature. Utilization is light to moderate with 13% of the plants displaying heavy use. Percent decadence is 34% with half of these plants classified as dying. Reproduction is good however, with enough young plants to replace decadent/dying individuals. Dead plants are abundant at 1,480 plants/acre or 30% of the population. But this is lower than either the total exclosure (42%) or the outside (43%).

Serviceberry numbers 740 plants/acre, 62% of which are mature. These shrubs show light to moderate use where available. Vigor is generally good and percent decadence is low at 11%. Bitterbrush has a density of 800 plants/acre. These plants also show light to moderate use suggesting that the extremely heavy use outside the exclosure is due to dual cow/deer utilization. Vigor is generally normal and percent decadence is low at only 10%. Reproduction is more than adequate to maintain the population.

The only other common shrub in the livestock exclosure is broom snakeweed which has an estimated population density of 1,780 mostly mature plants/acre. Pinyon and juniper trees occur at low densities. Point quarter data estimate 20 pinyon and 27 juniper trees/acre. Average basal diameter is 7.4 inches for pinyon and 6.8 inches for juniper. Most of these trees are in the 12 to 20 foot tall range.

The herbaceous understory is more abundant in the livestock exclosure compared to outside (18% cover vs 14%). The most common grass is the annual, cheatgrass. It provides 35% of the grass cover with a cover value of 5%. Nested frequency is also higher at 177 compared to 144 outside. Another annual, six weeks fescue, is also abundant and provides an additional 15% of the grass cover. However, perennial grasses are also common with western wheatgrass and mutton bluegrass being the most abundant. These species provide 21% and 15% of the grass cover respectively. Bluebunch wheatgrass and bottlebrush squirreltail are also fairly abundant. Forbs are similarly diverse in the livestock exclosure compared to the total exclosure or outside. Most (68%) of the forb cover comes from bastard toadflax, but silvery lupine is also fairly abundant. Several annuals are found in the livestock exclosure, yet they provide only 18% of the forb cover.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable. Vegetation and litter cover are higher in the livestock exclosure compared to the total exclosure or outside. Percent bare ground is similar to the total exclosure at 23% but lower than outside (23% vs 31%). Erosion does not appear to be a problem. Trend for the key browse species, basin big sagebrush, serviceberry, and bitterbrush appear stable with higher densities compared to outside the

exclosure. Serviceberry and bitterbrush display moderate use, good vigor and low decadence. Reproduction appears adequate to maintain the population. Sagebrush density is nearly two times higher in the livestock exclosure compared to outside. Utilization is moderate to heavy, although vigor is good on most plants and percent decadence is relatively low at 34%. There are a large number of dead plants and half of the decadent sagebrush were classified as dying (581 plants/acre). However, reproduction is currently appears adequate to maintain the stand. The herbaceous understory is more abundant in the livestock exclosure compared to outside. Total herbaceous cover is 18%. Annual grasses, cheatgrass and six weeks fescue, are abundant and provide half of the grass cover. Perennial grasses are also fairly abundant however. Forb diversity is similar compared to the total exclosure and outside. In addition, perennial forbs are more abundant in the livestock exclosure compared to outside. The most common species include bastard toadflax, silvery lupine, and wooly plantain.

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

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	59	19	1.37
G	Bromus tectorum (a)	97	30	3.62
G	Oryzopsis hymenoides	12	4	.10
G	Poa fendleriana	25	6	1.57
G	Sitanion hystrix	5	4	.05
G	Sporobolus cryptandrus	1	1	.00
G	Stipa comata	14	5	.07
G	Vulpia octoflora (a)	58	19	.87
Total for Annual Grasses		155	49	4.50
Total for Perennial Grasses		116	39	3.17
Total for Grasses		271	88	7.67
F	Arabis spp.	5	2	.01
F	Astragalus spp.	7	2	.01
F	Comandra pallida	81	30	1.53
F	Descurainia pinnata (a)	7	4	.10
F	Draba spp. (a)	7	3	.01
F	Erigeron spp.	3	1	.00
F	Eriogonum racemosum	5	2	.01
F	Lappula occidentalis (a)	5	3	.04
F	Lupinus argenteus	6	3	.39
F	Microsteris gracilis (a)	11	4	.02
F	Plantago patagonica (a)	38	14	.63
Total for Annual Forbs		68	28	0.80
Total for Perennial Forbs		107	40	1.97
Total for Forbs		175	68	2.77

BROWSE TRENDS --

Herd unit 27R, Study no: 5

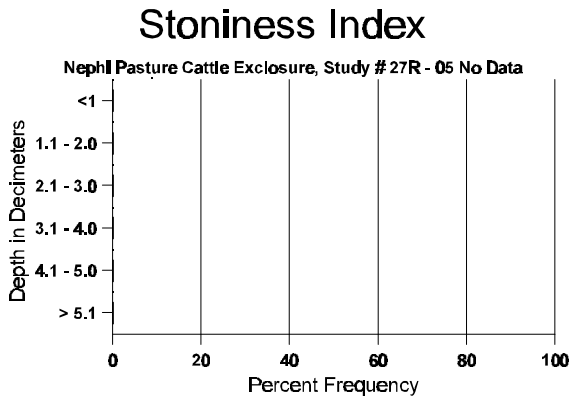
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	14	4.65
B	Artemisia tridentata tridentata	44	2.87
B	Gutierrezia sarothrae	20	1.39
B	Juniperus osteosperma	1	.38
B	Opuntia spp.	1	.03
B	Pinus edulis	-	.15
B	Purshia tridentata	14	3.66
B	Ribes spp.	1	-
Total for Browse		95	13.14

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

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	226	28.13
Litter	296	39.22
Cryptogams	20	1.08
Bare Ground	164	12.42

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 05, Study Name: Nephi Pasture Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
20.5	70.5 (17.7)	5.8	90.2	2.0	7.8	.8	6.9	12.8	.2



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 5

Type	Quadrat Frequency '98
Rabbit	18
Elk	1
Deer	21

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	98	1	-	-	4	-	-	-	-	-	5	-	-	-	100			5
Y	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
M	98	11	5	-	-	-	-	-	3	-	19	-	-	-	380	47	52	19
D	98	2	1	-	-	-	-	-	-	-	1	-	1	1	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98		Moderate Use 24%			Heavy Use 00%			Poor Vigor 08%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		500	Dec:		12%
Artemisia tridentata tridentata																		
S	98	2	-	-	4	-	-	-	-	-	6	-	-	-	120			6
Y	98	10	4	-	2	-	-	-	-	-	16	-	-	-	320			16
M	98	15	10	9	2	1	1	-	-	-	38	-	-	-	760	27	29	38
D	98	6	6	5	-	4	4	-	-	-	15	-	-	10	500			25
X	98	-	-	-	-	-	-	-	-	-	1	-	-	-	860			43
% Plants Showing '98		Moderate Use 32%			Heavy Use 24%			Poor Vigor 13%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1580	Dec:		32%
Gutierrezia sarothrae																		
S	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840	11	12	42
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		880	Dec:		-
Juniperus osteosperma																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	4	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	4	1	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	6	6	-	3	4	-	-	-	-	19	-	-	-	380	31	48	19
D	98	-	-	-	2	-	-	-	-	-	1	-	-	1	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 41%			Heavy Use 00%				Poor Vigor 04%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		540	Dec:		7%
Ribes spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-

Trend Study 27-7-98

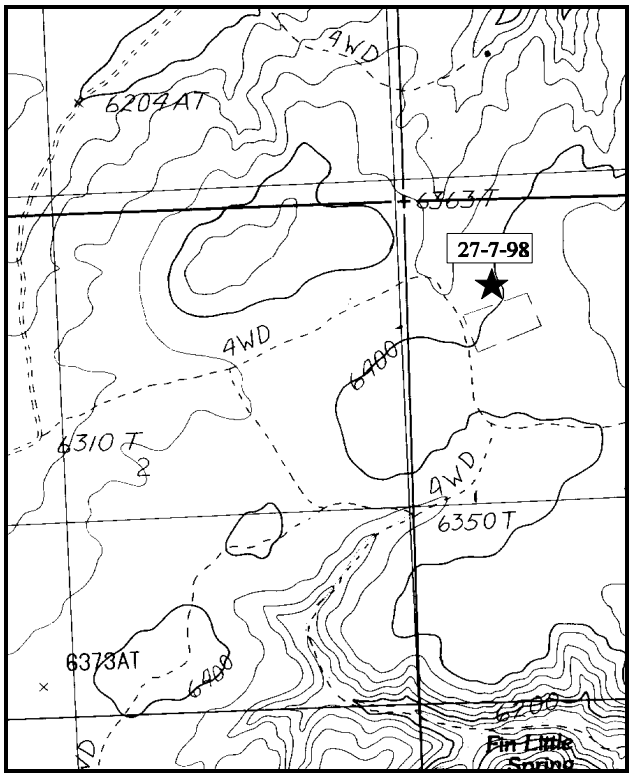
Study site name: Nephi Pasture Outside . Range type: Mixed Brush .

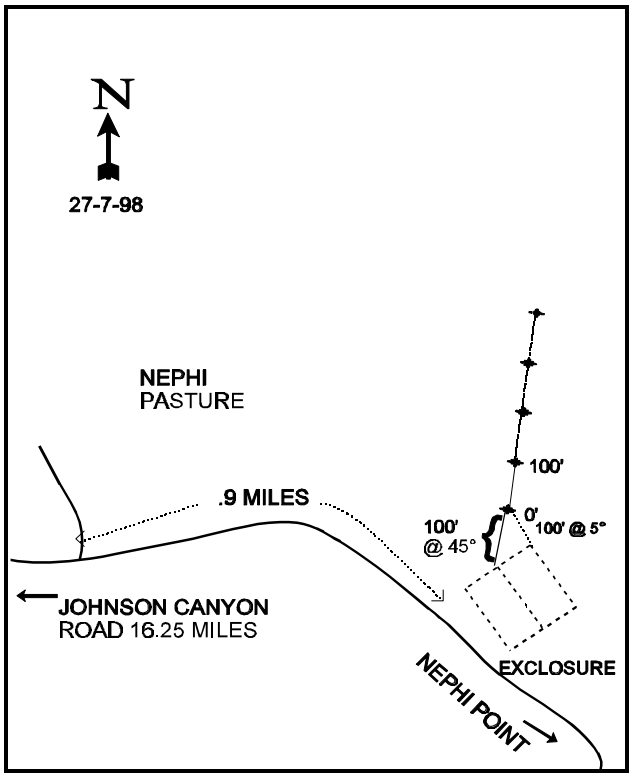
Compass bearing: frequency baseline 4 degrees.

Footmark (first frame at) 5 feet, footmarks (frequency belts) line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From Kanab, take US 9 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 52-6-87 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 exclosure. Walk east along the fence on the north side of the exclosure to the inner fence. From the northeast corner of the tallest fence, walk 100 feet NE to the 1st baseline stake, a cut fencepost tagged #7808. The study runs up the hill bearing 20°.





Map Name: Nephi Point Diagrammatic Sketch

Township 42S , Range 4W , Section 1 UTM 4116620.717 N, 394255.781 E

DISCUSSION

Trend Study No. 27-7 (52-7)

The Nephi Pasture Exclosure study samples the outside of the exclosure which is a basin big sagebrush type with a significant bitterbrush component. It was sampled in 1998 along with the adjacent exclosure treatments (livestock and total exclosure). It has a slope of 5% to 10% with a southwest aspect. Elevation is about 6,400 feet. The area is within the Vermillion-Nephi Pasture allotment, which allows 190 cattle during the winter. Pellet group data from 1998 estimate 64 deer, 16 cow, and only 1 elk days use/acre. Cow sign appeared old and most of the deer pellet groups were from last fall and winter. Deer use this area during mild winters, but utilize areas south of US-89 during severe winters.

The area was identified by the BLM as an Upland Sand site (11-13 inches precipitation) and a mountain big sagebrush/Indian ricegrass habitat type. On this study, the sagebrush was identified during the readings as basin big sagebrush, not mountain big sagebrush, because of it's size and growth form, in addition to the depth of the soils on the site. 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 acid pH (5.9). The soil is deep with an effective rooting depth (see methods) estimated at nearly 21 inches. There are no rock fragments apparent in the profile or on the surface. Soil temperature is fairly high at 60°F at an average depth of 18 inches. Soil temperature is about 10°F higher in the exclosure. Organic matter is limited at only 0.7%. Potassium may be limiting to plant growth at just 38.4 ppm. Values below 70 ppm are thought limiting to normal plant development. There is evidence of wind and surface water erosion, but erosion does not appear to be serious.

Serviceberry, basin big sagebrush, and antelope bitterbrush dominate the shrub component. These key species combined to produce 71% of the vegetative cover on the site in 1997 and 51% in 1998. Mature serviceberry plants are very large, averaging 5½ to 6 feet in height. Available parts of these shrubs have 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 the rhizomatous shrub. Clumps of several stems in the same area were considered one plant in 1997 and 1998. Vigor is good on most plants and percent decadency is low at only 11% in 1998. Reproduction has been poor since 1997, but adequate to maintain the stand.

The basin big sagebrush population has remained relatively stable at around 1,800 plants/acre since 1987. The population peaked in 1992 at 2,720 plants/acre, primarily due to the high number of young and decadent plants sampled. Mature plants are tall, averaging 3 to 4 feet in height with some up to 6 feet tall. Sagebrush has exhibited generally light to moderate use with heavy use on some individuals. The population appears to be in a state of decline, although density estimated don't yet show this. Percent decadence has increased from 7% in 1987 to 46% in 1997 and 1998. The number of plants classified as dying has been high since 1992 and reproduction has been poor since 1997. There is currently more decadent/dying plants than young plants to replace them. In addition, dead plants are abundant representing 42% of the population in 1997 increasing slightly to 43% by 1998.

Bitterbrush has a relatively stable density which has ranged from 1,700 plants/acre in 1992 to 1,220 by 1998. This preferred shrub is sought out by grazing animals with all observed plants being heavily hedged in 1987. Heavy use has since declined to 80% in 1992, 55% in 1997, and 75% by 1998. Many plants are partly unavailable for use due to the extensive hedging over the years. However, vigor is generally good and percent decadence low. Recruitment has declined since 1987 and 1992, but it is adequate to maintain the stand. Broom snakeweed occurs in scattered patches and appears to have a stable, mostly mature population.

The herbaceous understory is rather sparse. Perennial grass cover has provided only about 2% cover since 1992. Cheatgrass, found in only 1 quadrat in 1992, has steadily and significantly increased in nested

frequency. Currently it provides 45% of the meager grass cover. Six weeks fescue, another annual species, has also increased significantly since 1992. The most abundant perennial grasses include western wheatgrass and bottlebrush squirreltail. There has been light grazing of the palatable grasses, mainly sand dropseed and western wheatgrass. Forb cover is also low at only 2% in 1992, 3% in 1997, and 7% by 1998. The increase in 1998 forb cover comes entirely from a significant increase in wooly plantain, an annual which currently ('98) provides 74% of the forb cover. Perennial forbs are rare with the most common species being bastard toadflax.

1992 TREND ASSESSMENT

Percent bare ground is now estimated at 27%, down from 39% in 1987. Percent litter cover is similar to 1987 estimates. Trend for soil is considered slightly up, but still in poor condition. Because the sample size is much larger now, 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%). The basin big sagebrush is the browse with the highest percent 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. Now, if we "ignore" the annuals and look at the trend for only perennial species, the sum of nested frequencies would indicate a stable trend.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - stable but depleted

1997 TREND ASSESSMENT

Trend for soil is considered stable even with an increase in percent bare ground. Nested frequency of vegetation and litter increased as did the sum of nested frequency for grasses and forbs. There is some evidence of soil pedestaling, but much of this appears to be caused by livestock trails around shrubs. Erosion is not currently a problem on the site. Trend for the key browse species is mixed. Bitterbrush and serviceberry appear to be stable with moderate to heavy use, good vigor, and low decadence. The increase in density between 1992 and 1997 appear to be observer differences due to the lack of dead plants. This rhizomatous shrub 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, moderate to heavy use, reduced vigor, and increasing decadence. In addition, the large number of dead plants counted in 1997 indicate a definite 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 herbaceous trend 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.

TREND ASSESSMENT
soil - stable
browse - down for sagebrush, slightly down overall
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil appears up slightly due to a decline in percent bare ground from 36% to 31%, combined with an increase in vegetation and cryptogamic cover. Conditions are still poor however. Trend for the key browse species are similar to 1997 estimates. Utah serviceberry and antelope bitterbrush trends appear stable. Bitterbrush does show extremely heavy use, but vigor is good, reproduction adequate, and percent decadence low at only 13%. The sagebrush population has remained at a similar density since 1987, but the population has become increasingly decadent, (now at 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 herbaceous understory is stable, although poor condition. Sum of nested frequency for perennial grasses and forbs are similar to 1997 estimates. One negative factor is the significant increase in nest frequency for the annuals; cheatgrass, six weeks fescue, and wooly plantain.

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

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'87	'92	'97	'98	'87	'92	'97	'98	'92	'97	'98
G	Agropyron smithii	ab24	a4	bc48	c71	12	2	21	30	.03	.29	.50
G	Bromus tectorum (a)	-	a3	b112	c144	-	1	37	51	.00	2.35	3.21
G	Oryzopsis hymenoides	11	25	21	14	4	10	9	6	.34	.10	.25
G	Poa fendleriana	8	-	-	-	3	-	-	-	-	-	-
G	Poa secunda	a-	b12	b16	b15	-	5	6	5	.10	.39	.10
G	Sitanion hystrix	54	58	62	39	24	25	25	17	.51	.83	.62
G	Sporobolus cryptandrus	24	33	14	31	13	16	7	17	.63	.06	.33
G	Stipa comata	22	24	25	21	10	12	12	10	.32	.14	.16
G	Vulpia octoflora (a)	-	a27	b73	c144	-	-	31	-	-	.33	-
Total for Annual Grasses		0	30	185	288	0	13	68	103	0.11	2.69	5.13
Total for Perennial Grasses		143	156	186	191	66	70	80	85	1.94	1.82	1.97
Total for Grasses		143	186	371	479	66	83	148	188	2.06	4.51	7.10
F	Arabis spp.	-	-	5	3	-	-	3	2	-	.04	.01
F	Astragalus spp.	8	2	1	1	4	1	1	1	.00	.00	.00
F	Calochortus nuttallii	-	-	1	-	-	-	1	-	-	.01	-
F	Chaenactis douglasii	a-	ab2	ab1	b10	-	2	1	4	.01	.00	.19
F	Collomia linearis (a)	-	-	3	-	-	-	1	-	-	.00	-
F	Comandra pallida	ab72	a58	b117	b98	35	29	48	54	.50	1.79	1.04
F	Collinsia parviflora (a)	-	-	1	-	-	-	1	-	-	.15	-
F	Cruciferae	a-	b16	a-	a-	-	7	-	-	.03	-	-
F	Delphinium bicolor	-	-	3	-	-	-	1	-	-	.00	-
F	Descurainia spp. (a)	-	16	30	26	-	8	14	10	.40	.12	.13
F	Draba spp. (a)	-	-	-	8	-	-	-	4	-	-	.04

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'87	'92	'97	'98	'87	'92	'97	'98	'92	'97	'98
F	Eriogonum cernuum (a)	-	$_{b}$33	$_{a}$10	$_{a}$1	-	17	5	1	.24	.05	.00
F	Erigeron spp.	-	-	1	3	-	-	1	1	-	.00	.00
F	Eriogonum racemosum	1	-	7	4	1	-	3	2	-	.04	.01
F	Euphorbia glyptosperma (a)	17	8	-	-	8	4	-	-	.04	-	-
F	Frasera speciosa	-	-	2	-	-	-	1	-	-	.00	-
F	Gilia spp. (a)	-	$_{a}$-	$_{b}$24	$_{a}$-	-	-	10	-	-	.12	-
F	Lappula occidentalis (a)	-	$_{a}$-	$_{b}$4	$_{a}$-	-	-	4	-	-	.04	-
F	Lupinus spp.	-	-	1	-	-	-	1	-	.03	.03	-
F	Microsteris gracilis (a)	-	21	31	-	-	9	11	-	.04	.15	-
F	Oenothera pallida	-	-	-	3	-	-	-	1	-	-	.03
F	Oenothera pallida	-	3	-	-	-	1	-	-	.03	-	-
F	Penstemon spp.	$_{a}$-	$_{b}$10	$_{a}$-	$_{ab}$8	-	5	-	3	.22	-	.04
F	Phlox austromontana	$_{a}$-	$_{bc}$14	$_{c}$22	$_{ab}$6	-	7	11	2	.30	.20	.30
F	Phlox hoodii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$8	-	-	-	6	-	-	.05
F	Plantago patagonica (a)	-	$_{b}$88	$_{a}$46	$_{c}$195	-	36	22	62	.40	.18	5.36
F	Polygonum douglasii (a)	-	15	26	-	-	6	9	-	.03	.04	-
F	Senecio multilobatus	4	-	1	-	2	-	1	-	-	.00	-
F	Sphaeralcea parvifolia	$_{b}$12	$_{ab}$3	$_{a}$1	$_{a}$1	7	2	1	1	.01	.00	.00
F	Unknown forb-annual (a)	-	3	-	-	-	2	-	-	.01	-	-
Total for Annual Forbs		17	184	175	230	8	82	77	77	1.18	0.88	5.54
Total for Perennial Forbs		97	108	163	145	49	54	74	77	1.14	2.15	1.69
Total for Forbs		114	292	338	375	57	136	151	154	2.32	3.04	7.24

Values with different subscript letters are significantly different at % = 0.10 (annuals not read in 87)

BROWSE TRENDS --
Herd unit 27 , Study no: 7

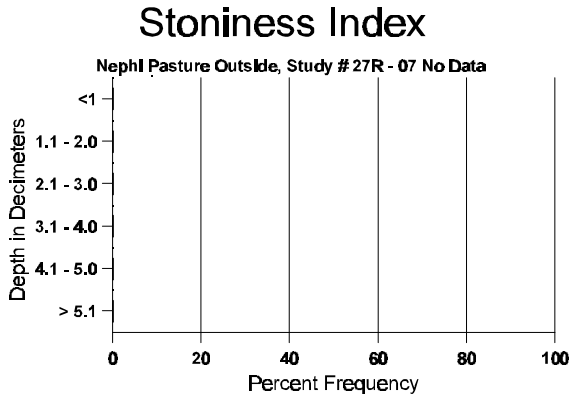
Type	Species	Quadrat Frequency '92	'97	'98	Average Cover % '92	'97	'98
B	Amelanchier utahensis	23	13	13	12.05	8.44	3.32
B	Artemisia filifolia	0	0	3	-	-	.18
B	Artemisia tridentata tridentata	58	58	55	11.92	5.20	3.20
B	Chrysothamnus viscidiflorus	0	1	1	-	.00	-
B	Eriogonum microthecum	0	0	1	-	-	-
B	Gutierrezia sarothrae	34	32	27	1.53	.26	.68
B	Leptodactylon pungens	3	5	0	.06	.06	-
B	Opuntia spp.	1	0	0	-	-	-
B	Purshia tridentata	36	34	37	6.50	6.59	7.64
B	Ribes spp.	0	0	0	-	-	-
Total for Browse		155	143	137	32.08	20.58	15.03

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

Cover Type	Nested Frequency '92	'97	'98	Average Cover % '87	'92	'97	'98
Vegetation	71	300	334	.75	34.50	27.35	34.91
Rock	-	13	-	0	.04	.05	0
Pavement	-	9	20	0	0	.02	.04
Litter	236	388	395	59.75	54.40	47.79	48.41
Cryptogams	21	78	150	1.00	2.00	1.93	8.56
Bare Ground	187	282	276	38.50	26.89	35.68	30.71

SOIL ANALYSIS DATA --
Herd Unit 27, Study # 07, Study Name: Nephi Pasture Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
20.8	60.0 (16.9)	5.9	87.0	7.4	5.6	.7	11.9	38.4	.2



PELLET GROUP FREQUENCY --
Herd unit 27 , Study no: 7

Type	Quadrat Frequency '92	'97	'98
Rabbit	49	20	25
Deer	26	32	27
Cattle	3	5	5

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	6	-	-	6	-	-	-	120			6
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	3	-	1	-	4	1	13	-	-	22	-	-	-	440			22
	97	-	-	-	5	-	-	-	-	-	5	-	-	-	100			5
	98	4	-	1	1	-	-	-	-	-	6	-	-	-	120			6
M	87	-	-	2	-	-	-	-	-	-	2	-	-	-	133	60	56	2
	92	-	-	4	-	5	1	10	2	-	22	-	-	-	440	-	-	22
	97	-	1	3	-	5	-	-	1	-	9	1	-	-	200	83	86	10
	98	3	4	-	1	1	2	-	-	-	11	-	-	-	220	66	73	11
D	87	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	92	-	-	2	-	-	-	3	-	-	-	-	2	3	100			5
	97	-	-	-	-	2	-	-	-	-	-	-	-	2	40			2
	98	-	-	-	-	-	1	-	1	-	2	-	-	-	40			2
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	25%	+73%
'92	18%	18%	10%	-65%
'97	47%	18%	12%	+11%
'98	26%	21%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'87	265		25%
	'92	980		10%
	'97	340		12%
	'98	380		11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	3	-	-	-	-	-	3	-	-	-	60			3
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	9	15	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'92	00%	00%	00%
'97	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
	'87	0	Dec: -
	'92	0	-
	'97	0	-
	'98	260	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	9	-	-	-	-	-	1	-	-	10	-	-	-	200			10
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	87	5	2	-	-	-	-	-	-	-	7	-	-	-	466			7
	92	24	2	-	7	-	-	7	-	-	37	3	-	-	800			40
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320			16
	98	4	8	-	-	-	-	-	-	-	11	-	1	-	240			12
M	87	2	11	6	-	-	-	-	-	-	19	-	-	-	1266	34	35	19
	92	36	10	2	3	-	-	-	-	-	49	2	-	-	1020	-	-	51
	97	6	15	7	1	-	1	-	-	-	28	-	2	-	600	36	45	30
	98	14	17	3	3	-	2	-	-	-	39	-	-	-	780	31	37	39
D	87	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	33	6	-	2	2	-	2	-	-	12	-	3	30	900			45
	97	8	29	1	-	1	-	-	-	-	2	-	2	35	780			39
	98	26	9	2	1	4	1	-	-	-	22	-	-	21	860			43
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	-	-	-	-	1200			60
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1440			72

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	54%	21%	00%	+31%
'92	15%	01%	24%	-38%
'97	53%	11%	46%	+10%
'98	40%	09%	23%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	1865	Dec:		7%
'92	2720			33%
'97	1700			46%
'98	1880			46%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	2	-	-	-	-	-	-	-	-	1	-	1	-	133			2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	7	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	18	13	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	50%	
'92	00%	00%	00%	
'97	00%	00%	00%	+ 0%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	133	Dec:	-
	'92	0		-
	'97	20		-
	'98	20		-

Eriogonum microthecum																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'97	00%	00%	00%	
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	0		-
	'97	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	10	-	-	-	-	-	-	-	-	9	-	-	1	200			10
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	97	8	-	-	1	-	-	-	-	-	9	-	-	-	180			9
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	87	58	-	-	-	-	-	-	-	-	58	-	-	-	3866	9	12	58
	92	48	-	-	3	-	-	1	-	-	52	-	-	-	1040	-	-	52
	97	49	-	-	4	-	-	-	-	-	53	-	-	-	1060	11	12	53
	98	62	-	-	-	-	-	-	-	-	62	-	-	-	1240	11	13	62
D	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	60			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-70%
'92	00%	00%	00%	+ 8%
'97	00%	00%	00%	+ 0%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	3932	Dec:	2%
	'92	1180		2%
	'97	1280		3%
	'98	1280		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Leptodactylon pungens																		
S	87	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	6	-	-	-	-	-	-	-	-	6	-	-	-	400	5	6	6
	92	16	-	-	-	-	-	-	-	-	16	-	-	-	320	-	-	16
	97	9	-	-	5	-	-	-	-	-	13	-	1	-	280	18	20	14
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-43%
'92	00%	00%	00%	-18%
'97	00%	00%	07%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	599	Dec:	11%	
'92	340		0%	
'97	280		0%	
'98	0		0%	

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	13	0
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'92	00%	00%	50%
'97	00%	00%	00%
'98	00%	00%	00%

%Change	
Dec:	0%
	50%
	0%
	0%

Total Plants/Acre (excluding Dead & Seedlings)		
'87	0	
'92	40	
'97	0	
'98	0	

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	1	-	-	-	2	-	-	-	40			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	-	-	6	-	-	-	-	-	-	6	-	-	-	400			6
	92	2	5	6	1	3	3	1	-	-	21	-	-	-	420			21
	97	-	3	1	-	-	-	-	-	-	4	-	-	-	80			4
	98	1	2	-	-	1	2	-	-	-	6	-	-	-	120			6
M	87	-	-	15	-	-	-	-	-	-	15	-	-	-	1000	12	41	15
	92	-	3	19	2	-	7	-	-	11	39	-	-	3	840	-	-	42
	97	3	17	20	1	1	9	2	-	-	51	-	2	-	1060	21	43	53
	98	3	6	19	-	2	16	-	-	1	47	-	-	-	940	20	43	47
D	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	6	-	-	-	-	-	16	11	-	-	11	440			22
	97	-	1	1	-	-	3	-	-	-	2	-	-	3	100			5
	98	-	-	3	-	-	5	-	-	-	7	-	-	1	160			8
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	00%	+14%
'92	13%	80%	16%	-27%
'97	35%	55%	08%	- 2%
'98	18%	75%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	1466	Dec:		5%
'92	1700			26%
'97	1240			8%
'98	1220			13%

Ribes spp.																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	30	25	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'97	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'87	0	Dec:	-
'92	0		-
'97	0		-
'98	0		-

NEPHI PASTURE EXCLOSURE COMPARISON SUMMARY

Total Exclosure 27R-4, Livestock Exclosure 27R-5, and Outside 27-7

1998 Comparisons

Ground cover characteristics differ slightly between grazing effects. Bare ground is more abundant outside of the exclosure, and similar between the livestock and total exclosure. Vegetation cover is highest in the livestock exclosure and lowest outside. Litter cover is highest in the livestock exclosure and lowest in the total exclosure. Soil characteristics are similar between treatments. Soils are deep with sandy loam to sand textures, a moderately acid pH, low organic matter content, deficient values for phosphorus and potassium, and high average soil temperatures. There is not much erosion occurring on any site due to the lack of slope, combined with the high permeability of the soil. Soil outside of the exclosure has a higher phosphorous level and a lower average soil temperature by 10°F.

All sites support good stands of basin big sagebrush, bitterbrush, and serviceberry, with sagebrush being the most prevalent. However, the sagebrush stand in the total exclosure is the least healthy followed closely by outside. Percent decadence is high at 64% in the total exclosure compared to 34% in the livestock exclosure and 46% outside. Vigor is poor on 46% of the total exclosure population, compared to 18% in the livestock, and 23% outside. Utilization is moderate to heavy outside and within the livestock exclosure. However, deer days use/acre is significantly higher within the livestock exclosure (111 ddu/acre vs 64 ddu/acre) where the sagebrush is in the best condition. Livestock use was estimated at 16 days use/acre outside. There was also some light to moderate use of the sagebrush within the total exclosure due to a poorly maintained fence. Weighing these factors, it appears that the sagebrush population is in a state of decline in the total exclosure and outside of the exclosure, with the livestock exclosure maintaining a stable trend. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

Trends for bitterbrush and serviceberry appear stable for all sites due to adequate reproduction, good vigor, and low decadence. Nevertheless, utilization of bitterbrush has been extremely heavy outside of the exclosure since 1987, while only moderate use is seen within the livestock exclosure. Since more deer days use/acre were found within the livestock exclosure than outside, a significant portion of the bitterbrush use outside of the exclosure appears to be coming from livestock.

The herbaceous understories are similar with respect to species composition. The annual, cheatgrass, is the most abundant grass on all three treatments and perennial species are generally lacking. Another annual, six weeks fescue, is also abundant on all sites. However, percent cover of cheat grass is highest inside of the total exclosure (7.4%) where it accounts for 61% of the grass cover. Next highest is the livestock exclosure where cheat grass has a cover value of 4.7% that represents 35% of the grass cover. The outside site has the lowest cover value for cheatgrass at 3.2%, but due to the lack of perennial grasses, it accounts for 45% of the grass cover. Perennial grasses are most abundant in the livestock exclosure (7% cover), followed by the total exclosure (3.4%), and then outside (2%). The most abundant grasses outside of the exclosure are western wheatgrass and bottlebrush squirreltail. In the livestock exclosure, western wheatgrass and mutton bluegrass are most abundant with bluebunch wheatgrass, Indian ricegrass, and bottlebrush squirreltail also being fairly common. In the total exclosure, the most common perennial grass is needle-and-thread which is rare on the other two treatments. Western wheatgrass and Sandberg bluegrass are also fairly common.

Forbs are depleted but composition is similar between sites. The most common species in the total and livestock exclosure is bastard toad flax. Wooly plantain is also fairly abundant. Outside of the exclosure, wooly plantain is the most abundant forb with smaller amounts of bastard toad flax. All other species occur rarely.

Trend Study 27R-8-98

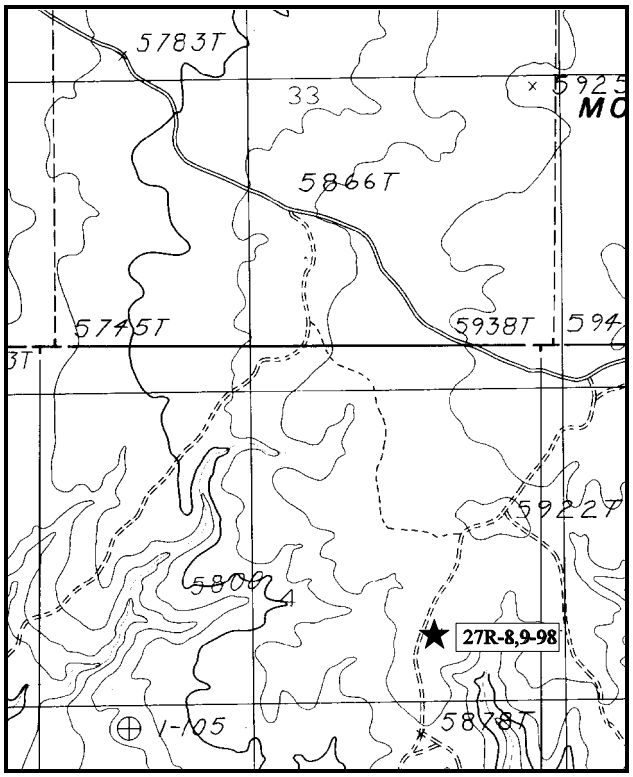
Study site name: Five Mile Mountain Outside . Range type: Burned Sagebrush/Annual Weed

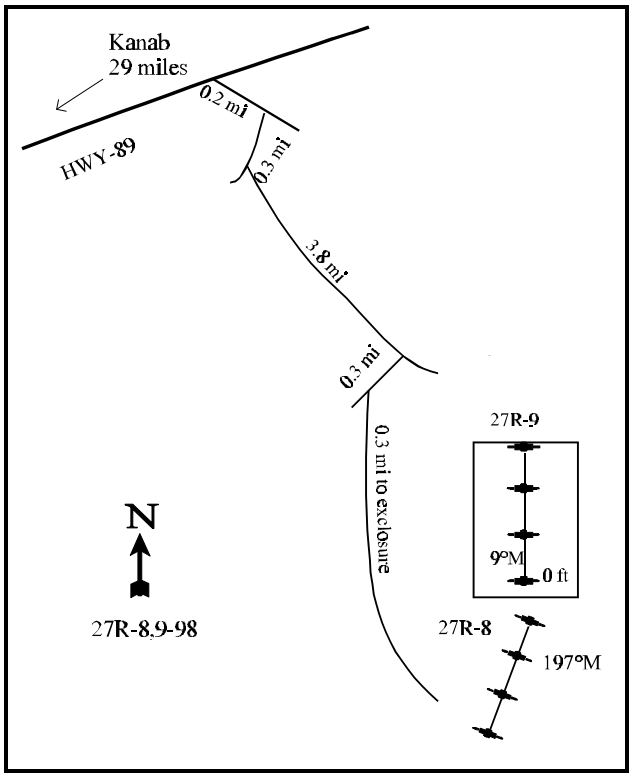
Compass bearing: frequency baseline 197°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From the 90° turn on HWY-89 in Kanab, travel 29 miles on south-89 (traveling east from Kanab) to the Five-mile Mountain turnoff. Turn right and go approximately 0.2 miles to a fork. Stay right at the fork and continue 0.3 miles to another fork. Go left for 3.8 miles to another fork. At the fork, go right for 0.3 miles to the next fork. From here, go right for 0.3 miles to the exclosure on the left. The 0 foot stake of the baseline is located on the south side of the exclosure and can be located by counting down 5 red posts from the SW corner of the exclosure. Browse tag #473 is attached to the 0 foot stake.





Map Name: Pine Hollow Canyon Diagrammatic Sketch

Township 43S , Range 2W , Section 4 UTM 4106245.732 N, 409584.807 E

DISCUSSION

Trend Study No. 27R-8

This is a new trend study located adjacent to the Five Mile Mountain Exclosure. It is a two-way exclosure (livestock exclosure and outside) with this study sampling the outside portion. A data summary for the livestock exclosure is found in the next study discussion (no. 27R-9). The area is almost level with a south, southeast aspect and an elevation of about 5,900 feet. It supports a black sagebrush-grass range type with scattered juniper trees. A fire has burned some of the area 3 to 4 years ago and eliminated most of the sagebrush in the burned areas. The site is located on the south slope of Five Mile Mountain, a low plateau south of Highway 89. It gets most big game use in severe winters when deer drop down off the Vermillion Cliffs. Pellet group data from outside of the exclosure estimate 20 deer and 12 cow days use/acre.

Soil at the site is shallow and rocky with a hard pan encountered at almost 9 inches in depth. Texture is a loam with a neutral pH (7.2). Both phosphorus and potassium appear to be limiting to plant development at just 8.2 ppm and 57.6 ppm respectively. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Rock and especially pavement are abundant on the soil surface. The profile is also quite rocky. Due to the rock content, average soil temperature is extremely high at 91°F at an average depth of just over 9 inches. This condition causes rapid soil drying and creates a harsh environment for sagebrush seedlings to become establish. It also gives winter annuals like cheatgrass and storksbill a competitive advantage against cool season perennial grasses and forbs.

The fire was spotty outside of the exclosure, leaving several areas unburned. Burned areas are dominated by broom snakeweed, while unburned spots support moderately dense stands of black sagebrush. The sagebrush has an estimated density of 2,180 plants/acre. Nearly half of the sagebrush exhibit some characteristics of Wyoming big sagebrush indicating possible hybridization between these two species. The population is heavily utilized, however vigor is normal on most plants and percent decadence is relatively low at 19%. Reproduction is poor with few seedlings encountered and young plants accounting for only 6% of the population. Recruitment is currently barely enough to maintain the stand, and unless it improves, the population will likely decline in the future.

Broom snakeweed is currently the most abundant shrub on the site with an estimated density of 2,360 mostly mature plants/acre. It appears that the population has declined considerably over the past few years due to the high number of dead snakeweed shrubs counted (4,280 plants/acre). Reproduction is also poor and a further decline in density is likely in the future.

The herbaceous understory is extremely poor in composition and abundance. Cheatgrass brome, an annual, totally dominates the site by providing 95% of the grass cover. Equally abundant is the annual forb storksbill which accounts for 95% of the forb cover. These two species alone provide 68% of the total vegetation cover on the site. Perennial grasses and forbs are rare in their occurrence with all species combined producing less than ½ of 1% cover.

1998 APPARENT TREND ASSESSMENT

Soil conditions are poor. Litter cover is limited, rock and pavement cover are high (38%), leaving 25% of the ground surface as bare ground. Erosion is not a problem however due to the levelness of the terrain. Trend for the key browse species, black sagebrush, is tenuous. The population is mostly mature with poor reproduction and heavy use. Unless recruitment improves, the population will decline. The increaser/invader, broom snakeweed, appears to be in the same situation. Most of the stand is mature, reproduction is poor, and an extremely large number of dead plants were sampled. The herbaceous understory is extremely poor with annuals totally dominating the herbaceous components. Perennial grasses and forbs are rare.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 8

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	424	99	8.36
G	Oryzopsis hymenoides	3	1	.03
G	Poa fendleriana	6	2	.01
G	Poa secunda	7	2	.06
G	Sitanion hystrix	3	1	.03
G	Vulpia octoflora (a)	39	15	.32
Total for Annual Grasses		463	114	8.68
Total for Perennial Grasses		19	6	0.13
Total for Grasses		482	120	8.81
F	Draba spp. (a)	102	38	.36
F	Erodium cicutarium (a)	264	67	8.71
F	Lappula occidentalis (a)	3	1	.00
F	Phlox longifolia	12	4	.02
F	Plantago patagonica (a)	1	1	.00
F	Salsola iberica (a)	1	1	.00
F	Sphaeralcea parvifolia	18	8	.04
F	Unknown forb-perennial	5	2	.01
Total for Annual Forbs		371	108	9.09
Total for Perennial Forbs		35	14	0.07
Total for Forbs		406	122	9.17

BROWSE TRENDS --
Herd unit 27R, Study no: 8

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	39	4.56
B	Cercocarpus ledifolius	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	44	1.92
B	Juniperus osteosperma	1	.71
B	Opuntia spp.	1	.03
B	Ribes spp.	1	-
B	Yucca baccata baccata	0	-
Total for Browse		96	7.22

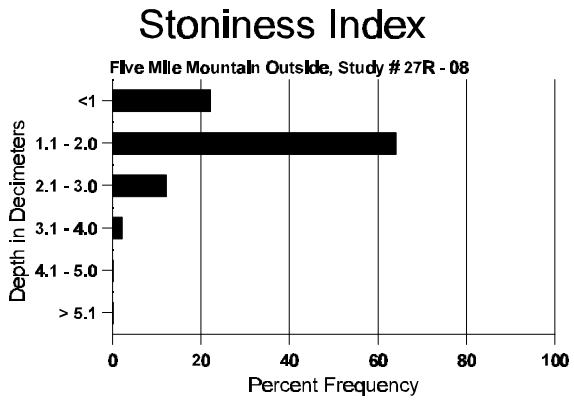
BASIC COVER --

Herd unit 27R, Study no: 8

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	447	30.02
Rock	306	12.34
Pavement	454	25.57
Litter	481	32.43
Cryptogams	48	.87
Bare Ground	406	25.17

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 08, Study Name: Five Mile Mountain Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.5	91.0 (9.4)	7.3	50.7	28.7	20.6	1.7	8.23	57.6	.5



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 8

Type	Quadrat Frequency '98
Rabbit	29
Deer	24
Cattle	5

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	3	-	-	-	-	3	-	-	-	6	-	-	-	120			6
M	98	10	12	28	-	-	32	-	-	-	82	-	-	-	1640	11	20	82
D	98	3	16	-	-	-	2	-	-	-	14	-	-	7	420			21
X	98	-	-	-	-	-	-	-	-	-	1	-	-	-	560			28
% Plants Showing '98				Moderate Use 26%			Heavy Use 60%				Poor Vigor 06%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2180	Dec:		19%
Cercocarpus ledifolius																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	29	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Chrysothamnus viscidiflorus viscidiflorus																		
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 100%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		100%
Gutierrezia sarothrae																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	91	-	-	-	-	-	-	-	-	91	-	-	-	1820	7	9	91
D	98	27	-	-	-	-	-	-	-	-	16	-	-	11	540			27
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	4280			214
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 09%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2360	Dec:		23%
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	8	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Ribes spp.																		

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Yucca baccata baccata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	20	0
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

Trend Study 27R-9-98

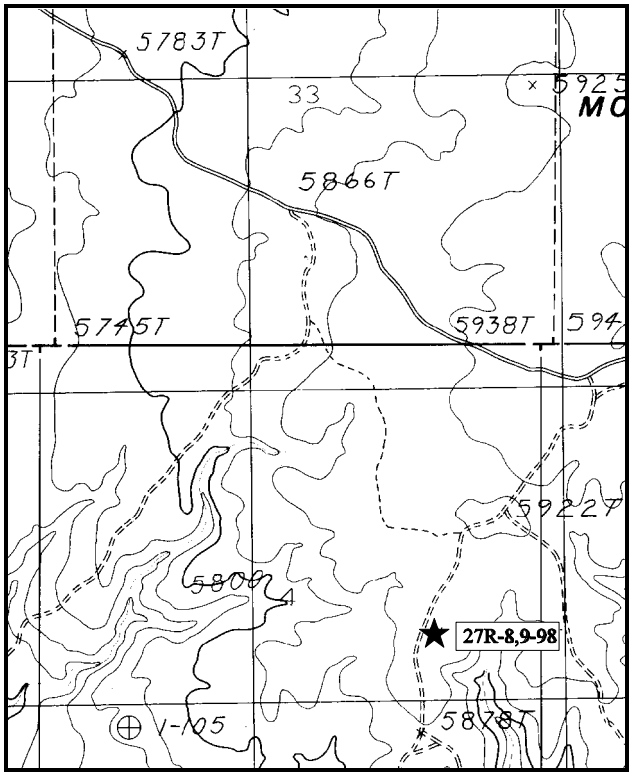
Study site name: Five Mile Mountain Exclosure . Range type: Burned Sagebrush/Annual Weed

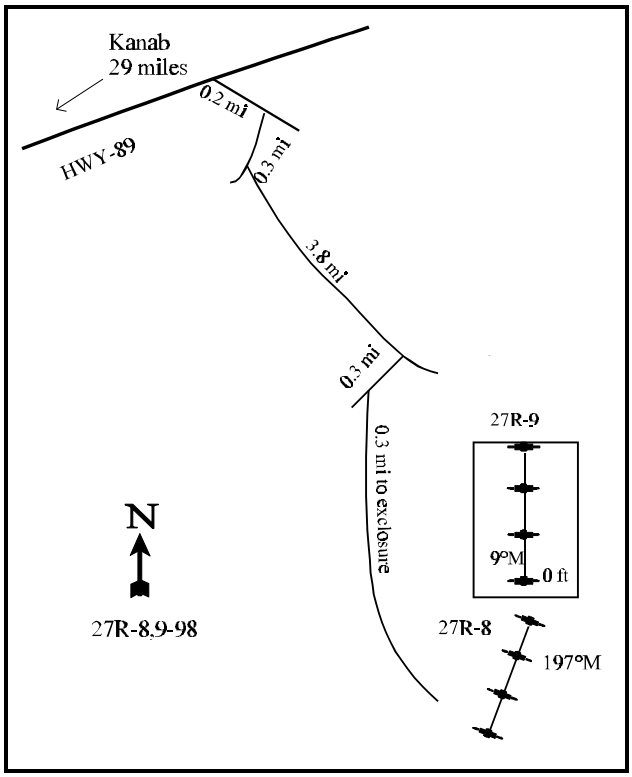
Compass bearing: frequency baseline 9°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95ft), line 2 (59ft), line 3 (34ft & 71ft).

LOCATION DESCRIPTION

From the 90° turn on HWY-89 in Kanab, travel 29 miles on south-89 (traveling east from Kanab) to the Five-mile Mountain turnoff. Turn right and go approximately 0.2 miles to a fork. Stay right at the fork and continue 0.3 miles to another fork. Go left for 3.8 miles to another fork. At the fork, go right for 0.3 miles to the next fork. From here, go right for 0.3 miles to the exclosure on the left. The 0 foot stake of the baseline is located within the exclosure on the south end and can be located by counting down 5 metal posts from the SW corner of the exclosure. Browse tag #107 is attached to the 0 foot stake.





Map Name: Pine Hollow Canyon Diagrammatic Sketch

Township 43S , Range 2W, Section 4 UTM 4106243.659 N, 409583.615 E

DISCUSSION

Trend Study No. 27R-9

This is a new trend study located within the Five Mile Mountain livestock exclosure. It samples a black sagebrush range type with a few scattered Utah juniper trees. Most of the inside of the exclosure was burned a few years ago which eliminated most of the sagebrush. Slope is about 4% with a south aspect. Elevation is about 5,900 feet. Deer use this area mostly during severe winters. Pellet group data estimate 24 deer days use/acre within the exclosure. Rabbits also use the area in significant numbers with quadrat frequency of rabbit pellets nearly twice as high as deer.

Soil within the exclosure is quite different compared to outside with respect to soil texture. Effective rooting depth is similar at just under 8 inches compared to over 8 inches with a hardpan present at about 7-8 inches in depth. However, soil texture is a sand inside the exclosure, but classified as a loam outside. Both phosphorus and potassium appear to be limiting to plant development at just 7.4 ppm and 32 ppm respectively. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Rock and pavement are common on the surface and within the profile. Due to the abundance of sand and rock in the soil, average temperature of the soil is extremely high at 84.8°F at an average depth of just under 8 inches. This condition causes rapid drying of the soil and gives a competitive advantage to winter annuals like cheatgrass and storksbill. Erosion is not a problem on the site due to the levelness of the terrain.

The site once supported a dense stand of black sagebrush, although a fire which burned a few years ago, eliminated most of the sagebrush. There were some unburned areas sampled near the end of the baseline. Broom snakeweed is the most abundant shrub on the site. It provides 45% of the shrub cover and it is more dense in burned areas. Density is estimated at 4,980 plants/acre. The population appears to have declined since the fire due to the high number of dead plants at 3,420 plants/acre. An additional 990 decadent plants/acre were classified as dying. Reproduction is poor with no seedlings sampled and only 2% of the population consisting of young plants. There are also a few unburned juniper trees in the exclosure which provide 20% of the browse cover or a total cover value of 2%.

Surviving black sagebrush is estimated at 700 plants/acre, 77% of which are mature. Two thirds of the sagebrush are found in the unburned area along belt 4. Utilization of the sagebrush is light to moderate, vigor is generally good with abundant seed stalks, and percent decadence is low at 11%. There is also a few widely scattered cliffrose plants in the exclosure. None were found in the shrub density strips but one plant was measured for height/crown.

The herbaceous understory is poor and dominated by annuals, but to a lesser extent compared to the outside of the exclosure. The annual, cheatgrass, is abundant and accounts for 86% of the grass cover. However, Indian ricegrass and bottlebrush squirreltail were also encountered occasionally. Forbs are depleted with the most abundant species being the annual storksbill, which provides 87% of the forb cover. The only perennial species sampled is globemallow.

1998 APPARENT TREND ASSESSMENT

Soil conditions are poor due to a lack of protective ground cover. Erosion is not a problem, however this is primarily due to the lack of significant slope. The browse composition is also poor due to the fire which burned through most of the exclosure. Burned areas have a higher density of the increaser/invader, broom snakeweed. Currently density is estimated at 4,980 plants/acre, 68% of which are mature. Its population appears to be in a state of decline however, with a large number of dead plants sampled, poor reproduction, poor vigor, and relatively high decadence (30%). Black sagebrush has a density of 700 plants/acre. It shows light to moderate utilization, and generally good vigor and low decadence. The sagebrush should increase over time within the burned areas. The herbaceous understory is poor with annuals dominating. Although,

annuals are at lower numbers and produce less cover in the exclosure when compared to outside, there are still more perennial grasses and forbs inside. Overall, the cheatgrass and storksbill are the dominant species inside as well as outside the exclosure. Cheatgrass provides 86% of the grass cover and storksbill accounts for 87% of the forb cover inside the exclosure. Cheatgrass produces nearly twice as much cover and storksbill accounts for 5 times more cover outside of the exclosure.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 9

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	371	92	4.94
G	Oryzopsis hymenoides	11	6	.42
G	Sitanion hystrix	5	4	.33
G	Vulpia octoflora (a)	25	9	.04
Total for Annual Grasses		396	101	4.98
Total for Perennial Grasses		16	10	0.75
Total for Grasses		412	111	5.74
F	Eriogonum cernuum (a)	3	1	.00
F	Erodium cicutarium (a)	217	63	1.69
F	Salsola iberica (a)	1	1	.00
F	Sphaeralcea parvifolia	61	25	.25
Total for Annual Forbs		221	65	1.70
Total for Perennial Forbs		61	25	0.25
Total for Forbs		282	90	1.95

BROWSE TRENDS --
Herd unit 27R, Study no: 9

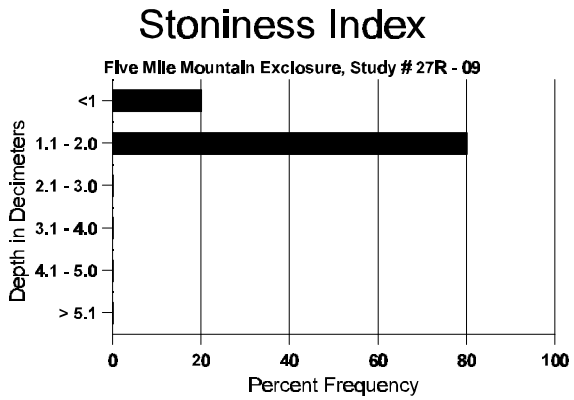
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	21	2.33
B	Cercocarpus ledifolius	0	-
B	Cowania mexicana stansburiana	0	-
B	Gutierrezia sarothrae	67	3.30
B	Juniperus osteosperma	0	1.48
B	Opuntia spp.	1	.15
B	Ribes spp.	0	-
Total for Browse		89	7.26

BASIC COVER --
Herd unit 27R, Study no: 9

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	406	15.70
Rock	276	7.30
Pavement	444	30.46
Litter	420	16.29
Cryptogams	151	2.13
Bare Ground	437	33.09

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 09, Study Name: Five Mile Mountain Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
7.6	84.8 (7.5)	7.2	92.2	2.0	5.8	1.6	7.4	32.0	.5



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 9

Type	Quadrat Frequency '98
Rabbit	13
Deer	7

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
Y	98	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	23	4	-	-	-	-	-	-	-	27	-	-	-	540	19	31	27
D	98	2	2	-	-	-	-	-	-	-	-	-	-	4	80			4
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	380			19
% Plants Showing '98				Moderate Use 20%			Heavy Use 00%				Poor Vigor 11%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		700	Dec:		11%
Cercocarpus ledifolius																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Cowania mexicana stansburiana																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	54	50	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
Y	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	170	-	-	-	-	-	-	-	-	170	-	-	-	3400	7	10	170
D	98	75	-	-	-	-	-	-	-	-	9	-	-	66	1500			75
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	3420			171
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 27%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		4980	Dec:		30%
Juniperus osteosperma																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	22	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ribes spp.																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings) '98 0 Dec: -

FIVE MILE MOUNTAIN EXCLOSURE COMPARISON SUMMARY

Outside 27R-8 and Inside 27R-9

1998 Comparisons

Ground cover characteristics differ between the outside and inside of the exclosure. Vegetation and litter cover are nearly two times higher outside of the exclosure. Percent bare ground is higher inside at 33% compared to 25% outside. The reason for the difference is primarily due to the more abundant herbaceous understory cover outside (18%) compared to inside the exclosure (8%). Shrub cover is similar between sites. Soil texture may be the reason for some of the difference. Texture is a sand inside and a loam outside of the exclosure. Both sites are deficient in phosphorus and potassium and both have extremely high average soil temperatures. Erosion is not currently a problem on either site however, due to the levelness of the terrain.

Both sites once supported similar browse stands with black sagebrush being the key species. A fire burned much of the area a few years ago and thinned out the sagebrush. Density is higher outside at 2,180 plants/acre where less of the area burned compared to 700 plants/acre inside the exclosure. Use is much heavier outside, where 76% of the sagebrush displayed heavy browsing. Use inside is mostly light to moderate. Pellet group data estimates similar deer use days/acre between grazing treatments (20 ddu outside and 24 ddu inside), suggesting dual use with deer and cows. Sagebrush appears to have a stable population on both sites with generally good vigor, adequate reproduction, and low decadence. The abundant broom snakeweed populations on both sites appear to be in a state of decline.

The herbaceous understories are similar with respect to composition. Annuals, cheatgrass and storksbill, dominate both sites, but to a higher degree outside the exclosure where total herbaceous cover is twice as high. Cover values for cheatgrass are nearly two times higher and storksbill provides 5 times more cover outside the exclosure compared to inside. Perennial grasses are rare on both sites, yet produce more cover inside the exclosure (.13% vs .75%). Nested frequency of perennial forbs is also high inside (61 vs 35). Some of the differences between sites may be due to the sandier soil texture inside of the exclosure.

Trend Study 27R-10-98

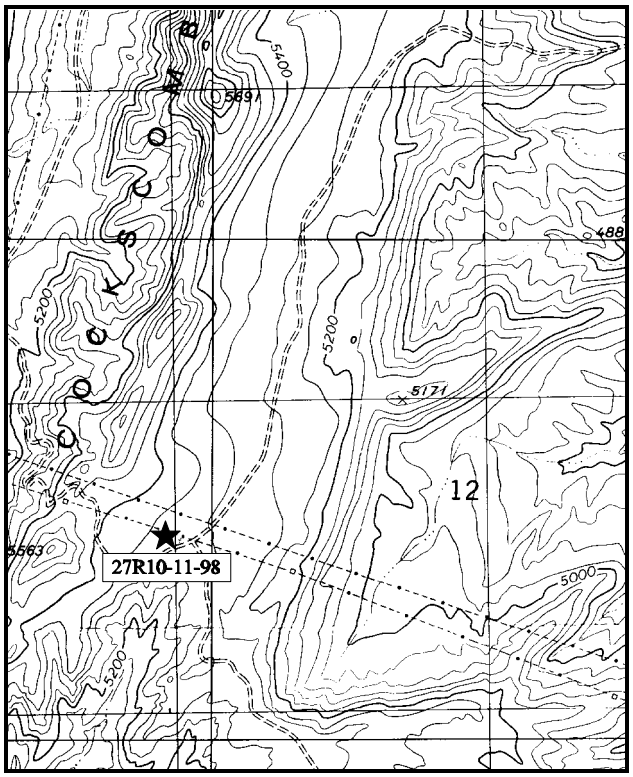
Study site name: Cockscomb Exclosure . Range type: Desert Brush .

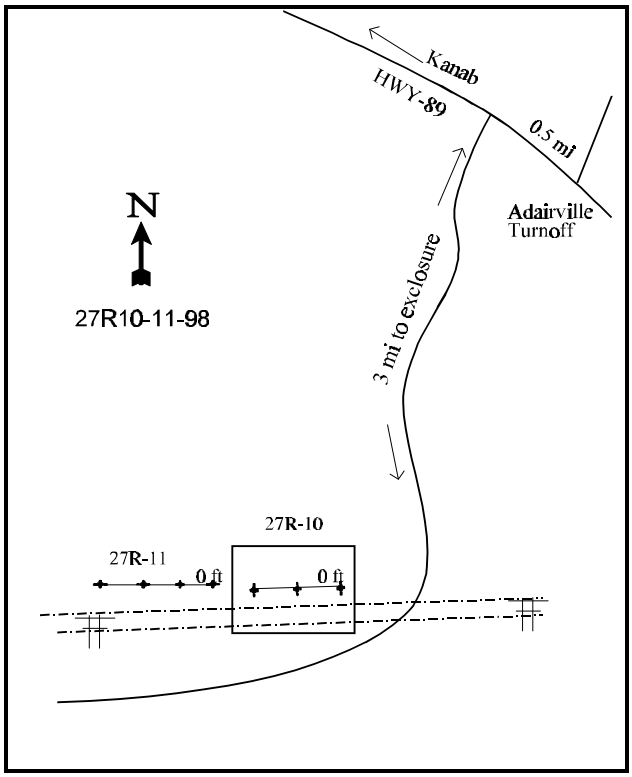
Compass bearing: frequency baseline 261°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft, 59 ft, & 95 ft), line 2 (34ft & 71 ft).

LOCATION DESCRIPTION

From HWY-89 and the Adairville turnoff (east of Kanab on south-89), go 0.5 miles west to a left turn. Turn left here and go 3 miles to an exclosure underneath the power lines. The 0 foot baseline stake is located inside the exclosure on the east side. The 0 foot stake has browse tag #110 attached and can be located by counting up 3 metal posts from the SE corner of the exclosure.





Map Name: West Clark Bench

Diagrammatic Sketch

Township 43S , Range 2W , Section 11

UTM 4104556.219 N, 413032.337 E

DISCUSSION

Trend Study No. 27R-10

This is a new trend study placed inside the livestock exclosure. The Cockscomb Exclosure is located about 30 miles east of Kanab and about 7 miles north of the Arizona-Utah border. This is a two-way exclosure (livestock and outside) in the most northern part of a hot desert shrub community. The exclosure is at an elevation of approximately 5,360 feet. It has an east aspect with a slight slope (6-7%). Located beneath a high voltage power line, the exclosure has an area of almost one and a half acres (about 30,000 ft^2). A pellet group transect indicated use at 11 deer use days/acre and also a moderate density of rabbit pellet groups.

Soil textural analysis indicates it to be a sandy clay loam soil with a neutral pH (7.1). Average effective rooting depth (see methods) was estimated at 17 inches with an average soil temperature of 77°F at 17 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 3.3 ppm respectively. This may limit plant development where 10ppm for potassium and 70 ppm for phosphorous are thought to be the minimum. Rocks and pavement were encountered on the soil surface and provide nearly 5% combined cover. Although percent bare ground cover is high (45%), there is little erosion apparent at this time due to the soil texture and the lack of significant slope.

Browse species currently provide 57% of the vegetative cover. The most abundant species include: shinnery oak, yucca, broom snakeweed, and green ephedra. Shinnery oak has an estimated density of 3,120 stems/acre. Most of these plants were classified as mature (74%) and no seedling plants were encountered. Percent decadency is 8% and 75% of these plants were classified as dying. Average cover for shinnery oak is 6%. The dead to live ratio is 1:5. There is no apparent utilization and most plants exhibit good vigor. Yucca has an estimated density of 1,540 plants/acre. Ninety-four percent of the population were classified as mature and the remaining 4% classified as young.

Broom snakeweed has an estimated density of 1,260 plants/acre with an apparent stable population. A majority of the plants were classified as mature (79%) and no seedlings were sampled. Percent decadency is low and the dead to live ratio is currently 1:8, or about 11% are dead. Green ephedra has an estimated density of 1,020 plants/acre. No seedlings were encountered and 71% of the population were classified as mature. All of the decadent plants are also classified as dying. Many of the plants exhibited poor vigor in 1998 (71% of the population). One live and one dead juniper were located within the exclosure. Other browse species scattered throughout the area include: prickly pear cactus, low rabbitbrush, penstemon spp., Ribes spp., sand sagebrush, buckwheat, four wing saltbush, and antelope bitterbrush.

Grasses provide 34% of the total vegetative cover and 79% of the herbaceous understory cover. Cheatgrass provides the most cover and was found in 75% of the quadrats. Six weeks fescue is also present, but relatively less abundant. Needle and thread grass and sandhill muhly are the most abundant perennial species and when combined they account for 35% of the herbaceous understory cover. Other scattered grasses include: Indian ricegrass, sand dropseed, blue grama, bottlebrush squirreltail, and purple threeawn. Forbs are not nearly as abundant with fineleaf hymenopappus and Utah deervetch accounting for 88% of the forb cover.

1998 APPARENT TREND ASSESSMENT

There is currently no erosion apparent on the site, although some pedestaling was noted around some of the shrubs. The soil appears to become very compacted at a depth of about 16-18 inches. Although no seedlings were encountered for any of the browse species, the browse populations appear to be stable considering the harsh environment of the site. None of the browse species exhibited utilization at this time. The herbaceous understory is dominated by cheatgrass and six weeks fescue. Several perennial species are also present and appear to have good vigor.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 10

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	-	-	.00
G	Bouteloua gracilis	16	4	.60
G	Bromus tectorum (a)	276	75	2.73
G	Muhlenbergia pungens	37	12	1.58
G	Oryzopsis hymenoides	21	9	.19
G	Sitanion hystrix	2	1	.03
G	Sporobolus cryptandrus	12	7	.08
G	Stipa comata	31	15	1.49
G	Vulpia octoflora (a)	123	38	.31
Total for Annual Grasses		399	113	3.04
Total for Perennial Grasses		119	48	3.99
Total for Grasses		518	161	7.03
F	Androstephium breviflorum	4	2	.06
F	Arabis spp.	4	2	.01
F	Artemesia carruthii	3	2	.06
F	Hymenopappus filifolius	26	11	1.29
F	Lotus utahensis	12	6	.20
F	Machaeranthera canescens	8	4	.08
F	Oenothera pallida	21	8	.06
F	Sphaeralcea coccinea	9	4	.04
Total for Annual Forbs		0	0	0
Total for Perennial Forbs		87	39	1.82
Total for Forbs		87	39	1.82

BROWSE TRENDS --
Herd unit 27R, Study no: 10

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	1	-
B	Atriplex canescens	0	1.48
B	Chrysothamnus viscidiflorus	2	.15
B	Ephedra viridis	13	1.61
B	Eriogonum spp.	1	-
B	Gutierrezia sarothrae	33	1.47
B	Opuntia spp.	7	.03
B	Penstemon spp.	2	.15
B	Pinus edulis	0	-
B	Purshia tridentata	0	-
B	Quercus havardii	27	5.97
B	Ribes spp.	2	-
B	Yucca spp.	20	.81
Total for Browse		108	11.68

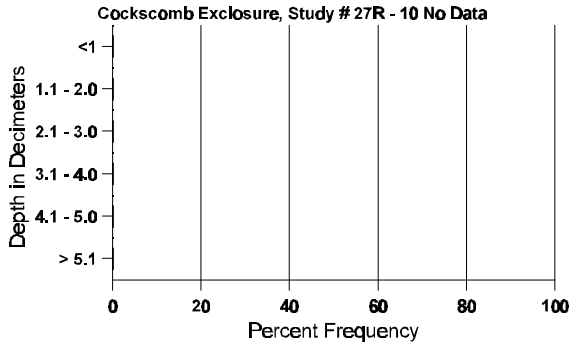
BASIC COVER --
Herd unit 27R, Study no: 10

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	378	21.95
Rock	137	.72
Pavement	223	3.92
Litter	456	31.32
Cryptogams	46	1.33
Bare Ground	384	45.26

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 10, Study Name: Cockscomb Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.3	77.0 (16.8)	7.1	60.2	18.0	21.8	.4	3.3	3.2	.4

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 10

Type	Quadrat Frequency '98
Rabbit	13
Deer	3

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	29	45	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				20	Dec:		-
Atriplex canescens																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	111	0
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				0	Dec:		-
Chrysothamnus viscidiflorus																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	24	40	2
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 33%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				60	Dec:		33%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra viridis																		
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	36	-	-	-	-	-	-	-	-	12	-	24	-	720	16	21	36
D	98	12	-	-	-	-	-	-	-	-	-	-	-	12	240			12
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 71%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1020	Dec:		24%
Eriogonum spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Gutierrezia sarothrae																		
Y	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	98	50	-	-	-	-	-	-	-	-	46	-	-	-	1000	10	16	50
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 03%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1260	Dec:		3%
Opuntia spp.																		
M	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140	7	16	7
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		140	Dec:		-
Penstemon spp.																		
M	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	16	22	3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Pinus edulis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	21	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	23	0
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Quercus havardii																		
Y	98	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
M	98	115	-	-	-	-	-	-	-	-	115	-	-	-	2300	44	37	115
D	98	12	-	-	-	-	-	-	-	-	3	-	-	9	240			12
X	98	3	-	-	-	-	-	-	-	-	3	-	-	-	820			41
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 06%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		3120	Dec:		8%
Ribes spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	11	1
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Yucca spp.																		
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	74	-	-	-	-	-	-	-	-	72	-	-	-	1480	21	28	74
% Plants Showing '98		Moderate Use 00%				Heavy Use 00%				Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1540	Dec:		-

Trend Study 27R-11-98

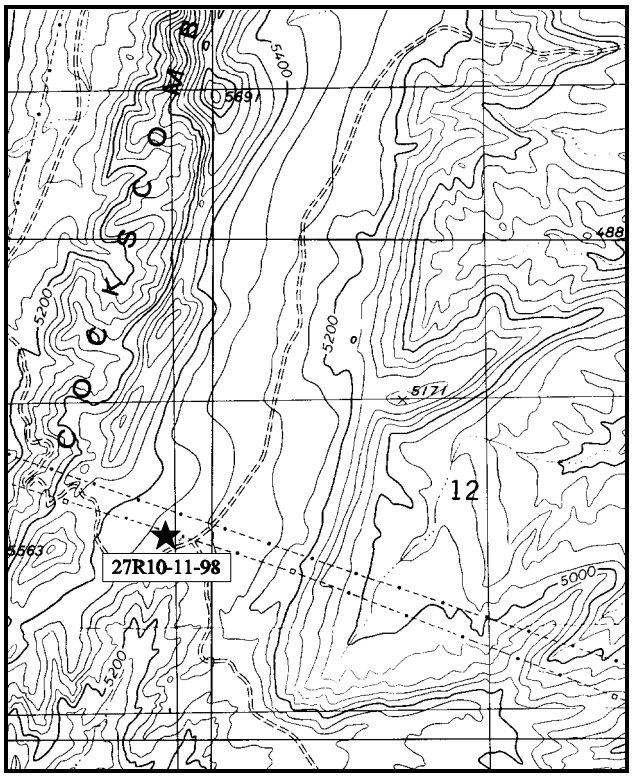
Study site name: Cockscomb Outside . Range type: Desert Brush .

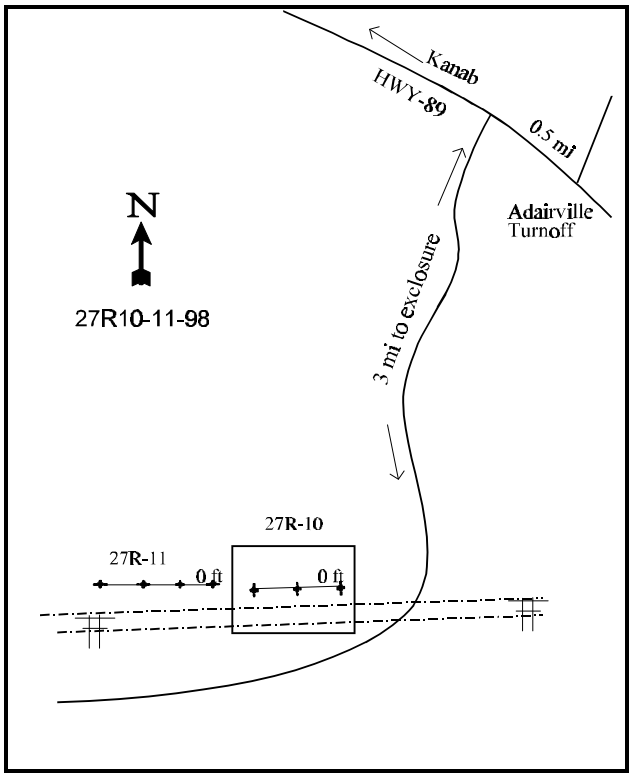
Compass bearing: frequency baseline 270°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From HWY-89 and the Adairville turnoff (east of Kanab on south-89), go 0.5 miles west to a left turn. Turn left here and go 3 miles to an exclosure underneath the power lines. The baseline starts on the west side of the exclosure and can be located by counting up to the second metal post from the SW corner.





Map Name: West Clark Bench

Diagrammatic Sketch

Township 43S , Range 2W , Section 11

UTM 4104565.072 N, 412971.257 E

DISCUSSION

Trend Study No. 27R-11

This is a new trend study placed outside the livestock exclosure. The Cockscomb Exclosure is located about 30 miles east of Kanab and about 7 miles north of the Arizona-Utah border. This is a two-way exclosure (livestock and outside) in the most northern reaches of a hot desert shrub community at an elevation of approximately 5,360 feet. The aspect is to the east with a slight slope (6-7%). The site is located beneath a high voltage power line adjacent to the exclosure. A pellet group transect indicated 19 deer use days/acre and 10 cow days use/acre. A moderate density of rabbit pellet groups were also encountered.

Soil textural analysis indicates it to be a sandy loam soil with a neutral pH (6.9). Average effective rooting depth (see methods) is estimated to be 20 inches with an average soil temperature of 79°F at 14 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 2.7 ppm respectively, and may limit plant development. Values of 10 ppm for potassium and 70 ppm for phosphorous are considered the minimum for normal plant development. Rocks and pavement were encountered on the soil surface and combined they only provided almost 2% cover. Although percent bare ground cover is high (54%), there is little erosion apparent at this time due to the soil texture and the lack of significant slope.

Browse species currently provide 52% of the vegetative cover. The most abundant species include: shinnery oak, green ephedra, penstemon sp., yucca, and broom snakeweed. Shinnery oak has an estimated density of 4,280 stems/acre. Most of these plants are classified as mature (70%) and young (24%). Three seedlings were sampled in 1998. Percent decadency is estimated to 6% with 69% of these plants classified as dying. The dead to live ratio is 1:10, or 9% of the population is dead. Utilization is light and most plants exhibit good vigor. This population currently appears to be a stable. Green ephedra has an estimated density of 1,700 plants/acre. No seedling plants were encountered and 61% of the population were classified as mature. All of the decadent plants exhibited poor vigor and classified as chlorotic or dying. Twenty-two percent of the population exhibited poor vigor in 1998.

A shrubby penstemon spp. was encountered with an estimated density of 860 plants/acre. This is a mostly mature population with only one seedling sampled. No decadent plants were encountered and the dead to live ratio is 1:4 (20% were dead). Yucca has an estimated density of 660 plants/acre. This was also a mostly mature population with 85% of the plants classified as mature and 15% classified as young. Broom snakeweed had an estimated density of 500 plants/acre. Eighty-eight percent of the pants were classified as mature and the remaining 12% classified as young. Other browse species scattered throughout the area include: prickly pear cactus, sand sagebrush, buckwheat, and gray horsebrush.

Grass currently contributes 67% of the herbaceous understory cover. Sandhill muhly is the most abundant of the grass species, followed by Indian ricegrass and sand dropseed. Although annual species percent cover is low, they still account for 50% of the grass sum of nested frequency. Six weeks fescue provides 27% of the grass cover and 18% of the herbaceous understory cover. Cheatgrass is also present but in low abundance.

The forb component is dominated by perennial species that include: Cruciferae spp., fineleaf hymenopappus, and purple funnellily. Other perennial species scattered throughout the site include: bastard toadflax, Utah deervetch, and pale evening primrose. Only one annual forb was encountered (Gilia spp.) and is in low abundance.

1998 APPARENT TREND ASSESSMENT

Erosion is currently minimal with only slight soil movement apparent with some pedestaling noted around some the shrubs. Seedlings were encountered for a few of the browse species (broom snakeweed, buckwheat, penstemon sp., and shinnery oak). All of the browse species exhibited light utilization. With the exception of

green ephedra, all browse species showed good vigor. The herbaceous understory is relatively diverse, although most species were seldom sampled.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 11

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	1	1	.03
G	Bouteloua gracilis	22	9	.17
G	Bromus tectorum (a)	30	11	.13
G	Muhlenbergia pungens	144	47	4.03
G	Oryzopsis hymenoides	31	17	.22
G	Sporobolus cryptandrus	27	12	.36
G	Stipa comata	28	10	.13
G	Stipa lettermani	-	-	.00
G	Vulpia octoflora (a)	218	72	1.85
Total for Annual Grasses		248	83	1.98
Total for Perennial Grasses		253	96	4.96
Total for Grasses		501	179	6.95
F	Androstephium breviflorum	55	23	.40
F	Arabis spp.	3	1	.00
F	Artemesia carruthii	4	2	.18
F	Comandra pallida	21	7	.13
F	Cruciferae	32	16	1.14
F	Cryptantha spp.	7	4	.07
F	Erigeron pumilus	2	1	.00
F	Gilia spp. (a)	10	3	.04
F	Hymenopappus filifolius	53	21	.95
F	Lotus utahensis	18	8	.17
F	Machaeranthera canescens	5	3	.05
F	Oenothera pallida	20	8	.16
F	Phlox longifolia	3	1	.00
F	Sphaeralcea coccinea	1	1	.00
F	Sphaeralcea parvifolia	3	2	.01
F	Townsendia spp.	9	5	.02
F	Unknown forb-perennial	4	2	.03
Total for Annual Forbs		10	3	0.03
Total for Perennial Forbs		240	105	3.37
Total for Forbs		250	108	3.41

BROWSE TRENDS --

Herd unit 27R, Study no: 11

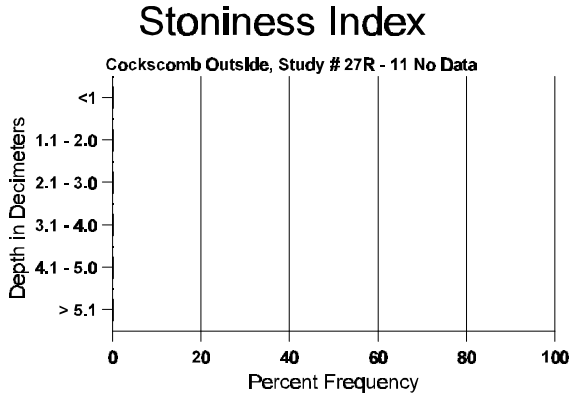
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	8	-
B	Ephedra viridis	24	1.70
B	Eriogonum spp.	14	.89
B	Gutierrezia sarothrae	18	.43
B	Juniperus osteosperma	-	.18
B	Opuntia polyacantha	5	.06
B	Penstemon spp.	22	.90
B	Quercus havardii	36	7.11
B	Tetradymia canescens	1	.15
B	Yucca spp.	9	-
Total for Browse		137	11.43

BASIC COVER --
Herd unit 27R, Study no: 11

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	370	31.28
Rock	42	.28
Pavement	130	1.41
Litter	466	33.50
Bare Ground	435	53.82

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 11, Study Name: Cockscomb Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
19.7	79.3 (14.2)	6.9	72.2	18.0	9.84	.3	2.7	3.2	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 11

Type	Quadrat Frequency '98
Rabbit	18
Deer	12
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 11

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180	26	27	9
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		-
Ephedra viridis																		
Y	98	28	-	-	-	-	-	2	-	-	29	-	1	-	600			30
M	98	37	7	-	7	-	-	1	-	-	37	-	15	-	1040	14	18	52
D	98	3	-	-	-	-	-	-	-	-	-	-	1	2	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
% Plants Showing '98				Moderate Use 08%			Heavy Use 00%				Poor Vigor 22%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1700	Dec:		4%
Eriogonum spp.																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	15	-	-	1	-	-	-	-	-	16	-	-	-	320	14	25	16
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		320	Dec:		-
Gutierrezia sarothrae																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	22	-	-	-	-	-	-	-	-	22	-	-	-	440	8	13	22
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		500	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia polyacantha																		
M	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120	7	11	6
D	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		33%
Penstemon spp.																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	98	35	-	-	-	-	-	1	-	-	36	-	-	-	720	16	21	36
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		860	Dec:		-
Quercus havardii																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	52	-	-	-	-	-	-	-	-	52	-	-	-	1040			52
M	98	121	10	-	18	-	-	-	-	-	146	-	3	-	2980	29	22	149
D	98	10	2	-	1	-	-	-	-	-	3	-	1	9	260			13
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
% Plants Showing '98				Moderate Use 06%			Heavy Use 00%				Poor Vigor 06%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		4280	Dec:		6%
Tetradymia canescens																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	30	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Yucca spp.																		
Y	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	98	28	-	-	-	-	-	-	-	-	28	-	-	-	560	17	22	28
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		660	Dec:		-

COCKSCOMB EXCLOSURE COMPARISON SUMMARY

Inside 29R-10 Outside 29R-11

1998 Comparisons

Ground cover characteristics differ slightly between inside and outside the exclosure. Percent vegetative cover was higher outside the exclosure (31%) than inside the exclosure (22%). Conversely, percent rock and pavement cover combined were higher inside (5%) than outside (2%). Percent litter cover is similar inside and outside (31% and 34% respectively), while percent bare ground cover is greater outside (54% vs 45%).

Soil texture characteristics differ in that inside the exclosure it is a sandy clay loam and outside it is a sandy loam. Average effective rooting depth and soil temperature are similar and both grazing treatments have low phosphorous and potassium levels that may be limiting to plant development. Erosion is negligible on both sites due to the soil texture and levelness of the site.

The most abundant browse on both treatments is shinnery oak. Inside it has an estimated density of 3,120 stems/acre, while outside it has an estimated density of 4,280 stems/acre. The plants inside are slightly taller (44 inches) than the plants outside (29 inches). These are both mostly mature populations with few seedlings present. Utilization is light on all plants. Pellet group data estimates 19 deer days use/acre outside and 11 deer days use/acre inside. Cow use outside is estimated to be 10 cow days/acre. Broom snakeweed density is higher inside the exclosure (1,260 plants/acre) than outside the exclosure (500 plants/acre). Both populations are mostly mature with no seedlings encountered inside the exclosure and an estimated 120 seedlings/acre outside the exclosure. Conversely, green ephedra density is greater outside the exclosure (1,700 plants/acre) than inside the exclosure (1,020 plants/acre). Also, the plants inside the exclosure were in poorer health than the plants outside the exclosure.

Herbaceous understory species richness and sum of nested frequency is greater outside the exclosure with (25 and 751 respectively vs 16 and 605 respectively). Grasses provide the bulk of the herbaceous understory cover for both grazing treatments. Both sites have the same number of grasses, but outside the exclosure has 9 more perennial species. Annual species sum of nested frequency is greater than perennial species sum of nested frequency inside the exclosure. The converse is true for outside the exclosure. Inside the exclosure, cheatgrass nested frequency is more than double that of six weeks fescue. Conversely, outside the exclosure, six weeks fescue nested frequency is more than seven times greater.

Trend Study 29R-1-98

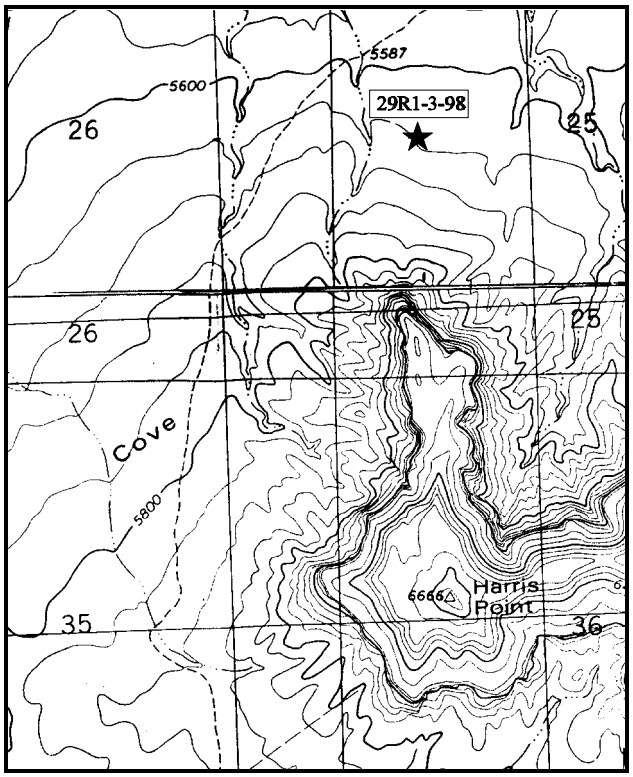
Study site name: Elephant Gap Total Exclosure . Range type: Pinyon-Juniper .

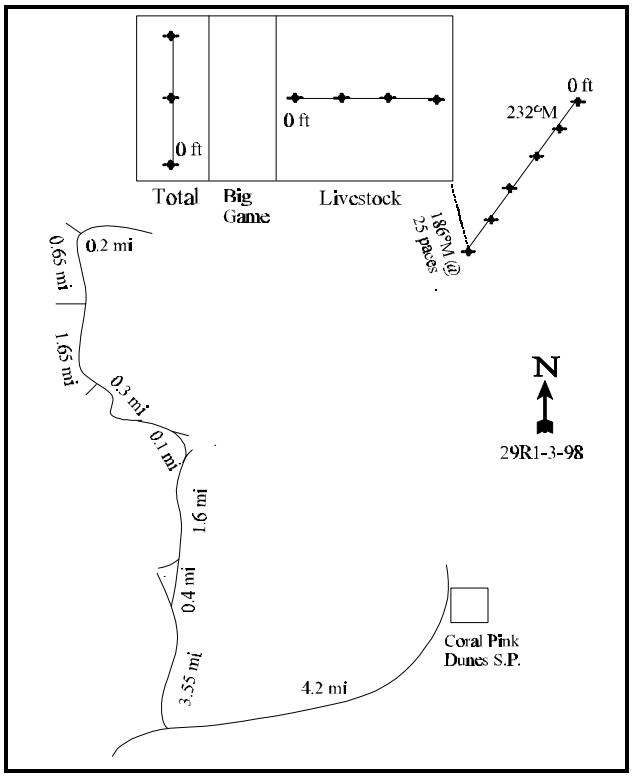
Compass bearing: frequency baseline 50°M degrees.

Footmark (first frame placement) 5 feet. 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. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 0.2 miles to the exclosure. The total exclosure is nearest the road, and the baseline (200 feet long) runs through the middle at 50°M. Browse tag #116 is attached to the 0 foot stake.





Map Name: The Barracks Diagrammatic Sketch

Township 42S , Range 9W , Section 25 UTM 4110568.401 N, 339642.612 E

DISCUSSION

Trend Study No. 29R-1

This is a new trend study established in 1998 within the Elephant Gap game/livestock exclosure which is located about 9 miles northwest of the Coral Pink San Dunes and just north of Harris Point. This, along with the John R Flat and Nephi Pasture exclosures, was built in the 1960's. They all are three way exclosures consisting of a total (game/livestock) and livestock grazing exclosure, and a site placed outside of the exclosure. The total exclosure is approximately 100 by 200 feet in size. Slope is about 6% with a north to northwest aspect. Elevation is about 5,630 feet. The area supports a moderately dense stand of pinyon and juniper trees with mixture of basin big sagebrush, bitterbrush, and serviceberry in the understory.

Soil at the site is moderately deep with an effective rooting depth (see methods) estimated at just over 31 inches. Texture is a sand, with a slightly acid pH (6.2). Phosphorus and potassium are limited at just 5.6 ppm and 12.8 ppm respectively. This could be effecting plant growth and development. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Average soil temperature is high at 71°F at a depth of 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile which effectively limits shallow rooted plants. There is no rock or pavement on the surface or within the profile. A considerable amount of bare ground is exposed (38%), but there is little erosion occurring due to the gentle slope and the rapid infiltration capacity of the soil.

There are six small pinyon pine and six large Utah juniper trees inside of the total exclosure. Average basal diameter was approximately 14 inches for juniper and 4 inches for pinyon. Juniper provides 38% of the shrub cover on the site and overhead canopy cover averages 12%. Basin big sagebrush and bitterbrush are the key browse species. They provide respectively 31% and 17% of the shrub cover. Density of basin big sagebrush is estimated at 1,280 plants/acre. The population appears healthy with good reproduction, generally good vigor, and low percent decadence at 19%. There are only 240 bitterbrush plants/acre estimated, however 92% are large mature shrubs measuring 4 feet in height with a crown diameter of 5 feet. There were no seedlings or young sampled, but vigor is good on most plants and percent decadence is low at 8%. Small numbers of sand sagebrush, rubber rabbitbrush, green ephedra, coin buckwheat, squawbush, and yucca are also found inside of the exclosure.

The herbaceous understory is very poor. Total herbaceous cover is estimated at only 6%. The most common perennial species consist of warm season species, blue grama and sand drop seed. These two species account for 93% of the grass cover. There is some cheatgrass present, although it was sampled in only two quadrats. Forbs are slightly more common with a milkvetch and pale evening primrose being the most abundant. This level of grass and forb abundance may be all that this site is capable of supporting due to the high sand content of the soil.

1998 APPARENT TREND ASSESSMENT

The soil trend appears relatively stable even with the abundance of bare soil. There is some soil pedestaling apparent, but soil erosion appears minimal due to the gentle terrain combined with the high infiltration capacity of the soil. The key browse species, basin big sagebrush and bitterbrush, appear to have healthy and stable populations. Vigor is normal on most plants and percent decadency is low at 19% for sagebrush and 8% for bitterbrush. The herbaceous understory is lacking, although this may be all the site can support. Composition of grasses is dominated by the warm season species, blue grama, and sand dropseed. Forb composition is composed mostly of milkvetch and pale evening primrose.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 1

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	51	21	1.21
G	Bromus tectorum (a)	4	2	.01
G	Muhlenbergia pungens	2	1	.03
G	Oryzopsis hymenoides	2	1	.03
G	Sporobolus cryptandrus	39	15	.77
G	Stipa comata	5	1	.00
G	Vulpia octoflora (a)	20	9	.09
Total for Annual Grasses		24	11	0.10
Total for Perennial Grasses		99	39	2.04
Total for Grasses		123	50	2.15
F	Artemisia dracunculus	5	2	.01
F	Astragalus spp.	60	27	1.92
F	Descurainia pinnata (a)	7	3	.16
F	Dithyrea wislizeni (a)	10	4	.27
F	Eriogonum cernuum (a)	9	4	.02
F	Gilia spp. (a)	6	2	.03
F	Lappula occidentalis (a)	3	2	.03
F	Oenothera pallida	43	17	1.06
Total for Annual Forbs		35	15	0.52
Total for Perennial Forbs		108	46	3.00
Total for Forbs		143	61	3.52

BROWSE TRENDS --
Herd unit 29R, Study no: 1

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	15	.62
B	Artemisia tridentata tridentata	37	6.46
B	Chrysothamnus nauseosus albicaulis	9	1.19
B	Chrysothamnus parryi howardi	0	-
B	Ephedra viridis	6	.56
B	Eriogonum nummulare	5	.33
B	Juniperus osteosperma	1	7.94
B	Opuntia spp.	1	.03
B	Purshia tridentata	9	3.56
B	Rhus trilobata trilobata	1	-
B	Yucca spp.	3	.16
Total for Browse		87	20.88

CANOPY COVER --
Herd unit 29R, Study no: 1

Species	Percent Cover '98
Juniperus osteosperma	12

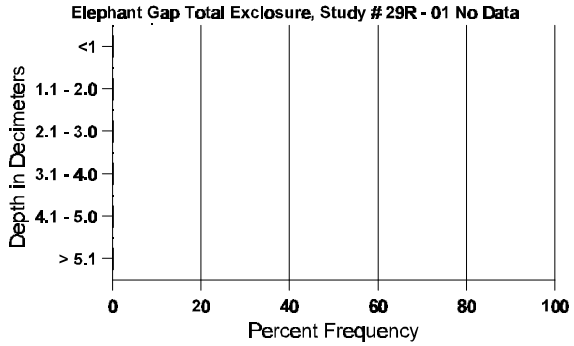
BASIC COVER --
Herd unit 29R, Study no: 1

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	216	28.10
Litter	438	44.43
Cryptogams	150	5.10
Bare Ground	319	38.44

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 01, Study Name: Elephant Gap Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
31.4	70.6 (17.7)	6.2	90.7	4.7	4.6	.6	5.6	12.8	.3

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 1

Type	Quadrat Frequency '98
Rabbit	2
Deer	1

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
Y	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260	24	63	13
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		380	Dec:		-
Artemisia tridentata tridentata																		
S	98	4	-	-	2	-	-	-	-	-	6	-	-	-	120			6
Y	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	98	39	-	-	2	-	-	-	-	-	41	-	-	-	820	35	45	41
D	98	12	-	-	-	-	-	-	-	-	4	-	-	8	240			12
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 13%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1280	Dec:		19%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
M	98	120	-	-	-	-	-	-	-	-	120	-	-	-	2400	38	80	120
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2400	Dec:		-
Chrysothamnus parryi howardi																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	48	86	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Ephedra viridis																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	3	-	-	-	-	-	-	-	-	2	1	-	-	60	28	26	3
D	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		38%
Eriogonum nummulare																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	22	23	4
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		120	Dec:		-
Juniperus osteosperma																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	14	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220	48	64	11
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 08%										%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		240	Dec:		8%
Rhus trilobata trilobata																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%										%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Yucca spp.																		
M	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60	33	42	3
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%										%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-

Trend Study 29R-2-98

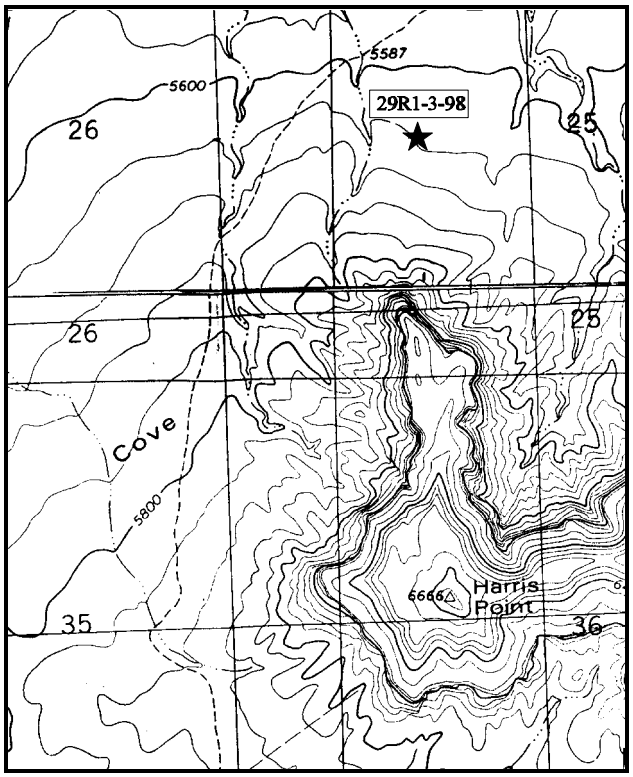
Study site name: Elephant Gap Livestock Exclosure. Range type: Pinyon-Juniper .

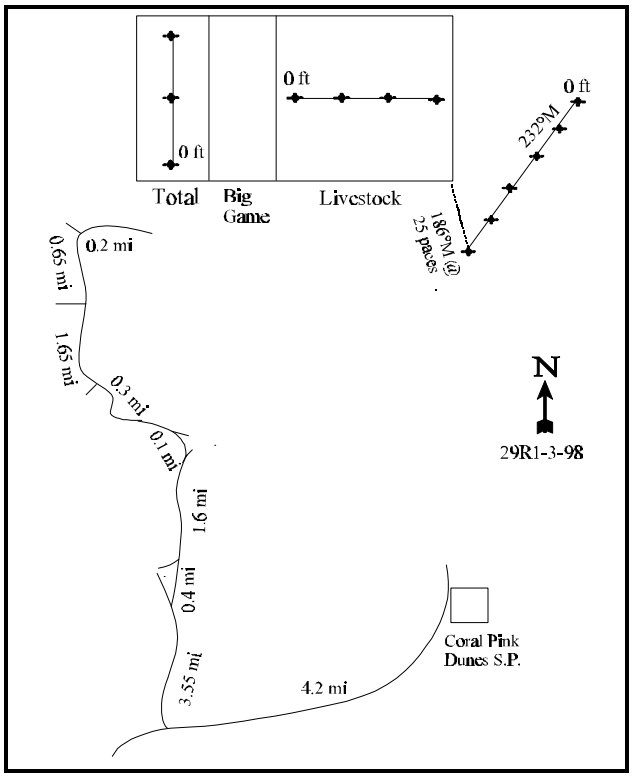
Compass bearing: frequency baseline___degrees.

Footmark (first frame placement) 5 feet. 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. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 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

Diagrammatic Sketch

Township 42S , Range 9W , Section 25

UTM NO GPS

DISCUSSION

Trend Study No. 29R-2

This is a new trend study established in 1998 within the Elephant Gap livestock exclosure. It is located about 100 feet east of the total exclosure. Slope is 7% with a northwest aspect. Elevation is approximately 5,630 feet. The area is composed of an open pinyon-juniper woodland with a mixed shrub understory. Deer use this area as winter range and pellet group data estimate a high level of use within the livestock exclosure at 96 deer days use/acre. Very little rabbit sign was encountered.

Soil in the livestock exclosure is very similar to the total exclosure and outside. It is moderately deep with an effective rooting depth (see methods) estimated at nearly 26 inches. Sol texture is a sand with a strongly acid pH (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. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. There is very little rock or pavement on the surface or within the profile. Percent bare ground is similar to the total exclosure at 35%, but cryptogamic cover is more than two times greater (5% vs 12%). Average soil temperature is high at 71°F at 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile, which effectively limits shallow rooted plants. There is some soil pedestaling around shrubs, but erosion does not appear to be a problem due to the gentle terrain and high infiltration capacity of the soil.

Total shrub cover is similar to the total exclosure yet composition differs. The key browse species consist of basin big sagebrush and green ephedra which account respectively for 24% and 41% of the browse cover. Bitterbrush is also found in small numbers. Basin big sagebrush, within the livestock exclosure, appears to be in a state of decline. It has an estimated population of 1,180 plants/acre. Dead plants are common (1,060 plants/acre) and are nearly as abundant as live plants. In addition, 46% of the population is decadent and nearly half of the decadent shrubs (260 plants/acre) were classified as dying. Some seedlings and young plants were found, but not in sufficient numbers to maintain the current population. Utilization of the sagebrush is mostly light with 15% of the plants sampled displaying moderate use.

Green ephedra is abundant at 1,060 plants/acre. Mature plants are large averaging over 4 feet in height with a crown diameter of nearly 7 feet making some portions of plants partly unavailable to browsing. Utilization of these shrubs is light. Bitterbrush density was estimated at only 60 plants/acre. Most (67%) are young plants. Utilization is light and vigor good. Other shrubs found on the site include: sand sagebrush, coin buckwheat, prickly pear cactus, and yucca. Juniper trees are scattered in the livestock exclosure. Point quarter data estimate 29 juniper trees/acre with an average basal diameter of 7.3 inches. Overhead canopy cover averages only 4%.

The grass composition is similar to the total exclosure, although forbs are more abundant and diverse in the livestock exclosure exclosure. Grasses combine to produce only 2% cover. Sand dropseed is the most abundant, producing 55% of the grass cover. The only other species which occurs more than rarely is six weeks fescue. Eighteen annual and perennial forbs were classified on the site, combining to produce 11% cover. The most common species include pale and prairie evening primrose, milkvetch, and bastard toad flax. All other species produce less than 1/4 of 1% cover.

1998 APPARENT TREND ASSESSMENT

Soil at the site appears stable. There is a high amount of bare soil (35%), but erosion is minimal due to the gentle terrain combined with the high infiltration capacity of the soil. The key browse species include basin big sagebrush and green ephedra. Sagebrush appears to be in a state of decline even though utilization is mostly light. However, 48% of the population is dead, 46% are decadent, and nearly half (48%) of the decadent sagebrush appear to be dying. Reproduction is poor and not adequate to maintain the stand at

current levels. The less preferred green ephedra population is healthy and appears to be increasing. Utilization is light, vigor normal and percent decadence low at only 2%. Probably the most preferred shrub on the site is antelope bitterbrush, but it only occurs in small numbers within the livestock exclosure. The population is mostly young and lightly utilized. The herbaceous understory is similar to the total exclosure with respect to the grass diversity and abundance. Sand dropseed is the most abundant species followed by six weeks fescue. Forbs are more diverse and produce three times more cover compared to the total exclosure. Common species include: pale and prairie evening primrose, milkvetch, and bastard toadflax.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 2

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	7	3	.30
G	Bromus tectorum (a)	11	5	.08
G	Muhlenbergia pungens	4	2	.01
G	Oryzopsis hymenoides	3	1	.06
G	Sitanion hystrix	1	1	.00
G	Sporobolus cryptandrus	34	19	1.11
G	Vulpia octoflora (a)	51	18	.44
Total for Annual Grasses		62	23	0.52
Total for Perennial Grasses		49	26	1.49
Total for Grasses		111	49	2.01
F	Artemisia dracunculus	2	1	.06
F	Astragalus spp.	56	22	1.74
F	Castilleja linariaefolia	-	-	.03
F	Chaenactis douglasii	5	2	.03
F	Comandra pallida	88	31	1.35
F	Cordylanthus parviflorus	5	3	.09
F	Descurainia pinnata (a)	16	7	.11
F	Dithyrea wislizeni (a)	4	2	.09
F	Draba spp. (a)	13	4	.07
F	Eriogonum cernuum (a)	11	5	.12
F	Euphorbia spp.	14	5	.02
F	Gilia spp. (a)	1	1	.03
F	Lappula occidentalis (a)	-	-	.00
F	Oenothera albicaulis (a)	18	7	.60
F	Oenothera pallida	155	61	6.51
F	Phlox longifolia	2	1	.00
F	Sphaeralcea grossulariaefolia	6	3	.16
F	Sphaeralcea parvifolia	5	2	.06

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
Total for Annual Forbs		63	26	1.03
Total for Perennial Forbs		338	131	10.07
Total for Forbs		401	157	11.11

BROWSE TRENDS --
Herd unit 29R, Study no: 2

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	3	.93
B	Artemisia tridentata tridentata	47	4.79
B	Ephedra viridis	23	8.32
B	Eriogonum nummulare	1	.03
B	Juniperus osteosperma	1	5.21
B	Opuntia spp.	2	-
B	Purshia tridentata	2	.66
B	Yucca spp.	2	.15
Total for Browse		81	20.11

CANOPY COVER --
Herd unit 29R, Study no: 2

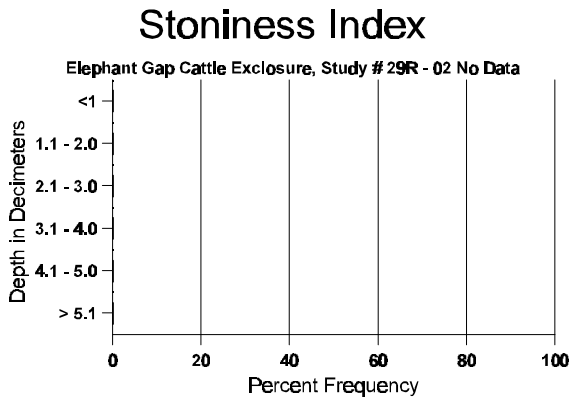
Species	Percent Cover '98
Juniperus osteosperma	5

BASIC COVER --
Herd unit 29R, Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	291	37.53
Rock	2	.00
Pavement	16	.08
Litter	472	42.49
Cryptogams	200	13.53
Bare Ground	308	34.80

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 02, Study Name: Elephant Gap Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
25.7	70.8 (17.7)	5.5	90.7	2.7	6.6	.6	3.8	3.2	.8



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 2

Type	Quadrat Frequency '98
Deer	47

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	47	51	1
D	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 33%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				60	Dec:		67%
Artemisia tridentata tridentata																		
S	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	22	4	-	2	-	-	-	-	-	28	-	-	-	560	37	38	28
D	98	19	5	-	3	-	-	-	-	-	13	-	1	13	540			27
X	98	1	-	-	-	-	-	-	-	-	-	-	-	-	1060			53
% Plants Showing '98		Moderate Use 15%		Heavy Use 00%		Poor Vigor 24%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				1180	Dec:		46%
Ephedra viridis																		

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	98	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
Y	98	24	-	-	4	-	-	-	-	-	28	-	-	-	560			28
M	98	22	-	-	2	-	-	-	-	-	24	-	-	-	480	52	81	24
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1060	Dec:		2%
Eriogonum nummulare																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	35	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	9	2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Purshia tridentata																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	36	44	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Yucca spp.																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	24	17	4
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		100	Dec:		-

Trend Study 29R-3-98

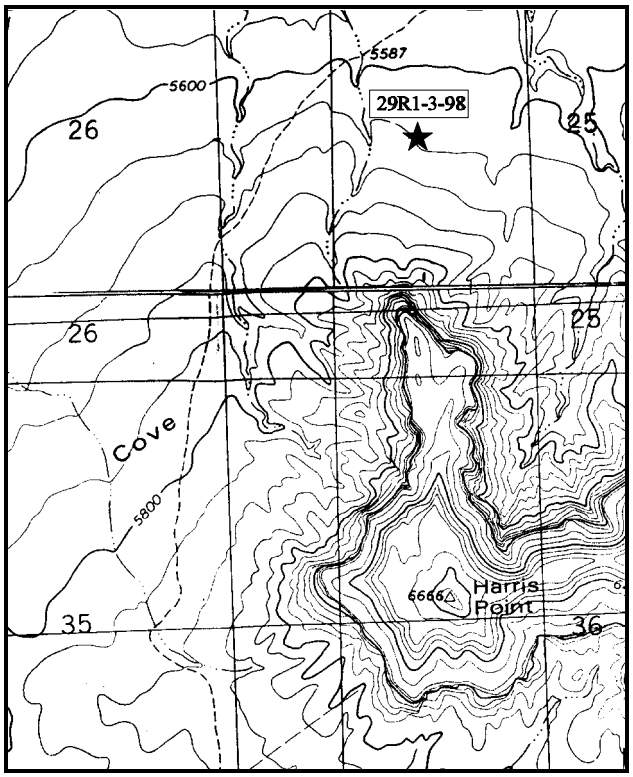
Study site name: Elephant Gap Outside . Range type: Pinyon-Juniper .

Compass bearing: frequency baseline 232°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

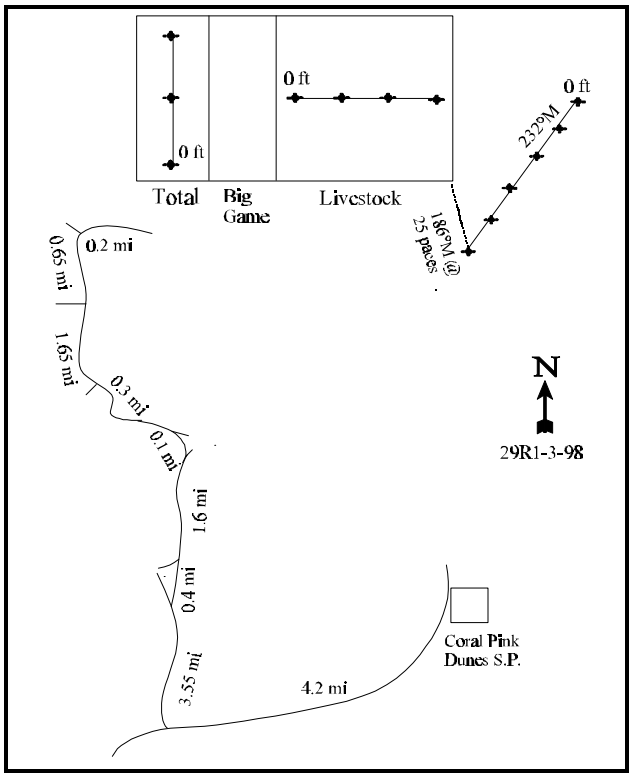
LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 0.2 miles to the exclosure. From the southeast corner of the livestock exclosure, 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

Township 42S , Range 9W , Section 25



Diagrammatic Sketch

UTM NO GPS

DISCUSSION

Trend Study No. 29R-3

This is a new trend study established in 1998 outside of the Elephant Gap exclosure. It is located about 100 feet east of the livestock exclosure. The site has a Slope of 7% with a northwest aspect and an elevation of approximately 5,630 feet. The area is composed of an open pinyon-juniper woodland with a mixed shrub understory. Deer use this area as winter range. Pellet group data estimate a similar high level of use for the "outside" when compared to the livestock exclosure (95 days use/acre). There was little rabbit or cow sign observed in the area.

Soil outside the exclosure is very similar to the total exclosure and livestock exclosure. It is moderately deep with an effective rooting depth (see methods) estimated at 26 inches. Soil texture is a sand with a strongly acidic pH (5.4). Phosphorus and potassium are in limited amounts at just 3.5 ppm and 51.2 ppm respectively, which may be limiting to plant growth and development. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. There is very little rock or pavement on the surface or within the profile. Percent bare ground is higher than the total exclosure or the livestock exclosure at 46%. Cryptogamic cover is similar to the livestock exclosure at 11%. Average soil temperature is fairly high at 69°F at a depth of 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile which effectively limits the establishment of shallow rooted plants. There is some soil pedestaling round shrubs, but erosion does not appear to be a significant problem due to the gentle terrain and high infiltration capacity of the soil.

The key browse species include: basin big sagebrush, green ephedra, and antelope bitterbrush. Sagebrush provides 36% of the browse cover, with a total cover value of 5%. Density is estimated at 1,520 plants/acre. Utilization is light to moderate with a few plants displaying heavy use. However, nearly half (45%) of the population is decadent and 62% of the decadent plants appear to be dying. Dead sagebrush are also abundant accounting for 38% of the population. Reproduction is fairly good with a biotic potential of 5% and young plants accounting for 14% of the population. Nevertheless, this is still not sufficient to maintain the current population.

Ephedra is estimated at 320 plants/acre. Mature plants are large, averaging 3 ½ feet in height and a crown diameter of nearly 7 feet. Available plants show light to moderate use. The population appears healthy with 44% of the population consisting of young plants and percent decadence low at 19%.

Bitterbrush is the most preferred species on the site. However, it occurs in very small numbers estimated at only 20 plants/acre. The only plant sampled was heavily hedged and measured only 11 inches in height with a crown diameter of 26 inches. Other shrubs occurring in limited numbers include: sand sagebrush, true mountain mahogany, rubber rabbitbrush, coin buckwheat, prickly pear, yucca, and gray horsebrush. Gray horsebrush was not found in the total exclosure or livestock exclosure. Juniper and pinyon trees are found scattered throughout the area. Point quarter data estimates 29 Utah juniper and 24 pinyon pine trees/acre. Average basal diameter is 9.8 inches for juniper and 5.5 inches for pinyon. Overhead canopy cover is 4% for juniper and 1% for pinyon.

The herbaceous understory is similar to the livestock exclosure with respect to composition and cover. Grasses provide 2% cover with similar amounts of blue grama , sand dropseed, and the annual, six weeks fescue. Forbs are diverse with 16 species identified. They produce 12% cover. Common species include bastard toad flax, pale evening primrose, prairie evening primrose, and spectacle-pod.

1998 APPARENT TREND ASSESSMENT

Soil condition is poor with a considerable amount of bare ground (46%). There is some soil pedestaling evident around shrubs, but erosion is minimal due to the lack of slope combined with the high infiltration capacity of the sandy soil. The browse trend is very similar to the livestock exclosure. Basin big sagebrush appears to be in a state of decline with abundant dead plants, high decadence, and poor vigor on 62% of the decadent plants. Reproduction is fairly good with a biotic potential of 5% and 14% of the population being young. However, the current density of young plants is insufficient to replace decadent/dying plants. The population could maintain itself with better recruitment in the future. Ephedra appears to be increasing with 44% of the population consisting of young plants. Utilization is light to moderate, vigor good, and percent decadence low at 19%. The more preferred bitterbrush occurs in very limited numbers. Understandably, the one plant sampled was heavily hedged. The herbaceous understory is very similar to the livestock exclosure. Grasses provide only 2% cover with equal amounts of sand drop seed, blue grama, and six weeks fescue (an annual). Forbs combine to produce 12% cover with the most common species being pale evening primrose, prairie evening primrose, and milk vetch.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	10	3	.53
G	Bromus tectorum (a)	20	11	.10
G	Oryzopsis hymenoides	1	1	.03
G	Sitanion hystrix	1	1	.03
G	Sporobolus cryptandrus	40	15	.68
G	Vulpia octoflora (a)	106	33	.68
Total for Annual Grasses		126	44	0.79
Total for Perennial Grasses		52	20	1.27
Total for Grasses		178	64	2.06
F	Ambrosia spp.	-	-	.03
F	Artemisia dracunculus	14	5	.53
F	Castilleja linariaefolia	-	-	.01
F	Comandra pallida	40	15	.42
F	Cryptantha spp.	28	10	.25
F	Descurainia pinnata (a)	26	14	.09
F	Dithyrea wislizeni (a)	28	14	.89
F	Draba spp. (a)	3	2	.01
F	Eriogonum cernuum (a)	92	33	.63
F	Euphorbia spp.	26	11	.05
F	Gilia spp. (a)	15	6	.13
F	Lappula occidentalis (a)	5	2	.01
F	Oenothera albicaulis (a)	40	15	1.77

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
F	Oenothera pallida	144	56	5.56
F	Sphaeralcea parvifolia	7	2	.01
F	Astragalus spp.	40	18	1.77
Total for Annual Forbs		209	86	3.55
Total for Perennial Forbs		299	117	8.66
Total for Forbs		508	203	12.22

BROWSE TRENDS --
Herd unit 29R, Study no: 3

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	0	.15
B	Artemisia tridentata tridentata	60	4.83
B	Cercocarpus montanus	0	-
B	Chrysothamnus nauseosus albicaulis	1	.15
B	Ephedra viridis	9	1.50
B	Eriogonum nummulare	0	.00
B	Juniperus osteosperma	1	4.40
B	Opuntia spp.	7	.03
B	Pinus edulis	-	.66
B	Purshia tridentata	1	.15
B	Tetradymia canescens	2	1.62
B	Yucca spp.	0	-
Total for Browse		81	13.52

CANOPY COVER --
Herd unit 29R, Study no: 3

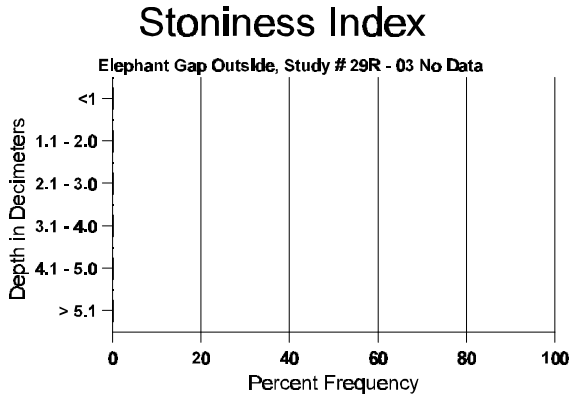
Species	Percent Cover '98
Juniperus osteosperma	4
Pinus edulis	1

BASIC COVER --
Herd unit 29R, Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	341	28.61
Rock	5	.01
Pavement	23	.08
Litter	466	38.06
Cryptogams	205	10.76
Bare Ground	418	46.34

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 03, Study Name: Elephant Gap Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
25.9	69.0 (17.7)	5.4	90.7	2.7	6.6	1.3	3.5	51.2	.1



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 3

Type	Quadrat Frequency '98
Rabbit	7
Deer	45
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32	32	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Artemisia tridentata tridentata																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	98	9	1	-	1	-	-	-	-	-	11	-	-	-	220			11
M	98	21	6	-	1	2	-	1	-	-	31	-	-	-	620	42	44	31
D	98	16	11	2	4	1	-	-	-	-	13	-	-	21	680			34
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	980			49
% Plants Showing '98				Moderate Use 28%			Heavy Use 03%			Poor Vigor 28%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1520	Dec:		45%
Cercocarpus montanus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	25	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Chrysothamnus nauseosus albicaulis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	45	61	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Ephedra viridis																		
Y	98	4	-	-	3	-	-	-	-	-	7	-	-	-	140			7
M	98	3	2	-	1	-	-	-	-	-	6	-	-	-	120	41	83	6
D	98	1	2	-	-	-	-	-	-	-	2	-	-	1	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98				Moderate Use 25%			Heavy Use 00%			Poor Vigor 06%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		320	Dec:		19%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum nummulare																		
S	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	36	49	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140	4	12	7
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 11%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		11%
Purshia tridentata																		
M	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	11	26	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 100%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Tetradymia canescens																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	58	65	1
D	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		50%
Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	28	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

ELEPHANT GAP EXCLOSURE COMPARISON SUMMARY

Total Exclosure 29R-1, Livestock Exclosure 29R-2, and Outside 29R-3

1998 Comparisons

Soil conditions are very similar between grazing effects. The soil is deep with a sandy texture and a slightly acidic to strongly acidic pH (5.4 to 6.2). Phosphorus and potassium appear to be limiting to plant growth and development on all sites, with some values well below 10 ppm for phosphorus and 70 ppm for potassium. Organic matter is low in the exclosures and higher outside. Percent bare ground is high on all sites, but highest outside of the exclosure at 46% compared to 35% in the livestock and 38% in the total exclosure. Vegetation cover is highest in the livestock exclosure with similar amounts outside and in the total exclosure. Cryptogamic crusts are abundant outside and in the livestock exclosure at 11% and 12% respectively, however it is low at only 5% inside of the total exclosure. Average soil temperatures are high on all sites ranging from 69°F outside of the exclosure to about 71°F in the livestock and total exclosure. This condition causes rapid soil drying in the surface horizons which limits establishment of shallow rooted plants. Soil erosion on all treatment effects appears to be minimal due to the levelness of the terrain, combined with the high infiltration capacity of the soil.

The key browse species for all grazing effects is basin big sagebrush, green ephedra, and antelope bitterbrush. Sagebrush appears to have a stable population within the total exclosure due to good reproduction, normal vigor on most plants, and low decadence at 19%. Dead plants are fairly abundant, although they represent only 30% of the population. The livestock exclosure and outside the exclosure have similar sagebrush populations which appear to be in a state of decline. Sagebrush in the livestock exclosure display poor reproduction and high decadence at 46%. In addition, dead plants are common and represent 48% of the population. Also, nearly half (46%) of the decadent plants were classified as dying. The sagebrush population is in a similar condition outside of the exclosure. However, reproduction is better yet still not enough to maintain the current population levels. If recruitment does not improve, then the population will decline. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

Green ephedra appears to have an increasing population due to high numbers of young plants at 25% in the total exclosure, 53% in the livestock, and 44% outside. Density is highest within the livestock exclosure at 1,060 plants/acre, compared to 320 outside, and 160 in the total exclosure. These shrubs display light to moderate use and are quite large in the livestock exclosure and outside with mature plants measuring 3 ½ to 4 feet in height.

Antelope bitterbrush is probably the most preferred shrub on the site. It occurs in moderate densities in the total exclosure at 240 plants/acre. This population is mostly mature (92%), vigor is good, and percent decadence is low at only 8%. Very few bitterbrush were found inside the livestock exclosure or outside the exclosure. In the livestock exclosure only one mature and two young, lightly utilized plants were sampled. Outside, only one stunted, heavily hedged mature plant was encountered.

The herbaceous understory is limited on all grazing effects, likely due to the soil conditions. Total herbaceous cover is 6% in the total exclosure, 13% in the livestock exclosure and 14% outside. Grass composition is similar between all sites, with the most common grasses consisting primarily of the warm

season grasses, blue grama and sand drop seed. Annual grasses, cheatgrass and six weeks fescue, are present yet only six weeks fescue is moderately abundant outside of the exclosure. Forb composition is similar between treatment effects with respect to the dominant species, but more species are found in the livestock exclosure and outside (18 and 16 species). In addition, forb cover is 3 times higher in both the livestock exclosure and outside the exclosure. The most abundant species on all sites consist of pale evening primrose, prairie evening primrose, bastard toadflax, and milkvetch.

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