UTAH BIG GAME RANGE TREND STUDIES

2004 Volume 2

Southeastern Region

PUBLICATION NUMBER 05-14
REPORT FOR FEDERAL AID PROJECT W-82-R-49

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME
RANGE TREND STUDIES
2004 Volume 2

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Performance Report for Federal Aid Project W-82-R-49

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UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources
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*Indicates study was not monitored in 2004, because it was suspended, replaced by another study, or was not accessible. Maps, discussion, and tables for these studies are available in 1999 Volume 2 report or at http://www.wildlife.utah.gov/range/.

PROGRAM NARRATIVE

State: UTAH Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need:

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

Objective:

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

Expected Results or Benefits:

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

REMARKS

The work completed during the 2004 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southeastern Region. Most trend studies surveyed in these management units were established in the 1980's with rereads at 5 year intervals.

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

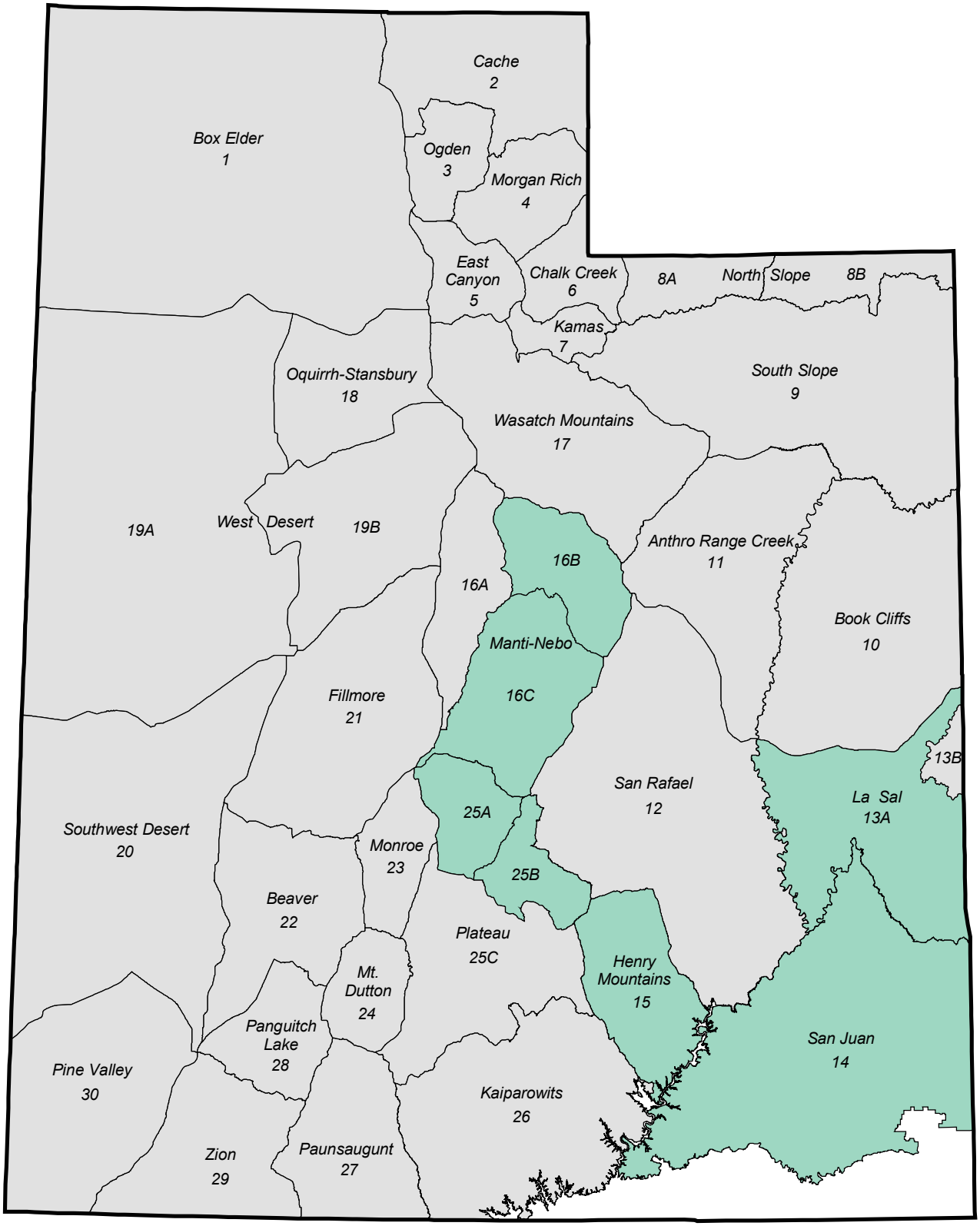
Bureau of Land Management
- Monticello Resource Area
- Moab resource Area

Manti-LaSal National Forest
- Ferron Ranger District
- Moab Ranger District
- Monitcello Ranger District
- Sanpete Ranger District

Fishlake National Forest
- Loa-Teasdale Ranger District
- Fillmore Ranger District

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

Utah Management Units Surveyed in 2004



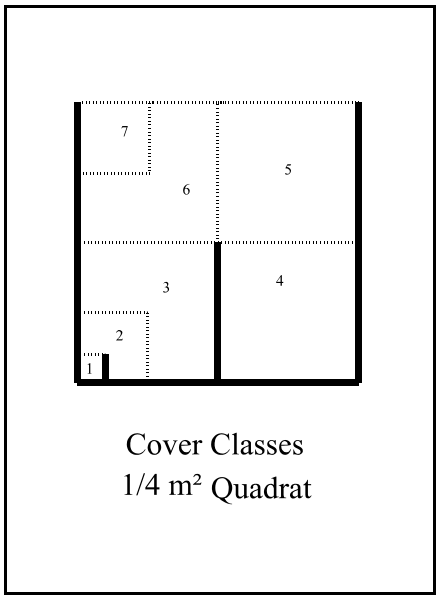
RANGE TREND STUDY METHODS

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

Vegetative composition

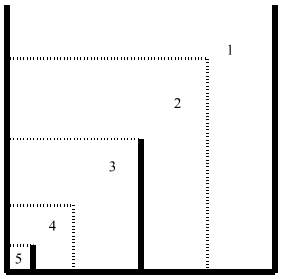
Determining vegetational characteristics for each “key” area is determined by setting up 5 consecutive 100 foot baseline transects in the area of interest. This 500 foot line is the baseline and one, 100 foot belt is placed perpendicular to each 100 foot section of the baseline at random foot marks and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

Cover is determined using an ocular cover estimation procedure using 7 cover classes (Bailey and Poulton, 1968, Daubenmire 1969). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100%. For example, to estimate vegetative cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the average for a given site.



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

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



Nested Frequency
1/4 m² Quadrat

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

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

Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100 foot belt. All shrubs rooted within each strip are counted and placed in the following five classes. ([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 1/4-inch diameter.

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

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

Dead: A plant which is no longer living.

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

1. All available, lightly hedged.

2. All available, moderately hedged.

3. All available, heavily hedged.

4. Largely available, lightly hedged.

5. Largely available, moderately hedged.

6. Largely available, heavily hedged.

7. Mostly unavailable.

8. Unavailable due to height.

9. Unavailable due to hedging.

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

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

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

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

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

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

1. Normal and vigorous.

2. Insect infested or diseased.

3. Poor vigor - chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.

4. Dying - substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

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

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

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

TREND DETERMINATION

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

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

Trends in herbaceous plants as a group or as a single "key" species can be determined by comparing the sum of nested frequency values between readings. Attention is also given to changes in species composition of grasses and forbs through time. A non-parametric statistical test (Friedman test which is analogous to analysis of variance) (Conover 1980) is conducted on nested frequencies of each species to determine significant changes at alpha = .10. Ground cover parameters are analyzed and compared in the discussions of the reread studies. Trends for soil are determined by comparing basic ground cover measurements and cover composition (herbs vs shrubs) between years as well as comparing photos and observer observations between readings. A ratio of the nested frequency values of protective cover types (vegetation, litter, and cryptogams) to bare soil can also be used to help determine changes in soil trend. Beginning in 2002, an erosion condition class assessment adapted from the Bureau of Land Management is also completed on each study site to provide additional qualitative information on soil condition. On newly established studies, a more subjective or apparent assessment is made from qualitative comparisons.

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

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

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

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

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

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

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

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

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	35	26	2.24	2.41
B	Artemisia tridentata vaseyana	40	26	2.54	.76
B	Gutierrezia sarothrae	2	0	-	-
B	Juniperus osteosperma	4	5	5.51	9.29
B	Opuntia spp.	1	2	.15	-
B	Pinus edulis	4	6	5.99	8.81
B	Purshia tridentata	18	15	3.20	4.31
Total for Browse		104	80	19.63	25.58

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

CANOPY COVER, LINE INTERCEPT --
Management unit 23 , Study no: 1

Species	Percent Cover	
	'98	'03
Artemisia nova	-	1.85
Artemisia tridentata vaseyana	-	.55
Juniperus osteosperma	7.19	23.31

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

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

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

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

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

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

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

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

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

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

SOIL ANALYSIS DATA --
Management unit 23, Study # 01, Study Name: Bear Ridge

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

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

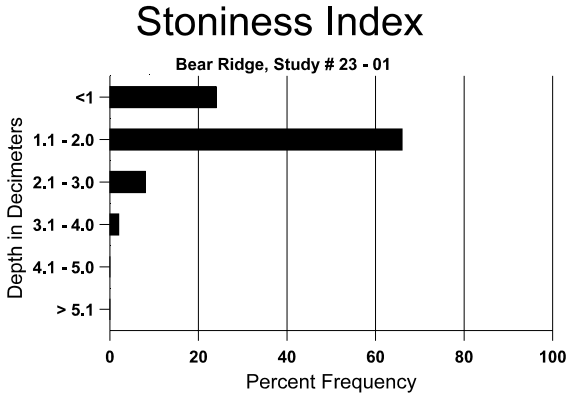
Ultra acid	< 3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	> 9.1

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

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

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

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



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

PELLET GROUP DATA --
Management unit 23 , Study no: 1

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

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

The “Browse Characteristics” table summarizes characteristics of the shrub community on study 23-1. Only mountain big sagebrush is included in this example. The sagebrush population is characterized by age class, vigor, utilization, and average height and crown for mature plants. Total density in plants/acre for mountain big sagebrush, excluding seedlings, was 1,400 in 1985, 1,065 in 1991, 1,100 in 1998, and 840 plants/acre in 2003. Seedlings are excluded from the population estimate because with summer drought, many will die by late fall causing great fluctuations in population estimates between sampling dates. Since mid-1992, a larger shrub sample (more than three times larger) is used to better characterize the shrub populations. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that characteristically are clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent of the population classified as dying, percent decadence, percent of the population displaying poor vigor, percent heavy hedging, young recruitment, etc. should be given more weight in determining shrub trend when comparing survey years where sample sizes are different.

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

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
85	**1400**	266	200	400	800	-	67	24	57	-	14	13/15
91	**1065**	333	333	66	666	-	19	6	63	11	38	12/13
98	**1100**	-	100	260	740	2300	56	2	67	27	40	15/23
03	**840**	-	120	140	580	1740	29	0	69	40	40	14/21

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

Considering all these factors, trend for sagebrush in 2003 is slightly downward due to a decline in density, increased decadence, and an higher proportion of plants classified as dying. No seedlings were encountered in 1998 or 2003 and young plants are only moderately abundant.

Management background information, photographs, and knowledgeable plant identification add to the database for each site. Management and background information for each site is obtained from the administering agency. Permanently located photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Species identification mostly follows "A Utah Flora" (Welsh et al. 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.

The desirable components index (DCI) was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, not a replacement for, the site specific range trend assessments that are found in the annual Utah Big Game Range Trend Studies report. This index was designed to score mule deer winter range based upon several important vegetative components (ie., preferred browse cover, shrub decadence and young recruitment, cover of perennial grasses and forbs and annual grasses, etc.). Although the index may be useful for assessing habitat for other species (ie. sage grouse and elk), the rating system was devised to specifically address mule deer winter range requirements.

This index is used primarily to determine if a particular site has the vegetation components necessary to be a good winter range for mule deer. It can also be used to identify areas where habitat restoration projects may be needed and assist land managers in determining possible rehabilitation options. Because it does not take into account factors such as soil stability, hydrologic function, and other environmental factors, it should not be used to assess a sites function and/or condition as typically used by the Federal land management agencies. The Desirable Components Index Ratings are divided into three categories because of different ecological potential, these include: Wyoming Big Sagebrush – Cliffrose – Desert shrubs, Mountain Big Sagebrush, and Mountain Brush. Desirable mule deer winter range provides 12-20% of preferred browse cover, 20% or less shrub decadency, and 10% or more of the shrub population is young. The herbaceous understory contains 8-15% perennial grasses cover, 5% perennial forb cover, and less than 5% annual grass cover.

Desirable Components Index Ratings

Wyoming Big Sagebrush and Desert Shrub Communities

> 65 points =	Excellent
45 – 64	Good
25 – 44	Fair
10 – 24	Poor
< 10	Very poor

Mountain Big Sagebrush and Pinyon-Juniper Chainings

> 80 points =	Excellent
79 – 65	Good
64 – 50	Fair
49 – 35	Poor
< 35	Very poor

Mountain Brush Communities

> 90 points =	Excellent
89 – 70	Good
69 – 55	Fair
54 – 40	Poor
< 39	Very poor

(Black sagebrush and Basin big sagebrush will be placed in Wyoming or Mountain big sagebrush scales based on precipitation and elevation).

Desirable Components Index Scoring

Preferred Browse (60 points)

(Preferred Browse species are favorable or critical to deer)

Preferred Browse Cover (30 pts. possible)
1.5 points for each 1% of preferred browse cover (maximum is 20% or 30 points)

Percent Decadence (15 points possible)
-0.3 points for each 1% decadence (do not exceed 15 points)

Percent Young (15 points possible)
0.5 points for each 1% of young

Herbaceous Understory (40 points)

Perennial Grass Cover (30 points possible)
2 points for each 1% cover

Perennial Forb Cover (10 points possible)
2 points for each 1% cover

Annual Grass Cover (-20 points possible)
-0.75 points for each 1%cover

Noxious Weeds (State List)
-2 points for each species present

REFERENCES

Bailey, A. W. & C. E. Poulton. 1968. Plant communities and environmental interrelationships in a portion of the Tillomook burn, Northwest Oregon. Ecology. Vol 49, No. 1. pp. 1-13.

Conover, W. J. 1980. Practical Nonparametric Statistics (second edition). John Wiley & Sons, New York. 493pp.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. Reveal and P. Holmgren. 1977. Intermountain Flora (volume six). Columbia University Press, New York. 584pp.

Daubenmire, R. 1959. A canopy coverage method of vegetational analysis. Northwest Science 33:43-66.

Giunta, B. C. 1983. Utah interagency big game range trend plant species list. Utah Dept. Of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Mosley, J. C., S. C. Bunting, and M. Hironaka. 1986. Determining range condition from frequency data in mountain meadows of central Idaho. J. Range Manage. 39:561-565.

Smith, S. D., S. C. Bunting, and M. Hironaka. 1987. Evaluation of the improvement in sensitivity of nested frequency plots to vegetational change by summation. Great Basin Naturalist. 47(2): 299-307.

Smith, S. D., S. C. Bunting, and M. Hironaka. 1986. Sensitivity of frequency plots for detecting vegetation change. Northwest Science. 60:279-286.

[1]U.S. Department of Interior Bureau of Land Management. 1996. Utilization Studies and Residual Measurements, Interagency Technical Reference, BLM/RS/ST-96/004+1730.

[2]U.S. Department of Interior Bureau of Land Management. 1996. Sampling vegetation attributes, Interagency Technical Reference, BLM/RS/ST-96/002+1730.

Welsh, S. L., et al. 1993. A Utah Flora. Brigham Young University. Provo, Utah.

REPORT FORMAT

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

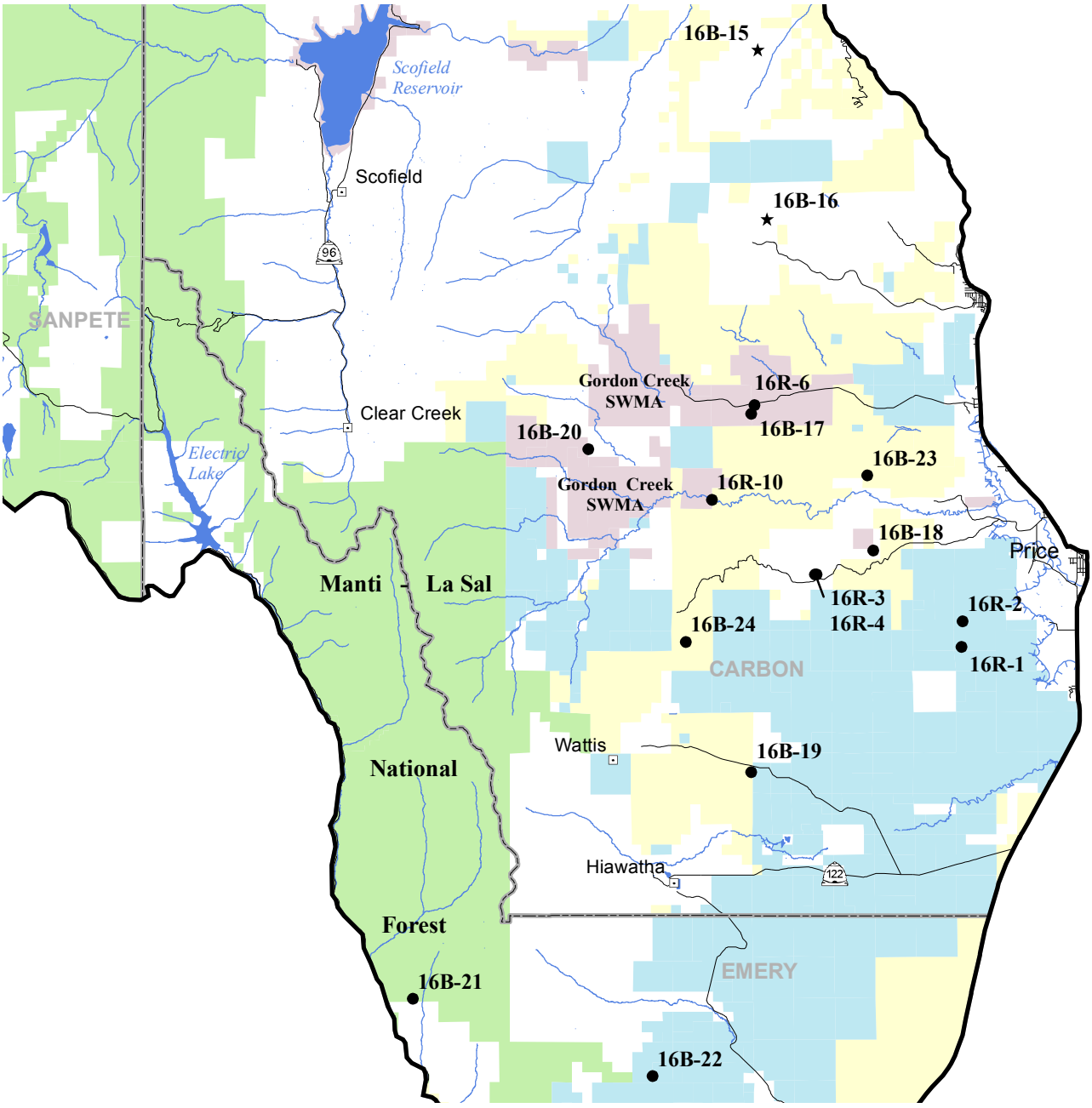
The name of the site and directions for locating the site are given on the location page. Also included on this page are the vegetation type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description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

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

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

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

Management Unit 16B

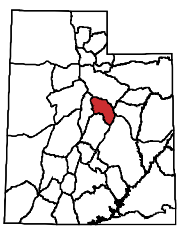


Map scale 1:255,000 (1 inch = 4 miles)

- Transect location
- Suspended site
- National Forest
- BLM
- State of Utah
- State Wildlife Mgmt. Area
- Private land
- Water body
- River or stream
- Intermittent stream
- Road

N

Unit Location



WILDLIFE MANAGEMENT UNIT 16B - CENTRAL MOUNTAINS, MANTI NORTH

Boundary Description

Utah, Sanpete, Emery, and Carbon counties - Boundary begins at Highway SR-10 and Highway SR-31 in Huntington; then north on SR-10 to Highway US-6; northwest on US-6 to Highway US-89; south on US-89 to SR-31; southeast on SR-31 to Huntington.

Management Unit Description

Management unit 16B covers the east and west sides of the Wasatch Plateau. The eastern and western halves are roughly divided by the Skyline Drive to Soldiers Summit. The eastern half was monitored in 2004 and will next be monitored in 2009. The western half was monitored in 2002 with the Central Region and will be monitored again in 2007.

This unit was previously called the Northeast Manti Deer Herd Unit 30. In the spring of 1998, this unit was incorporated into the much larger Wildlife Management Unit #16. Most of the winter range in subunit 16B lies on the east side of the Wasatch Plateau, which rises straight up from the valley floor to ridges with heights over 9,500 feet. The winter range is a narrow strip of land along the base of the plateau below the 8,000 foot contour. It runs from Price Canyon south to Huntington Canyon. Other important winter ranges include a large section of land along the Price River in the Colton area, below Scofield Reservoir and in the mouths of several side canyons in Huntington Canyon. Elk winter ranges are found on south-facing grassy points at high elevations on the Wasatch Plateau.

Currently, 54% of the winter range in Wildlife Management Unit 16 is managed by the BLM and U.S. Forest Service. The remaining portion is primarily owned by private entities, with a small amount of acreage being owned by the DWR. Summer range is 72% Forest Service lands, 22% privately owned, with the remainder made up of state owned lands.

The Manti-North area has historically supported a variety of wildlife and outdoor recreation, livestock grazing, ranches and farms, energy developments, and some forest industry. Industrial activities on the deer herd unit are associated primarily with coal production, electrical power generation, and oil and gas development. Exploration and development activities for oil and gas have the potential for future increases. Add to this a growing demand for low-sulfur Wasatch coal, and one can begin to visualize the demands placed upon winter ranges in this area.

Power plants, pipe lines, slack piles, coal load-out facilities, ghost towns, railroads, and agriculture compete for valuable winter range property. The Huntington Canyon Power Plant alone has removed over 400 acres of critical winter range. An extensive road system provides year-round access to large portions of the winter range. Heavily used access roads to coal mines dissect important winter ranges all along the east side of the Wasatch Plateau and are accountable for significant highway deer mortality.

Herd Unit Management Objectives

There are no current specific management objectives for subunit 16B, but only unit wide objectives. The current target winter herd size for all of unit 16 is to achieve a target population size of 60,600 (38,000 wintering deer on the Wasatch Plateau or Manti Mountain Portion of the unit and 22,600 on the Nebo portion). A post season buck to doe ration of 15:100 is sought with 30% of these bucks being 3 point or better (UDWR 1998).

Key Areas

Key wintering areas for deer include Wildcat Canyon and the Gordon Creek basin, Consumers Bench, Porphyry Bench, North Spring, several areas in Huntington Canyon, Gentry Mountain, and Spring Canyon drainages. Preferred elk wintering areas include Miles Point, Reynolds Point on Trail Mountain, Telephone Bench, and Diamanti Bench.

The winter range is made up of several habitat types which include pinyon-juniper, sagebrush/grass, mountain brush, grassland, seedings, and other miscellaneous vegetation types. Pinyon-juniper woodland is the most widespread type, accounting for 40 percent of the total winter range. Unfortunately, it is also among the least productive according to the 1980 range inventory. Sagebrush grass communities make up approximately 24 percent of the winter range and probably receive the heaviest use due to the availability of preferred forage.

Eight interagency range trend studies were established in June and July of 1988. Six sites sample the big sagebrush/grass range type. One study is on a higher elevation, steep slope, dominated by perennial grass, and another is in a pinyon-juniper chaining. Two additional studies were added in 1994. Both sites are on sagebrush-grass range, one on Consumer Bench, and the other on Wiregrass Bench. Six of the studies are on BLM land including Ford Ridge (#15), Hardscrabble (#16), North Springs Bench (#19), Poison Spring Bench (#22), Consumer Bench (#23) and Wiregrass Bench (#24). Five studies occur on State land including Starvation Mahogany (#8), Starvation Mountain Brush (#9), Slackpile (#17), Porphyry Bench (#18), and Telephone Bench (#20). One study, Huntington Canyon (#21), occurs on land administered by the U.S. Forest Service.

Six special studies have been established within the last 7 years and were reread in 2004. Two paired studies were established in 1997 to monitor rehabilitation of natural gas pipelines. One pair is located on a low elevation desert shrub community and the other pair is on Porphyry Bench, which is critical winter range. North Slackpile (16R-6) was established in 1998 on Division land near Slackpile (16B-17) to monitor different grazing regimes. Gordon Creek Burn (16R-10) was established in 1999 to monitor the rehabilitation of a prescribed burn near Gordon Creek.

Grazing Summary

Most of the study sites in subunit 16B are administered by the BLM. Ford Ridge is in the Price Canyon West allotment which is grazed by 92 cattle from May 17 to November 15. This sagebrush/grass ridge receives year-round elk use. Hardscrabble is in the Crandall Canyon allotment which is grazed from May 1 to October 31 by 31 cattle. It is an important site for elk in winter. North Spring Bench is permitted for 1,000 sheep from May 1 to June 30. This is critical deer winter range. Poison Spring Bench is in the North Huntington cattle allotment which is currently utilized by 354 cows in the spring (April 22 through June 26) and 282 cows in the winter (November 1 through December 15). The management plan outlines a two pasture deferred rotation system. The upper end of the allotment where the study is located was chained and seeded in the late 1960's. The Consumer Bench site is within the Consumer Wash allotment which is grazed by 54 sheep from October 1 to April 21, when an additional 821 sheep are allotted until June 20. Wiregrass Bench occurs in the Haley allotment which is grazed by 27 cattle from May 16 to October 31 in a two pasture deferred rotation.

There are 4 trend studies that are on Division land. Slackpile and North Slackpile are grazed by cattle to favor shrubs over grasses. These 2 studies are in different pastures that are grazed every other year. This is a critical deer winter range. The other two sites are Porphyry Bench and Telephone Bench which are not grazed by livestock.

Huntington Canyon, is on U.S. Forest Service land. It occurs in the Gentry Mountain cattle allotment which is grazed by 1,440 cattle from June 27 through September 30. It is on a four pasture rest rotation schedule. This

area contains important winter range for elk and portions of the southwest side of Gentry Mountain have been designated by the Forest Service in their Land and Resource Management Plan as "Key big game winter range." This designation stipulates “the area must be available to big game and unencumbered each year during the critical winter period.”

Trend Study 16B-17-04

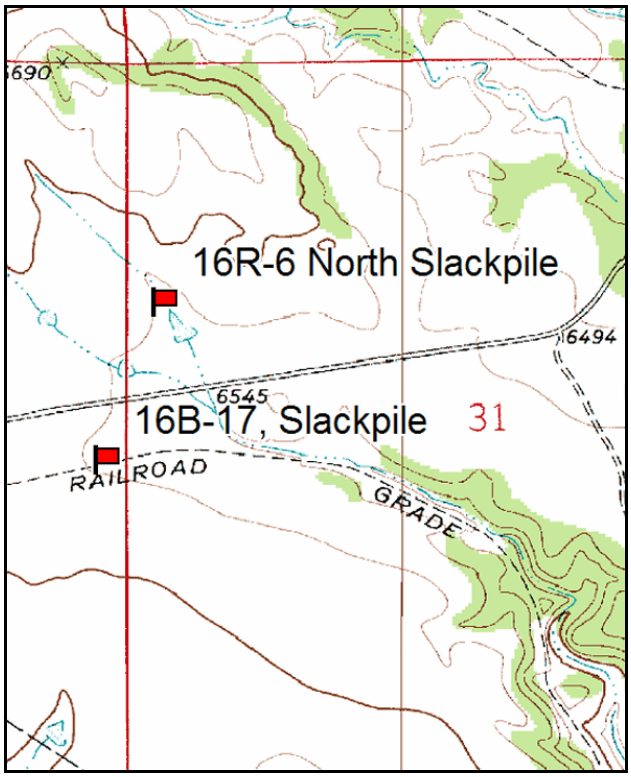
Study site name: Slackpile . Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic- Line 1 & 2; 163 degrees magnetic- Line 3 & 4.

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

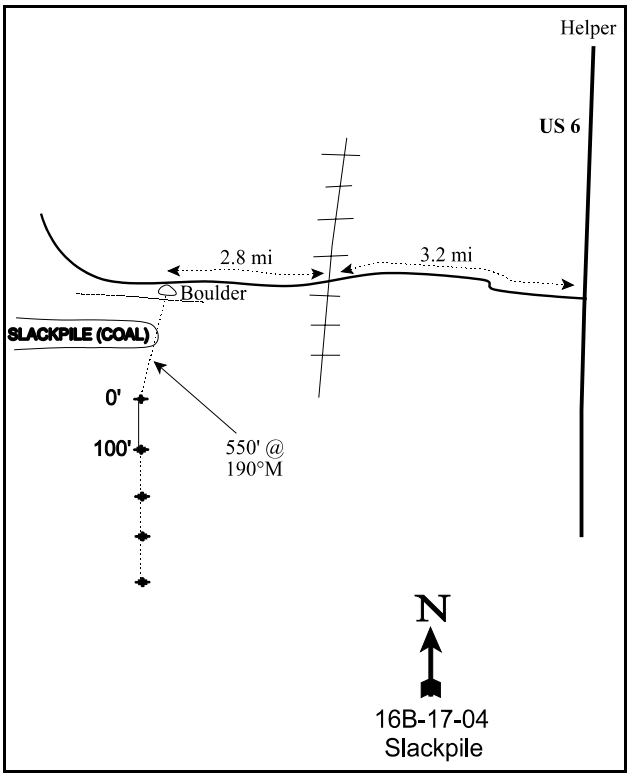
LOCATION DESCRIPTION

On US 6 south of Helper, turn west onto Consumers Road. Proceed west 3.2 miles to the railroad tracks. Cross the tracks and continue 2.8 miles to a large boulder on the left. The study is located in the sagebrush south of the fence. Walk 550 feet at 190°M from the boulder to the start of the frequency baseline. The first stake is marked with a red browse tag, #9022.



Map Name: Standardville

Township 13S , Range 8E , Section 36



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4388792 N, 502890 E

DISCUSSION

Slackpile - Trend Study No. 16B-17

The Slackpile study samples a representative sagebrush-grass site owned by the Utah Division of Wildlife. The study is at an elevation of 6,600 feet on an 8% north-facing slope. The sagebrush-grass type covers an extensive part of the Gordon Creek range, an important wintering area for large numbers of deer. The Division allows spring cattle grazing on two pastures, one south of Consumers road and another north of the road. Each pasture is grazed every other year. North Slackpile (16R-6) was established to monitor the north pasture, while this site monitors the south pasture. Cattle were on the site when it was read in May of 1999 and in 2004. Pellet group transects estimated livestock use was moderate in 1999 with 23 cow days use/acre (57 cdu/ha). By May 18, 2004, cattle use was estimated to be 7 cow days use/acre (18 cdu/ha) and cows were still using the site. Deer use was estimated at 65 deer days use/acre (160 ddu/ha) in 1999 and 52 deer days use/acre (139 ddu/ha) in 2004.

Soil texture is a loam with a slightly alkaline pH (7.5). Phosphorus (5.1 ppm) and potassium (44.8 ppm) are lower than the 10 ppm and 70 ppm that may be necessary for normal plant development and growth. The soil is moderately deep with an estimated effective rooting depth of 18 inches. There are very few rocks or pavement on the surface or throughout the profile. There is a considerable amount of bare ground on the site. In 1999, bare ground was estimated at 43% and increased to 62% in 2004, which was greater than protective cover at only 48% (vegetation, litter, cryptogams). Cryptogams decreased from 10% cover in 1999 to just over 1% in 2004. It was reported in 1999 that the soil surface was very hard with a crust present, but in 2004 the soil was soft and easily disturbed. Pedestaling is present around the baseline stakes and shrub stems. Exposed roots and small gullies indicate some erosion problems on the site. An erosion class assessment rated erosion as slight in 2004.

The key browse species for Slackpile is Wyoming big sagebrush. Density for Wyoming big sagebrush was stable from 1988 to 1999 at about 2,800 plants/acre. This area has experienced drought conditions from 2001-2003. Annual precipitation has only been 48-60% of average during this time. Spring conditions (April-June) have been very dry and were only 13% of normal in 2002. Due to this drought, sagebrush density decreased by 4-fold to 660 plants per acre in 2004. Percent decadence varied from 36 to 57% between 1988 and 1999, but in 2004 decadence was at 88% and 67% of the population was classified as dying. Sagebrush cover decreased from 7.6% in 1999 to 1.5% in 2004. In 1999, sagebrush made up 45% of total browse cover. This declined to 25% of total browse cover in 2004. Utilization was consistent from 1988-2004 with typically moderate to heavy use. In 1999, 31% were classified with moderate use and 42% with heavy use. Utilization was similar in 2004, with 39% moderate use and 45% heavy use. Recruitment was low, with only 3% of population consisting of young plants. The spring of 2004 was conducive to sagebrush seedlings with an estimated count of 6,440 plants/acre. It remains to be seen if these plants will be recruited into the population. Black sagebrush has also been identified on this site, but in low numbers. Stickyleaf low rabbitbrush is the most abundant shrub in both cover and density and was estimated at 4,820 plants/acre in 2004, which was 4 times lower than the 1999 estimate of 19,040 plants/acre. Cover decreased from 8.4% in 1999 to 3.9% in 2004. Rabbitbrush made up 68% of the total browse cover in 2004, up from 51% in 1994 and 49% in 1999. There was little to no use in 2004. Seedlings were very abundant in 2004 and estimated at 133,300 per acre.

Species richness of herbaceous vegetation is average for this range type with 7 grass and 7 forb species identified in 1994. The number of herbaceous species sampled in 1999 increased, with 7 grasses and 17 forbs present. In 2004, 6 grasses and 21 forbs were sampled. Most of the increase in forbs comes from species infrequently encountered. Bluebunch wheatgrass and blue grama are the most common grasses. Bluebunch wheatgrass was only sampled in 45% of quadrats in 2004, which was significantly lower than 87% in 1999 and 70% in 1994. Cover decreased from 8.9% in 1999 to 1.5% in 2004. Bluebunch wheatgrass made up 76% of total grass cover in 1999 and was only 35% of the total grass cover in 2004. The decline of this cool season

grass can be attributed to drought and spring grazing. Bluebunch wheatgrass was heavily grazed at the time of sampling in May of 2004. The warm season grass Blue grama has remained stable over the past 10 years. Cover had increased to 2% in 2004, which makes up 48% of the total grass cover. Cover for Indian ricegrass has decreased to only 0.3% in 2004, but many seedlings were encountered. Nested frequency for all perennial grasses combined has decreased each time this site has been sampled. Nested frequency for both annual and perennial forbs has increased since 1999. Total cover for forbs was three times higher in 2004. Cover for Scarlet globemallow increased from 0.2% in 1999 to 1.9% in 2004. Sego lily significantly increased in 2004. It had only been encountered in 10% of quadrats in 1999 and was up to 40% in 2004. Longleaf phlox and hollyleaf clover were also fairly abundant.

2004 Comparison to North Slackpile 16R-6

The goal of the spring grazing on these pastures is to favor browse which is important for wintering deer. Both pastures experienced the sagebrush die-off that has effected the area. The North Slackpile study in the north pasture has a slightly higher density and cover of sagebrush than Slackpile (16B-17) in the south pasture. Sagebrush cover for North Slackpile was 3.0%, while it was only 1.5% at Slackpile. Slackpile had less grass also. Sum of nested frequency for all perennial grasses was lower for Slackpile (228) than for North Slackpile (341). Cover of perennial grasses was about 12% for the north compared to only 4% for the south, which may be low because of grazing when the site was monitored. Slackpile actually had a more cool season grasses (nested freq of cool season was 198 compared to 101 for North Slackpile) than the north pasture did. Grass for North Slackpile was mostly made up of the warm season blue grama, which made up 87% of the total grass cover.

1994 TREND ASSESSMENT

Protective ground cover has increased since 1988, with bare ground now covering 40% of the ground surface. Percent litter and cryptogamic cover have declined somewhat but vegetative cover appears to have increased. Fifty-one percent of that cover comes from herbaceous vegetation which is best at holding soil in place. There is still a considerable amount of exposed soil and some signs of soil movement, but it does not appear to be severe. Trend for soil is therefore improving.

Browse trend is slightly down. The key species on this site is Wyoming big sagebrush. Population density for sagebrush is currently stable with light to moderate use and good vigor. Biotic and reproductive potentials are low and decadency has increased from 42% to 57%. The number of dead plants was estimated at 1,580 plants/acre in 1994, a very high number. The main negative aspect of this site is the extremely high number of small rabbitbrush (12,620 plants/acre). Currently, the population is mostly mature with few young and decadent. This shrub will replace Wyoming big sagebrush if current trends continue. The only positive aspect of the browse trend on this site is the 90% reduction in broom snakeweed density (13,398 to 1,400 plants/acre). Broom snakeweed is a short-lived shrub which commonly dies off in large numbers during extended drought.

Sum of nested frequency for perennial grasses have declined slightly since the last reading, while those of the perennial forbs have declined 50%. The native, bluebunch wheatgrass, increased significantly, nested frequency increased by about 66%. All other grasses encountered in 1988, declined significantly in nested frequency. The sum of nested frequency for grasses and forbs combined declined. Trend for grasses is stable, while those for forbs is down. The Desirable Components Index (see methods) rating is fair at 40 for a Wyoming big sagebrush community. Percent decadence is poor and the amount of young sagebrush plants is low. Perennial grasses are abundant.

TREND ASSESSMENT
soil - up slightly (4)
browse - down slightly (2)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 40 (fair) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable, but still in poor condition. Relative bare ground cover is the same as in 1994. The ratio of protective cover to bare soil has actually improved slightly. Bare ground cover still remains relatively high and soil movement is noticeable with pedestalling occurring around the base of shrubs. The proportion of protective ground cover (herbaceous vegetation, cryptogams, and litter) to bare ground is marginally low, indicating high amounts of exposed bare soil. Wyoming big sagebrush, the key species, has a marginally stable trend. The population density remains stable overall, although recruitment is low. Decadency decreased from 57% to 36%. However, the proportion of the population displaying heavy use increased from 7% to 42% in 1999. A negative aspect for browse on the site comes from the increase in stickyleaf low rabbitbrush, currently at 19,040 plants/acre. Any continued increase in rabbitbrush could result in deleterious effects to the key species, Wyoming big sagebrush. Trend for the herbaceous understory is stable overall. Perennial grass sum of nested frequency decreased, while perennial forb nested frequency increased. The DCI score improved to fair to good as decadence and proportion of young sagebrush plants improved.

TREND ASSESSMENT
soil - stable (3)
browse - stable for the key species, Wyoming big sage (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 48 (fair to good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is slightly down. Percent relative bare ground cover increased 37%. The decline of grass and shrub cover has increased the amount of unprotected soil. Dry conditions have also reduced cryptogamic cover, which helps hold soil in place. Browse trend is down due to the dramatic decline of Wyoming big sagebrush. Density in 2004 is four times lower than 1999 and decadency of the remaining population was very high at 88%. Stickyleaf low rabbitbrush density also declined, but it is still the most dominant browse species. Herbaceous understory trend is slightly down. Nested frequency for perennial grasses is down, especially with the decline in Bluebunch wheatgrass. Cover for grasses is nearly 3 times lower than it was in 1999. Trend for forbs is slightly up as Segolily, longleaf phlox, and scarlet globemallow were found in greater abundance and increased cover. The loss of perennial grasses makes the understory trend slightly down. The die off of sagebrush and the very high decadence has caused the DCI score to decline to poor. Perennial grass cover also declined.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 11 (poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 17

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	a127	b211	b235	a97	10.30	8.85	1.50
G	Bouteloua gracilis	a-	b37	b30	b30	1.72	1.22	2.04
G	Elymus salina	a-	ab17	b20	a3	.51	.87	.00
G	Oryzopsis hymenoides	95	81	53	81	1.77	.57	.27
G	Poa fendleriana	-	3	3	3	.01	.03	.00
G	Sitanion hystrix	b172	a26	a7	a-	.29	.04	-
G	Stipa comata	15	6	3	14	.06	.03	.40
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		409	381	351	228	14.68	11.61	4.23
Total for Grasses		409	381	351	228	14.68	11.61	4.23
F	Arabis spp.	6	-	5	-	-	.01	-
F	Astragalus convallarius	b44	a5	b35	b48	.01	.08	.65
F	Castilleja linariaefolia	1	-	13	8	-	.20	.02
F	Calochortus nuttallii	a1	a-	b19	c82	-	.05	.30
F	Chenopodium leptophyllum(a)	-	a-	a-	b51	-	-	.28
F	Convolvulus arvensis	-	-	-	3	-	-	.00
F	Collinsia parviflora (a)	-	-	5	-	-	.01	-
F	Descurainia pinnata (a)	-	a-	a-	b13	-	-	.07
F	Eriogonum cernuum (a)	-	-	-	3	-	-	.01
F	Eriogonum umbellatum	a-	a3	b10	a3	.15	.16	.15
F	Gayophytum ramosissimum(a)	-	a-	a-	b46	-	-	.60
F	Lappula occidentalis (a)	-	-	-	5	-	-	.15
F	Machaeranthera grindelioides	ab9	ab10	b19	a2	.07	.07	.18
F	Orthocarpus spp. (a)	b46	a-	a-	a3	-	-	.01
F	Penstemon caespitosus	c43	b23	a-	a-	.11	-	-
F	Penstemon carnosus	a-	a-	a31	b17	-	.13	.12
F	Phlox austromontana	a3	b29	b32	a2	.36	.70	.00
F	Phlox longifolia	c235	ab106	a88	b131	.25	.25	.72
F	Physaria spp.	-	-	1	-	-	.00	-
F	Polygonum douglasii (a)	-	a-	a-	b80	-	-	.43
F	Potentilla spp.	-	-	2	-	-	.03	-
F	Ranunculus testiculatus (a)	-	-	-	5	-	-	.01
F	Schoencrambe linifolia	-	a-	b9	ab9	-	.03	.05
F	Sphaeralcea coccinea	44	45	49	68	.35	.20	1.94
F	Thlaspi montanum	-	-	2	-	-	.00	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Trifolium gymnocarpon	$_{b}$59	$_{a}$-	$_{b}$47	$_{b}$64	-	.24	.86
F	Zigadenus paniculatus	-	-	-	7	-	-	.02
Total for Annual Forbs		46	0	5	206	0	0.01	1.57
Total for Perennial Forbs		445	221	362	444	1.31	2.19	5.04
Total for Forbs		491	221	367	650	1.31	2.21	6.62

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

BROWSE TRENDS --
Management unit 16B, Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	4	3	2	.76	.38	-
B	Artemisia tridentata wyomingensis	74	73	25	5.03	7.57	1.45
B	Chrysothamnus viscidiflorus viscidiflorus	90	95	76	6.42	8.37	3.90
B	Echinocereus spp.	0	3	0	-	.00	-
B	Gutierrezia sarothrae	42	27	7	.17	.30	.03
B	Opuntia spp.	17	19	15	.22	.37	.39
B	Pediocactus simpsonii	0	0	1	-	-	-
B	Pinus edulis	0	0	0	.00	-	-
B	Sclerocactus	0	1	0	-	-	-
Total for Browse		227	221	126	12.63	17.00	5.79

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 17

Species	Percent Cover '04
Artemisia tridentata wyomingensis	.76
Chrysothamnus viscidiflorus viscidiflorus	3.01

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 17

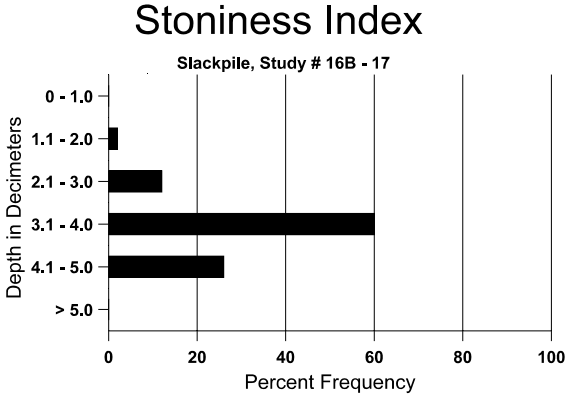
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.9

BASIC COVER --
Management unit 16B, Study no: 17

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	4.50	28.70	30.32	17.02
Rock	0	.06	.00	.04
Pavement	.50	.09	.01	.19
Litter	29.25	25.67	21.25	29.62
Cryptogams	10.00	2.78	9.93	1.43
Bare Ground	55.75	40.50	42.94	62.46

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 17, Study Name: Slackpile

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
18.0	59.0 (17.3)	7.5	39.3	34.2	26.6	1.5	5.1	44.8	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 17

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	8	54	25
Elk	4	2	-
Deer	48	59	61
Cattle	1	6	2

Days use per acre (ha)	
'99	'04
-	-
-	-
65 (160)	52 (139)
23 (57)	7 (18)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**160**	-	40	80	40	-	50	0	25	13	13	16/34
99	**220**	-	-	180	40	-	27	64	18	-	0	7/14
04	**80**	-	-	-	80	60	0	0	100	25	25	9/15
Artemisia tridentata wyomingensis												
88	**2999**	200	800	933	1266	-	40	44	42	-	4	13/18
94	**2800**	-	60	1140	1600	1580	52	7	57	11	13	16/23
99	**2800**	-	240	1540	1020	1940	31	42	36	10	10	18/27
04	**660**	6440	20	60	580	4400	39	45	88	67	67	18/21
Atriplex canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	14/47
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	37/24
Ceratoides lanata												
88	**66**	66	66	-	-	-	100	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**53799**	2000	44266	9400	133	-	3	.12	0	-	0	6/9
94	**12620**	-	400	12200	20	20	0	0	0	.15	.15	5/12
99	**19040**	560	3460	15500	80	120	23	6	0	.31	.31	4/9
04	**4820**	133300	620	4180	20	1800	2	.82	0	.41	.41	7/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Echinocereus spp.												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	-	60	-	-	0	0	-	-	0	2/4
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
88	**13398**	133	2466	10466	466	-	0	0	3	.14	.99	7/7
94	**1400**	-	-	1400	-	60	0	0	0	-	0	8/5
99	**2000**	-	20	1980	-	-	0	0	0	-	0	4/3
04	**280**	-	-	280	-	20	0	0	0	-	0	6/6
Opuntia spp.												
88	**399**	66	266	133	-	-	0	0	0	-	33	3/7
94	**440**	-	-	440	-	20	0	0	0	-	0	4/13
99	**540**	20	100	320	120	-	0	4	22	19	19	3/13
04	**520**	40	60	440	20	20	0	0	4	4	4	4/9
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	2/2
Pinus edulis												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Sclerocactus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 16B-18-04

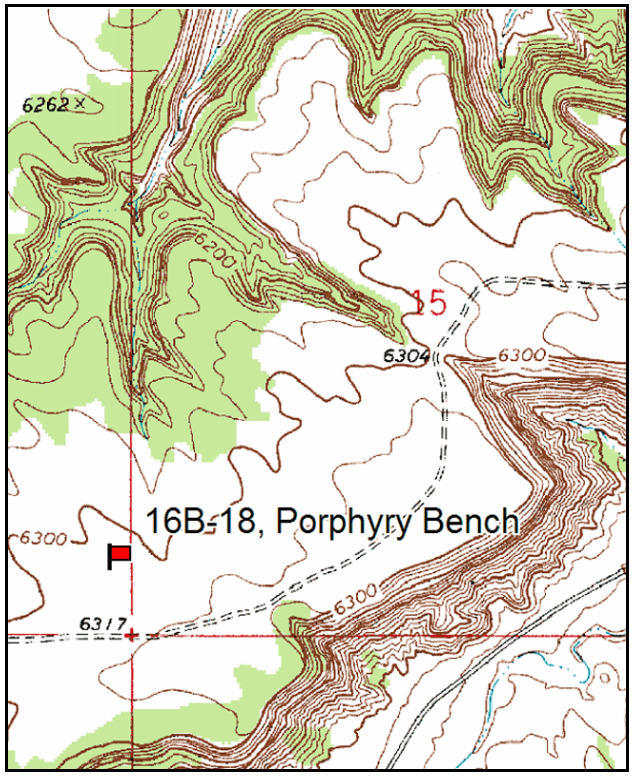
Study site name: Porphyry Bench . Vegetation type: Wyoming Big Sagebrush .

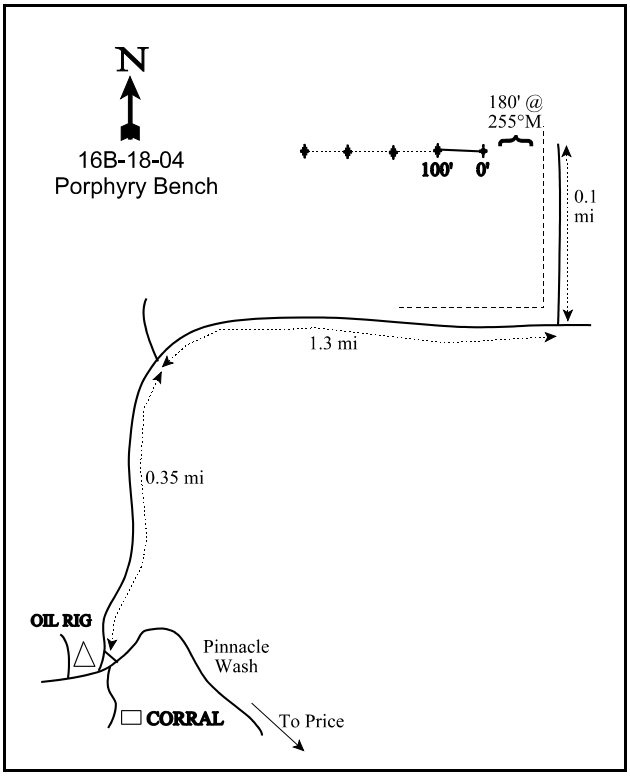
Compass bearing: frequency baseline 270 degrees magnetic.

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

LOCATION DESCRIPTION

Take Westwood Blvd (1550 W) northwest out of Price 2.35 miles to a major intersection. Turn left onto Gordon Creek Road and travel 0.45 miles to a fork. Bear left away from Gordon Creek, going 0.1 miles to a gravel pit. Continue 5.2 miles on the Pinnacle Peak Road to a 3-way fork at the top of the bench. Go right 0.35 miles to a fork. Bear right and continue 1.3 miles, going alongside a fence to the SE corner. Turn left and go along the fence 0.1 mile to the fifth wood post from the corner. Walk west into the sagebrush 180 feet to the 0-foot baseline stake. It is a 1 1/2 foot tall fencepost marked by browse tag #9021.





Map Name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 9E , Section 16

GPS: NAD 27, UTM 12S 4383382 N, 507731 E

DISCUSSION

Porphyry Bench - Trend Study No. 16B-18

The Porphyry Bench study site is located on critical deer winter range. The bench is largely a sagebrush/grass type, with juniper covered side hills and draws. The study is on a very gentle (1-2%) west-facing slope at an elevation of 6,300 feet. Located on a fenced 1/4 section of DWR land, the study site shows signs of heavy use. A nearby pellet group transect has had an average of 45 deer days use/acre between 1988 and 1994. Pellet group transect data from 1999 found high deer use with an estimated 149 deer days use/acre (369 ddu/ha). Deer use in 2004 was extremely high with an estimated 317 deer days use/acre (784 ddu/ha). Use by elk was light in 1999 with 1 elk day use/acre (3 edu/ha) and increased to 31 elk days use/acre (76 edu/ha) in 2004. In 1999, 4 cow days use/acre (9 cdu/ha) were estimated and no sign of cattle use was evident in 2004.

The soil appears to be moderately deep with an estimated effective rooting depth of just over 16 inches. A compacted layer is present at about 16 inches below the surface. Rock and pavement cover is nearly non-existent on the surface and very little is found in the profile. The soil has a loam texture with a moderately alkaline pH (8.1). Potassium is very low at 25.6 ppm. Values less than 70 ppm can effect plant development and growth. Surface erosion is minimal on the site due to the level topography and substantial vegetation and litter cover. Evidence of some pedestalling is apparent around the base of sagebrush stems and the larger bunch grasses. The ratio of bare ground to protective cover (vegetation, litter, and cryptogams) has dropped from 1:2.7 in 1999 to 1:2.2 in 2004. Relative percent bare ground during this same period increased from 28 to 39%.

Wyoming big sagebrush is the key species for this site. When this site was established in 1988, the Wyoming big sage population was characterized as being large and vigorous with good leader growth, with marginal seed production. The mature shrubs sampled in 1988 were heavily utilized with 48% of the shrubs displaying heavy hedging. Density was 6,933 plants/acre, 19% of which were young shrubs. Vigor was generally good, but 46% percent of the population was classified as decadent. By 1994, there was an estimated density of 6,200 plants/acre, most of which were mature (71%). Utilization was light and vigor had improved. Decadency also declined to 25%. In 1999, the population was estimated at 7,540 plants/acre, with 62% of these being mature plants. Very few seedlings were found, but recruitment was moderate with 10% of the population being classified as young. Decadency was at 28%, with very few plants displaying poor vigor. Deer use of the area greatly increased since the 1994 reading as evidenced by pellet group counts and the percentage of plants exhibiting heavy use (56%). In 2004, the density of Wyoming big sagebrush declined to 1,200 plants/acre, which is an 84% decrease. Drought conditions from 2001-2003 have had deleterious effects on this population. Annual precipitation has only been 48-60% of average during this time and spring conditions (April-June) have been very dry and were only 13% of normal in 2002. Cover decreased from 12% in 1999 to 1% in 2004. About 95% of the remaining population are classified as decadent and 87% of the plants were classified as dying. Surviving plants only have a few branches that have live growth. Leader growth is long (8.2 in) on live portions of plants and 88% percent of the population has been heavily utilized. Only 3% of the population was classified as young and very few seedlings were found. This population is in serious trouble and cannot support this level of use as it did in the past.

Clumps of brittle pricklypear cactus are very abundant. The cactus has been nearly as abundant as sagebrush over all sampling years in terms of strip frequency. In 2004, it had nearly 3% cover which made up 68% of the total browse cover. The density declined from 7,360 plants/acre in 1999 to 5,080 plants/acre in 2004, but only 13% of the population was considered decadent. This population is enduring the drought better than sagebrush. Brittle pricklypear spreads readily when the joints easily break off and then root. Winterfat was found in the vicinity, but is relatively uncommon.

The most abundant grass is needle-and-thread, which has had an average quadrat frequency of 91% during the first 3 sampling years (1988, 1994, and 1999). Cover provided by this species was high in 1994 at nearly 9%, increased to nearly 10% in 1999. In 2004, needle-and-thread was only found in 37% of quadrats and cover was down to less than 1%. In 1999, it made up 69% of the total grass cover and in 2004 it was 65% of the total grass cover. Western wheatgrass and Indian ricegrass have also decreased to less than 1% cover. Three forb species have increased to be the most dominant understory species in 2004. The annual forbs slimleaf goosefoot and groundsmoke increased to 7.0 and 1.8% cover respectively. The perennial scarlet globemallow did not increase significantly in abundance, but was very robust and increased from 1.6% cover in 1999 to 9.1% in 2004.

1994 TREND ASSESSMENT

Percent ground characteristics have improved on this site. Vegetation currently covers nearly 28% of the ground surface. Fifty-three percent of that cover comes from grasses and forbs. Litter cover has declined, but this trend is common during these dry years. Percent bare ground has also declined from 43% to 35%, and erosion is not currently a problem. The browse trend is currently stable. Decadency has declined from 46% to 25%. No seedlings were encountered in 1994 and young plants only make up almost 4% of the population. Reproductive potential will likely improve with normal precipitation patterns.

Sum of nested frequency for grasses and forbs have both increased indicating an improving trend. The most abundant grass, needle-and-thread, declined slightly in nested frequency while western wheatgrass and squirreltail both increased significantly. Perennial forbs are lacking on this site with only 5 species encountered in 1994. The only perennial forb that is very abundant is scarlet globemallow which makes up 81% of the forb cover. The Desirable Components Index (see methods) rating is good at 53. Sagebrush is abundant and health and perennial grasses are also abundant.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 53 (good) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable. Percent cover from herbaceous vegetation increased while cover from litter and bare ground decreased. Erosion is minimal due to the gentle slope. Trend for browse is stable. Wyoming big sagebrush has a stable density with a moderate level of recruitment (10%). Decadency increased only slightly in 1999 to 28%. A major factor that will influence the condition of the sagebrush population in the future is the level of use, associated with drought. In 1994, no plants displayed heavy use, while 56% of the population were heavily browsed in 1999. If continued, this high level of use coupled with drought could cause a downward trend in the sagebrush on this critical winter range. Trend for the herbaceous understory is stable. Sum of nested frequency and cover for perennial species slightly increased since 1994. Annual species such as cheatgrass are still insignificant in the understory. The DCI score increased to 62 which is good to excellent. Sagebrush is healthy and abundant, while the herbaceous understory is very abundant.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 62 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Soil trend is slightly down. Protective cover from perennial grasses has decreased significantly. Forb cover is higher, but much of that is from annuals. Bare ground has increased. Trend for browse is down. Wyoming big sagebrush has declined dramatically. Drought in combination with heavy use could threaten this population. Decadency is at 95% for the population which has declined from 7,540 plants/acre in 1999 to 1,200 plants/acre in 2004. Recruitment is low and very few seedlings were observed in 2004. Hopefully improved weather patterns can improve enough for surviving plants to produce seed and for seedlings to be recruited into the population. Trend for herbaceous understory is down. Needle-and-thread nested frequency is down significantly and cover went from 10% in 1999 to 1% in 2004. Nested frequency of perennial grasses went from 431 in 1999 to 190 in 2004. Nested frequency for perennial forbs decreased from 223 in 1999 to 169 in 2004. Spring precipitation conditions must have been favorable for scarlet globemallow to increase in cover to 9%, but it was not significantly more abundant. Annual forbs have increased and now are significant on this site. The DCI score declined from good to excellent to very poor. Sagebrush die off and high decadence caused this decline.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 3 (very poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 18

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{a}$21	$_{c}$91	$_{bc}$84	$_{ab}$52	.67	1.79	.26
G	Bouteloua gracilis	$_{a}$1	$_{ab}$8	$_{b}$11	$_{ab}$2	.06	.22	.01
G	Bromus tectorum (a)	-	3	-	-	.00	-	-
G	Oryzopsis hymenoides	59	40	67	59	1.26	2.12	.20
G	Sitanion hystrix	$_{c}$43	$_{c}$77	$_{b}$13	$_{a}$-	1.15	.28	-
G	Sporobolus cryptandrus	$_{a}$3	$_{b}$13	$_{a}$-	$_{a}$3	.39	-	.00
G	Stipa comata	$_{b}$262	$_{b}$250	$_{b}$256	$_{a}$74	8.67	9.88	.88
Total for Annual Grasses		0	3	0	0	0.00	0	0
Total for Perennial Grasses		389	479	431	190	12.24	14.31	1.36
Total for Grasses		389	482	431	190	12.24	14.31	1.36
F	Astragalus convallarius	10	-	4	4	-	.00	.07
F	Calochortus nuttallii	-	-	5	2	-	.03	.00
F	Castilleja spp.	-	-	2	-	-	.00	-
F	Chenopodium fremontii (a)	-	-	-	8	-	-	.07
F	Chenopodium leptophyllum(a)	-	$_{b}$19	$_{a}$-	$_{c}$279	.03	-	7.03
F	Cruciferae	6	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	$_{a}$-	$_{a}$-	$_{b}$37	-	-	.16
F	Eriogonum alatum	-	-	2	-	-	.00	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Eriogonum cernuum (a)	-	8	-	3	.01	-	.03
F	Gayophytum ramosissimum(a)	-	a-	a-	b95	-	-	1.77
F	Lappula occidentalis (a)	-	b16	a-	c38	.05	-	.23
F	Lesquerella spp.	5	7	-	-	.01	-	-
F	Lomatium spp.	-	-	4	4	-	.01	.01
F	Machaeranthera canescens	2	-	-	-	-	-	-
F	Orobanche spp.	1	-	-	-	-	-	-
F	Penstemon caespitosus	1	-	-	-	-	.00	-
F	Penstemon carnosus	-	-	-	-	-	-	.00
F	Phlox longifolia	a-	a4	b68	a13	.04	.32	.08
F	Plantago patagonica (a)	-	b37	a9	c53	.08	.01	.38
F	Salsola iberica (a)	-	a-	a-	b16	-	-	.37
F	Schoencrambe linifolia	-	-	3	2	-	.00	.03
F	Senecio multilobatus	6	5	6	1	.01	.04	.00
F	Sisymbrium altissimum (a)	-	-	-	2	-	-	.03
F	Sphaeralcea coccinea	a94	ab125	ab126	b141	1.13	1.59	9.13
F	Taraxacum officinale	-	10	-	-	.01	-	-
F	Tragopogon dubius	3	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	3	2	-	.00	.00
Total for Annual Forbs		0	80	9	531	0.18	0.01	10.10
Total for Perennial Forbs		128	151	223	169	1.22	2.02	9.35
Total for Forbs		128	231	232	700	1.40	2.04	19.46

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

BROWSE TRENDS --
Management unit 16B, Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata wyomingensis	85	95	42	10.81	11.91	1.36
B	Chrysothamnus viscidiflorus viscidiflorus	0	4	1	-	.03	-
B	Gutierrezia sarothrae	3	11	0	.03	.10	-
B	Opuntia fragilis	93	93	80	2.96	3.74	2.83
Total for Browse		181	203	123	13.81	15.78	4.19

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 18

Species	Percent Cover '04
Artemisia tridentata wyomingensis	1.36
Opuntia fragilis	2.78

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 18

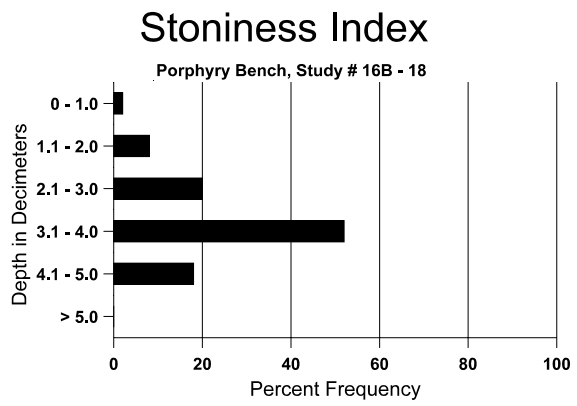
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	3.2

BASIC COVER --
Management unit 16B, Study no: 18

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	5.50	27.77	31.73	26.38
Rock	0	.00	0	0
Pavement	0	.05	.00	.05
Litter	49.50	35.52	29.25	42.54
Cryptogams	2.25	.90	7.30	.72
Bare Ground	42.75	35.40	26.54	44.39

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 18, Study Name: Porphyry Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.1	59.3 (18.1)	8.1	47.3	30.2	22.6	1.1	12.3	25.6	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 18

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	21	32	19
Elk	11	2	4
Deer	52	79	67
Cattle	-	1	-

Days use per acre (ha)	
'99	'04
-	-
1 (3)	31 (76)
149 (369)	317 (784)
4 (9)	-

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
88	**6933**	66	1333	2400	3200	-	35	48	46	.86	13	17/21
94	**6200**	-	220	4420	1560	1360	2	0	25	6	6	17/24
99	**7540**	60	780	4640	2120	1740	31	56	28	7	7	16/24
04	**1200**	40	40	20	1140	5860	10	88	95	87	87	13/18
Ceratoides lanata												
88	**199**	-	66	133	-	-	33	33	-	-	0	15/8
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	12/11
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**100**	-	-	100	-	-	0	0	-	-	0	4/10
04	**40**	-	-	40	-	-	0	0	-	-	0	8/8
Gutierrezia sarothrae												
88	**1066**	-	266	800	-	-	0	0	-	-	0	8/4
94	**80**	-	-	80	-	-	0	0	-	-	0	6/7
99	**1040**	-	560	480	-	-	0	0	-	-	0	3/5
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia fragilis												
88	**8133**	266	3533	4200	400	-	0	0	5	-	4	3/9
94	**6960**	-	60	6840	60	-	0	0	1	-	0	3/12
99	**7360**	20	280	6320	760	40	0	0	10	7	15	3/12
04	**5080**	-	80	4320	680	100	0	0	13	6	6	4/13

Trend Study 16B-19-04

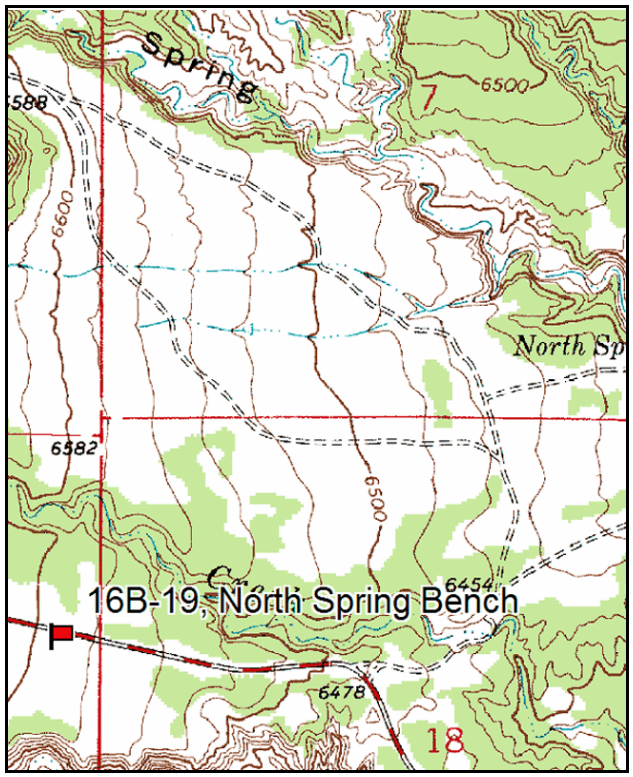
Study site name: North Spring Bench . Vegetation type: Wyoming Big Sagebrush .

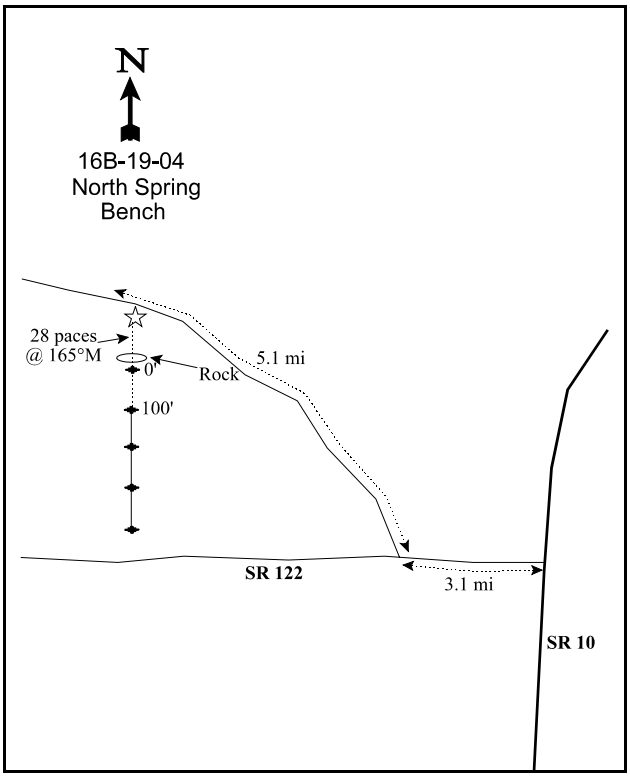
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of state highways 10 and 122 south of Price, go west on SR 122. Go 3.1 miles to a major fork. Go right towards Wattis for 5.1 miles. Look for a witness post 10 feet off the south side of the road in a sagebrush flat. The first baseline stake is 28 paces south of the witness post at 165° M, and located behind a large rock. It is marked with a red browse tag (#9013). The other study posts, all 18" fenceposts, are south at 100 foot intervals.





Map Name: Pinnacle Peak

Diagrammatic Sketch

Township 15S , Range 9E , Section 18

GPS: NAD 27, UTM 12S 4374591 N, 502899 E

DISCUSSION

North Spring Bench - Trend Study No. 16B-19

The North Spring Bench trend study samples part of the critical deer winter range below Wattis in the Spring Creek area. The study is located on a sagebrush flat surrounded by mature pinyon-juniper at an elevation of 6,600 feet and a slope of 3-4%. Drainage and aspect is generally to the east. Deer often occupy the area until the first of May. Managed by the BLM, the North Springs allotment is used by sheep from May 1 to June 30. This southern end of the Gordon Creek sagebrush range receives heavy use by deer. Deer use was extremely high in 1999 with an estimated 159 deer days use/acre (392 ddu/ha) and increased to 263 deer days use/acre (650 ddu/ha) in 2004. There were also 10 elk days use/acre (25 edu/ha) estimated in 2004.

The soil is a sandy clay loam with a neutral pH (7.2). The soil is moderately deep with an estimated effective rooting depth of 16 inches. A stoniness index shows rock to be uniformly distributed throughout the upper 20 inches of the profile. A calcium carbonate hardpan is present about 12 inches below the surface which may be restrictive to plants roots. Surface runoff has caused pedestalling and moderate soil movement. The gentle slope, vegetation, and litter cover help keep erosion at a minimal level. There are no major gullies, but nearby washes show continued down cutting and active erosion. Ratio of protective cover (vegetation, litter, and cryptogams) to bare ground decreased from 1:2.7 in 1999 to 1:2.3 in 2004. Dry conditions have reduced cryptogam cover from 8% in 1999 to 2% in 2004. Relative percent bare soil during this same time period has increased from 32% to 41%.

The key browse species is Wyoming big sagebrush. There were many indicators of a downward trend during the 1988 and 1994 readings. The population declined by 24% between 1988 and 1994, however much of this change can be attributed to the much larger sample size which began in 1994. Over one-half the population was decadent (52% in 1988, and 62% in 1994) and 1 in 5 shrubs was classified as dead. Very few plants were classified as young in either 1988 or 1994. During the 1994 reading, more seedlings were encountered. Heavy use was noted on 32% of the plants in 1988. In 1994, only 8% showed heavy use. Vigor declined however, from 10% with poor vigor in 1988 to 27% by 1994. Decadency in 1999 decreased from 62% to 31% and plants with poor vigor decreased from 27% to 14%. Recruitment of young plants was relatively high at 23%. Only 14% of the population displayed poor vigor. Heavy use was higher in 1999 with 48% of the population displaying heavy use. In 2004, density was three times lower and down to 2,060 plants/acre. Decadency increased to 97% while 91% of the population showed signs of poor vigor. No plants were classified as mature and only 3% of the population were young. Heavy use increased to 88% in 2004. The combination of heavy use and drought conditions, especially from 2001-2003, have put this sagebrush population in peril. This area will not be able to support the amount of deer that have historically used this site without a healthy sagebrush population.

Increaser species, most notably broom snakeweed, have varied in abundance throughout each sampling year. This is reflective of precipitation cycles. Populations were high in 1988 and 1999 and very low in 1994 and 2004. Prickly pear decreased from 4,900 plants/acre in 1999 to 1,920 plants/acre in 2004.

Pinyon and juniper trees surround the site and are encroaching into the sagebrush flat. Point quarter data from 1999 estimated a density of 100 pinyon trees/acre with an average stem diameter of 2.1 inches. In 2004, pinyon increased to 146 trees/acre with an average stem diameter of 2.6 inches. Most of the trees are smaller and 53% were classified as 1-4 feet tall, which is an indication of the encroachment of pinyon.

Blue grama has been the most dominant species on this site with about 6% cover in both 1994 and 1999. In 2004, cover for blue grama decreased to 2.7%. Sum of nested frequency was significantly lower in 2004. Western wheatgrass and Indian ricegrass also decreased significantly. Needle-and-thread was the only perennial grass that increased significantly in both sum of nested frequency and cover. A good trend in 2004

was the significant decrease of cheatgrass, which never has had more than 1% cover. Perennial forbs increased in cover but sum of nested frequency remained about the same. Scarlet globemallow did not significantly increase in sum of nested frequency, but was more robust. Cover increased from 0.2% in 1999 to 1.5% in 2004. Annual forbs have increased dramatically from only 0.2% cover in 1999 to over 7% cover in 2004. Fremont goosefoot, slimleaf goosefoot, nodding eriogonum, groundsmoke, gilia, annual stickseed, wooly plantain, and russian thistle all increased significantly.

1994 TREND ASSESSMENT

Ground cover characteristics have improved on this site. Vegetation cover is quite high for a Wyoming big sagebrush site. Even though grasses and forbs make up only 33% of the vegetation cover, it appears to be evenly dispersed. Percent cover of litter has improved from 27% to 34%. The high sum of nested frequency for litter indicates well dispersed litter cover. Percent bare ground declined from 53% to 47%. Erosion on the site is minimal due to the protective cover combined with the gentle terrain. Even with decreased heavy use on the Wyoming big sagebrush, the browse trend is down because the sagebrush community has increased percent decadence (52-62%), the proportion of shrubs in poor vigor has increased (10-27%), and there is one dead plant to every five live plants. Trend for herbaceous understory has also declined since 1988. Sum nested frequency of perennial grasses and forbs have declined. Normal precipitation patterns will likely reverse this trend. The Desirable Components Index (see methods) rating is fair at 36 for a Wyoming big sagebrush community. Sagebrush is very abundant, but decadence is high. Perennial grasses and forbs are also abundant.

TREND ASSESSMENT
soil - up slightly (4)
browse - down (1)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 36 (fair) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is slightly improved, but is still only in fair condition. Some soil movement is apparent, but the gentle terrain keeps erosion at minimal levels directly on the site. Vegetation cover increased and bare ground decreased. Trend for browse is up slightly. The key species, Wyoming big sagebrush, shows improving trends with decreased decadency from 62% to 31%. Plants displaying poor vigor also decreased from 27% to 14%. Recruitment from young plants is currently high at 23%, and biotic potential is moderate at 12%. The main concern is that heavy use increased to 48%. Continued heavy use (and drought), could reverse current upward trend. Broom snakeweed drastically increased in 1999 due to more normal precipitation patterns in recent years. The herbaceous understory trend is stable. Sum of nested frequency for perennial species increased in 1999. Perennial grasses dominate the herbaceous component at this site. The DCI score increased to 61 which is considered good. Perennial grasses and forbs increased, while sagebrush decadence was much lower.

TREND ASSESSMENT
soil - up slightly (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 61 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is slightly down. The ratio of bare ground to protective cover (vegetation, litter, and cryptogams) decreased from 1:2.7 in 1999 to 1:2.3 in 2004. Perennial grass cover dropped from 12 to 6% in 2004 and cryptogam cover decreased from 8.3% in 1999 to 2.4% in 2004. Browse trend is down. Cover for Wyoming big sagebrush decreased from 13.7% in 1999 to 1.8% in 2004. Density is three times lower and 97% of the population is decadent. There are very few young or seedlings to replace the dying plants. Heavy use is extremely high at 88%. The herbaceous understory trend is slightly down. Sum of nested frequency and cover for perennial grasses is down. Seven annual forbs significantly increased in 2004 and 6 of these had never been previously sampled on this site. Perennial forb cover was higher, but nested frequency did not increase very much. The DCI score decreased to poor. Sagebrush die off and very high decadence are the biggest reason for the decline.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 10 (poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 19

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{b}$99	$_{b}$125	$_{c}$171	$_{a}$18	.85	2.81	.18
G	Agropyron spicatum	-	-	-	6	-	-	.01
G	Bouteloua gracilis	$_{c}$213	$_{b}$147	$_{b}$136	$_{a}$96	6.20	5.74	2.65
G	Bromus tectorum (a)	-	$_{a}$7	$_{b}$96	$_{a}$15	.01	.88	.08
G	Oryzopsis hymenoides	$_{ab}$37	$_{a}$23	$_{b}$64	$_{a}$30	.22	1.22	.13
G	Sitanion hystrix	$_{b}$153	$_{a}$76	$_{a}$80	$_{a}$75	1.57	1.72	1.00
G	Sporobolus cryptandrus	-	9	-	-	.04	-	-
G	Stipa comata	$_{b}$35	$_{b}$35	$_{a}$1	$_{c}$120	.36	.15	2.13
Total for Annual Grasses		0	7	96	15	0.01	0.87	0.08
Total for Perennial Grasses		537	415	452	345	9.26	11.65	6.12
Total for Grasses		537	422	548	360	9.27	12.53	6.21
F	Astragalus convallarius	-	-	3	4	-	.00	.03
F	Caulanthus crassicaulis	2	-	-	-	-	-	-
F	Castilleja linariaefolia	-	-	2	-	-	.06	-
F	Calochortus nuttallii	-	-	-	1	-	-	.01
F	Chaenactis douglasii	-	-	1	-	-	.00	-
F	Chenopodium fremontii (a)	-	$_{a}$-	$_{a}$-	$_{b}$31	-	-	.18
F	Chenopodium leptophyllum(a)	-	$_{a}$-	$_{a}$-	$_{b}$154	-	-	1.35
F	Cryptantha spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$35	-	-	.78
F	Cymopterus spp.	-	-	1	5	-	.00	.01

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Descurainia pinnata (a)	-	19	5	10	.03	.01	.04
F	Eriogonum cernuum (a)	-	$_{ab}$5	$_{a}$-	$_{b}$15	.03	-	.08
F	Erigeron spp.	3	-	-	-	-	-	-
F	Gayophytum ramosissimum(a)	-	$_{a}$-	$_{a}$-	$_{b}$110	-	-	.97
F	Gilia spp. (a)	-	$_{a}$-	$_{a}$-	$_{b}$117	-	-	1.12
F	Lappula occidentalis (a)	-	$_{a}$-	$_{b}$15	$_{c}$122	-	.06	1.34
F	Leucelene ericoides	-	-	-	-	-	-	.00
F	Oenothera spp.	-	-	-	1	-	-	.00
F	Phlox longifolia	$_{a}$11	$_{a}$1	$_{b}$47	$_{b}$41	.00	.15	.16
F	Plantago patagonica (a)	-	$_{a}$10	$_{b}$50	$_{c}$129	.02	.15	1.88
F	Salsola iberica (a)	-	$_{a}$-	$_{a}$-	$_{b}$23	-	-	.21
F	Schoencrambe linifolia	$_{a}$-	$_{a}$-	$_{b}$22	$_{b}$16	-	.04	.14
F	Sphaeralcea coccinea	$_{a}$23	$_{a}$23	$_{b}$48	$_{b}$50	.05	.17	1.47
F	Thermopsis montana	-	-	1	-	-	.00	-
F	Townsendia spp.	-	-	2	1	-	.00	.00
F	Unknown forb-perennial	1	-	-	-	-	-	-
Total for Annual Forbs		0	34	70	711	0.09	0.22	7.20
Total for Perennial Forbs		40	24	127	154	0.05	0.46	2.64
Total for Forbs		40	58	197	865	0.15	0.68	9.84

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

BROWSE TRENDS --
Management unit 16B, Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata wyomingensis	86	95	62	12.75	13.66	3.66
B	Atriplex canescens	0	1	0	-	-	-
B	Ephedra viridis	0	0	1	-	-	-
B	Gutierrezia sarothrae	28	88	30	.08	3.01	.32
B	Juniperus osteosperma	0	0	1	1.25	-	.15
B	Opuntia fragilis	75	76	51	1.29	2.41	1.03
B	Pinus edulis	0	3	3	3.08	4.51	2.00
Total for Browse		189	263	148	18.48	23.60	7.18

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 19

Species	Percent Cover	
	'99	'04
Artemisia tridentata wyomingensis	-	1.79
Gutierrezia sarothrae	-	.21
Opuntia fragilis	-	.20
Pinus edulis	10.19	12.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 19

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	2.1

POINT-QUARTER TREE DATA --
Management unit 16B, Study no: 19

Species	Trees per Acre	
	'99	'04
Juniperus osteosperma	17	-
Pinus edulis	100	146

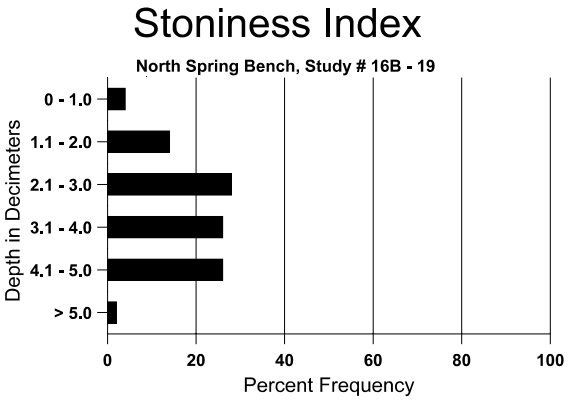
Average diameter (in)	
'99	'04
2.7	-
2.1	2.6

BASIC COVER --
Management unit 16B, Study no: 19

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	12.25	26.72	36.40	22.96
Rock	1.25	1.11	.79	.83
Pavement	.25	.20	.27	.54
Litter	27.25	34.23	32.38	37.97
Cryptogams	6.50	2.03	8.32	2.43
Bare Ground	52.50	46.56	36.29	45.27

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 19, Study Name: North Spring Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.0	60.3 (11.8)	7.2	57.3	20.2	22.6	1.2	10.9	51.2	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 19

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	45	54	44
Elk	4	-	12
Deer	76	82	68

Days use per acre (ha)	
'99	'04
-	-
-	10 (25)
159 (392)	263 (650)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
88	**6065**	-	266	2666	3133	-	53	32	52	2	10	14/18
94	**4580**	1180	120	1640	2820	1180	49	8	62	27	27	37/35
99	**6320**	760	1480	2900	1940	1720	15	48	31	12	14	17/26
04	**2060**	20	60	-	2000	3440	3	88	97	91	91	12/18
Atriplex canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	60	-	-	-	100	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**199**	-	66	133	-	-	67	0	-	-	33	6/5
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	10/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ephedra viridis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	-	40	-	-	0	0	-	-	0	13/18
Gutierrezia sarothrae												
88	**17266**	1200	4733	11933	600	-	4	.77	3	-	.38	7/5
94	**860**	-	200	640	20	-	0	0	2	-	0	6/6
99	**16500**	1020	3920	12540	40	-	9	.36	0	.24	.60	4/6
04	**1340**	160	100	1240	-	20	6	0	0	-	0	5/6
Juniperus osteosperma												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Opuntia fragilis												
88	**7199**	-	2333	3733	1133	-	0	0	16	.55	22	2/4
94	**4800**	-	160	4640	-	-	0	0	0	-	0	2/8
99	**4900**	-	740	3800	360	100	0	0	7	7	19	2/6
04	**1920**	-	260	1560	100	100	0	0	5	3	3	3/7
Pinus edulis												
88	**266**	-	200	66	-	-	75	0	-	-	0	109/118
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	40	20	-	-	0	0	-	-	0	-/-
04	**60**	-	-	60	-	-	0	0	-	-	0	-/-

Trend Study 16B-20-04

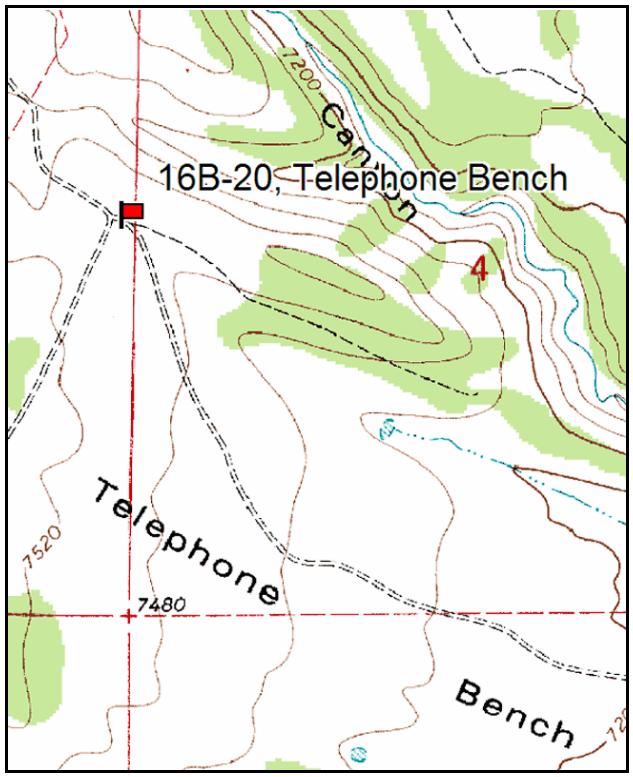
Study site name: Telephone Bench . Vegetation type: Mountain Big Sagebrush .

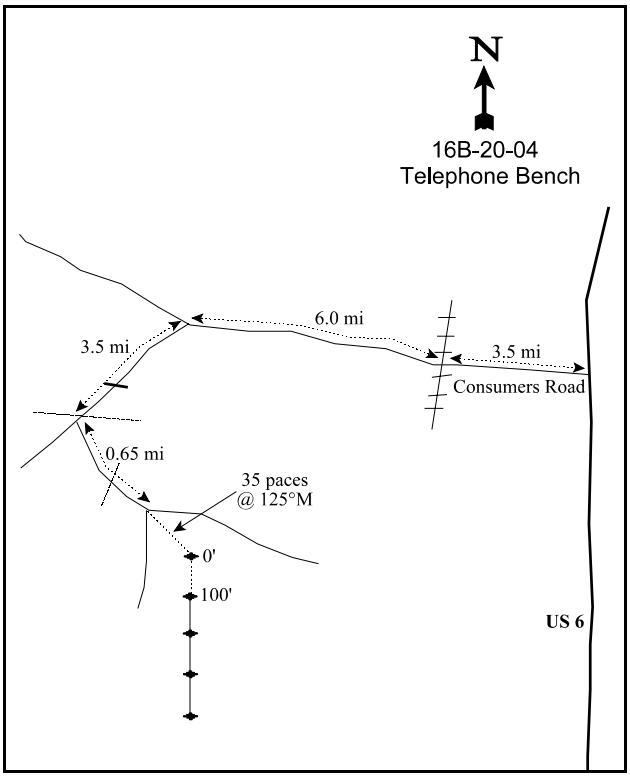
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of US 6 and the Consumers Road south of Helper, go 3.5 miles to a railroad crossing. Continue up the oiled road 6.0 miles. Turn left onto a dirt road, cross Gordon Creek and proceed approximately 2.3 miles to a cattleguard. Go 1.2 miles to a wire fence. Just beyond the fence, turn left at the fork and go 0.45 miles to another fence. Continue on 0.2 miles to a fork at the top of the hill. The study site is between the forks. The 0-foot baseline stake is 35 paces southeast of fork. The study is marked by cut green fenceposts about 18" tall.





Map Name: Jump Creek

Diagrammatic Sketch

Township 14S ,Range 8E , Section 5

GPS: NAD 27, UTM 12S 4387379 N, 496439 E

DISCUSSION

Telephone Bench - Trend Study No. 16B-20

Telephone Bench area is owned by the Utah Division of Wildlife and is located southwest of Price. This study samples a big sagebrush/grass type on the northern end of Telephone Bench at an elevation of 7,470 feet. The site aspect is northeast with a slope of 5%. This site is the highest of the winter range study sites in the area which allows for the presence of mountain big sagebrush along with black sagebrush. At one time, the area was heavily grazed by cattle, but currently no livestock grazing is permitted. Pellet group data indicates fluctuating deer use, depending on severity of the winter. During the 1990-91 winter, 51 days use/acre (125 ddu/ha) were estimated. This dropped to only 5 days use/acre (12 ddu/ha) in 1992-93, which was a hard winter. The winter of 1994-95, had an estimated 17 days use/acre (42 ddu/ha). The 1999 pellet transect data indicated light to moderate use by deer, but high use by elk. Deer use was estimated at 19 days use/acre (48 ddu/ha), and elk use at 72 days use/acre (179 edu/ha). Deer and elk use increased in 2004. For deer it went up to 32 days use/acre (79 ddu/ha). Elk use was estimated at 94 days use/acre (233 edu/ha) and only one cattle pat was sampled in both 1999 and 2004.

The soil is somewhat shallow as black sagebrush predominates (estimated effective rooting depth is about 11 inches), but there are some deeper areas where mountain big sagebrush occurs. The soil is a dense clay loam with a slightly alkaline pH (7.4). Phosphorus is low at 5.7 ppm. There is moderate localized erosion on the site with some pedestalling noted around the base of the shrubs. Litter cover substantially decreased in 1999. The ratio of bare ground to protective cover (vegetation, litter, and cryptogams) decreased from 1:2.8 in 1999 to 1:2.4 in 2004, indicating less protective cover for the soil. Bare ground relative cover increased from 31% in 1999 to 41% in 2004.

The most abundant shrub on the site is black sagebrush which had an average density of 6,817 from 1988 to 1999. Black sagebrush density in 2004 was 35% lower at 4,480 plants/acre in 2004. This loss of sagebrush was not unusual because of the exceptionally dry conditions from 2001 to 2003, which caused large losses for many sagebrush communities in Utah. Sagebrush cover was almost 8% in 1999. It deceased to just over 4% in 2004. Recruitment was good in 2004 as 9% of the population was young and 8,160 seedlings/acre were estimated. Decadency increased from 15% in 1999 to 25% in 2004. Twelve percent showed signs of poor vigor, which was up from only 3% in 1999. The drought conditions have accounted for much of the high decadency and poor vigor of black sage during the 1994 and 2004. Better precipitation patterns in 1999 resulted in a healthier population. Mountain big sagebrush has a low population density on this site. There were only 466 plants/acre in 1988, 180 in 1994, and 360 in 1999. The population dropped to 100 plants/acre in 2004. Heavy use (more highly preferred than black sagebrush) increased from 28% in 1999 to 60% in 2004. There were no young or seedling plants sampled in 2004 and decadency was up to 60% from 17% in 1999. This is likely a marginal site for mountain big sagebrush due to soil conditions, and when coupled with drought, has caused a decline in population density. Improved precipitation should help to increase reproduction for mountain big sagebrush in the future. There are a few scattered serviceberry on the site. All plants showed heavy use in 2004. Dwarf rabbitbrush declined from 6,260 plants/acre in 1999 to 2,240 in 2004. Broom snakeweed increased from 6,260 plants/acre in 1999 to 14,220 in 2004.

Grasses are dominant as they provide about half of the total vegetative cover in 1994, 1999, and 2004. Total grass cover declined from 22% in 1999 to 17% in 2004. Identification of grasses in past readings resulted in several species being “lumped” together including: bluebunch and western wheatgrass, and mutton and Sandberg bluegrass. These species were separated in the 1999 reading. Bluebunch wheatgrass was the most dominant species in 1999 with almost 13% cover. This dropped significantly in 2004 to 3%. Quadrat frequency went from 79 to 55%. Western wheatgrass also significantly declined in 2004 from 27% quadrat frequency to 4% in 2004. Mutton bluegrass and bottlebrush squirreltail also significantly declined from 1999 to 2004. Sandberg bluegrass was the only species to increase. It rose from 67 to 98% quadrat frequency and

from 2 to 9% cover. In 2004, it made up 33% of the total grass cover. Twenty perennial forbs were sampled in 1999 and 2004. Bladderpod increased significantly and made up 39% of the forb cover in 2004. Annual forbs increased from nearly nothing in 1994 and 1999 to 2% in 2004.

1994 TREND ASSESSMENT

Ground cover characteristics have remained basically stable since the last reading. The abundant herbaceous ground cover and litter cover adequately protect the soil on the site. Due in part to drought conditions, mountain big sagebrush and serviceberry are not doing well on this marginal site. Black sagebrush, the key browse species, is also suffering the effects of drought. It has a stable population density at the present time, however decadency has increased (from 45 to 55%), coupled with the reduced vigor (those with poor vigor have gone from 10 to 34%), there has also been an increase in percentage of decadent plants classified as dying (from 9 to 50%). All of these downward indicators indicate a decline in population density in the future if current drought conditions persist. These factors, and the abundance of increaser rabbitbrush and broom snakeweed, combine to cause a slightly downward browse trend on this site. Like many of the sites on this unit, the herbaceous understory trend is mixed. Sum of nested frequency for perennial grasses increased 51% while those of perennial forbs declined 37%. Combined nested frequencies of grasses and forbs resulted in a fairly stable trend. The Desirable Components Index (see methods) rating is fair at 58 for a black sagebrush/mountain big sagebrush community. The sagebrush component is healthy, but not overly abundant. The herbaceous understory is healthy.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 58 (fair) Black sagebrush/mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable. While percent litter substantially decreased, vegetative cover increased, and bare ground decreased. Herbaceous vegetation provides 64% of the vegetation cover at the site with most of this coming from perennial species which are good at holding soils in place. Evidence of erosion is slight at the present time, although it could increase in the future with a continuing decline in litter cover. Trend for browse is slightly up. Many of the browse parameters measured showed a declining trend 5 years ago due to drought. With better moisture in the past few years, these parameters currently are showing improvement. Decadency for black sagebrush has declined from 55% to 15%, with many of the decadent plants regaining their vigor and being classified as mature with normal vigor in 1999. Biotic potential and recruitment are high, increasing to 21% and 16% respectively. Use has increased from 35% to 40% of the population showing moderate use. Mountain big sagebrush is not particularly abundant, although density increased in 1999. Decadency also decreased from 33% in 1994 to 17% in 1999. One negative aspect is the abundance of broom snakeweed. Trend for the herbaceous understory is fairly stable. Although sum of nested frequency for perennial species declined as a whole, perennial grass nested frequency increased. Since perennial grasses make up over 80% of the perennial herbaceous cover on the site, trend is considered stable for herbaceous species. The DCI score increased to good due to increased preferred browse cover, improved decadence, higher proportion of young shrubs, and increased forb abundance.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 76 (good) Black sagebrush/mountain big sagebrush type

2004 TREND ASSESSMENT

Soil trend is slightly down. Vegetation and cryptogam cover decreased, while relative percent bare ground increased from 31% in 1999 to 41% in 2004. Trend for browse is down. Black sagebrush density declined 35% and decadency increased from 15 to 25%. Moderate-heavy use declined from 55% to only 19%. Mountain big sagebrush (which provides a very minor browse component for this site) density is lower and percent decadency is higher than 1999. Drought conditions have contributed to these declines. Broom snakeweed density is twice as high as it was in 1999. Herbaceous understory trend is slightly down. Perennial grasses decreased from 22% cover in 1999 to 17% in 2004. Sum of nested frequency for perennial grasses also declined. Bluebunch wheatgrass declined significantly. Sandberg bluegrass has increased, but is not as good of a forage species. Perennial forb cover and nested frequency is higher, but annual forbs have also increased with the decrease in sagebrush. The DCI score decreased to fair due to decreased preferred browse cover and slight declines in decadence and the amount of young shrubs.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 61 (fair) Black sagebrush/mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 20

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{c}$265	$_{c}$238	$_{b}$72	$_{a}$11	8.94	.72	.59
G	Agropyron spicatum	$_{a}$-	$_{a}$-	$_{c}$239	$_{b}$131	-	12.92	3.01
G	Bouteloua gracilis	15	13	22	15	.48	.46	.86
G	Bromus tectorum (a)	-	-	-	4	-	-	.01
G	Elymus salina	$_{a}$-	$_{b}$65	$_{b}$78	$_{b}$60	2.37	4.17	3.00
G	Koeleria cristata	-	3	3	-	.01	.03	-
G	Oryzopsis hymenoides	-	3	3	10	.00	.00	.31
G	Poa fendleriana	$_{c}$95	$_{d}$250	$_{b}$36	$_{a}$1	4.42	.41	.00
G	Poa secunda	$_{a}$-	$_{a}$-	$_{b}$156	$_{c}$274	-	2.30	8.67
G	Sitanion hystrix	$_{ab}$16	$_{b}$26	$_{b}$22	$_{a}$4	.13	.44	.03
G	Stipa comata	4	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	4	0	0	0.00
Total for Perennial Grasses		395	598	631	506	16.36	21.48	16.50
Total for Grasses		395	598	631	510	16.36	21.48	16.51
F	Agoseris glauca	-	-	5	-	-	.04	.00
F	Antennaria rosea	$_{b}$59	$_{a}$46	$_{a}$15	$_{a}$2	.90	.26	.00
F	Arabis spp.	8	2	4	1	.00	.01	.00
F	Astragalus convallarius	$_{b}$91	$_{a}$40	$_{a}$52	$_{a}$60	.14	.77	.50
F	Astragalus tenellus	$_{ab}$10	$_{ab}$1	$_{b}$9	$_{a}$-	.00	.64	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Balsamorhiza hookeri	$_{b}$22	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Castilleja linariaefolia	$_{b}$137	$_{a}$21	$_{a}$29	$_{a}$12	.06	.19	.14
F	Calochortus nuttallii	$_{a}$-	$_{a}$4	$_{a}$3	$_{b}$27	.01	.00	.07
F	Comandra pallida	20	24	31	15	.15	.37	.09
F	Collinsia parviflora (a)	-	$_{a}$3	$_{a}$-	$_{b}$67	.00	-	.25
F	Crepis acuminata	$_{a}$2	$_{b}$36	$_{a}$1	$_{a}$-	.26	.03	.00
F	Delphinium nuttallianum	-	-	-	3	-	-	.00
F	Descurainia pinnata (a)	-	$_{a}$3	$_{a}$1	$_{b}$18	.00	.03	.03
F	Erigeron eatonii	$_{c}$64	$_{b}$37	$_{b}$15	$_{a}$-	.19	.04	-
F	Eriogonum jamesii	11	12	10	12	.34	.24	.48
F	Gilia spp. (a)	-	4	-	-	.01	-	-
F	Hymenoxys acaulis	$_{b}$10	$_{a}$-	$_{ab}$4	$_{a}$3	-	.06	.03
F	Lappula occidentalis (a)	-	$_{a}$3	$_{a}$-	$_{b}$124	.00	-	2.05
F	Lesquerella spp.	$_{a}$20	$_{ab}$47	$_{b}$63	$_{c}$151	.10	.48	3.35
F	Lomatium spp.	-	6	1	-	.01	.03	-
F	Machaeranthera grindelioides	$_{b}$26	$_{ab}$11	$_{ab}$15	$_{a}$5	.03	.39	.06
F	Paronychia sessiliflora	10	-	-	-	-	-	-
F	Penstemon carnosus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$13	-	-	.06
F	Pedicularis centranthera	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$11	-	-	.39
F	Penstemon watsonii	$_{b}$45	$_{b}$38	$_{b}$50	$_{a}$2	.10	.79	.03
F	Phlox longifolia	$_{c}$175	$_{b}$119	$_{a}$8	$_{a}$5	.27	.01	.04
F	Polygonum douglasii (a)	-	2	-	4	.00	-	.01
F	Schoencrambe linifolia	-	-	-	2	-	-	.03
F	Senecio multilobatus	$_{ab}$2	$_{a}$-	$_{ab}$5	$_{b}$12	-	.01	.25
F	Sphaeralcea coccinea	$_{a}$1	$_{ab}$5	$_{bc}$20	$_{c}$19	.06	.09	.44
F	Trifolium gymnocarpon	$_{c}$30	$_{ab}$16	$_{a}$3	$_{bc}$22	.04	.00	.16
F	Zigadenus paniculatus	-	-	-	5	-	-	.01
Total for Annual Forbs		0	15	1	213	0.02	0.03	2.35
Total for Perennial Forbs		743	465	343	382	2.71	4.48	6.20
Total for Forbs		743	480	344	595	2.74	4.51	8.56

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

BROWSE TRENDS --
Management unit 16B, Study no: 20

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	9	10	11	.56	.38	.56
B	Artemisia nova	94	96	84	5.24	7.77	4.29
B	Artemisia tridentata vaseyana	8	12	5	.83	.03	.00
B	Chrysothamnus depressus	84	80	56	2.48	4.32	1.16
B	Chrysothamnus viscidiflorus viscidiflorus	48	38	10	.90	.66	.00
B	Eriogonum corymbosum	3	5	0	.03	.09	-
B	Gutierrezia sarothrae	53	68	82	1.54	1.50	3.17
B	Opuntia spp.	2	0	0	.00	-	-
B	Pediocactus simpsonii	1	1	1	.01	-	.00
B	Tetradymia canescens	2	5	5	-	.00	-
Total for Browse		304	315	254	11.61	14.75	9.20

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 20

Species	Percent Cover '04
Amelanchier utahensis	.08
Artemisia nova	5.30
Artemisia tridentata vaseyana	.25
Chrysothamnus depressus	1.06
Chrysothamnus viscidiflorus viscidiflorus	.15
Gutierrezia sarothrae	2.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 20

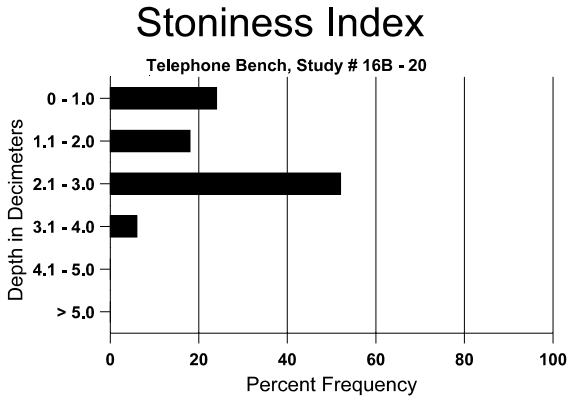
Species	Average leader growth (in) '04
Amelanchier utahensis	1.6
Artemisia tridentata vaseyana	3.2

BASIC COVER --
Management unit 16B, Study no: 20

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	14.00	32.61	37.92	32.43
Rock	4.25	2.26	1.97	2.67
Pavement	1.00	.54	.61	.52
Litter	42.00	42.15	24.82	28.38
Cryptogams	3.75	4.62	6.30	2.60
Bare Ground	35.00	34.70	31.67	45.57

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 20, Study Name: Telephone Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.2	56.4 (12.8)	7.4	38.4	29.8	31.8	1.7	5.7	83.2	0.5



PELLET GROUP DATA --
Management unit 16B, Study no: 20

Type	Quadrat Frequency		
	'94	'99	'04
Sheep	-	1	-
Rabbit	20	6	4
Elk	51	37	61
Cattle	-	-	-
Deer	18	16	7

Days use per acre (ha)	
'99	'04
-	-
-	-
72 (179)	94 (233)
1 (2)	1 (2)
19 (48)	32 (79)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**466**	66	466	-	-	-	29	57	-	-	0	-/-
94	**180**	-	-	180	-	-	44	22	-	-	0	63/88
99	**200**	20	60	140	-	-	30	70	-	-	0	24/28
04	**220**	-	-	220	-	-	0	100	-	-	0	21/26
Artemisia nova												
88	**6932**	2400	1866	1933	3133	-	11	0	45	1	10	10/12
94	**6680**	120	900	2080	3700	1920	35	1	55	33	34	9/14
99	**6840**	1460	1080	4760	1000	1580	40	15	15	2	3	8/16
04	**4480**	8160	400	2980	1100	3440	19	.44	25	12	12	9/17
Artemisia tridentata vaseyana												
88	**466**	66	200	133	133	-	14	57	29	-	0	11/12
94	**180**	-	-	120	60	20	78	0	33	11	11	18/21
99	**360**	120	40	260	60	260	50	28	17	11	11	14/19
04	**100**	-	-	40	60	80	20	60	60	20	20	16/26
Chrysothamnus depressus												
88	**5133**	200	2200	2800	133	-	1	1	3	.38	4	5/7
94	**6140**	-	40	6020	80	120	0	0	1	.32	.32	4/8
99	**6260**	680	320	5880	60	20	19	0	1	-	0	4/10
04	**2240**	20	40	1740	460	520	21	9	21	15	15	5/8
Chrysothamnus nauseosus												
88	**66**	-	-	-	66	-	0	100	100	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**5599**	133	1933	3533	133	-	2	0	2	-	0	4/6
94	**2520**	-	80	2420	20	40	0	0	1	-	0	4/10
99	**1600**	-	20	1580	-	-	1	0	0	-	0	5/10
04	**380**	-	-	380	-	-	5	0	0	-	0	5/11
Eriogonum corymbosum												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**60**	-	-	60	-	-	33	0	-	-	0	13/27
99	**180**	-	-	180	-	-	11	0	-	-	0	10/18
04	**0**	-	-	-	-	-	0	0	-	-	0	15/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
88	**800**	-	400	400	-	-	0	0	0	-	0	5/4
94	**2300**	20	500	1720	80	140	0	0	3	.86	.86	5/6
99	**5940**	100	440	5500	-	40	0	0	0	-	0	6/7
04	**14220**	340	1760	12460	-	20	0	0	0	-	.14	4/7
Opuntia spp.												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**40**	-	20	20	-	-	0	0	-	-	0	2/7
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	100	-	-	0	6/3
04	**20**	-	-	20	-	-	0	0	-	-	0	1/2
Sambucus cerulea												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	2/11
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Tetradymia canescens												
88	**66**	-	-	66	-	-	100	0	0	-	0	12/16
94	**40**	20	-	40	-	-	0	0	0	-	0	11/14
99	**100**	-	20	80	-	-	20	0	0	-	0	8/16
04	**100**	-	-	80	20	-	0	0	20	-	0	10/17

Trend Study 16B-21-04

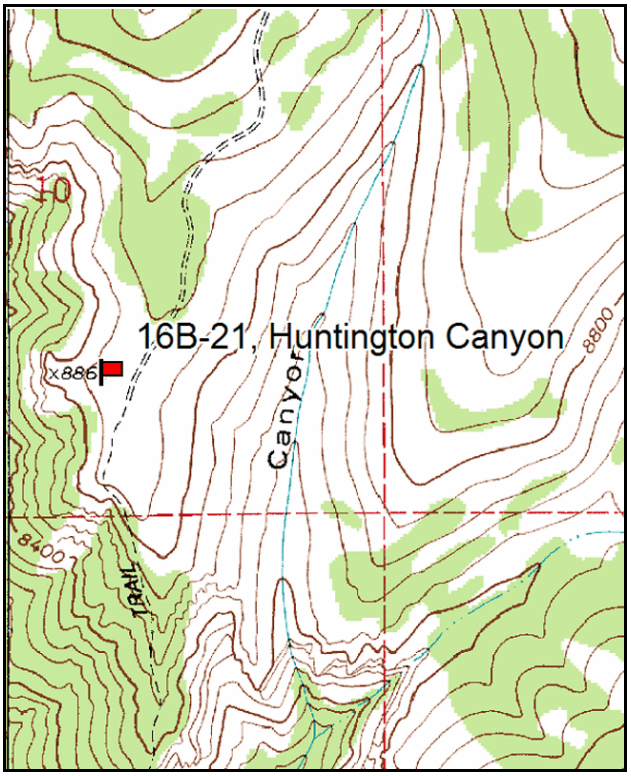
Study site name: Huntington Canyon . Vegetation type: Perennial Grass .

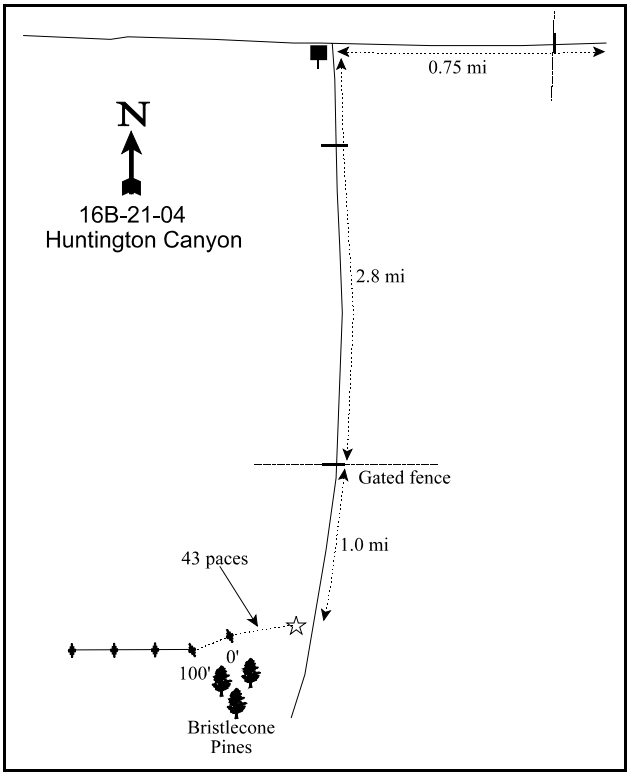
Compass bearing: frequency baseline Line 1- 235 degrees magnetic, Lines 2-4- 248 degrees magnetic.

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

LOCATION DESCRIPTION

From the ghost town of Mohrland, proceed past the coal loadout and up Cedar Creek. Go 4.5 miles to the top of Gentry Mountain and a three-way junction. Take the middle road (#252) and go 0.1 mile to a fence and cattleguard at the Forest Boundary. Continue 0.65 miles to a fork with a sign, and turn right toward McCadden Hollow. Go 0.7 miles to a cattleguard. Continue 2.1 miles on the main road, passing a few minor forks, to a gated fence. Continue down the road for one mile. There is a witness post on the right. Walk west from the road 43 paces to the edge by a patch of bristlecone pine. The 0' stake is just north of these trees.





Map Name: Hiawatha

Diagrammatic Sketch

Township 16S , Range 7E , Section 10

GPS: NAD 27, UTM 12S 4365595 N, 489477 E

DISCUSSION

Huntington Canyon - Trend Study No. 16B-21

The Huntington Canyon study samples a very steep Salina wildrye slope on the east side of Huntington Canyon. The windswept ridge tops and steep side hills are important winter range for the elk on Gentry Mountain. The slope on the study site is variable from 35% to over 50% in some places. It has a west-southwest aspect and an elevation of 8,800 feet. Adjacent stands of curlleaf mountain mahogany show signs of elk use. Although they provide good thermal cover, much of the forage is unavailable because the mature trees are highlined. The land is managed by the Forest Service. Although cows graze Gentry Mountain during the summer (June 27 to September 30), they use the steep side hills near the study site less frequently. Wildlife use is mostly by elk, with light deer use. Pellet group transect data estimated 53 elk days use/acre (131 edu/ha) and 3 deer days use/acre (7 ddu/ha) on the site in 1999. In 2004, elk use was estimated at 55 elk days use/acre (136 edu/ha) and deer use was 1 deer days use/acre (2 ddu/ha). In 2004, cows were seen on the site when it was read in early August. Cow use was estimated at 9 cow days use/acre (23 cdu/ha).

The soil is very rocky on the surface with rock and pavement fragments loose and easily dislodged downslope. The soil is moderately deep beneath the rock with an estimated effective rooting depth of 16 inches. Soil texture is a clay loam with a slightly alkaline pH (7.5). Both potassium (64 ppm) and phosphorus (2.8 ppm) are low. The steep slope and rocky surface increases runoff, but armor the soil from severe erosion. An erosion class rating in 2004 rated erosion on this site as slight, with signs of erosion from rills and pedestalling. Relative vegetation cover decreased and bare ground increased from 16% to 28%.

There is little browse directly on the study site. Scattered curlleaf mahogany show evidence of heavy browsing. Mountain big sagebrush are also found on the site, but the density was moderately low at 820 plants/acre in 1999 and 680 in 2004. It shows only light to moderate hedging. This species had higher decadency in 2004 and there was no sign of recruitment. The most numerous shrubs are broom snakeweed and fringed sagebrush. Fringed sagebrush has increased with each reading and increased 35% in 2004. If available, the fringed sagebrush can be a nutritious palatable winter forage. Moderate use was sampled on 20% of the population in 1999 and 30% in 2004. Broom snakeweed density increased by 37% in 2004 to about the same density it was in 1994.

Salina wildrye dominates the plant community on the steep upper slopes with a quadrat frequency of over 80% in all sampling years. Its frequency and cover have been stable for all readings. It provides 99% of the grass cover. In 2004, it made up 77% of the herbaceous cover and 56% of the total vegetation cover at the site. There was some evidence of grazing in 2004, but generally the large bunch grass is choked with old growth and a substantial build-up of litter. Other grasses and forbs are relatively uncommon. Timber poison vetch and Pingue hymenoxys were common in 1999, but sum of nested frequency declined significantly in 2004.

1994 TREND ASSESSMENT

Soil trend is currently stable with similar ground cover characteristics in 1994 compared to 1988. The well dispersed bunch grasses combined with the extensive rock and pavement cover adequately protect the soil. Useful browse is lacking on this site but those that do exist display stable trends. Sum of nested frequency for grasses increased while those of forbs declined. Combined nested frequencies of grasses and forbs remained about the same. Trend for herbaceous understory is currently stable. There is no DC (desirable components) index for this site for this index is more appropriate for use on deer winter ranges.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is slightly up. Relative percent bare ground cover decreased (from 29% to 16%) in 1999, with vegetation cover increasing. Erosion continues to be held in check with abundant rock and pavement cover even with the extremely steep slope. Browse trend is stable. Mountain big sagebrush is the most abundant key species and it increased in density in 1999. However, recruitment is low at the present time. Decadency increased from 7% to 20% in 1999, with 40% of the population displaying moderate use. Fringed sagebrush is the most abundant species in number, increasing to 2,300 plants/acre in 1999. This species can be a palatable browse source if not buried too deep under winter snows, but not critical for a site that is normally too high for deer and mostly utilized by elk. The herbaceous understory is considered stable with perennial sum of nested frequency increasing for forbs, but slightly decreasing for grasses in 1999. Because this is an elk winter range, and forbs are not an essential component, the increase in perennial forbs is not as influential in the trend. Overall, Salina wildrye dominates the site and diversity is lacking.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - stable (3)

2004 TREND ASSESSMENT

Trend for soil is slightly down. Relative percent bare ground cover increased from 16% to 28%. Vegetation cover is down due to loss of forbs. Some slight erosion was noticed in 2004. Trend for browse is slightly down, but is not critical on this site. Mountain big sagebrush density is slightly down and decadency is up. There is currently no recruitment of young. Fringed sagebrush density is up, but can be buried by snow. Broom snakeweed density has also increased. The trend for herbaceous understory is down slightly. Trend for Salina wildrye is stable, but the site lacks diversity and all the other perennial grasses showed declining trends. Salina wildrye is the dominant species. Perennial forbs declined from 1999. Cover of perennial forbs declined from 9% in 1999 to 1% in 2004. Sum of nested frequency for forbs declined by nearly half.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 16B, Study no: 21

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron intermedium	-	3	-	-	.00	-	-
G	Agropyron spicatum	-	-	-	3	-	-	.00
G	Elymus salina	222	252	237	236	12.20	12.80	12.23
G	Poa fendleriana	$_{a}$-	$_{ab}$12	$_{b}$17	$_{a}$2	.24	.11	.00
G	Poa secunda	-	1	3	1	.00	.03	.00
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		222	268	257	242	12.45	12.93	12.25
Total for Grasses		222	268	257	242	12.45	12.93	12.25
F	Agoseris spp.	7	-	-	-	-	-	-
F	Antennaria microphylla	4	-	-	-	-	-	-
F	Arenaria fendleri	8	6	-	-	.01	-	-
F	Astragalus convallarius	$_{a}$-	$_{b}$9	$_{c}$97	$_{b}$19	.12	4.75	.23
F	Astragalus coltoni	$_{b}$82	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Astragalus tenellus	$_{ab}$12	$_{b}$27	$_{ab}$9	$_{a}$2	1.16	.69	.03
F	Chaenactis douglasii	$_{b}$11	$_{ab}$2	$_{b}$12	$_{a}$-	.00	.06	-
F	Cryptantha spp.	-	-	-	2	-	-	.00
F	Holosteum umbellatum (a)	-	-	-	3	-	-	.00
F	Hymenoxys acaulis	$_{b}$65	$_{a}$19	$_{a}$17	$_{a}$28	.05	.16	.14
F	Hymenopappus filifolius	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	-	-	.14
F	Hymenoxys richardsonii	$_{b}$63	$_{c}$97	$_{bc}$91	$_{a}$34	1.93	1.85	.21
F	Lesquerella spp.	-	-	1	-	-	.00	-
F	Lupinus spp.	-	-	-	-	.00	.06	-
F	Machaeranthera canescens	-	-	-	2	-	-	.00
F	Machaeranthera grindelioides	$_{a}$14	$_{ab}$19	$_{b}$30	$_{ab}$22	.17	.98	.34
F	Penstemon spp.	-	1	1	-	.01	.00	-
F	Phlox austromontana	$_{a}$-	$_{a}$-	$_{ab}$4	$_{b}$17	-	.15	.35
F	Streptanthus cordatus	-	-	-	4	-	-	.01
F	Unknown forb-perennial	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	3	0	0	0.00
Total for Perennial Forbs		267	180	262	145	3.48	8.75	1.47
Total for Forbs		267	180	262	148	3.48	8.75	1.47

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

BROWSE TRENDS --
Management unit 16B, Study no: 21

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia frigida	41	44	53	.56	.94	.63
B	Artemisia tridentata vaseyana	17	23	23	2.44	5.01	3.20
B	Cercocarpus ledifolius	6	2	4	.01	.15	.00
B	Chrysothamnus nauseosus glabratus	34	20	23	.76	.77	1.21
B	Chrysothamnus viscidiflorus viscidiflorus	0	4	7	-	.15	.24
B	Eriogonum corymbosum	1	1	1	-	-	.00
B	Gutierrezia sarothrae	57	38	53	1.14	.42	1.04
B	Juniperus osteosperma	0	0	0	.15	-	-
B	Juniperus scopulorum	0	0	1	-	.85	.85
B	Pinus edulis	0	1	0	-	-	-
B	Pinus flexilis	0	0	0	.53	1.38	2.07
B	Pseudotsuga menziesii	0	0	0	.15	-	.38
B	Symphoricarpos oreophilus	3	2	3	.15	.45	.45
Total for Browse		159	135	168	5.91	10.15	10.10

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 21

Species	Percent Cover	
	'99	'04
Artemisia frigida	-	.88
Artemisia tridentata vaseyana	-	3.93
Cercocarpus ledifolius	5.19	1.89
Chrysothamnus nauseosus glabratus	-	1.13
Gutierrezia sarothrae	-	1.56
Juniperus scopulorum	-	1.00
Pinus flexilis	2.20	5.06
Pseudotsuga menziesii	.60	1.00
Symphoricarpos oreophilus	-	1.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 21

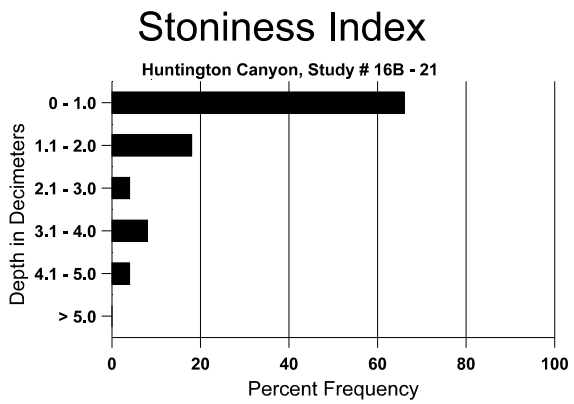
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.2
Cercocarpus ledifolius	4.3

BASIC COVER --
Management unit 16B, Study no: 21

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	13.25	20.46	34.86	24.12
Rock	21.75	30.95	18.72	21.60
Pavement	16.50	6.52	14.21	14.98
Litter	23.50	22.46	20.60	19.57
Cryptogams	0	.08	.04	.33
Bare Ground	25.00	33.02	17.42	30.67

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 21, Study Name: Huntington Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.0	49.0 (12.1)	7.5	36.0	25.4	38.6	1.6	2.8	64.0	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 21

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	7	7	5
Elk	29	24	43
Deer	4	3	2
Cattle	-	-	-

Days use per acre (ha)	
'99	'04
-	-
53 (131)	55 (136)
3 (7)	1 (2)
-	9 (23)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
88	**1166**	166	666	500	-	-	6	0	0	-	0	4/6
94	**1720**	-	20	1680	20	-	13	0	1	1	14	6/7
99	**2300**	420	560	1740	-	-	20	0	0	-	0	8/7
04	**3520**	-	160	3200	160	40	30	12	5	2	2	4/5
Artemisia tridentata vaseyana												
88	**465**	66	166	266	33	-	0	0	7	-	0	19/28
94	**560**	-	-	520	40	60	0	0	7	-	0	10/22
99	**820**	-	40	620	160	80	41	5	20	2	2	18/28
04	**680**	-	-	380	300	180	65	6	44	32	32	14/30
Cercocarpus ledifolius												
88	**433**	66	433	-	-	-	31	62	-	-	0	-/-
94	**160**	-	80	80	-	-	0	0	-	-	0	33/24
99	**80**	20	60	20	-	-	0	75	-	-	0	149/121
04	**120**	20	100	20	-	20	0	83	-	-	0	90/93
Chrysothamnus nauseosus glabratus												
88	**1166**	-	100	866	200	-	17	0	17	-	0	11/13
94	**1180**	-	-	1180	-	-	0	0	0	-	0	41/34
99	**580**	-	40	500	40	-	0	0	7	-	0	17/20
04	**580**	20	20	420	140	-	14	10	24	14	14	15/20
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	6/16
99	**160**	-	40	120	-	-	25	0	0	-	0	14/18
04	**240**	-	-	180	60	-	8	25	25	-	8	9/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum corymbosum												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	100	0	-	-	0	3/14
99	**40**	-	20	20	-	-	0	0	-	-	0	6/15
04	**20**	-	-	20	-	-	0	100	-	-	0	6/14
Gutierrezia sarothrae												
88	**3866**	700	2333	1400	133	-	4	.86	3	-	.86	8/7
94	**3140**	-	320	2600	220	100	0	0	7	4	4	6/7
99	**1960**	100	160	1720	80	20	7	0	4	1	1	8/8
04	**3100**	-	20	3020	60	-	2	0	2	2	2	6/7
Juniperus osteosperma												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus scopulorum												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Pinus edulis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pinus longaeva												
88	**0**	33	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**80**	-	20	60	-	-	0	0	-	-	0	16/48
99	**40**	40	-	40	-	-	50	0	-	-	0	19/54
04	**80**	-	-	80	-	-	0	25	-	-	0	15/41

Trend Study 16B-22-04

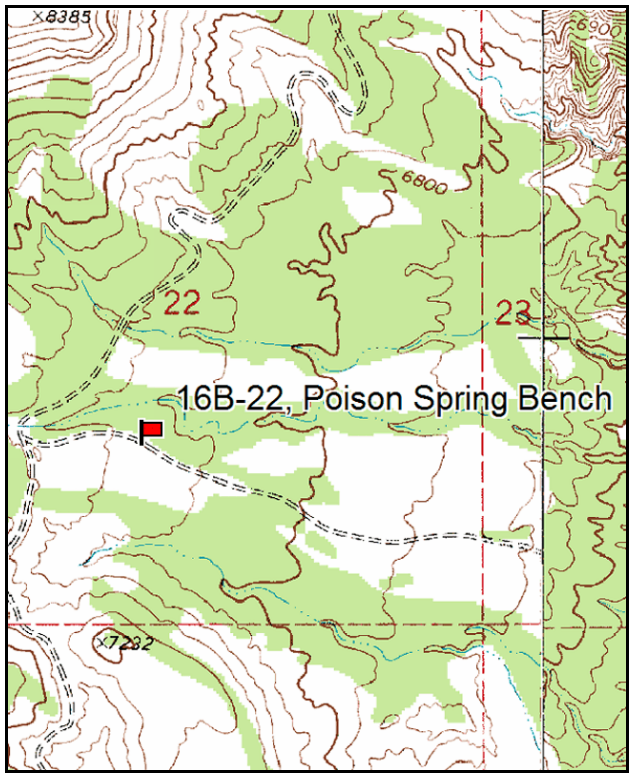
Study site name: Poison Spring Bench . Vegetation type: Chained, Seeded, P-J .

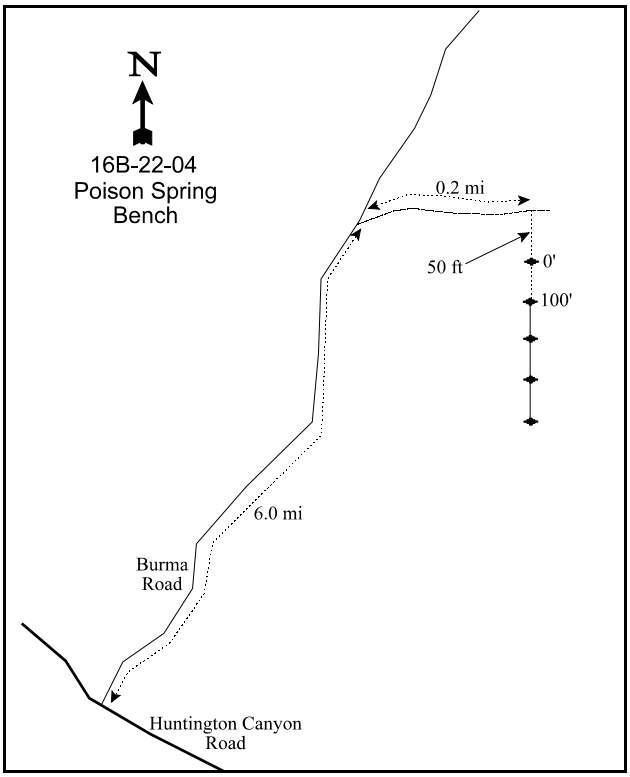
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

To reach Poison Spring Bench, go up the Huntington Canyon Road to the Huntington research farm below the power plant. Across from the farm gate, turn right onto the Burma Road. Follow the Burma Road for 6 miles. Turn right onto a faint road that goes into the chaining below the road. Go down along the edge of the chaining for 0.2 miles to the study site. The zero-foot witness post is about 50 feet off the road, and the transect runs south.





Map Name: Hiawatha

Diagrammatic Sketch

Township 16S , Range 8E , Section 22

GPS: NAD 27, UTM 12S 4362530 N, 498982 E

DISCUSSION

Poison Spring Bench - Trend Study No. 16B-22

The Poison Spring Bench study is located south of Cedar Creek and southwest of Poison Spring Bench. Elevation at the site is about 6,800 feet. Aspect is to the east, with a gentle slope of 3-5%. This area is managed by the BLM and is part of the North Huntington cattle allotment which is grazed in the spring and fall. The site was chained and seeded in the late 1960's. The area is now dominated by black sagebrush with several released pinyon and juniper trees. The area is considered critical deer winter range, but pellet group transects indicate only light to moderate use. It also receives a small amount of elk use. In 1999, a pellet group transect estimated 13 deer days use/acre (32 ddu/ha) and 8 elk days use/acre (20 edu/ha). In 2004, deer use was down to 7 days use/acre (32 ddu/ha), while elk use was higher at 19 days use/acre (46 edu/ha). Livestock use was light with an estimated 15 cow days use/acre (36 cdu/ha) in 1999 and 7 days use/acre (16 cdu/ha) in 2004.

The soil is a gravelly, sandy clay loam with a slightly alkaline pH (7.6). There is a concentration of large rocks, boulders, and pavement on the surface, with a high number of rock in the upper profile. Although there are calcium carbonate (alkali) deposits on the rocks, no hardpan was evident. Soil depth is moderately shallow with an estimated effective rooting depth of just over 12 inches. Phosphorus (4.4 ppm) and potassium (57.6) are both low. Some soil erosion is apparent with pedestalling occurring around the base of black sagebrush and small gullies running through the site. The soil is protected by rock and pavement cover. An erosion condition class rating in 2004 rated this site as stable.

Browse species dominate this site. Shrubs and trees made up 88% of the total vegetation cover in 1994 and 1999. In 2004, browse species contributed to 98% of the total vegetation cover. Perfectly suited to the dry, rocky country, black sagebrush is the most common browse species. Black sagebrush has made up 82, 74, and 73% of the total browse cover in 1994, 1999, and 2004 respectively. Cover was up from 19% in 1999 to 23% in 2004. Population density was estimated at 15,333 plants/acre in 1988, 78% percent of these were young plants. Seedlings numbered 1,400 plants/acre. During the 1994 reading, 9,740 mostly mature plants/acre were estimated using a much larger sample size. Density was estimated at 11,200 plants/acre in 1999 with the vast majority (88%) being mature plants. This remained stable in 2004 with 10,700 plants/acre. Recruitment was low with 80 seedlings/acre and 420 young plants/acre in 1999 and 60 seedlings/acre and 180 young plants/acre in 2004. Percent decadence was 15% in 1994, 9% in 1999, and increased to 15% in 2004. The plants are vigorous and show signs of light hedging.

Other desirable browse species occur on the site in low densities. These include serviceberry, true mountain mahogany, ephedra, and four-wing saltbush. True mountain mahogany, four-wing saltbush, and serviceberry have all been heavily browsed which should be expected with their respective and relative low abundance. Young pinyon and juniper trees that survived the chaining are increasing in size. The point-quarter method estimated pinyon at 103 trees/acre, and juniper at 43 trees/acre in 1999. Average stem diameter for pinyon was 2.1 inches and juniper was 3 inches. In 2004, pinyon was estimated at 111 trees/acre with an average diameter of 2.9 inches. Juniper increased to 56 trees/acre with 5.8 inches stem diameter. Thirty percent of the junipers sampled were trees that survived the chaining. Total pinyon-juniper canopy cover in 2004 was just over 6%. It would be good to implement a thinning program of some kind on this area in the near future, because it would not be very expensive at this time. In another 10 years it could be very costly to implement a practical thinning program which then would involve much larger adult trees.

Herbaceous density and diversity is extremely low. Crested wheatgrass is the most abundant grass on the site. It was stable for the first 3 sampling periods, but plants were small and produced very little aboveground biomass. This is due to the poor site potential of the area that results from shallow, less fertile soils. In 2004, crested wheatgrass decreased significantly, due to drought conditions over the previous 3 years. Cover was

3% in 1999 and was down to only 0.1% in 2004. All grasses combined provide only 3% cover in 1999 and this declined to only 0.1% in 2004. Forbs are even less abundant, with all species combined providing less than 1% cover each time this site was monitored.

1994 TREND ASSESSMENT

Even through shrubs dominate the site, bare ground cover is still quite low at 22%. It has increased since 1988, but only slightly. There is still abundant litter cover from chaining debris but it is declining. Currently the soil trend would be considered stable. Due to the gentle terrain and protective ground cover, erosion is not a serious problem. However, if the chaining litter is not replaced by herbaceous vegetation the soil trend would tend to decline. There is a variety of palatable browse on the site but only black sagebrush is abundant. Population density of this shrub has declined, but this is primarily because of the sampling design was greatly enlarged. The sampling design now gives significantly better estimates for browse populations that have discontinuous and/or clumped distributions. The reproductive potential has declined. Decadency has increased but is still low at 15%. Most of these changes would be due to the increased sample size used in 1994. Trend for browse is stable. Herbaceous vegetation is seriously lacking on this site. Combined nested frequencies of all grasses and forbs sum to only 266. Several forb species encountered in 1988 were not seen in 1994. Trend for herbaceous vegetation is slightly down. The Desirable Components Index (see methods) rating is good at 51. This black sagebrush site was rated using the Wyoming big sagebrush scale because of the elevation. This stand of black sagebrush is abundant and healthy.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 51 (good) black sagebrush (Wyoming big sagebrush scale)

1999 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics remain at similar levels to those in 1994. Erosion remains low due to the gentle slope and low precipitation at the site. Trend for browse is stable. The key species, black sagebrush, shows decreased decadency and slightly improved vigor. The population remains stable and use is light to moderate. True mountain mahogany shows improvements in recruitment although density remains relatively low. No plants were classified as decadent in 1999, down from 7% in 1994. Trend for the herbaceous understory is stable, but depleted. The only species that is somewhat abundant is crested wheatgrass, which is low compared to other chained and seeded sites. Sum of nested frequency for perennial grasses and forbs increased in 1999. The DCI score has remained stable and is rated good.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 52 (good) black sagebrush (Wyoming big sagebrush scale)

2004 TREND ASSESSMENT

Soil trend is stable. Percent bare ground has not changed much since the last reading. Rock, pavement, litter, and the slight slope protect this site from erosion. Browse trend continues to be considered stable. Black sagebrush density has remained stable despite recent drought conditions. Decadence is slightly higher, but cover also is higher. Recruitment is low, but should improve if precipitation patterns return to normal. True mountain mahogany is also stable. The herbaceous understory was depleted in 1999 and is even worse in

2004. Crested wheatgrass was the only abundant species found in previous readings and is significantly lower in 2004. Grasses and forbs make up less than 1% of cover in 2004. Trend is down for understory species. The DCI score dropped to fair to good mostly due to the loss in perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down (1)
winter range condition (DC Index) - 42 (fair to good) black sagebrush (Wyoming big sagebrush scale)

HERBACEOUS TRENDS --
Management unit 16B, Study no: 22

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{b}$172	$_{b}$143	$_{b}$175	$_{a}$30	2.30	2.82	.14
G	Elymus junceus	-	-	3	-	-	.15	-
G	Oryzopsis hymenoides	-	1	-	-	.00	-	-
G	Sitanion hystrix	6	11	2	3	.02	.03	.00
G	Stipa comata	-	3	-	-	.00	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		178	158	180	33	2.34	3.00	0.14
Total for Grasses		178	158	180	33	2.34	3.00	0.14
F	Arabis spp.	$_{ab4}$	$_{b}$12	$_{ab}$9	$_{a}$-	.05	.01	-
F	Castilleja linariaefolia	-	-	2	-	-	.03	-
F	Cirsium spp.	5	-	-	-	-	-	-
F	Cryptantha confertiflora	$_{ab}$44	$_{b}$51	$_{ab}$46	$_{a}$18	.56	.28	.22
F	Cruciferae	8	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	1	6	5	.00	.01	.01
F	Eriogonum cernuum (a)	-	5	-	9	.01	-	.01
F	Gilia spp. (a)	-	-	-	4	-	-	.01
F	Ipomopsis aggregata	$_{b}$9	$_{a}$1	$_{ab}$8	$_{a}$-	.00	.04	-
F	Lappula occidentalis (a)	-	-	-	4	-	-	.01
F	Lepidium montanum	2	6	-	-	.04	-	-
F	Lepidium montanum	-	-	-	7	-	-	.01
F	Machaeranthera spp	-	-	-	3	-	-	.03
F	Medicago sativa	3	-	3	-	-	.00	-
F	Penstemon caespitosus	$_{b}$18	$_{b}$19	$_{b}$29	$_{a}$-	.11	.09	-
F	Penstemon carnosus	$_{c}$22	$_{a}$-	$_{b}$9	$_{bc}$14	-	.04	.06
F	Salsola iberica (a)	-	$_{b}$13	$_{a}$-	$_{a}$2	.07	-	.00
F	Schoencrambe linifolia	-	-	2	1	-	.00	.00
F	Senecio multilobatus	4	-	5	-	-	.01	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
Total for Annual Forbs		0	19	6	24	0.09	0.01	0.05
Total for Perennial Forbs		119	89	113	43	0.77	0.54	0.33
Total for Forbs		119	108	119	67	0.87	0.56	0.38

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

BROWSE TRENDS --
Management unit 16B, Study no: 22

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	97	98	97	19.75	19.35	22.97
B	Cercocarpus montanus	10	14	14	1.14	3.25	2.56
B	Ephedra viridis	4	7	8	.18	.00	.38
B	Eriogonum microthecum	13	12	16	.06	.04	.09
B	Gutierrezia sarothrae	0	4	2	-	-	.00
B	Juniperus osteosperma	0	3	3	1.78	2.67	3.05
B	Opuntia polyacantha	5	5	5	.00	.03	.03
B	Pinus edulis	0	4	6	1.03	.85	1.69
B	Pseudotsuga menziesii	-	-	-	-	-	.63
B	Purshia tridentata	1	0	0	.03	-	-
Total for Browse		130	147	151	24.00	26.20	31.42

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 22

Species	Percent Cover	
	'99	'04
Artemisia nova	-	23.75
Cercocarpus montanus	-	2.83
Ephedra viridis	-	1.21
Eriogonum microthecum	-	.01
Juniperus osteosperma	1.39	2.73
Pinus edulis	-	3.34

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 22

Species	Average leader growth (in) '04
Artemisia nova	0.73
Cercocarpus montanus	3.1

POINT-QUARTER TREE DATA --
Management unit 16B, Study no: 22

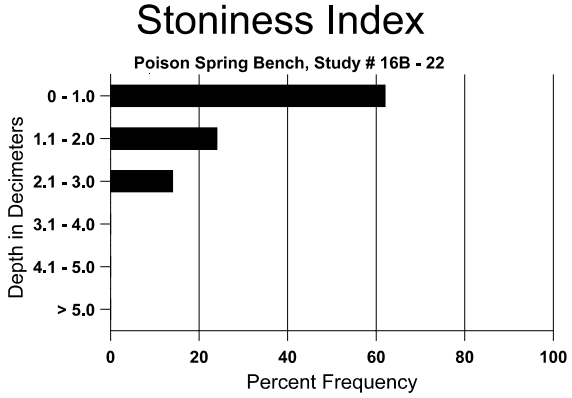
Species	Trees per Acre '99	Trees per Acre '04	Average diameter (in) '99	Average diameter (in) '04
Juniperus osteosperma	43	56	3.0	5.8
Pinus edulis	103	111	2.1	2.9

BASIC COVER --
Management unit 16B, Study no: 22

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	6.00	26.07	29.60	33.03
Rock	12.25	9.63	9.84	11.06
Pavement	7.00	4.24	8.36	8.55
Litter	56.75	38.77	41.91	38.04
Cryptogams	0	.01	1.03	.03
Bare Ground	18.00	22.43	23.83	21.89

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 22, Study Name: Poison Spring Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.3	60.7 (13.5)	7.6	50.7	27.4	21.8	3.9	4.4	57.6	0.8



PELLET GROUP DATA --
Management unit 16B, Study no: 22

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	26	18	10
Elk	7	6	7
Deer	24	24	7
Cattle	7	5	2

Days use per acre (ha)	
'99	'04
-	-
8 (20)	19 (46)
13 (32)	5 (12)
15 (36)	7 (16)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	17/21
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
88	**15333**	1400	12000	2533	800	-	9	0	5	-	.86	9/19
94	**9740**	-	880	7380	1480	200	9	.41	15	5	5	10/27
99	**11200**	80	420	9820	960	300	26	0	9	2	3	9/20
04	**10700**	60	180	8880	1640	960	10	10	15	7	7	10/22
Atriplex canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	40/37
99	**0**	-	-	-	-	-	0	0	-	-	0	52/41
04	**0**	-	-	-	-	-	0	0	-	-	0	36/48
Atriplex confertifolia												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	20/25
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Cercocarpus montanus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**300**	-	-	280	20	20	20	7	7	-	0	33/38
99	**400**	60	40	360	-	20	5	70	0	-	0	36/47
04	**320**	20	20	260	40	20	31	63	13	13	13	35/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus												
88	**66**	-	66	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Cowania mexicana stansburiana												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Ephedra viridis												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**160**	-	-	160	-	-	50	25	0	-	25	25/32
99	**300**	100	40	200	60	40	33	7	20	-	0	23/30
04	**320**	-	20	200	100	-	0	0	31	6	6	28/39
Eriogonum microthecum												
88	**933**	333	400	533	-	-	0	0	0	-	21	3/3
94	**620**	-	100	520	-	20	0	0	0	-	0	3/6
99	**540**	120	40	440	60	20	0	11	11	11	11	2/3
04	**820**	-	-	740	80	60	10	61	10	2	2	2/4
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	8/8
99	**120**	-	-	120	-	-	0	0	-	-	0	4/4
04	**40**	20	-	40	-	-	0	0	-	-	0	3/3
Juniperus osteosperma												
88	**0**	200	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	20	40	20	-	-	0	0	-	-	0	-/-
04	**80**	-	40	40	-	-	0	0	-	-	0	-/-
Opuntia polyacantha												
88	**333**	-	-	333	-	-	0	0	0	-	0	3/4
94	**100**	-	20	80	-	-	0	0	0	-	0	4/9
99	**100**	-	-	80	20	-	0	0	20	20	20	3/14
04	**100**	-	20	80	-	20	0	0	0	-	0	3/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	-	60	20	-	-	0	0	-	-	0	-/-
04	**120**	-	40	80	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	8/8
99	**0**	-	-	-	-	-	0	0	-	-	0	6/11
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 16B-23-04

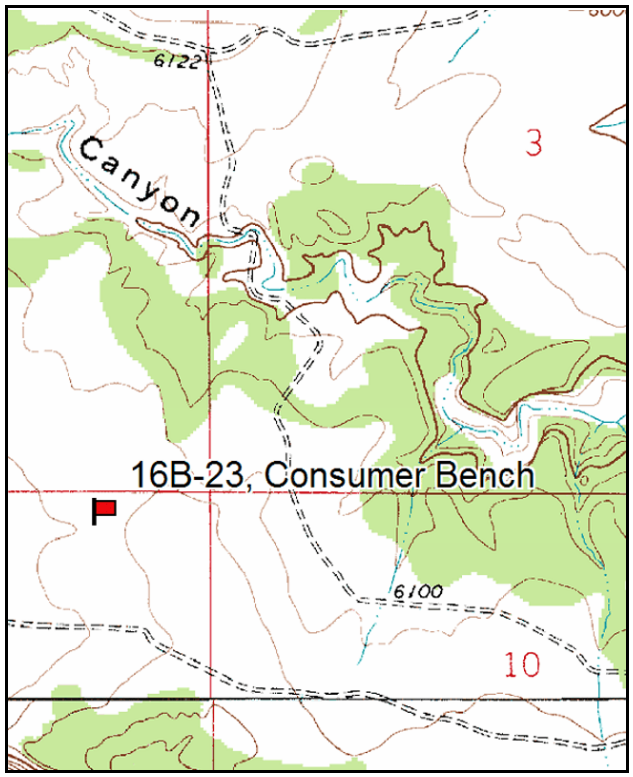
Study site name: Consumer Bench . Vegetation type: Wyoming Big Sagebrush .

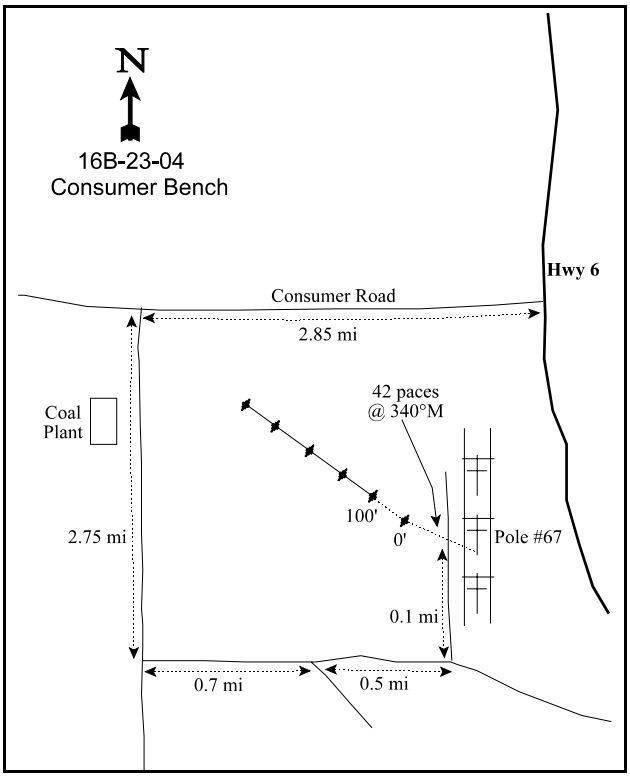
Compass bearing: frequency baseline 328 degrees magnetic.

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

LOCATION DESCRIPTION

On US 6 south of Helper, turn right (west) on Consumer Road and travel 2.85 miles. Turn left on a dirt road, and go 2.75 miles passing a coal plant. Turn left and travel 0.7 miles to a fork. Stay left for an additional 0.5 miles to another fork. Turn left and go 0.1 miles to a telephone pole (#67). The 0' stake is 42 paces away at 340°M from the telephone pole.





Map Name: Standardville

Diagrammatic Sketch

Township 14S , Range 9E , Section 4

GPS: NAD 27, UTM 12S 4386343 N, 507494 E

DISCUSSION

Consumer Bench - Trend Study No. 16B-23

The Consumer Bench trend study was established to monitor deer and elk winter range administered by the BLM. The site monitors a Wyoming big sagebrush/grass vegetation type with a few scattered junipers at an elevation of 6,100 feet. The aspect is southwest and the slope is gentle at approximately 5%. The site occurs within the Consumers Wash allotment, which is allotted for 54 sheep from October 1 to April 21, with an additional 821 sheep from April 21 until June 20. Because sheep use the area in the winter, the pellet-group counts will be combined for sheep and deer use. Days use/acre was moderately high in both 1999 and 2004. Pellet group transect data in 1999 estimated 90 sheep-deer days use/acre (223 s-ddu/ha) and 64 elk days use/acre (159 edu/ha). In 2004, sheep-deer use increased to 106 days use/acre (263 s-ddu/ha) and elk use declined to 25 days use/acre (63 edu).

The soil is a sandy loam with few rocks on the surface or within the profile. The estimated stoniness index is more a measure of a compacted layer about 12 inches below the surface than the presence of rock. The soil is moderately deep with an estimated effective rooting depth of over 16 inches. The soil has a slightly alkaline pH (7.8), and is low in both phosphorus (3.3 ppm) and potassium (41.6 ppm). Low values for these two basic elements effect plant growth and development. Relative percent bare ground cover was moderately high at 51% in 1994, decreasing to 35% in 1999, and then increasing to 46% in 2004. Ratio of bare ground to protective cover (vegetation, litter, and cryptogams) decreased from 1:3.0 in 1999 to 1:2.2 in 2004. Cryptogam cover decreased from 11% in 1999 to 3% in 2004. A couple of active gullies were noted on the site in 2004 and an erosion condition class rating in 2004 rated erosion on this site as slight. The slight slope has mitigated erosion problems.

The key browse species is Wyoming big sagebrush. The BLM has raised concerns in the past that sagebrush in the area was declining. This area has experienced drought conditions from 2001-2003 and annual precipitation has only been 48-60% of average during this time. Spring conditions (April-June) have been very dry and were only 13% of normal in 2002. The results of this drought were seen in 2004 as sagebrush density was four times lower than it was in 1999. Ninety-four percent of the population was classified as decadent and 90% showed signs of poor vigor. This was up from 27% decadency in 1999. Use was only slightly higher in 2004 with 38% showing moderate use and 54% heavy compared to 26 and 47% in 1999. Utilization was light in 1994. Cover declined from 9% in 1994, 10% in 1999, and down to 2% in 2004. Sagebrush density was stable from 1994 to 1999. Broom snakeweed density has fluctuated greatly with each reading and was down from 6,460 plants/acre in 1999 to 340 plants/acre in 2004. A few healthy winterfat were also present on this site.

In the past the herbaceous understory was relatively abundant for a Wyoming big sagebrush site. Grasses provided over half of the total vegetation cover in both 1994 and 1999. Six perennial species are present including: western wheatgrass, blue grama, Salina wildrye, Indian ricegrass, bottlebrush squirreltail, and needle-and-thread. All perennial grasses increased or remained stable in nested and quadrat frequency between 1994 and 1999. In 2004, four species had significantly lower nested frequencies. Cover declined from 16% in 1999 to 5% in 2004. Grasses made up only 22% of the total vegetation cover in 2004. Needle-and-thread and blue grama were the species found in the greatest abundance. Forbs are diverse. Scarlet globemallow is the dominant forb and was robust in 2004. It increased from 1% cover in 1999 to 9% in 2004, but was not significantly more abundant than it was in 1999. Annual forbs were higher in 2004 than they previously had been.

1994 APPARENT TREND ASSESSMENT

Relative cover of bare ground is high at 51%, but due to the gentle terrain and the abundance of herbaceous

vegetation, erosion does not seem to be a major problem. The apparent trend for soil is stable. The browse trend is also stable for the time being. The reproductive potential (number of young) is sufficient at 17% to replace dying shrubs on the site. It is apparent by the large number of dead shrubs counted that the population was once larger. Increaser shrubs, broom snakeweed and rabbitbrush are not abundant and do not have age classes characteristic of an expanding populations. The herbaceous understory is abundant. Perennial forbs are lacking somewhat, but typical for a Wyoming big sagebrush community. Currently, grasses and forbs account for 60% of the vegetation cover. Blue grama, a warm season grass, and needle-and-thread are the dominant grasses on the site. The Desirable Components Index (see methods) rating is good at 60. The sagebrush is abundant with low decadence and good recruitment. The herbaceous understory is diverse and abundant.

winter range condition (DC Index) - 60 (good) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is slightly improved. Relative bare ground is still moderately high at 35%, but decreased from 51% in 1994. Vegetation and litter cover both increased in 1999, resulting in better protective ground cover to hold soils in place. The key browse species, Wyoming big sagebrush, shows a stable trend. Age class distribution of the population is nearly identical to the 1994 reading. The proportion of the population classified as decadent, and those showing poor vigor are about the same as 1994 levels. Recruitment is moderate at 17% . The only negative aspect with Wyoming big sagebrush is that the level of use has greatly increased. In 1999, 26% of the population displayed moderate use, with an additional 47% showing heavy use. Continued high use could reverse the stability of this species in the future, especially when accompanied with drought. Broom snakeweed is expanding with an 84% increase in its density in 1999. Half of the population is young plants which indicates possible expansion in the future. The overall trend for browse is stable. The herbaceous understory shows a mixed trend, overall it would be considered stable. Sum of nested frequency for perennial grasses was stable and perennial forbs showed an increase in 1999. However, perennial grasses are the most abundant group in cover (90% of herbaceous perennial cover) and frequency. The DCI index shows that this is an excellent Wyoming big sagebrush site. Both sagebrush and the herbaceous understory are abundant and healthy.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 65 (good to excellent) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Soil trend is slightly down. Relative bare ground increased to 46%, but not as high as it was in1994 at 51%. Both cryptogams and grass cover decreased with the drought. Ratio of bare ground to protective cover (vegetation, litter, and cryptogams) decreased to only 1:2.2 in 2004 (same ratio as 1994). Signs of erosion were seen in 2004 with active gullies and rills. Browse trend is down as the 1999 trend assessment predicted would happen with the combination of high use (sheep and deer) and severe drought. Wyoming big sagebrush density is four times lower than it was previously and the remaining plants are nearly all decadent with 90% of the plants left in the population classified as dying. Cover is down to less than 2%, which will not support very many deer. The herbaceous understory is also considered down. Sum of nested frequency for perennial grasses is only about one-half of what it was in 1999. Grass cover also is down to 5% from 16% in 1999. Perennial forb cover increased, but nested frequency actually was slightly lower. Annual forbs have also increased. Sagebrush die off and high decadency has reduced the DCI score to poor. Perennial grass cover also decreased.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 11 (poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 23

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron smithii	a-	a-	b18	-	-	.12
G	Bouteloua gracilis	b195	b193	a109	6.22	4.79	2.02
G	Elymus salina	b86	b105	a1	.95	2.59	.00
G	Oryzopsis hymenoides	ab114	b159	a68	2.06	3.80	.22
G	Sitanion hystrix	b24	b22	a1	.39	.56	.03
G	Sporobolus cryptandrus	1	-	1	.00	-	.00
G	Stipa comata	b181	ab142	a147	4.69	4.33	3.02
G	Vulpia octoflora (a)	a-	a6	b44	-	.01	.10
Total for Annual Grasses		0	6	44	0	0.01	0.10
Total for Perennial Grasses		601	621	345	14.33	16.10	5.44
Total for Grasses		601	627	389	14.33	16.11	5.53
F	Astragalus convallarius	a6	b39	b30	.01	.19	1.57
F	Astragalus spp.	7	-	-	.04	-	-
F	Castilleja linariaefolia	a-	b17	a3	-	.04	.00
F	Calochortus nuttallii	a-	b11	b16	-	.04	.05
F	Chenopodium fremontii (a)	-	-	3	-	-	.04
F	Chenopodium leptophyllum(a)	a-	a-	b162	-	-	1.55
F	Comandra pallida	a-	b10	b11	-	.02	.25
F	Collinsia parviflora (a)	17	15	16	.06	.25	.11
F	Cordylanthus spp. (a)	-	-	1	-	-	.00
F	Cryptantha spp.	a-	a-	b11	-	-	.27
F	Cymopterus spp.	-	3	1	-	.00	.00
F	Descurainia pinnata (a)	a3	a1	b16	.00	.01	.08
F	Eriogonum cernuum (a)	a4	a-	b22	.01	-	.12
F	Eriogonum ovalifolium	ab5	b16	a1	.04	.34	.03
F	Gayophytum ramosissimum(a)	a-	a-	b65	-	-	.73
F	Gilia spp. (a)	a-	a-	b114	-	-	.95
F	Lappula occidentalis (a)	a-	a-	b20	-	-	.06
F	Lepidium montanum	12	3	3	.21	.01	.07
F	Lygodesmia spp.	-	-	3	-	-	.06

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Machaeranthera canescens	1	3	2	.00	.03	.03
F	Penstemon linarioides	3	-	-	.00	-	-
F	Penstemon spp.	11	3	4	.02	.03	.03
F	Phlox longifolia	$_{a}$26	$_{b}$50	$_{ab}$30	.05	.15	.18
F	Plantago patagonica (a)	$_{a}$3	$_{a}$2	$_{b}$103	.00	.01	1.00
F	Salsola iberica (a)	$_{a}$-	$_{a}$-	$_{b}$38	-	-	.57
F	Schoencrambe linifolia	$_{a}$7	$_{b}$17	$_{a}$5	.01	.07	.06
F	Sphaeralcea coccinea	$_{a}$128	$_{ab}$166	$_{b}$173	.93	1.04	8.54
F	Taraxacum officinale	-	-	1	-	-	.00
F	Tragopogon dubius	-	2	1	-	.00	.00
Total for Annual Forbs		27	18	560	0.08	0.26	5.25
Total for Perennial Forbs		206	340	295	1.33	2.00	11.18
Total for Forbs		233	358	855	1.41	2.27	16.43

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

BROWSE TRENDS --
Management unit 16B, Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata wyomingensis	77	74	35	9.19	10.31	1.80
B	Ceratoides lanata	2	1	2	-	.00	.01
B	Chrysothamnus viscidiflorus	1	2	2	-	.15	.01
B	Gutierrezia sarothrae	28	62	11	.78	.97	.25
B	Opuntia polyacantha	29	21	20	.51	.66	.64
B	Pinus edulis	0	1	1	-	-	.03
Total for Browse		137	161	71	10.49	12.11	2.74

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 23

Species	Percent Cover '04
Artemisia tridentata wyomingensis	1.23
Ceratoides lanata	.01
Chrysothamnus viscidiflorus	.01
Gutierrezia sarothrae	.20
Opuntia spp.	.35

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 23

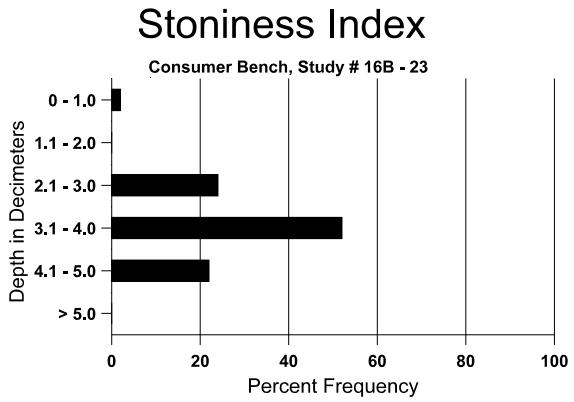
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	4.3
Ceratoides lanata	9.4

BASIC COVER --
Management unit 16B, Study no: 23

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	24.62	32.35	26.23
Rock	.05	.01	.00
Pavement	.44	.26	.60
Litter	17.95	24.32	30.77
Cryptogams	1.43	11.09	2.56
Bare Ground	45.88	36.49	51.98

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 23, Study Name: Consumer Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.4	58.9 (11.6)	7.8	54.7	27.4	17.8	1.7	3.3	41.6	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 23

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'99	'04	'99	'04
Rabbit	6	66	36	-	-
Elk	20	17	16	64 (159)	25 (63)
Deer	55	58	62	90 (223)	106 (263)
Cattle	-	-	-	-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
94	**3820**	260	660	2080	1080	1660	15	0	28	10	10	16/26
99	**4480**	300	780	2480	1220	1200	26	47	27	8	11	17/30
04	**1040**	-	20	40	980	2880	38	54	94	90	90	16/19
Ceratoides lanata												
94	**60**	-	-	60	-	-	0	0	-	-	0	9/8
99	**20**	-	20	-	-	-	0	0	-	-	0	3/4
04	**40**	20	-	40	-	-	0	100	-	-	0	11/13
Chrysothamnus viscidiflorus												
94	**60**	-	-	60	-	-	0	0	-	-	0	7/18
99	**60**	-	60	-	-	-	0	0	-	-	0	4/10
04	**60**	140	-	60	-	-	0	0	-	-	0	9/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
94	**1020**	-	-	980	40	40	0	4	4	-	0	8/9
99	**6460**	2220	3240	3200	20	120	.30	.61	0	-	.30	4/4
04	**340**	-	20	320	-	-	6	0	0	-	0	6/8
Opuntia polyacantha												
94	**920**	-	40	840	40	-	0	0	4	-	0	3/10
99	**700**	40	100	500	100	-	0	0	14	6	6	3/9
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Opuntia spp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**740**	40	140	600	-	-	0	0	-	-	0	4/12
Pinus edulis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 16B-24-04

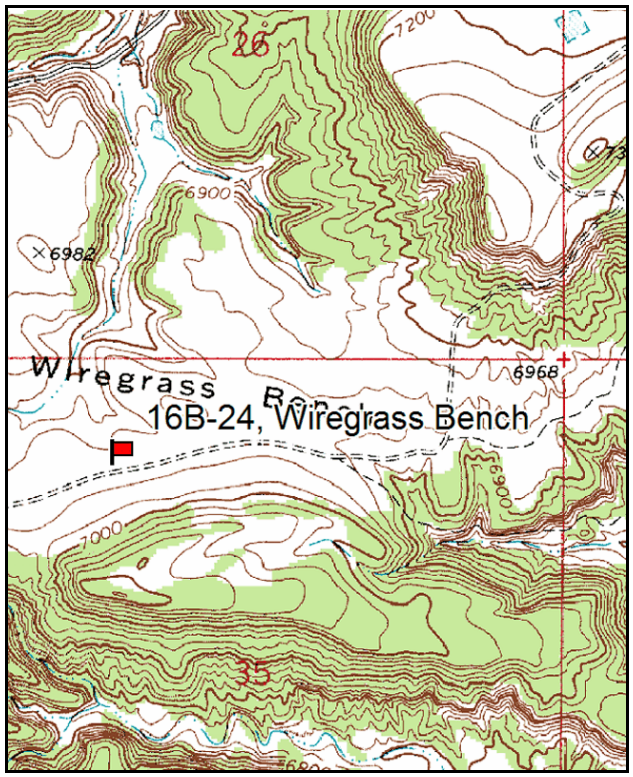
Study site name: Wiregrass Bench . Vegetation type: Wyoming Big Sagebrush .

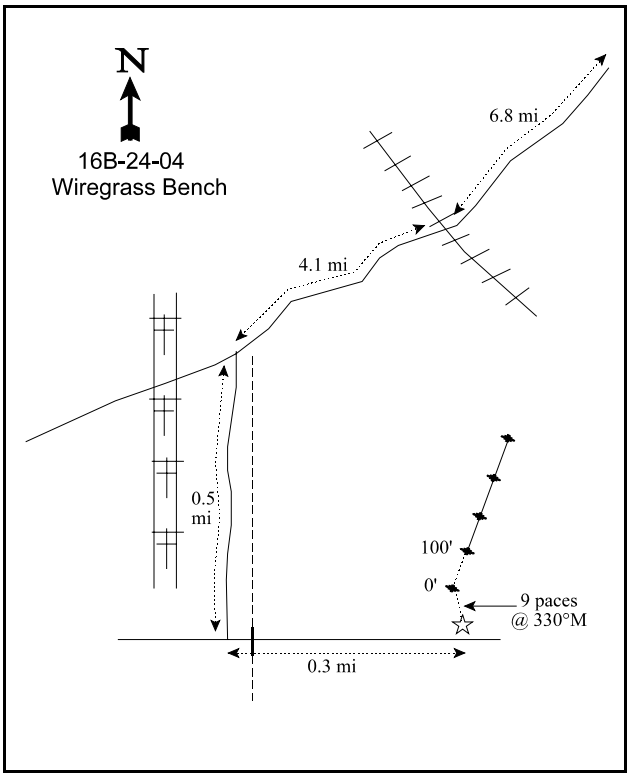
Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

Take exit 240 on highway 6 in Price just past the hospital. Turn right at the stop sign, continue to another stop sign and turn right again. Stay on this road until you go over a canal, then turn right at the first road on the right. Proceed 6.8 miles to a railroad crossing. From the railroad tracks, travel 4.1 miles. Just before reaching the power lines turn left and travel 0.5 miles along the fence to a "T" in the road. Turn left through a gate and travel 0.3 miles to the witness post on the left. The 0' stake is 9 paces at 330/ M. The baseline runs in the direction of 0°M.





Map Name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 8E , Section 35

GPS: NAD 27, UTM 12S 4379741 N, 500290 E

DISCUSSION

Wiregrass Bench - Trend Study No. 16B-24

Wiregrass Bench is located about 10 miles west of Price. This study was established in 1994 to monitor possible sagebrush die-off on important winter range. The site has a northwest aspect and a gentle slope of 5-10%. Elevation is 6,900 feet. The site is on the Haley allotment which is grazed from May 16 to October 31 by cattle and is managed by the BLM. Pellet group frequency data from 1994 indicated high deer use on the site as well as some elk use. Pellet group transect data taken in 1999 estimated moderate use by wildlife with 38 deer days use/acre (93 ddu/ha), 23 elk days use/acre (56 edu/ha), and 15 cow days use/acre (38 cdu/ha). Deer use was higher in 2004 at 69 days use/acre (93 ddu/ha). Elk and cattle use remained about the same with 12 elk days use/acre (31 edu/ha) and 12 cow days use/acre (30 cdu/ha).

Soil depth is quite deep with an estimated effective rooting depth of over 20 inches. The soil is slightly alkaline pH (7.6). Rock is fairly uniformly distributed throughout the profile as evidenced by the stoniness index data. Phosphorus is low at 6.8 ppm. Percent bare ground was fairly low for a Wyoming big sagebrush site at 32% in both 1994 and 1999. This increased to 47% in 2004. Cryptogam cover also fell from 13% in 1999 to less than 2% in 2004. Ratio of bare ground to protective cover (vegetation, litter, and cryptogams) decreased from 1:3.1 in 1999 to 1:2.2 in 2004. An erosion class rating in 2004 rated erosion on this site as slight, with signs of erosion from rills, gullies, and pedestaling.

The key browse species on this site is Wyoming big sagebrush which had a population density of 1,860 plants/acre in 1994. Density increased to 2,380 plants/acre in 1999 and then decreased by 18% to 1,940 plants/acre in 2004. While density has remained relatively stable, cover and decadence has been reflective of precipitation patterns. Annual precipitation was low in 1993 and 1994 at about 80% of normal each year and was even lower from 2001-2003 at about 56% of normal. Percent cover was 6% in 1994, 10% in 1999, and decreased to 5% in 2004. Percent decadence was 49% in 1994 and 63% in 2004, while it was 29% in 1999 when precipitation was better. Seventy percent of the decadent plants showed signs of poor vigor in 2004. Recruitment has been good in this population. Young plants made up 18% of the population in 1999 and 13% were classified as young in 2004. Seedlings were very abundant in 2004 estimating 30,460 plants/acre. Utilization has increased with each reading. In 2004, 40% were showing moderate use and 45% showed heavy use. Some of the mature and decadent plants sampled in 1999 showed evidence of insect infestation.

The most numerous shrub on the site is the increaser low rabbitbrush. This species had a 41% increase in density in 1999, but declined by 15% in 2004. Cover has remained stable at about 3% for each reading. Broom snakeweed is present at the site and estimated 3,260 plants/acre and 3,480 plants/acre in 1994 and 1999 respectively. This decreased to only 460 plants/acre in 2004. Utah serviceberry is present in low numbers. In 1999, only 33% showed signs of moderate use. This increased to 100% heavy use in 2004.

The herbaceous understory is very abundant and diverse. Grasses provide 66%, 50%, and 60% of the total vegetation cover in 1994, 1999, and 2004 respectively. Blue grama and Salina wildrye account for the majority of the cover. Blue grama is a warm season grass which provides little forage and increases under excessive spring livestock grazing. This species decreased significantly in sum of nested frequency in 1999. It increased slightly in 2004 and was closer to its highest level in 1994. Salina wildrye provides poor to fair forage for livestock and big game. This species has remained relatively stable through the three readings. Other perennial species include: western wheatgrass, mutton bluegrass, Indian ricegrass, needle-and-thread, and bottlebrush squirreltail. Forbs are diverse but not abundant. Perennial forbs nearly doubled in sum of nested frequency in 1999, but decreased in 2004. A few important perennial species include: narrowleaf paintbrush, redroot eriogonum and scarlet globemallow occur on the site.

1994 APPARENT TREND ASSESSMENT

Ground cover characteristics show adequate cover to control soil erosion. Herbaceous ground cover is high at 25% and litter cover is also high for a Wyoming big sagebrush site at 23%. The apparent browse trend is declining somewhat for Wyoming big sagebrush. Reproductive potential is low and the majority of the population is decadent. This is likely caused by a combination of drought and competition from the abundant herbaceous understory and increaser shrubs rabbitbrush and broom snakeweed. The herbaceous understory is abundant and diverse but the composition of grasses is dominated by blue grama and Salina wildrye, both of which offer only fair forage value. The Desirable Components Index (see methods) rating is fair to good at 48. Decadence is higher than desired, but recruitment is fair and the herbaceous understory is abundant.

winter range condition (DC Index) - 48 (good) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is slightly up. Relative percent cover for bare ground decreased from 42% down to 31%. There was a notable increase in cryptogamic cover also. Erosion is not a problem at the site, and herbaceous sum of nested frequency increased in 1999. Trend for the key browse Wyoming big sagebrush is slightly up. Decadency decreased from 49% to 29%, the proportion of decadent plants classified as dying decreased from 26% to 12%, and plants showing poor vigor decreased from 14% to 4%. Biotic potential and recruitment both increased in 1999 as well. Improved precipitation patterns in last few years has helped restore vigor and increase the number of seedlings and young. The only negative aspect for this population of Wyoming big sagebrush is that use has increased. Currently, 50% of the population is classified as moderately browsed, up from 16% in 1994. An additional 10% show heavy use. Trend for the herbaceous understory is slightly up. Perennial species dominate the understory. Sum of nested frequency for perennial grasses and forbs increased in 1999. The DCI score improved to good to excellent as sagebrush was more abundant, less decadent, and had more young plants in the population.

TREND ASSESSMENT
soil - slightly up (4)
browse - slightly up (4)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 66 (good to excellent) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Soil trend is slightly down. Cryptogam cover decreased from 13% to 2%. Relative percent bare ground is higher, from 31% to 42%. A few signs of erosion were noted in 2004. Browse trend is slightly down. Density has remained relatively stable, but cover decreased and decadency has increased to 63%. Forty-four percent of the population is now classified as dying, from only 3% in 1999. Use has increased with each reading and now 85% of the population show signs of moderate or heavy use. Recruitment is good at 13% and seedlings are very abundant. Return to normal precipitation pattern should help this population. Trend for herbaceous understory is stable. Cover of perennial grasses was higher by 3% in 2004. No cheatgrass was sampled in 2004. Cover increased for the two dominant species blue grama and Salina wildrye. Sum of nested frequency declined for perennial forbs, but increased for annual forbs. Cover remained stable for perennial forbs. The DCI score declined to fair to good, due to decreased sagebrush cover and increased decadence.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 47 (fair to good) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16B, Study no: 24

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron smithii	a-	a-	b42	-	-	.32
G	Agropyron spicatum	10	2	12	.53	.01	.05
G	Bouteloua gracilis	b274	a230	ab254	10.33	4.77	6.64
G	Bromus tectorum (a)	ab5	b20	a-	.01	.20	-
G	Elymus salina	ab263	b294	a265	9.56	8.72	10.01
G	Oryzopsis hymenoides	b25	b19	a-	.38	.20	-
G	Poa fendleriana	56	98	71	.51	1.27	.66
G	Poa secunda	a-	a-	b59	-	-	.61
G	Sitanion hystrix	c95	b53	a15	1.06	1.19	.07
G	Sporobolus cryptandrus	-	-	5	-	-	.00
G	Stipa comata	a17	a4	b70	.32	.00	.93
G	Vulpia octoflora (a)	-	-	2	-	-	.01
Total for Annual Grasses		5	20	2	0.00	0.20	0.00
Total for Perennial Grasses		740	700	793	22.71	16.18	19.34
Total for Grasses		745	720	795	22.72	16.38	19.35
F	Agoseris glauca	a-	c55	b10	-	.24	.05
F	Arabis spp.	-	-	2	-	-	.00
F	Astragalus convallarius	a42	ab38	b57	.41	.14	1.11
F	Astragalus spp.	ab7	b13	a-	.30	.21	-
F	Castilleja linariaefolia	a14	b51	a7	.05	.38	.05
F	Calochortus nuttallii	a3	b31	b37	.00	.07	.14
F	Castilleja spp.	-	-	6	-	-	.03
F	Chenopodium spp. (a)	-	-	2	-	-	.01
F	Comandra pallida	a35	b69	b59	.36	.19	.45
F	Collinsia parviflora (a)	b21	b27	a3	.05	.06	.00
F	Crepis acuminata	-	3	-	-	.03	-
F	Cryptantha spp.	2	-	-	.01	-	-
F	Cymopterus spp.	-	7	-	-	.04	-
F	Delphinium nuttallianum	-	5	-	-	.00	-
F	Descurainia pinnata (a)	1	-	3	.00	-	.01

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Eriogonum alatum	$_{a}$4	$_{b}$33	$_{a}$3	.03	.16	.03
F	Eriogonum racemosum	44	45	31	.39	.32	.27
F	Eriogonum umbellatum	3	1	3	.03	.00	.03
F	Gayophytum ramosissimum(a)	$_{a}$-	$_{a}$-	$_{b}$24	-	-	.10
F	Hedysarum boreale	-	-	5	-	-	.12
F	Hymenoxys acaulis	1	-	-	.00	-	-
F	Lappula occidentalis (a)	$_{a}$-	$_{a}$3	$_{b}$25	-	.00	.10
F	Lepidium densiflorum (a)	18	15	9	.04	.02	.02
F	Lesquerella spp.	1	-	1	.00	-	.00
F	Machaeranthera grindelioides	$_{a}$8	$_{b}$11	$_{a}$-	.06	.10	-
F	Penstemon caespitosus	5	20	8	.05	.09	.05
F	Penstemon carnosus	-	-	3	-	-	.01
F	Penstemon palmeri	3	-	-	.01	-	-
F	Phlox longifolia	$_{a}$43	$_{b}$74	$_{b}$80	.08	.56	.35
F	Plantago patagonica (a)	$_{a}$42	$_{a}$37	$_{b}$78	.12	.08	.19
F	Polygonum douglasii (a)	$_{a}$21	$_{a}$6	$_{b}$146	.04	.01	.31
F	Ranunculus testiculatus (a)	-	-	4	-	-	.01
F	Schoencrambe linifolia	14	12	19	.03	.02	.27
F	Sphaeralcea coccinea	52	48	37	.18	.48	.72
F	Taraxacum officinale	7	12	2	.01	.02	.00
F	Zigadenus paniculatus	$_{a}$-	$_{b}$24	$_{a}$-	-	.06	.00
Total for Annual Forbs		103	88	294	0.26	0.19	0.77
Total for Perennial Forbs		288	552	370	2.05	3.16	3.74
Total for Forbs		391	640	664	2.31	3.35	4.51

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

BROWSE TRENDS --
Management unit 16B, Study no: 24

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	2	2	3	-	-	.38
B	Artemisia tridentata wyomingensis	58	66	56	5.51	9.74	4.90
B	Chrysothamnus viscidiflorus viscidiflorus	72	76	86	2.94	2.96	2.96
B	Echinocereus spp.	0	4	0	-	-	-
B	Gutierrezia sarothrae	63	34	13	.61	.18	.00
B	Opuntia spp.	9	3	2	.01	-	-
B	Pediocactus simpsonii	0	0	2	-	-	-
B	Pinus edulis	0	1	0	.38	.15	-
Total for Browse		204	186	162	9.46	13.05	8.25

CANOPY COVER, LINE INTERCEPT --
Management unit 16B, Study no: 24

Species	Percent Cover '04
Amelanchier utahensis	.16
Artemisia tridentata wyomingensis	5.13
Chrysothamnus viscidiflorus viscidiflorus	2.71
Gutierrezia sarothrae	.25
Opuntia spp.	.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16B, Study no: 24

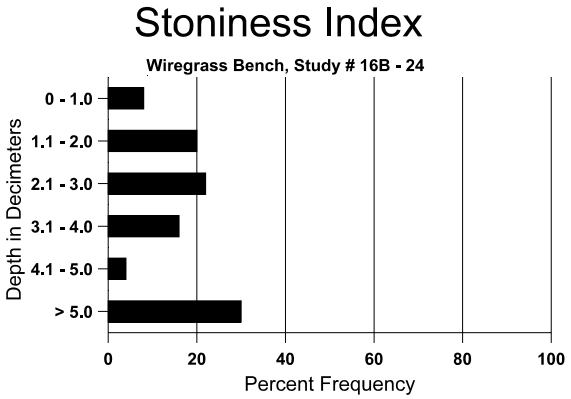
Species	Average leader growth (in) '04
Amelanchier utahensis	2.6
Artemisia tridentata wyomingensis	2.5

BASIC COVER --
Management unit 16B, Study no: 24

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	34.32	32.04	34.01
Rock	1.33	.57	.25
Pavement	.41	.33	3.89
Litter	23.33	24.23	26.12
Cryptogams	3.75	13.03	1.58
Bare Ground	31.76	32.17	47.34

SOIL ANALYSIS DATA --
Management unit 16B, Study no: 24, Study Name: Wiregrass Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
20.2	55.5 (16.1)	7.6	34.7	41.4	23.8	1.7	6.8	121.6	0.6



PELLET GROUP DATA --
Management unit 16B, Study no: 24

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	33	56	25
Elk	12	5	6
Deer	36	53	50
Cattle	6	7	4

Days use per acre (ha)	
'99	'04
-	-
23 (56)	13 (31)
38 (93)	69 (170)
15 (38)	12 (30)

BROWSE CHARACTERISTICS --
Management unit 16B, Study no: 24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**40**	-	-	40	-	-	50	0	-	-	0	17/20
99	**60**	-	40	20	-	-	33	0	-	-	0	37/42
04	**60**	-	-	60	-	-	0	100	-	-	0	24/22
Artemisia tridentata wyomingensis												
94	**1880**	20	180	780	920	580	16	1	49	13	14	22/33
99	**2380**	260	420	1280	680	760	50	10	29	3	4	23/34
04	**1940**	30460	260	460	1220	1060	40	45	63	44	44	23/33
Chrysothamnus viscidiflorus viscidiflorus												
94	**4400**	-	40	4360	-	20	0	0	0	-	0	21/25
99	**7480**	200	1280	6200	-	20	4	.26	0	-	0	4/8
04	**6360**	480	800	5340	220	80	17	3	3	3	3	5/9
Echinocereus spp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	-	-	80	-	-	0	0	-	-	0	1/2
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
94	**3260**	-	40	3180	40	40	0	0	1	.61	.61	31/6
99	**3480**	-	540	2920	20	100	0	0	1	-	0	3/4
04	**460**	-	60	400	-	-	0	0	0	-	0	4/5
Opuntia spp.												
94	**260**	-	-	260	-	-	0	0	-	-	0	3/7
99	**80**	-	-	80	-	-	0	0	-	-	0	2/5
04	**40**	-	-	40	-	-	0	0	-	-	0	3/16
Pediocactus simpsonii												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**60**	-	20	40	-	-	0	0	-	-	0	1/2
Pinus edulis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 16R-1-04

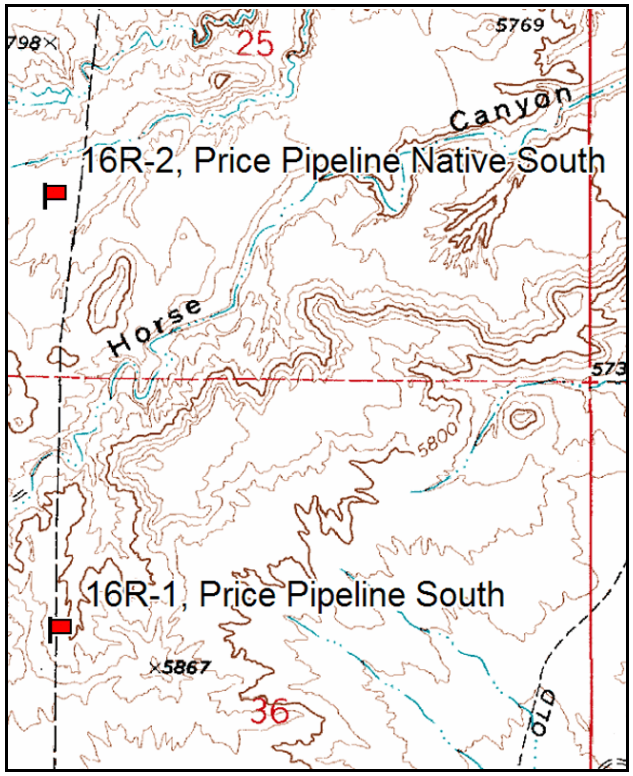
Study site name: Price Pipeline South . Vegetation type: Desert Shrub .

Compass bearing: frequency baseline 349 degrees magnetic.

There are no frequency belts on this site. The quadrats are placed on the baseline every five feet, alternating left and right sides. The quadrats point down the line.

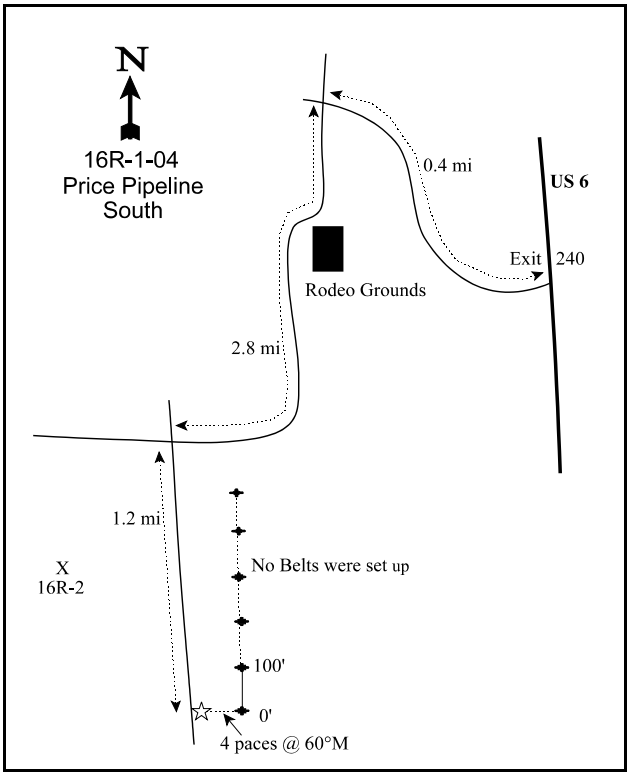
LOCATION DESCRIPTION

Take exit 240 off of US 6 and head west 0.4 miles to an intersection. Turn left at this intersection and go 2.8 miles, through the rodeo grounds to another intersection. Turn left (south) and drive 1.2 miles past site 16R-2 to a witness post on the left side of the road. From the witness post walk 4 paces at 60° M to the 0-foot stake. The 0-foot stake is marked with browse tag number 89. The study is marked by 12-18 inch high, green, steel fenceposts.



Map name: Price .

Township 14S , Range 9E , Section 36



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4379341 N, 511317 E

DISCUSSION

Price Pipeline South - Trend Study No. 16R-1

The Price Pipeline South study was established in 1997 to monitor effects of rangeland drilling to rehabilitate after the disturbance for an underground natural gas pipeline. Study number 16R-2 was paired with this site to compare the pipeline to the undisturbed native community. The study is located about 4 miles southwest of Price and is characterized as a desert shrub community. Due to a rain shadow, this area has a poor site potential. This site has a slight slope of 2% with an aspect to the northeast. Elevation is 5,800 feet. Pellet group data in 2004 showed only light use by wildlife. Deer or antelope use was estimated as 9 days use/acre (21 ddu/ha) and elk use was 4 days use/acre (10 edu/ha). Livestock use was about 5 days use/acre (13 cdu/ha).

Soil depth is moderate with an estimated effective rooting depth of just over 9 inches. The soil has a slightly alkaline pH (7.4). Very few rocks were found in the profile. Phosphorus is low at 3.2 ppm. Organic matter is also low at less than 1%. Textural analysis indicates this soil is a loam. This soil is susceptible to erosion because there is very little protective cover. Relative percent bare ground cover was 92% in 1997. In 2004, relative percent bare ground went down to 86%. An erosion class index in 2004 rated erosion on this site as moderate. Gullies and pedestaling are evidence of ongoing erosion.

Shadscale is the browse species found in the greatest abundance. Density increased from 1,440 plant/acre in 1997 to 1,600 plants/acre in 2004. In 1997, all of the population was classified as young after the disturbance for the pipeline. In 2004, 91% of the population was mature with 9% young. No plants were decadent. Cover increased from less than 1% to 3% in 2004. Black sagebrush, Gardner saltbush, and corymbed buckwheat were also found in small numbers.

Long term results indicate little success for the drill seeding. No data was available for what was seeded. Crested wheatgrass was the only species found that typically is used in range seedings. It decreased significantly in 2004 in sum of nested frequency from 1997. Crested wheatgrass was found in 57% of quadrats in 1997 and was only found in 4% in 2004. Western wheatgrass also decreased significantly. Grass cover decreased from 3% in 1997 to 0.5% in 2004. Forbs are diverse, but not abundant. Halogeton and Russian thistle are the most dominant forb species and both increased significantly in 2004.

The paired native study near this one shows few differences. Perennial grasses and browse are sparse and is also covered by invasive annual weeds. This area has low site potential and revegetation success is difficult.

2004 TREND ASSESSMENT

Soil trend is stable, but in very poor condition. Relative percent bare soil decreased a little but not enough to warrant an improving trend. There is very little ground cover and erosion is apparent on this site. The slight slope prevents large scale erosion. Browse trend is slightly up as shadscale has gone from a young to mature population. Recruitment was 9% in 2004 and a few seedlings were encountered. The herbaceous understory trend is down. Abundance of grasses decreased ten-fold in 2004. Halogeton and Russian thistle are the most dominant forbs. The Desirable Components Index (see methods) rating was very poor in 1997 as there was very little browse and improved to poor to fair in 2004. Shadscale cover increased and there were many young plants, but this is still rated as poor winter range.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - down (1)
1997 winter range condition (DC Index) - 9 (very poor) desert shrub type
2004 winter range condition (DC Index) - 26 (poor to fair) desert shrub type

HERBACEOUS TRENDS --
Management unit 16R, Study no: 1

Type	Species	Nested Frequency '97	Nested Frequency '04	Average Cover % '97	Average Cover % '04
G	Agropyron cristatum	$_{b}$136	$_{a}$10	.91	.10
G	Agropyron smithii	$_{b}$299	$_{a}$15	2.32	.29
G	Oryzopsis hymenoides	19	19	.07	.14
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		454	44	3.31	0.54
Total for Grasses		454	44	3.31	0.54
F	Astragalus convallarius	1	1	.00	.03
F	Astragalus spp.	-	9	-	.02
F	Castilleja spp.	4	-	.01	-
F	Cordylanthus kingii (a)	-	9	-	.02
F	Eriogonum inflatum	$_{b}$54	$_{a}$34	.14	.22
F	Euphorbia spp.	$_{a}$6	$_{b}$24	.03	.17
F	Halogeton glomeratus (a)	$_{a}$133	$_{b}$313	.30	1.38
F	Helianthus annuus (a)	15	16	.02	.07
F	Hymenoxys acaulis	-	-	-	.00
F	Hymenoxys richardsonii	-	3	-	.06
F	Kochia spp.	1	-	.03	-
F	Lappula occidentalis (a)	-	6	-	.01
F	Malcolmia africana	$_{a}$-	$_{b}$80	-	.85
F	Machaeranthera canescens	-	4	-	.07
F	Machaeranthera grindelioides	5	15	.19	.58
F	Oenothera caespitosa	16	17	.05	.32
F	Penstemon carnosus	-	1	-	.03
F	Salsola iberica (a)	$_{a}$156	$_{b}$302	.42	1.63
F	Trifolium gymnocarpon	$_{b}$33	$_{a}$1	.13	.03
F	Unknown forb-annual (a)	3	-	.00	-
Total for Annual Forbs		307	646	0.75	3.12
Total for Perennial Forbs		120	189	0.59	2.41
Total for Forbs		427	835	1.35	5.53

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

BROWSE TRENDS --
Management unit 16R, Study no: 1

Type	Species	Strip Frequency '97	Strip Frequency '04	Average Cover % '97	Average Cover % '04
B	Artemisia nova	2	2	.06	.30
B	Atriplex confertifolia	42	45	.29	3.09
B	Atriplex gardneri	4	17	.03	.09
B	Chrysothamnus nauseosus	0	12	-	.14
B	Eriogonum corymbosum	10	7	.04	.08
Total for Browse		58	83	0.43	3.72

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 1

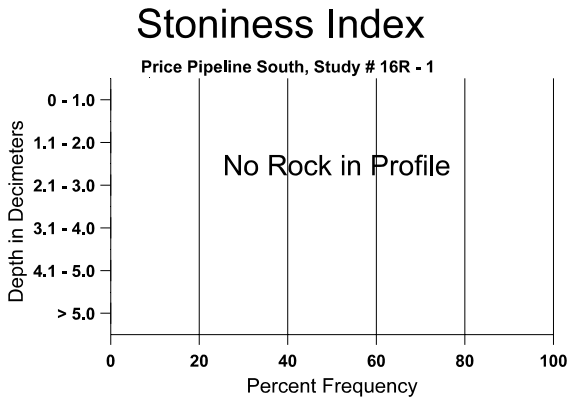
Species	Percent Cover '04
Atriplex confertifolia	2.48
Atriplex gardneri	.23
Chrysothamnus nauseosus	.05

BASIC COVER --
Management unit 16R, Study no: 1

Cover Type	Average Cover % '97	Average Cover % '04
Vegetation	4.47	8.90
Rock	.55	1.71
Pavement	.64	1.81
Litter	1.58	2.69
Cryptogams	.04	0
Bare Ground	85.52	89.27

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 1, Study Name: Price Pipeline South

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
9.3	64.0 (12.7)	7.4	21.4	44.7	33.8	0.9	3.2	230.4	3.9



PELLET GROUP DATA --
Management unit 16R, Study no: 1

Type	Quadrat Frequency '97	Quadrat Frequency '04	Days use per acre (ha) '04
Sheep	-	2	-
Rabbit	-	1	-
Elk	-	6	4 (10)
Deer	5	10	9 (21)
Cattle	2	1	5 (13)

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
97	**40**	-	20	20	-	160	0	0	-	-	0	6/11
04	**40**	80	-	40	-	-	0	0	-	-	0	7/12
Atriplex confertifolia												
97	**1440**	180	1440	-	-	40	0	0	-	-	0	-/-
04	**1600**	40	140	1460	-	40	3	0	-	-	0	9/17
Atriplex gardneri												
97	**80**	-	80	-	-	-	0	0	0	-	0	-/-
04	**760**	-	120	560	80	20	0	0	11	5	5	4/15
Chrysothamnus nauseosus												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**280**	3200	80	200	-	-	21	7	-	-	0	12/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	7/10
Eriogonum corymbosum												
97	**280**	-	280	-	-	-	0	0	-	-	0	-/-
04	**160**	300	60	100	-	-	0	13	-	-	0	5/10
Gutierrezia sarothrae												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/15

Trend Study 16R-2-04

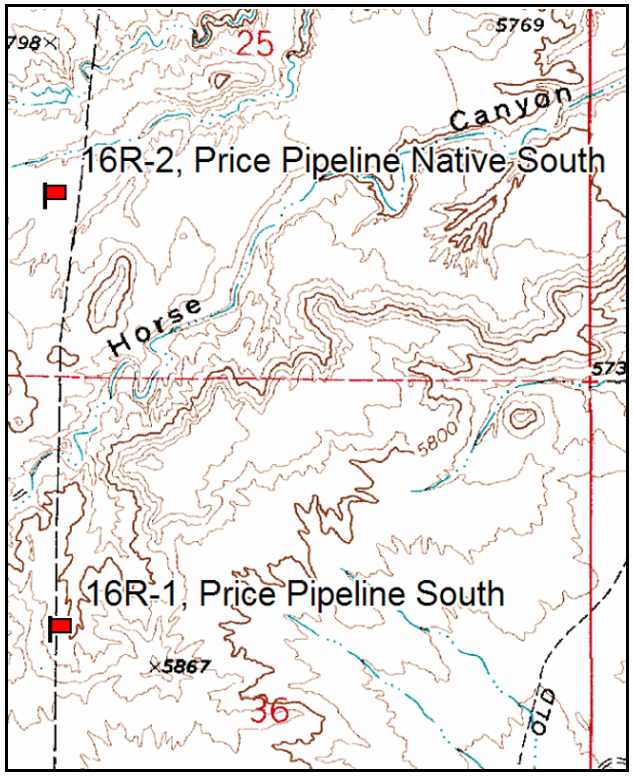
Study site name: Price Pipeline South Native . Vegetation type: Desert Shrub .

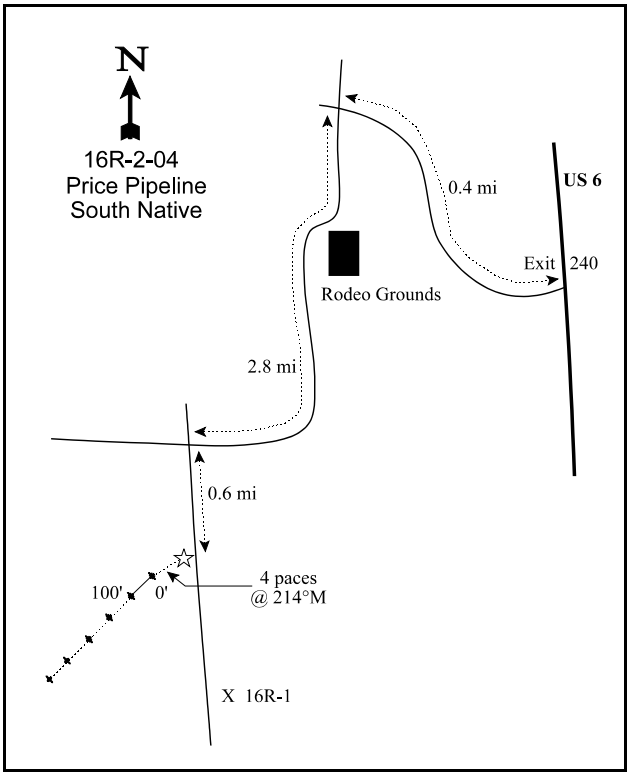
Compass bearing: frequency baseline 250 degrees magnetic.

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

LOCATION DESCRIPTION

Take exit 240 off of US 6 and head west 0.4 miles to an intersection. Turn left at this intersection and go 2.8 miles, through the rodeo grounds to another intersection. Go 0.6 miles to a witness post on the right. From the witness post walk 4 paces at 214 degrees magnetic to the 0-foot stake. The study site is marked by green, steel fenceposts approximately 12-18 inches in height.





Map name: Price .

Diagrammatic Sketch

Township 14S , Range 9E , Section 25

GPS: NAD 27, UTM 12S 4380411 N, 511302 E

DISCUSSION

Price Pipeline South Native - Trend Study No. 16R-2

The "Price pipeline south native" study is paired with 16R-1 and monitors the native undisturbed community near a natural gas pipeline. This study is 0.6 miles north of 16R-1 on a desert shrub flat with 3% slope and a northerly aspect. Elevation is about 5,800 feet. This site is located in a rain shadow and has low site potential. Wildlife use was light in 2004. Pellet group data estimated 7 elk days use/acre (18 edu/ha). Livestock use was estimated at 12 cow days use/acre (30 cdu/ha).

Soil textural is classified as loam. Soil depth is moderate with an estimated effective rooting depth of just over 12 inches. The soil has a slightly alkaline pH (7.4). Very few rocks were found in the profile. Phosphorus is low at 9.2 ppm. Organic matter was also low at 1%. This soil is susceptible to erosion because there is very little protective cover. Relative percent bare ground cover was 80% in 1997 and 78% in 2004. An erosion class index in 2004 rated erosion on this site as moderate. Gullies and pedestaling are evidence of ongoing erosion.

The most abundant browse species is winterfat. Density has remained stable at about 7,600 plants/acre. In 1997, 31% of the population was considered young. Only 1% were classified as young in 2004. A high amount of seedlings were found in both 1997 and 2004. Six percent of the population were classified as decadent in 2004. Only light to moderate use was observed. Winterfat cover increased from about 3% in 1997 to almost 4% in 2004. Density of budsage dropped 89% to only 240 plants/acre in 2004 and Gardner saltbush density in was nearly half of what it was in 1997.

The herbaceous understory is sparse and has declined since 1997. Sum of nested frequency for Sandberg bluegrass, bottlebrush squirreltail, and sand dropseed was significantly lower in 2004. Only two perennial grasses were sampled in 2004 and cover dropped from a little over 1% in 1997 to only about 0.1% in 2004. Halogeton is the most dominant forb. It increased significantly from 1997 and makes up 49% of the total vegetation cover. Annual forbs made up 31% of the total vegetation cover in 1997 and this increased to 63% in 2004.

2004 TREND ASSESSMENT

Trend for soil is stable but very poor condition. The slope is not steep, but erosion is classified as moderate. Relative percent bare ground is very high and there is little vegetation to hold soil. The trend for browse is slightly down. The most abundant species, winterfat, is stable. Recruitment is low, but seedlings are abundant. Decadence is very low at 6%. Density and cover for both budsage and Gardner saltbush has declined since 1997. The herbaceous understory is down and wasn't in good condition in 1997. Perennial grasses declined to nearly nothing with only two species being sampled in 2004. Forbs are dominated by halogeton, which makes up 71% of the herbaceous cover and 49% of the total vegetation cover. The Desirable Components Index (see methods) rating was fair in 1997 as winterfat had many young plants and decadence was low. The rating dropped to poor in 2004 as there were very few young shrubs encountered. This is not an important winter range for wildlife.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down (1)
1997 winter range condition (DC Index) - 38 (fair) desert shrub type
2004 winter range condition (DC Index) - 17 (poor) desert shrub type

HERBACEOUS TRENDS --
Management unit 16R, Study no: 2

Type	Species	Nested Frequency '97	Nested Frequency '04	Average Cover % '97	Average Cover % '04
G	Agropyron cristatum	3	-	.03	-
G	Bromus tectorum (a)	$_{b}$26	$_{a}$-	.06	-
G	Hilaria jamesii	-	6	-	.06
G	Oryzopsis hymenoides	25	19	.22	.04
G	Poa secunda	$_{b}$84	$_{a}$-	.88	-
G	Sitanion hystrix	$_{b}$20	$_{a}$-	.13	-
G	Sporobolus cryptandrus	$_{b}$16	$_{a}$-	.07	-
Total for Annual Grasses		26	0	0.06	0
Total for Perennial Grasses		148	25	1.34	0.10
Total for Grasses		174	25	1.40	0.10
F	Chorispora tenella (a)	$_{a}$-	$_{b}$53	-	.48
F	Cymopterus spp.	-	8	-	.01
F	Eriogonum inflatum	2	-	.00	-
F	Halogeton glomeratus (a)	$_{a}$88	$_{b}$404	.52	7.13
F	Lappula occidentalis (a)	$_{a}$67	$_{b}$115	.12	1.26
F	Lactuca serriola	1	-	.00	-
F	Oenothera caespitosa	-	7	-	.04
F	Plantago patagonica (a)	$_{b}$385	$_{a}$26	2.27	.18
F	Ranunculus testiculatus (a)	$_{a}$-	$_{b}$8	-	.05
F	Salsola iberica (a)	43	44	.11	.17
F	Sphaeralcea coccinea	$_{a}$12	$_{b}$27	.02	.55
Total for Annual Forbs		583	650	3.03	9.28
Total for Perennial Forbs		15	42	0.03	0.61
Total for Forbs		598	692	3.07	9.90

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

BROWSE TRENDS --
Management unit 16R, Study no: 2

Type	Species	Strip Frequency '97	Strip Frequency '04	Average Cover % '97	Average Cover % '04
B	Artemisia frigida	5	0	.03	-
B	Artemisia spinescens	41	7	.68	.00
B	Atriplex confertifolia	1	0	-	-
B	Atriplex gardneri	73	56	1.77	.91
B	Ceratoides lanata	74	66	2.68	3.74
B	Cercocarpus ledifolius	0	1	-	-
B	Gutierrezia sarothrae	8	1	.03	-
B	Opuntia spp.	4	6	-	-
Total for Browse		206	137	5.21	4.66

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 2

Species	Percent Cover '04
Atriplex gardneri	.90
Ceratoides lanata	3.46
Opuntia spp.	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16R, Study no: 2

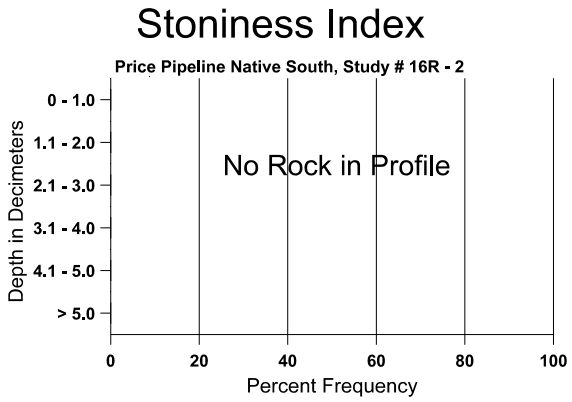
Species	Average leader growth (in) '04
Ceratoides lanata	3.7

BASIC COVER --
Management unit 16R, Study no: 2

Cover Type	Average Cover % '97	Average Cover % '04
Vegetation	10.61	15.95
Rock	0	.03
Pavement	.08	.17
Litter	5.93	6.80
Cryptogams	1.51	.58
Bare Ground	71.30	82.50

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 2, Study Name: Price Pipeline Native South

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.1	62.7 (10.8)	7.8	30.7	42.7	26.6	1.0	9.2	198.4	1.7



PELLET GROUP DATA --
Management unit 16R, Study no: 2

Type	Quadrat Frequency '97	Quadrat Frequency '04	Days use per acre (ha) '04
Sheep	4	10	-
Rabbit	5	3	-
Grouse	-	-	-
Elk	9	2	7 (18)
Deer	3	6	-
Cattle	7	8	12 (30)

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
97	**120**	-	20	100	-	-	0	0	-	-	0	13/11
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia spinescens												
97	**2120**	-	420	1700	-	60	60	8	0	-	0	6/12
04	**240**	-	-	160	80	340	8	42	33	17	25	6/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex confertifolia												
97	**40**	-	-	40	-	20	0	0	-	-	0	13/26
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Atriplex gardneri												
97	**4020**	-	720	3180	120	360	.49	0	3	2	2	3/11
04	**2400**	20	120	2080	200	300	28	18	8	4	5	4/7
Ceratoides lanata												
97	**7660**	1620	2340	5300	20	-	40	9	0	.26	.26	5/11
04	**7600**	1500	60	7120	420	6720	32	7	6	3	3	7/9
Cercocarpus ledifolius												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**140**	-	-	140	-	100	0	0	-	-	0	-/-
Gutierrezia sarothrae												
97	**280**	-	-	280	-	-	0	0	-	-	0	9/12
04	**40**	-	-	40	-	780	0	0	-	-	0	6/6
Opuntia spp.												
97	**80**	-	-	80	-	-	0	0	0	-	0	5/14
04	**120**	-	-	80	40	40	0	0	33	17	17	5/11
Tetradymia spinosa												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	18/33

Trend Study 16R-3-04

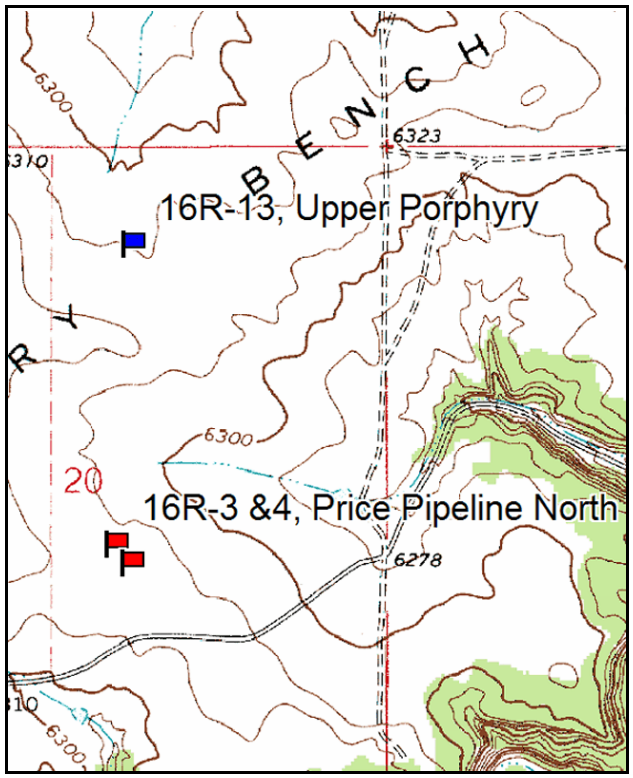
Study site name: Price Pipeline Native North . Vegetation type: Wyoming Big Sagebrush .

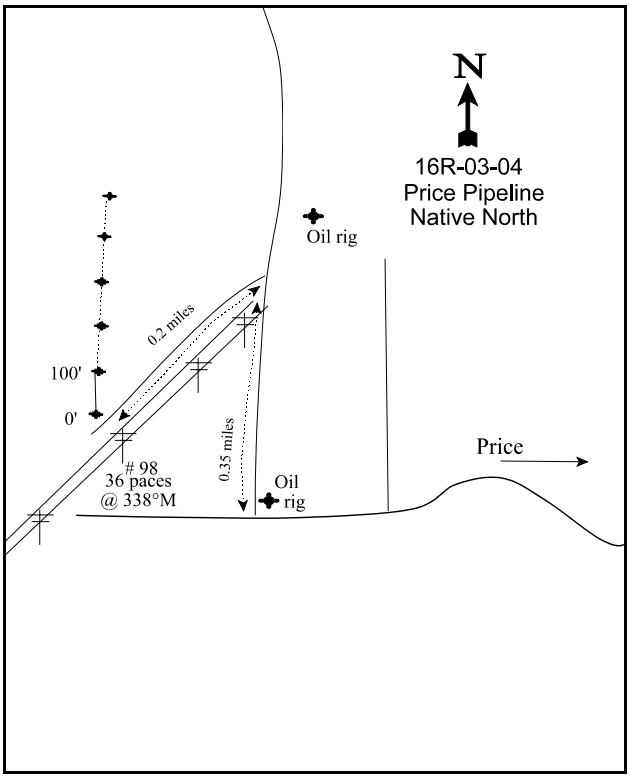
Compass bearing: frequency baseline 6 degrees magnetic.

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

LOCATION DESCRIPTION

Take Westwood Blvd (1550 W) northwest out of Price 2.35 miles to a major intersection. Turn left onto Gordon Creek Road and travel 0.45 miles to a fork. Bear left away from Gordon Creek, going 0.1 miles to a gravel pit. Continue 5.6 miles on the Pinnacle Peak Road to a 3-way fork at the top of the bench with an oil rig near the intersection. Drive 0.35 miles north to a small road that goes under the powerlines. Turn left (southwest) and travel 0.2 miles to power pole number 98. From this power pole walk 36 paces at 338 degrees magnetic to the 0-foot stake. The study is marked by green, steel fenceposts approximately 12-18 inches in height.





Map name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 9E , Section 20

GPS: NAD 27, UTM 12S 4382223 N, 505506 E

DISCUSSION

Price Pipeline North Native - Trend Study No. 16R-3

This trend study is found on Porphyry Bench west of Price. This study was established in 1997 to compare the undisturbed community to the area that was rehabilitated (16R-4) for a natural gas pipeline. These paired studies are found about 1.5 miles west of the regular trend study Porphyry Bench 16B-18, which was established in 1988. The vegetation type on this bench is Wyoming big sagebrush. Elevation is 6,330 feet, with a slope of 6% and aspect to the north. This area is critical winter range for deer. Pellet group transect data in 2004 estimate 90 deer days use/acre (222 ddu/ha). Cattle use was 14 cow days use/ac (34 cdu/ha).

Soil texture is classified as sandy loam. Rocks are very rare throughout the profile. This soil is susceptible to erosion because there is very little protective cover. Relative percent bare ground cover was 51% in 1997 and increased to 57% in 2004. Cryptogam cover decreased from 11 to 2%. An erosion class index in 2004 rated erosion on this site as stable, but due to high bare ground this site could be susceptible to erosion.

Wyoming big sagebrush is the key species here. Drought conditions from 2001-2003 have had harmful effects on this population. This has been documented with many trend studies in the area including the nearby Porphyry Bench. Annual precipitation has only been 48-60% of average during this time and spring conditions (April-June) have been very dry and were only 13% of normal in 2002. Sagebrush density on this site dropped from 3,720 plants/acre to 2,020 plants/acre in 2004. Decadency was 48% in 1997 and increased to 97% of the population in 2004. Sixty eight percent of the population were classified as dying. Only a few branches had live foliage on them. No young were found in 2004, but 4,320 seedlings/acre were sampled. Use was considered heavy in 2004 with 82% showing heavy use. Use was mostly moderate in 1997. Cover decreased from 9% to 4%. Sagebrush die-off at this site was not quite as severe as it was at other sites in the area. Broom snakeweed density declined from 2,100 plants/acre to only 40 plants/acre in 2004.

The seeded grass crested wheatgrass indicates that this site was seeded in the past. In 1997 it was the most dominant grass species. It was found in 82% of the quadrats and had 6% cover. This dropped significantly to 14% quadrat frequency and only 1% cover in 2004. Bottlebrush squirreltail also decreased significantly, while western wheatgrass increased significantly from less than 1% cover to 9% cover in 2004. Reduction in competition with sagebrush and crested wheatgrass may have allowed this species to increase. Abundance of perennial grasses was almost two times lower in 2004. Forbs were diverse, but mostly annual species. Ten annual species were encountered in 2004. Scarlet globemallow was the only perennial species found in any abundance. It increased significantly from 1997.

2004 TREND ASSESSEMENT

Soil trend is slightly down. Bare ground has increased and cryptogam cover has decreased. No signs of erosion were found in 2004. Browse trend is down. Drought and heavy use has had harmful effects on sagebrush. Wyoming big sagebrush density decreased and 97% of the population was considered decadent. Seedlings were very abundant, which is encouraging for the future. Herbaceous understory trend is down slightly. Crested wheatgrass declined, but is being replaced by western wheatgrass. Scarlet globemallow increased, but many annual forbs are found on this site. The Desirable Components Index (see methods) rating was fair in 1997, but dropped to poor in 2004 with the sagebrush die off and high decadence.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down slightly (2)
1997 winter range condition (DC Index) - 29 (fair) Wyoming big sagebrush type
2004 winter range condition (DC Index) - 17 (poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16R, Study no: 3

Type	Species	Nested Frequency '97	Nested Frequency '04	Average Cover % '97	Average Cover % '04
G	Agropyron cristatum	$_{b}$285	$_{a}$36	5.97	.96
G	Agropyron smithii	$_{a}$106	$_{b}$208	.37	9.39
G	Bromus tectorum (a)	13	8	.04	.01
G	Oryzopsis hymenoides	$_{a}$14	$_{b}$35	.12	.12
G	Sitanion hystrix	$_{b}$54	$_{a}$5	.51	.06
G	Sporobolus cryptandrus	-	5	-	.03
G	Stipa comata	5	1	.01	.03
G	Vulpia octoflora (a)	$_{a}$-	$_{b}$16	-	.03
Total for Annual Grasses		13	24	0.03	0.04
Total for Perennial Grasses		464	290	6.98	10.60
Total for Grasses		477	314	7.02	10.64
F	Astragalus convallarius	3	2	.03	.16
F	Chenopodium fremontii (a)	-	5	-	.04
F	Chenopodium leptophyllum(a)	$_{a}$-	$_{b}$42	-	.20
F	Descurainia pinnata (a)	$_{a}$-	$_{b}$22	-	.40
F	Draba spp. (a)	-	1	-	.00
F	Eriogonum cernuum (a)	-	3	-	.00
F	Erodium cicutarium (a)	-	3	-	.00
F	Gayophytum ramosissimum(a)	-	2	-	.00
F	Gilia spp. (a)	-	3	-	.01
F	Halogeton glomeratus (a)	-	2	-	.01
F	Lappula occidentalis (a)	$_{a}$3	$_{b}$11	.00	.03
F	Machaeranthera spp	-	1	-	.00
F	Sphaeralcea coccinea	$_{a}$23	$_{b}$39	.10	1.47
Total for Annual Forbs		3	94	0.00	0.70
Total for Perennial Forbs		26	42	0.13	1.64
Total for Forbs		29	136	0.13	2.35

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

BROWSE TRENDS --
Management unit 16R, Study no: 3

Type	Species	Strip Frequency '97	Strip Frequency '04	Average Cover % '97	Average Cover % '04
B	Amelanchier utahensis	-	-	-	.15
B	Artemisia tridentata wyomingensis	86	55	9.04	3.85
B	Chrysothamnus viscidiflorus viscidiflorus	4	12	.03	.21
B	Gutierrezia sarothrae	48	2	.76	.00
B	Opuntia spp.	1	4	-	.03
Total for Browse		139	73	9.84	4.26

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 3

Species	Percent Cover '04
Artemisia tridentata wyomingensis	1.71
Chrysothamnus viscidiflorus viscidiflorus	.48

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16R, Study no: 3

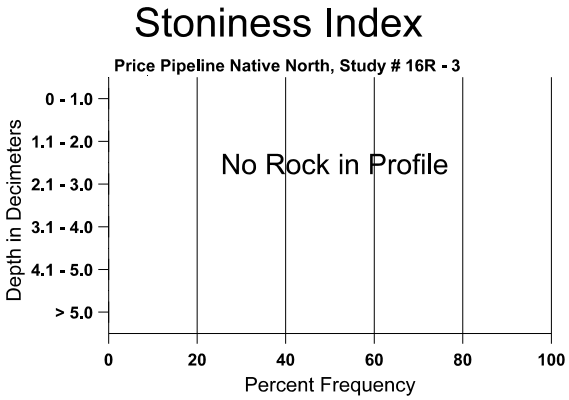
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.9

BASIC COVER --
Management unit 16R, Study no: 3

Cover Type	Average Cover % '97	Average Cover % '04
Vegetation	16.18	18.00
Rock	.14	.22
Pavement	.18	.03
Litter	21.45	26.72
Cryptogams	10.79	2.07
Bare Ground	49.81	61.62

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 3, Study Name: Price Pipeline Native North

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.6	59.0 (17.7)	7.9	47.6	29.8	22.6	1.2	13.7	86.4	0.5



PELLET GROUP DATA --
Management unit 16R, Study no: 3

Type	Quadrat Frequency '97	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	17	30	-
Horse	1	-	-
Elk	1	1	-
Deer	24	70	90 (222)
Cattle	3	7	14 (34)

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
97	**3720**	20	80	1840	1800	1640	64	12	48	34	35	17/29
04	**2020**	4320	-	60	1960	3440	12	82	97	68	68	24/32
Chrysothamnus viscidiflorus viscidiflorus												
97	**80**	-	20	60	-	-	0	25	-	-	0	5/6
04	**360**	1120	60	300	-	20	0	0	-	-	0	7/11
Gutierrezia sarothrae												
97	**2100**	1160	200	1900	-	-	0	0	-	-	0	10/11
04	**40**	20	-	40	-	-	0	0	-	-	0	6/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	4/5
Opuntia spp.												
97	**20**	-	-	20	-	-	0	0	0	-	0	5/13
04	**120**	-	60	40	20	-	0	0	17	17	17	4/8

Trend Study 16R-4-04

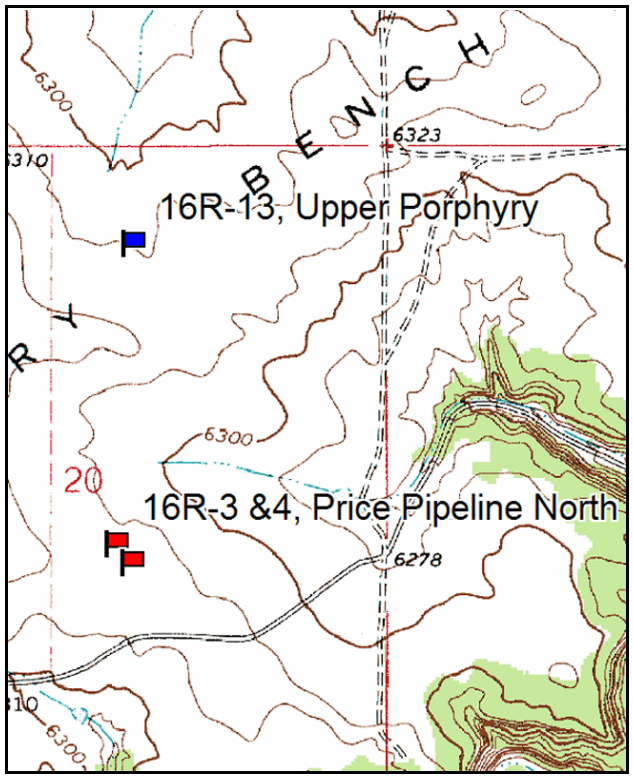
Study site name: Price Pipeline North . Vegetation type: Grass .

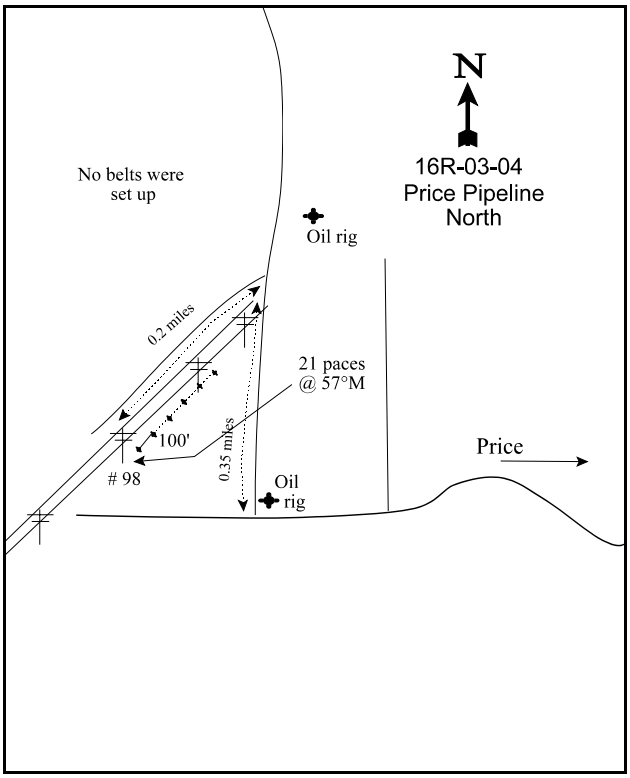
Compass bearing: frequency baseline 15 degrees magnetic.

There are no frequency belts on this site. The quadrats are placed on the baseline every five feet, alternating left and right sides. The quadrats point down the line.

LOCATION DESCRIPTION

Take Westwood Blvd (1550 W) northwest out of Price 2.35 miles to a major intersection. Turn left onto Gordon Creek Road and travel 0.45 miles to a fork. Bear left away from Gordon Creek, going 0.1 miles to a gravel pit. Continue 5.6 miles on the Pinnacle Peak Road to a 3-way fork at the top of the bench with an oil rig near the intersection. Drive 0.35 miles north to a small road that goes under the powerlines. Turn left (southwest) and travel 0.2 miles to power pole number 98. From this pole walk 21 paces at 57 degrees magnetic to the 0-foot stake. The study is marked by 12-18 inch high, green, steel fenceposts.





Map name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 9E , Section 20

GPS: NAD 27, UTM 12S 4382177 N, 505544 E

DISCUSSION

Price Pipeline North - Trend Study No. 16R-4

This trend study monitors rehabilitation of a natural gas pipeline on Porphyry Bench west of Price. A rangeland drill was used to seed the pipeline after the disturbance. This trend study was established in 1997 along with 16R-3 to compare the pipeline to the undisturbed community. Elevation is 6,330 feet, with a slope of 6% and aspect to the north. This area is critical winter range for deer. Pellet group data was much less abundant for deer on the pipeline (15 ddu/acre, 38 ddu/ha) than in the native sagebrush (90 ddu/ac, 222 ddu/ha). Livestock use was higher on the pipeline since grass cover was higher. On the pipeline there was 20 cow days use/acre (50 cdu/ha), compared to 14 cow days use/ac (34 cdu/ha) in the sagebrush.

Effective rooting depth was almost 14 inches. Soil texture is classified as sandy loam. Rocks are very rare throughout the profile. This soil is susceptible to erosion because there is very little protective cover. When cover is used on a relative scale, bare ground decreased from 80% in 1997 to 64% in 2004. Vegetation cover increased from 6% to 24%, most of which is grass cover which is good at holding soil. An erosion class index in 2004 rated erosion on this site as stable.

No significant browse were found on the pipeline site. Sagebrush has not recovered from the disturbance. A few fourwing saltbush seedlings were seen. They were probably seeded from the seed mix.

No data was available on what was seeded. Crested wheatgrass and Russian wildrye were encountered that were likely seeded with the rangeland drill on the pipeline. Crested wheatgrass has established very successfully. In 1997, crested wheatgrass was present in 98% of the quadrats. This declined significantly to 56% in 2004. Cover was 2% in 1997, but as the plants matured they increased to 8% cover in 2004. Loss of abundance may be due to drought and self thinning as the population matured. Russian wildrye was only found in 1% of the quadrats. Western wheatgrass is a more drought tolerant species and has increased significantly during the drought period. It is found in large patches as it is a rhizomatous species. It had 12% cover in 2004. Alfalfa was seeded onto the pipeline. Initially, it was very successful and was found in 97% of the quadrats with 3% cover. In 2004, it declined significantly probably due to drought and was found in only 8% of the quadrats. Cover of alfalfa was only 0.6%. Scarlet globemallow has increased significantly and was robust with 3% cover in 2004. Perennial forbs were nearly five times less abundant in 2004. Five annual forbs were sampled in 2004, while none were sampled in 1997.

2004 TREND ASSESSEMENT

Soil trend is slightly up. Bare ground has decreased with the increase in perennial grass cover. No signs of erosion were found in 2004. Herbaceous understory trend is stable. Crested wheatgrass declined, but is being replaced by western wheatgrass. Perennial grass abundance has remained stable and cover is eight times higher. Drought conditions have been detrimental for alfalfa as it was much less abundant. The drought tolerant native, scarlet globemallow increased and cover was much higher. Annual forbs increased on this site. The Desirable Components Index (see methods) rating was poor in 1997, but increased to fair in 2004 with increased grass cover. The lack of browse cover after treatment is not good winter range.

TREND ASSESSMENT
soil - slightly up (4)
browse - n/a
herbaceous understory - stable (3)
1997 winter range condition (DC Index) - 11 (poor) Wyoming big sagebrush type
2004 winter range condition (DC Index) - 38 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16R, Study no: 4

Type	Species	Nested Frequency '97	Nested Frequency '04	Average Cover % '97	Average Cover % '04
G	Agropyron cristatum	$_{b}$326	$_{a}$165	2.39	8.34
G	Agropyron smithii	$_{a}$47	$_{b}$182	.12	11.51
G	Agropyron spicatum	-	1	-	.00
G	Bouteloua gracilis	-	3	-	.00
G	Elymus junceus	-	1	-	.15
G	Oryzopsis hymenoides	$_{a}$-	$_{b}$16	-	.03
G	Sitanion hystrix	-	4	-	.06
G	Sporobolus cryptandrus	-	4	-	.02
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		373	376	2.51	20.13
Total for Grasses		373	376	2.51	20.13
F	Chenopodium fremontii (a)	$_{a}$-	$_{b}$13	-	.10
F	Chenopodium leptophyllum(a)	$_{a}$-	$_{b}$32	-	.63
F	Descurainia pinnata (a)	$_{a}$-	$_{b}$16	-	.12
F	Gilia spp. (a)	$_{a}$-	$_{b}$27	-	.13
F	Haplopappus gracilis	-	1	-	.00
F	Lappula occidentalis (a)	-	2	-	.04
F	Lactuca serriola	-	3	-	.00
F	Lygodesmia spp.	-	3	-	.03
F	Medicago sativa	$_{b}$324	$_{a}$14	3.01	.64
F	Sphaeralcea coccinea	$_{a}$26	$_{b}$55	.17	3.05
F	Unknown forb-annual (a)	4	3	.04	.00
Total for Annual Forbs		4	93	0.03	1.03
Total for Perennial Forbs		350	76	3.19	3.73
Total for Forbs		354	169	3.23	4.77

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

BROWSE TRENDS --
Management unit 16R, Study no: 4

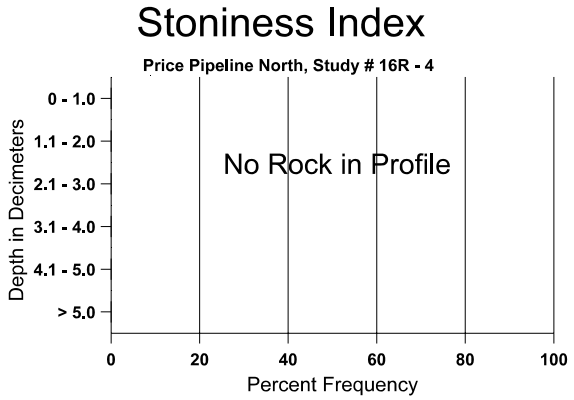
Type	Species	Strip Frequency '97	Strip Frequency '04	Average Cover % '97	Average Cover % '04
B	Artemisia tridentata wyomingensis	0	0	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	-	.03
Total for Browse		0	0	0	0.04

BASIC COVER --
Management unit 16R, Study no: 4

Cover Type	Average Cover % '97	Average Cover % '04
Vegetation	5.14	26.03
Rock	1.97	.68
Pavement	3.40	.60
Litter	7.65	11.53
Cryptogams	.04	0
Bare Ground	71.12	70.51

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 4, Study Name: Price Pipeline North

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.6	59.3 (15.5)	7.9	47.6	29.8	22.6	1.2	13.7	86.4	0.5



PELLET GROUP DATA --
Management unit 16R, Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'04	'04
Rabbit	8	59	-
Elk	-	1	-
Deer	11	27	15 (38)
Cattle	3	6	20 (50)

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	20	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	1400	-	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	20	0	0	-	-	0	-/-

Trend Study 16R-6-04

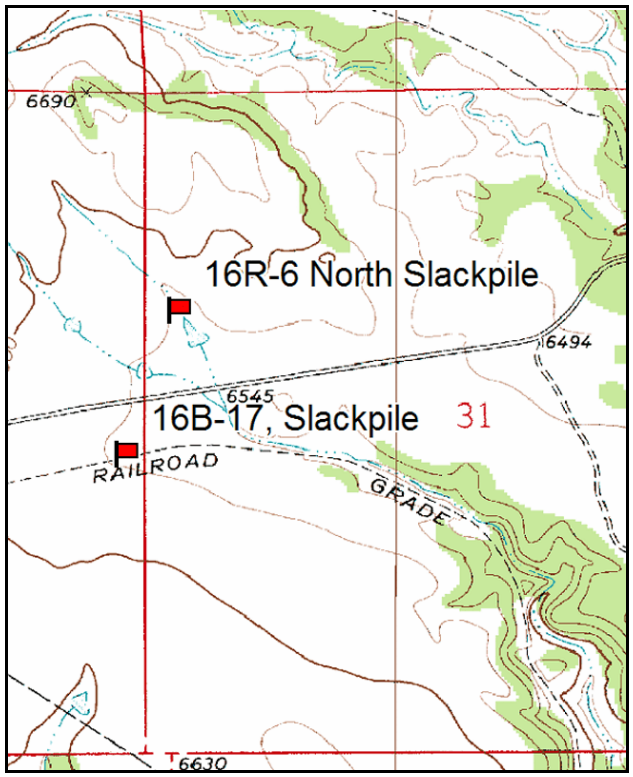
Study site name: North Slackpile . Vegetation type: Wyoming Big Sagebrush.

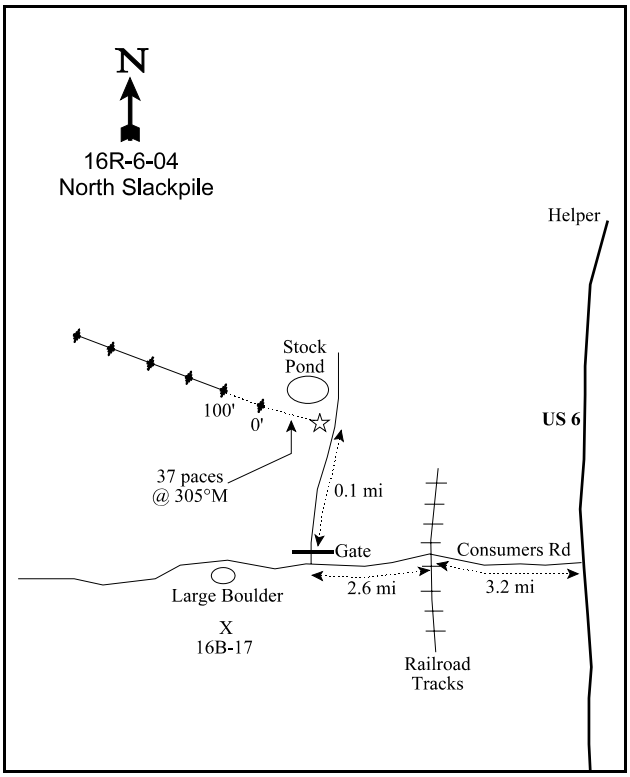
Compass bearing: frequency baseline 283 degrees magnetic.

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

LOCATION DESCRIPTION

On US 6 south of Helper, turn west on to Consumer Road. Proceed west 3.2 miles to railroad tracks. Cross the tracks and continue 2.6 miles to a road on the right with a gate. Go through the gate and travel 0.1 miles to a witness post before a stock pond on the left. Walk 37 paces at 305°M to the start of the frequency baseline. The first stake is marked with a browse tag #453.





Map name: Standardville

Diagrammatic Sketch

Township 13S , Range 9E , Section 31

GPS: NAD 27, UTM 12S 4389146 N, 503019 E

DISCUSSION

North Slackpile - Trend Study No. 16R-6

The North Slackpile trend study is located about a quarter mile north of the Slackpile (16B-17) trend study. The study was established in 1998 and monitors a Wyoming big sagebrush community on critical deer winter range. This area is managed by the Utah Division of Wildlife Resources and is usually grazed every other year. The pasture to the south, across the road, is grazed the other year. The regular trend study Slackpile 16B-17 is in the south pasture. The elevation is 6,600 with a slope of 4-5% and a southeasterly aspect. A stockpond is located about 150 feet from the 0-foot post. Pellet group transect data in 1998 estimated 86 deer days use/acre (213 ddu/ha) and 7 elk days use/acre (17 edu/ha). Livestock use was estimated at 17 cow days use/acre (41 cdu/ha). In 2004, deer, elk, and livestock use was lower: 42 deer days use/acre (104 ddu/ha), 2 elk days use/acre (5 edu/ha), and 3 cow days use/acre (17 cdu/ha).

Soil texture is a loam with a slightly acidic pH of 6.4. Phosphorus (9.7 ppm) is lower than the 10 ppm that may limit normal plant development and growth. The soil is moderately deep with an estimated effective rooting depth of 15 inches. There are very few rocks or pavement on the surface or throughout the profile. There is a considerable amount of bare ground on the site. Vegetation cover declined from 34% in 1998 to 19% in 2004. Cryptogam cover also decreased from 6% to 2%. Signs of active gully erosion were noted in 1998. An erosion class index in 2004 rated erosion on this site as slight, due to signs of rills, gullies, and soil movement.

This area has experienced severe drought conditions from 2001-2003. Annual precipitation has only been 48-60% of average during this time. Spring conditions (April-June) have been very dry and were only 13% of normal in 2002. Browse cover was four times lower in 2004 than it was in 1998. The key browse species is Wyoming big sagebrush. Due to this drought, sagebrush density was about three times lower in 2004 (1,180 plants/acre) than it was in 1998 (3,180 plants/acre). Decadence increased from 19% to 80%. Sagebrush cover decreased from 14% in 1998 to 3% in 2004. Utilization was moderately-heavy in both 1998 and 2004. In 1998 recruitment was good with 26% of the population classified as young. Only 6% were young in 2004, although seedlings were very abundant in 2004. Drought also had a big effect on stickyleaf low rabbitbrush and broom snakeweed. Rabbitbrush density was three times lower in 2004, while snakeweed density was nearly ten times lower.

The warm season grass Blue grama is the most dominant understory species, which may be an indication of heavy spring grazing on this site over a period of many years. Blue grama cover remained constant between 1998 and 2004 at 10%, but the sum of nested frequency significantly declined. This indicates that it is less abundant but more robust. Western wheatgrass also declined significantly. In 1998, it was found in 51% of quadrats, but was only found in 3% in 2004. Bluebunch wheatgrass and needle-and-thread increased significantly in abundance but are still found in small numbers. Scarlet globemallow was much more robust in 2004 as cover increased by about 2%, but abundance was equal to 1998. Seven annual forb species were sampled in 2004 that weren't sampled in 1998.

2004 Comparison to Slackpile 16B-17

The goal of the spring grazing on these pastures is to favor browse which is important for wintering deer. Both pastures experienced the sagebrush die off that has effected the area. The North Slackpile study in the north pasture has a slightly higher density and cover of sagebrush than Slackpile (16B-17) in the south pasture. Sagebrush cover for North Slackpile was 3.0%, while it was only 1.5% at Slackpile. Slackpile had less grass also. Sum of nested frequency for all perennial grasses was lower for Slackpile (228) than for North Slackpile (341). Cover of perennial grasses was about 12% for the north compared to only 4% for the south, which may be low because of grazing when the site was monitored. Slackpile actually had more cool season grasses

(nested freq of cool season was 198 compared to 101 for North Slackpile) than the north pasture did. Grass for North Slackpile was mostly made up of the warm season blue grama, which made up 87% of the total grass cover.

2004 TREND ASSESSMENT

Trend for soil would be considered stable, for there was not enough increase in bare soil to warrant a downward change in trend. The decline of shrub cover was mediated by increases in litter cover. Dry conditions have also reduced cryptogamic cover, which helps hold soil in place. Browse trend is down due to the dramatic decline of the key species Wyoming big sagebrush. Density in 2004 is three times lower than 1998 and decadency of the remaining population was very high at 80%. Stickyleaf low rabbitbrush and broom snakeweed density also declined. Herbaceous understory trend is slightly down. Nested frequency for perennial grasses is down, but cover for grasses actually increased. Sum of nested frequency for perennial forbs increased as did cover. Annual forbs increased as well. The loss of perennial grasses makes the understory trend slightly down. The Desirable Components Index (see methods) rating was excellent in 1998, but dropped to fair in 2004. Sagebrush die off and high decadence have brought this score down.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - down slightly (2)
1998 winter range condition (DC Index) - 69 (excellent) Wyoming big sagebrush type
2004 winter range condition (DC Index) - 28 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16R, Study no: 6

Type	Species	Nested Frequency '98	Nested Frequency '04	Average Cover % '98	Average Cover % '04
G	Agropyron smithii	$_{b}$148	$_{a}$9	1.34	.16
G	Agropyron spicatum	$_{a}$5	$_{b}$22	.03	.13
G	Bouteloua gracilis	$_{b}$301	$_{a}$240	10.07	10.48
G	Elymus salina	-	2	-	.15
G	Oryzopsis hymenoides	5	11	.03	.07
G	Sitanion hystrix	37	28	.31	.58
G	Stipa comata	$_{a}$10	$_{b}$29	.15	.49
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		506	341	11.94	12.09
Total for Grasses		506	341	11.94	12.09
F	Arabis spp.	-	-	.00	-
F	Calochortus nuttallii	$_{a}$-	$_{b}$33	-	.09
F	Chenopodium fremontii (a)	-	-	-	.03
F	Chenopodium leptophyllum(a)	$_{a}$-	$_{b}$67	-	.42
F	Descurainia pinnata (a)	-	9	-	.07
F	Gayophytum ramosissimum(a)	-	5	-	.01

Type	Species	Nested Frequency		Average Cover %	
		'98	'04	'98	'04
F	Lappula occidentalis (a)	-	3	-	.01
F	Lomatium spp.	-	2	-	.00
F	Lygodesmia grandiflora	-	4	-	.03
F	Phlox longifolia	40	48	.09	.20
F	Plantago patagonica (a)	a-	b12	-	.06
F	Ranunculus testiculatus (a)	a-	b19	-	.03
F	Schoencrambe linifolia	-	2	-	.01
F	Sphaeralcea coccinea	76	73	.54	2.54
F	Tragopogon dubius	-	1	-	.00
F	Trifolium spp.	A-	b19	-	.10
Total for Annual Forbs		0	115	0	0.64
Total for Perennial Forbs		116	182	0.63	3.00
Total for Forbs		116	297	0.63	3.64

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

BROWSE TRENDS --
Management unit 16R, Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'98	'04	'98	'04
B	Artemisia tridentata wyomingensis	83	40	13.80	3.04
B	Atriplex canescens	1	2	.03	.63
B	Chrysothamnus nauseosus	2	0	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	38	13	1.07	.06
B	Gutierrezia sarothrae	86	39	3.89	.66
B	Opuntia spp.	9	10	.36	.30
B	Pediocactus simpsonii	0	3	-	.03
B	Ribes spp.	1	0	-	-
B	Tetradymia canescens	0	1	-	-
Total for Browse		220	108	19.17	4.73

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 6

Species	Percent Cover '04
Artemisia tridentata wyomingensis	2.08
Atriplex canescens	.66
Chrysothamnus viscidiflorus viscidiflorus	.05
Gutierrezia sarothrae	.53
Pediocactus simpsonii	.05
Tetradymia canescens	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16R, Study no: 6

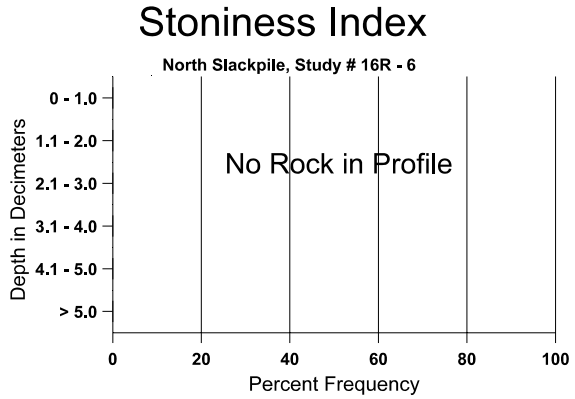
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	3.2
Atriplex canescens	4.2

BASIC COVER --
Management unit 16R, Study no: 6

Cover Type	Average Cover % '98	'04
Vegetation	34.43	19.45
Rock	.39	.41
Pavement	.39	.84
Litter	13.63	23.67
Cryptogams	5.50	2.01
Bare Ground	50.01	51.99

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 6, Study Name: North Slackpile

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.6	58.7 (16.7)	6.4	40.7	34.7	24.6	1.9	9.7	83.2	1.0



PELLET GROUP DATA --
Management unit 16R, Study no: 6

Type	Quadrat Frequency '98	Quadrat Frequency '04	Days use per acre (ha) '98	Days use per acre (ha) '04
Rabbit	15	22	-	-
Elk	3	3	7 (17)	2 (5)
Deer	41	35	86 (213)	42 (104)
Cattle	4	1	17 (41)	3 (7)
Antelope	1	-	-	-

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
98	**3180**	280	820	1760	600	900	48	19	19	18	19	27/41
04	**1080**	820	60	160	860	2360	33	35	80	65	65	19/25
Atriplex canescens												
98	**20**	-	-	20	-	-	0	100	0	-	0	27/45
04	**40**	-	-	-	40	-	100	0	100	-	0	24/37
Atriplex confertifolia												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	20/24
Chrysothamnus nauseosus												
98	**60**	-	40	20	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
98	**2360**	-	480	1860	20	-	36	52	1	.84	.84	7/12
04	**720**	620	80	580	60	-	0	0	8	3	3	6/7
Gutierrezia sarothrae												
98	**15440**	-	380	15000	60	60	0	0	0	.25	.25	10/8
04	**1600**	300	160	1400	40	20	8	4	3	1	1	6/6
Opuntia spp.												
98	**220**	-	40	160	20	-	0	0	9	9	9	3/5
04	**240**	-	40	200	-	-	0	0	0	-	0	4/10
Pediocactus simpsonii												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**60**	-	-	60	-	-	0	0	-	-	0	1/2
Ribes spp.												
98	**220**	-	-	220	-	-	0	0	-	9	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Tetradymia canescens												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	100	0	-	-	0	10/10

Trend Study 16R-10-04

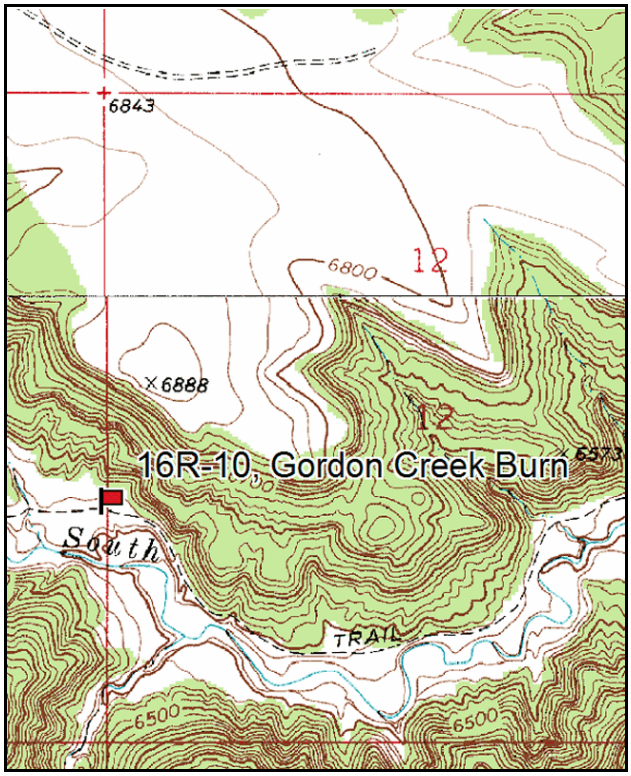
Study site name: Gordon Creek Burn . Vegetation type: Prostrate Kochia .

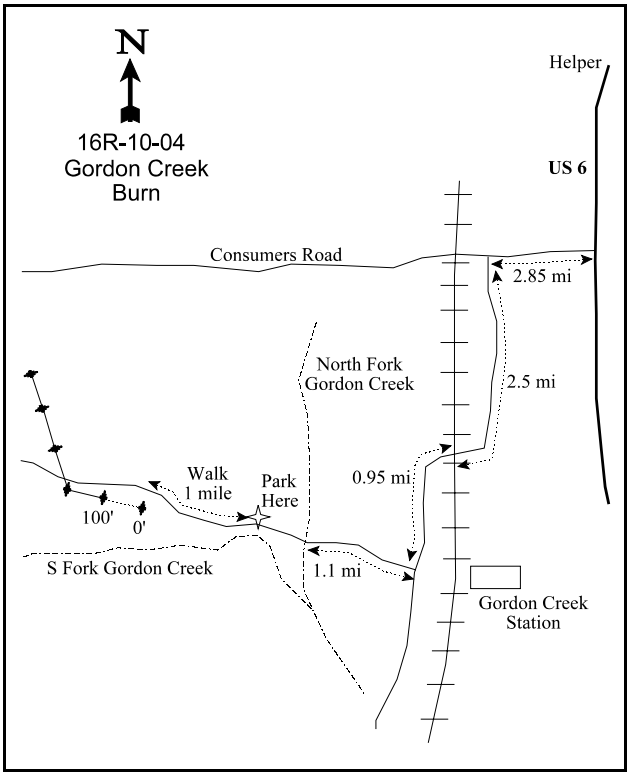
Compass bearing: frequency baseline westerly direction .

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

LOCATION DESCRIPTION

Travel west on Consumers Road (off of US 6 south of Helper) 2.85 miles and turn left. Continue 2.5 miles and cross the railroad tracks. Continue 0.95 miles, staying left, to the Gordon Creek Station. Turn right off the main road and proceed 1.1 miles, crossing the North Fork of Gordon Creek. Continue on this road over the next ridge to the South Fork of Gordon Creek. Park where the road is washed out. From here walk up the canyon about 1 mile to a flat that opens up on both sides of the road. The 0-foot baseline stake is located on the south side of the road. The baseline doglegs to the north after 200 feet. The 0-foot stake is marked by browse tag #187.





Map name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 8E , Section 11

GPS: NAD 27, UTM 12S 4385391 N, 501413 E

DISCUSSION

Gordon Creek Burn - Trend Study No. 16R-10

The Gordon Creek Burn study is located west of Price on the South Fork of Gordon Creek. The site was established to monitor a 160-acre prescribed burn/seeding project that was conducted as part of a cooperative effort by the BLM, Division of Wildlife Resources, and the River Gas Corporation. The site once supported an overly mature stand of basin big sagebrush. In March of 1999, the site was burned using a helitorch, aerially seeded, and then lightly harrowed using ATVs to cover the seed. The transect was placed on an elevated flood plain above Gordon Creek to monitor the recovery of the vegetative community following the treatment. The site lies at an elevation of 6,300 feet on nearly level terrain. A pellet group transect was read along the vegetation baseline each time the site was monitored. In 1999, deer use was low at an estimated 4 deer days use/acre (10 ddu/ha), with no elk or cattle sign present. In 2001, deer and cattle use remained low at an estimated 5 deer days use/acre (12 ddu/ha), and 9 cow days use/acre (23 cdu/ha). However, elk use was heavy in 2001 at an estimated 139 elk days use/acre (344 edu/ha). In 2004, elk use was estimated at 130 elk days use/acre (321 edu/ha). Deer use was only 1 deer days use/acre (2 ddu/ha) and cattle use was only 2 cow days use/acre (5 cdu/ha). This particular area appears to be attracting elk due to the abundance of prostrate kochia.

Soils on the site are loamy in texture and very deep (>18 inches). Very little rock or pavement was sampled on the surface or within the profile. Soil reactivity is slightly alkaline (7.5 pH). The soils are low in phosphorus at 6.6 ppm, where values lower than 10 ppm can be limiting to normal plant growth and development. Several shallow gullies were forming on the site in 1999. In 2001 and 2004, the vegetative community was better established and erosion was minimal. An erosion condition class assessment showed soils to be stable in both 2001 and 2004.

Prostrate kochia was seeded at a rate of 1 lb of PLS/acre as part of the seed mix and has become the dominant species. Density was estimated at 14,300 plants/acre in 1999. Density was so high in 2001 and 2004 that density was estimated by counting mature plants within each quadrat rather than strips. Young and seedling plants were so numerous they were too difficult to count. They occupy all interspaces between mature plants. Kochia can remain in this juvenile stage until resources become available to grow to maturity. Density of mature plants was estimated at 22,986 plants/acre in 2001. This doubled to 46,619 plants/acre in 2004. Kochia cover was estimated at 2% in 1999, increased to 28% in 2001, and was estimated at 40% in 2004 using the line intercept method. Kochia plants were all classified as lightly utilized in 1999 and 2001. In 2004, 13% were classified as having moderate use and 16% had heavy use. Estimating utilization on this species is extremely difficult due to their low growth form and abundant annual leader growth and heavy use has little effect on kochia. With the high number of elk pellet groups sampled, it is apparent that kochia is the primary forage for elk.

Other important browse on the site include winterfat, fourwing saltbush, and Wyoming big sagebrush. Fourwing saltbush was seeded as part of the prescribed burn. It had an estimated density of 1,880 plants/acre in 1999, decreased to 1,520 plants/acre in 2001, and decreased again to only 120 plant/acre by 2004. Half of the population was decadent in 2004 and two-thirds showed signs of heavy use. Most of the plants sampled in 1999 and 2001 were young or seedlings, but they never survived to maturity. Wyoming big sagebrush was also seeded and many young plants were counted in 2001, but mortality was 96% between 2001 and 2004.

The herbaceous understory is diverse, but most species are not very abundant. Basin wildrye, hard fescue, intermediate wheatgrass, crested wheatgrass, and Russian wildrye were seeded. Basin and Russian wildrye were the only seeded species found in 2004. Cheatgrass was sampled each year, but it is infrequent and will likely be held in check by the abundance and competition of prostrate kochia. Forbs declined significantly between 2001 and 2004. Alfalfa, which was seeded, established well, but declined significantly to less than

1% cover in 2004. Sum of nested frequency for perennial forbs was nine times lower in 2004 than it was in 2001. Several annual forbs are present, but most were sampled only occasionally.

2001 TREND ASSESSMENT

Trend for soils is slightly up. Vegetation and litter cover have improved since 1999, resulting in less bare soil. Erosion is currently minimal. Trend for browse is up. Prostrate kochia has dramatically increased in density and cover which is good for soil protection as well as increases the palatable forage available to wildlife. A negative aspect to the dynamic expansion of kochia is that future increases in the understory and other desired shrubs may be suppressed. Fourwing saltbush and basin big sagebrush appear to be persisting on the site, but may not increase. Trend for the herbaceous understory is down. Perennial species decreased in sum of nested frequency, while annuals increased. Even with this increase they still only make up 17% of the herbaceous understory cover. The Desirable Components Index (see methods) rating was fair to good in 1999 and increased to good in 2001.

TREND ASSESSMENT
soil - slightly up (4)
browse - up (5)
herbaceous understory - down (1)
1999 winter range condition (DC Index) - 42 (fair to good) Prostrate kochia
2001 winter range condition (DC Index) - 74 (excellent) Prostrate kochia

2004 TREND ASSESSMENT

Trend for soils is stable. Erosion is minimal as vegetation cover is high. Browse trend is up, but lacks diversity as prostate kochia is out competing other species. Prostate kochia cover and density increased in 2004. Juvenile plants are very abundant and waiting for resources to mature. Elk are using forage kochia in high numbers. Herbaceous understory is slightly down. Prostate kochia is flourishing in this environment while the other understory species are not. Alfalfa has declined significantly. Perennial grasses are holding stable, but are sparse. Cheatgrass is being held in check with competition from prostate kochia. The DCI score dropped slightly due to the loss of forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up (5)
herbaceous understory - slightly down (2)
2004 winter range condition (DC Index) - 67 (good to excellent) Prostrate kochia

HERBACEOUS TRENDS --
Management unit 16R, Study no: 10

Type	Species	Nested Frequency			Average Cover %		
		'99	'01	'04	'99	'01	'04
G	Agropyron cristatum	6	-	-	.13	-	-
G	Agropyron intermedium	$_{b}$15	$_{ab}$8	$_{a}$-	.69	.56	-
G	Agropyron smithii	$_{b}$27	$_{ab}$11	$_{a}$5	1.68	.82	.03
G	Bouteloua gracilis	5	6	-	.15	.53	-

Type	Species	Nested Frequency			Average Cover %		
		'99	'01	'04	'99	'01	'04
G	Bromus inermis	4	-	-	.03	-	-
G	Bromus japonicus (a)	2	-	-	.06	-	-
G	Bromus tectorum (a)	$_{a}$36	$_{b}$76	$_{ab}$50	.46	1.03	.88
G	Elymus cinereus	-	-	5	-	-	1.03
G	Elymus junceus	$_{a}$-	$_{b}$9	$_{c}$31	-	.15	2.46
G	Elymus salina	-	-	3	-	-	.06
G	Festuca ovina	-	3	-	-	.03	-
G	Oryzopsis hymenoides	14	4	13	.23	.15	.08
G	Sitanion hystrix	$_{b}$11	$_{a}$-	$_{ab}$2	.02	.00	.00
G	Sporobolus cryptandrus	$_{a}$1	$_{b}$15	$_{a}$1	.21	.15	.01
G	Stipa lettermani	-	2	-	-	.00	-
Total for Annual Grasses		38	76	50	0.52	1.03	0.87
Total for Perennial Grasses		83	58	60	3.16	2.42	3.70
Total for Grasses		121	134	110	3.68	3.46	4.58
F	Chenopodium fremontii (a)	$_{b}$58	$_{a}$17	$_{c}$111	7.25	.03	.71
F	Chenopodium leptophyllum(a)	$_{a}$-	$_{a}$-	$_{b}$9	-	-	.02
F	Descurainia pinnata (a)	$_{a}$-	$_{b}$13	$_{ab}$5	-	.05	.01
F	Lappula occidentalis (a)	$_{a}$-	$_{b}$29	$_{b}$22	-	.14	.10
F	Lepidium montanum	-	-	5	.00	-	.63
F	Linum lewisii	$_{b}$43	$_{a}$1	$_{a}$-	.77	.06	-
F	Medicago sativa	$_{c}$178	$_{b}$142	$_{a}$7	6.57	10.65	.21
F	Physalis longifolia	$_{b}$91	$_{a}$-	$_{a}$-	5.83	-	-
F	Physaria spp.	2	-	-	.01	-	-
F	Salsola iberica (a)	-	7	1	-	.15	.00
F	Sanguisorba minor	$_{b}$25	$_{a}$-	$_{a}$-	.61	-	-
F	Sisymbrium altissimum (a)	$_{a}$-	$_{b}$96	$_{a}$-	-	2.62	-
F	Taraxacum officinale	-	-	-	.00	-	-
F	Trifolium spp.	-	-	4	-	-	.00
F	Unknown forb-annual (a)	-	-	2	-	-	.00
Total for Annual Forbs		58	162	150	7.25	3.00	0.86
Total for Perennial Forbs		339	143	16	13.82	10.71	0.85
Total for Forbs		397	305	166	21.07	13.72	1.71

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

BROWSE TRENDS --
Management unit 16R, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'99	'01	'04	'99	'01	'04
B	Artemisia tridentata wyomingensis	2	16	1	.02	.06	-
B	Atriplex canescens	33	34	6	.41	.07	.01
B	Ceratoides lanata	24	17	13	.09	.06	.09
B	Gutierrezia sarothrae	0	1	0	-	.03	-
B	Kochia prostrata	93	71	85	2.20	28.48	53.82
B	Opuntia spp.	0	3	1	-	-	-
Total for Browse		152	142	106	2.72	28.71	53.93

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 10

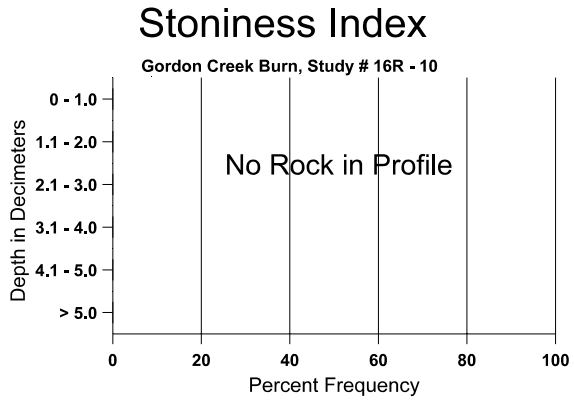
Species	Percent Cover '04
Kochia prostrata	39.66

BASIC COVER --
Management unit 16R, Study no: 10

Cover Type	Average Cover %		
	'99	'01	'04
Vegetation	33.91	43.19	63.50
Rock	.06	.04	.03
Pavement	.04	.09	.03
Litter	10.20	34.84	16.26
Bare Ground	69.72	35.97	33.64

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 10, Study Name: Gordon Creek Burn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.3	59.3 (17.7)	7.5	41.3	44.2	14.5	1.9	6.6	144.0	0.8



PELLET GROUP DATA --
Management unit 16R, Study no: 10

Type	Quadrat Frequency		
	'99	'01	'04
Rabbit	21	29	2
Elk	-	56	83
Deer	1	4	5
Cattle	-	2	-

Days use per acre (ha)		
'99	'01	'04
-	-	-
-	139 (344)	130 (321)
4 (10)	5 (12)	1 (2)
-	9 (23)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
99	**40**	140	40	-	-	3980	0	0	-	-	0	-/-
01	**500**	-	480	20	-	-	0	0	-	-	0	11/7
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Atriplex canescens												
99	**1880**	100	1880	-	-	20	0	0	0	-	0	-/-
01	**1520**	20	1520	-	-	-	1	0	0	-	0	19/10
04	**120**	-	40	20	60	20	0	67	50	33	33	17/11
Ceratoides lanata												
99	**680**	180	460	220	-	-	0	0	0	-	0	13/5
01	**480**	-	320	160	-	-	4	0	0	-	0	10/8
04	**320**	-	20	280	20	-	13	38	6	6	6	7/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	11/11
Gutierrezia sarothrae												
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**20**	-	-	-	20	-	0	0	100	100	100	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Juniperus osteosperma												
99	**0**	-	-	-	-	20	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Kochia prostrata												
99	**14300**	20	1640	12660	-	-	0	0	-	-	0	16/16
01	**22986**	-	-	22986	-	-	0	0	-	-	0	16/21
04	**46619**	-	-	46619	-	-	13	16	-	-	0	8/15
Opuntia spp.												
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**60**	-	40	20	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	4/12

SUMMARY

DEER HERD UNIT 16B - CENTRAL MOUNTAINS, MANTI NORTH

Eight of the 10 range trend studies on the old NE Manti unit were monitored in 2004. Six other special studies located within this unit were also monitored.

The range trend studies in this unit focus on two different types of key areas related to the big game species involved. Ford Ridge (#15), Hardscrabble (#16), and Huntington Canyon (#21) were established to monitor key elk winter range. The other studies are on ranges critical to deer, although many receive elk use also. Most of the sites on the unit sample sagebrush-grass ranges. The Poison Spring Bench study (#22) is located in a pinyon-juniper chaining and Huntington Canyon samples a perennial grass range. Two studies established in 1994 at Consumer Bench (#23) and Wiregrass Bench (#24) were established to monitor possible Wyoming big sagebrush die-off on important winter ranges for deer.

The higher elevation site at Ford Ridge was suspended due to lack of use by elk, the primary reason the site was established. Hardscrabble was not read due to access problems. Huntington Canyon was the only high elevation site that was read in 2004 to monitor elk use. It currently shows slightly downward trends, which are most likely due to recent drought conditions.

The other studies in this unit are on sagebrush ranges that are critical for deer winter range. Soil trends are down for this unit. Most sites have downward trends due to loss of vegetative cover and increased bare ground. Increased erosion was noted on a few studies.

Browse trends are down for nearly every study in this unit. Wyoming big sagebrush has been hit hardest by recent drought conditions and sagebrush die off was observed on many studies. Density was significantly lower and the remaining population was decadent. Sagebrush cover was also much lower. Deer use has increased on many of these studies and will be difficult to sustain with the decline in sagebrush. Only 3 trend studies did not have downward browse trends. Poison Spring Bench (16B-22) has a stable population of black sagebrush, but it is not overly abundant. Price Pipeline South (16R-1) has a shadscale population with an upward trend following the pipeline disturbance, but this is not an area heavily used by wildlife. Gordon Creek Burn (16R-10) has an upward browse trend. This study monitors a seeded burn that is now dominated by prostate kochia. This plant is very drought tolerant, down to as little as 5 inches of precipitation per year. It is also very tolerant of heavy winter grazing and has seen a high amount of elk use.

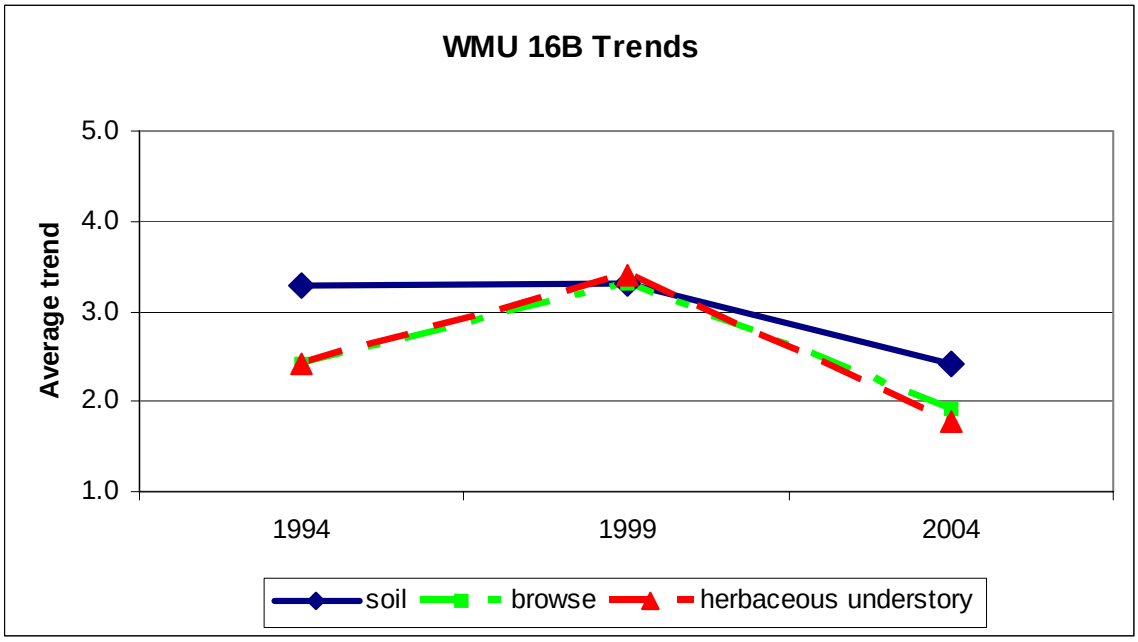
Herbaceous trends are down for every study in this unit except for Wire Grass Bench (16B-24) and a seeded pipeline on Porphyry Bench (16R-4). Drought conditions have caused a decline in herbaceous species on most sites. Trends for perennial grasses are down for each study except for Huntington Canyon (16B-21) and Wire Grass Bench (16B-24). Huntington Canyon is a high elevation site and Wire Grass Bench is slightly higher than most of the other deer winter range studies. Perennial forb trends are also down for nearly every study. Scarlet globemallow was very robust in 2004 and was abundant on most studies, probably in response to lower sagebrush densities.

Many of these range trends are driven by precipitation patterns. Utah has been in a drought for the past five years. Data from three weather stations near this subunit (Price, Helper, and Wellington) were analyzed to look at precipitation patterns since 1982 (Utah Climate Summaries 2004). Precipitation was averaged for each station and analyzed as percent of normal precipitation. Below normal precipitation is defined as less than 90% and drought as less than 75% of normal. Total annual precipitation has been below normal since 1998 with the exception of 2000. Drought conditions have persisted since 2001. Drought was also seen from 1988 to 1991. 1993 and 1994 were also below normal. Seasonal distribution of precipitation was also analyzed for spring (April-June) and fall (September-November). Spring precipitation is important for cool season grasses

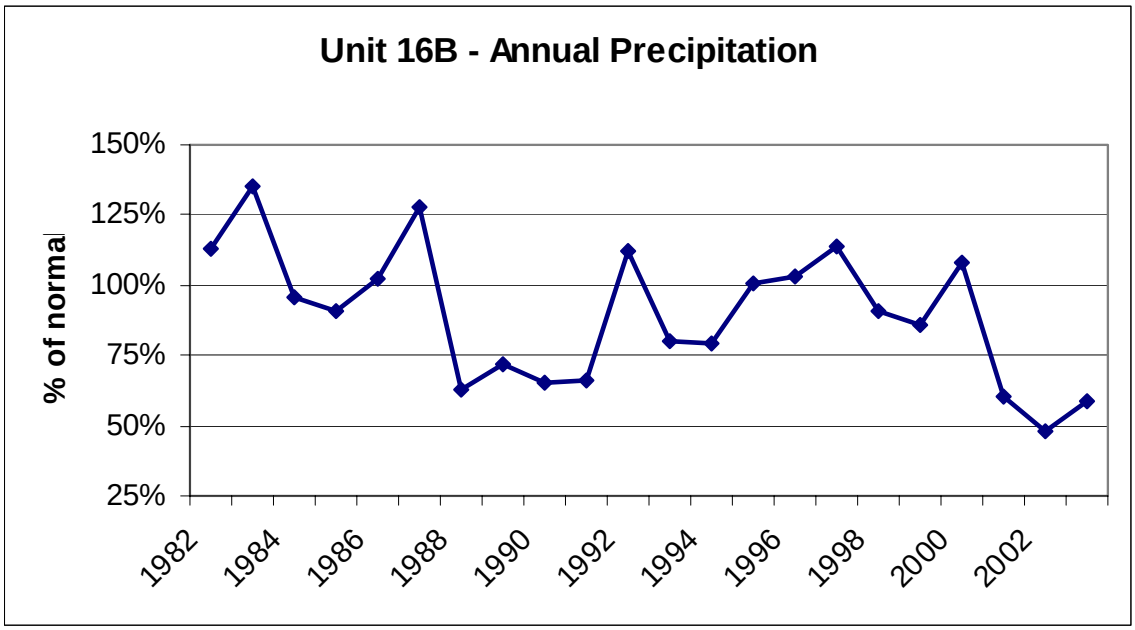
and forbs, as well as shrubs that initiate growth during this period. Spring precipitation has been below normal since 2000. Spring precipitation in 2002 was only 12% of normal and the entire year was only 48% of normal. Fall precipitation was very low at only about 30% of normal in 1999, 2001, and 2003 (see graphs below).

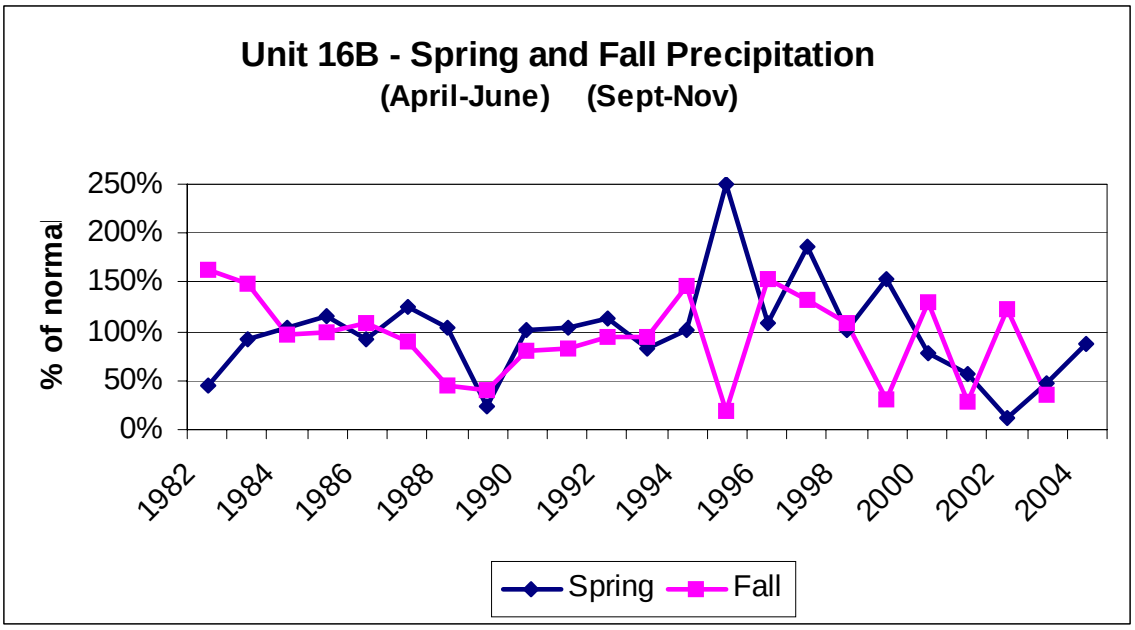
Average Trends -- WMU 16B Manti North

	1994	1999	2004
soil	3.3	3.3	2.4
browse	2.4	3.3	1.9
herbaceous understory	2.4	3.4	1.8
	8 sites	10 sites	16 sites



Precipitation graphs for Manti North unit. Data is percent of normal precipitation averaged for 3 weather stations at Price, Helper, and Wellington (Utah Climate Summaries 2004).





Trend Summary

	Category	1988	1994	1999	2004
16B-15 Ford Ridge	soil	est	3	1	susp
	browse	est	3	2	susp
	herbaceous understory	est	2	4	susp
16B-16 Hardscrabble	soil	est	2	4	NR
	browse	est	3	4	NR
	herbaceous understory	est	2	5	NR
16B-17 Slackpile	soil	est	4	3	2
	browse	est	2	3	1
	herbaceous understory	est	2	3	2
16B-18 Porphyry Bench	soil	est	4	3	2
	browse	est	3	3	1
	herbaceous understory	est	4	3	1
16B-19 North Spring Bench	soil	est	4	4	2
	browse	est	1	4	1
	herbaceous understory	est	2	3	2
16B-20 Telephone Bench	soil	est	3	3	2
	browse	est	2	4	1
	herbaceous understory	est	3	3	2
16B-21 Huntington Canyon	soil	est	3	4	2
	browse	est	3	3	2
	herbaceous understory	est	3	3	2
16B-22 Poison Spring Bench	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	2	3	1
16B-23 Consumer Bench	soil		est	4	2
	browse		est	3	1
	herbaceous understory		est	3	1

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

	Category	1994	1999	2004
16B-24 Wire Grass Bench	soil	est	4	2
	browse	est	4	2
	herbaceous understory	est	4	3

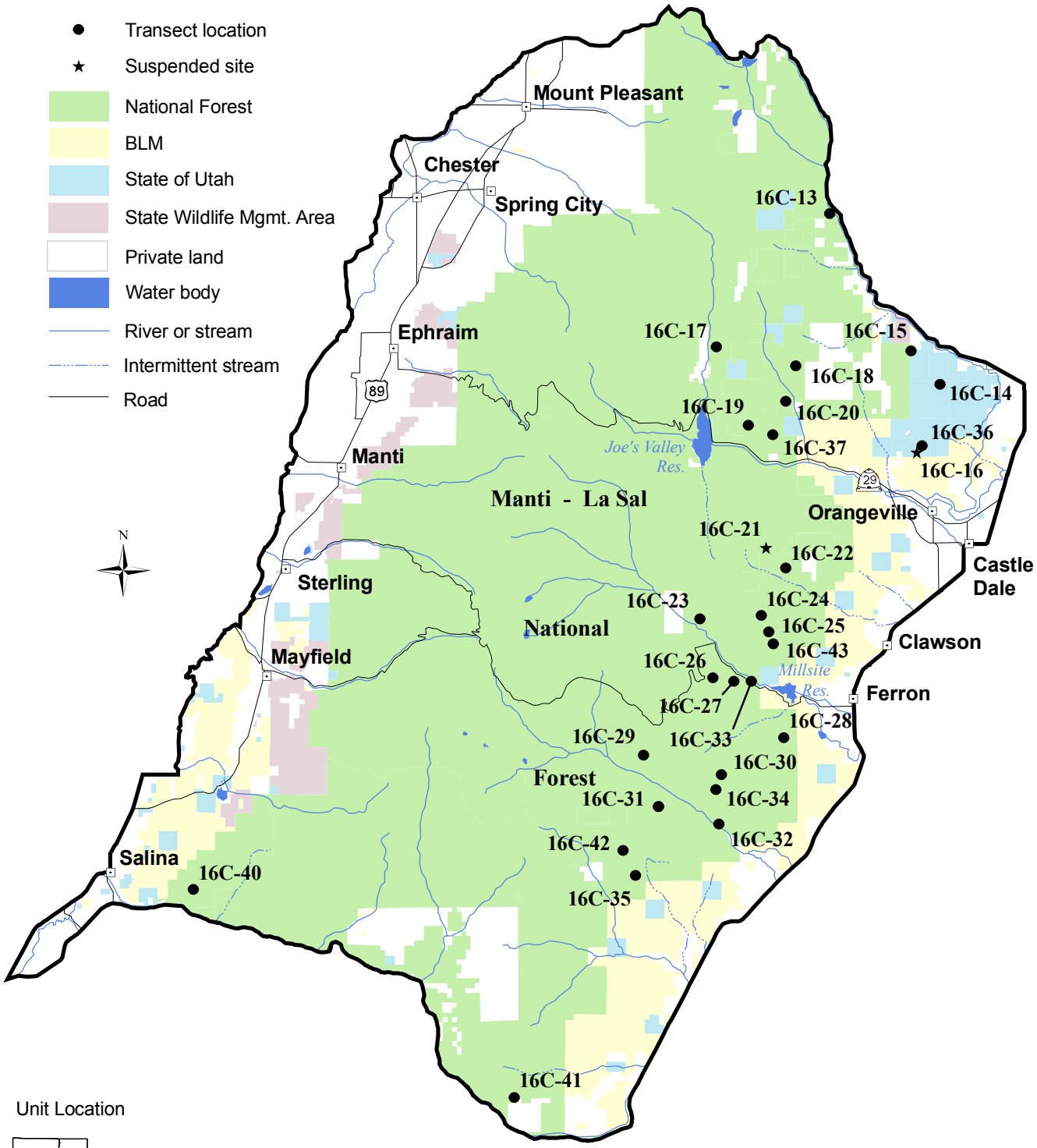
Special Studies Summary for WMU 16B

	Category	1997	2004
16R-1 Price Pipeline South	soil	est	3
	browse	est	4
	herbaceous understory	est	1
16R-2 Price Pipeline Native South	soil	est	3
	browse	est	2
	herbaceous understory	est	1
16R-3 Price Pipeline Native North	soil	est	2
	browse	est	1
	herbaceous understory	est	2
16R-4 Price Pipeline North	soil	est	4
	browse	est	n/a
	herbaceous understory	est	3
	Category	1998	2004
16R-6 North Slackpile		est	2
		est	1
		est	2

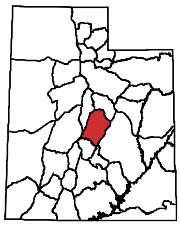
	Category	1999	2001	2004
16R-10 Gordon Creek Burn	soil	est	4	3
	browse	est	5	5
	herbaceous understory	est	1	2

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Management Unit 16C



Unit Location



Map scale 1:500,000 (1 inch = 7.9 miles)

WILDLIFE MANAGEMENT UNIT 16C - CENTRAL MOUNTAINS, MANTI SOUTH

Boundary Description

Sanpete, Emery, and Sevier counties - Boundary begins at the junction of Highway SR-10 and Highway SR-31 at Huntington; then south on SR-10 to Interstate 70; west on I-70 to Highway US-89 at Salina; north on US-89 to SR-31 at Fairview; southeast on SR-31 to SR-10 at the beginning point at Huntington.

Herd Unit Description

Unit 16C was previously called Deer Herd Unit 31- South East Manti. It was enlarged in the spring of 1998 to include both the east and west sides of the Wasatch Plateau and renamed Wildlife Management Unit 16C. Unit 16C is a subunit of the very large management unit 16 which encompasses areas in Utah, Carbon, Juab, Sevier, and Sanpete Counties. Approximately 54% of unit 16's winter range is on land administered by the U.S. Forest Service and the BLM. Another 35% is on private land. The U.S. Forest Service administers 72% of the summer range, while 22% is private.

The upper limits of the winter range on subunit 16C - South-East Manti, generally follow the rim of the plateau and the 9,000 foot level of the south and west exposures of the large canyons and mountain slopes. A good description of winter range limits and prominent vegetative types can be found in the 1980 Utah Big Game Range Inventory (Giunta l982).

The upper portions of the winter range on Forest Service lands are managed primarily for livestock grazing. Widespread watershed rehabilitation, contour trenching and seeding, was done on this rangeland in the 1960's. An extensive road system provides access to a large percentage of the winter range. Many roads in critical areas are open or maintained and used winter long in relation to various activities, namely mining, gas wells, the Horn Mountain TV towers, and for recreation. Access is more restricted further south in the Ferron and Muddy Creek drainages.

The lowest foothill ranges are accessible year-round and are usually adjacent to agricultural areas. Coal mining and the power plants are the major economic activities in the area. Other associated impacts include road improvements, truck traffic, and an increased human population. This all assuredly has an effect on the distribution and abundance of big game animals. Outdoor recreation is popular in the area. These activities include camping, hunting, fishing, four-wheeling, and snowmobiling which are facilitated by the extensive road system in the mountains and foothills. The very lowest portion of the herd unit supports a low desert shrub type on unproductive shale hills. This acreage is not considered part of the winter range.

Key Areas

The key deer wintering areas are the lower end of Muddy Creek and Ferron Creek, Black Dragon, Biddlecome Hollow, Cottonwood Canyon, and Huntington Canyon. Elk winter higher on Trail Mountain, North and South Horn Mountain, and Sage Flat. Deer also utilize these areas during mild winters. Elk utilize the mahogany and sagebrush on the lower points of the plateau, such as North and South Horn Mountain and Trail Mountain.

On the Southeast Manti Unit, much of the key winter range is on Forest Service lands. Pinyon-juniper benches become more limited to the south and there are mostly low desert shrub foothills associated with Muddy Creek. Overall, the pinyon-juniper type occupies a fair amount of the winter range at low elevations, but is not critical to the trend monitoring program. However, the chained and seeded portions of this type provide important wintering areas where many are monitored for trend. Chainings are sampled in the foothills from Huntington Canyon to south of Dry Wash. Other key areas at Middle Mountain and Dry Mountain are

also sampled. The big sagebrush/grass range type is found on many key areas, especially on the North East Manti Unit, but also on high elevation elk winter range on Trail, East, and Horn Mountains. Big sagebrush/grass is limited on critical deer winter range, but key areas are found on Black Dragon and Muddy Creek. Large areas of key winter range, also identified by the U.S. Forest Service in their Land and Resource Management Plan, are found on Trail Mountain, North Horn and South Horn Mountain, in lower Dry Wash, and along Muddy Creek. Mixed mountain brush and curlleaf mountain mahogany types are especially important in these areas.

Grazing Summary

The livestock grazing programs on Forest Service lands in the Southeast Manti Unit generally involve a deferred or rest-rotation system for cattle, or sheep grazing during the summer and fall. Specific allotment management plans vary as to exact season dates. Several study sites receive little impact from livestock due to accessibility, livestock distribution and management. The study site on Middle Mountain (#17), the only trend study on a sheep allotment, apparently receives little livestock use because the sheep are not grazed on the west side due to closure of the area after the chaining. Although contained in the Gentry Mountain cattle allotment, West Huntington Canyon (#13) above Crandall Canyon is not used by cows due to the long steep slopes up to the ridge top. The trend study on East Mountain (#18) is in the East Mountain Allotment which is made up of both private and USFS land. It is permitted for grazing June 21 to September 10 by 341 cattle in a four pasture rest rotation system. There are two studies in the Trail Mountain Cattle allotment. The area around the Trail Mountain Exclosure (#19) has been closed to grazing since the late 1960's after a watershed treatment, but there is some trespass. The site at Miles Point (#20) is grazed from June 21 to September 20 by 901 cows under a deferred-rotation system.

There are five studies in the Horn Mountain cattle allotment (#21, #22, #23, #24, #25). The season of use on this allotment is June 6 to September 30, with 849 cows (4,371 AUM's) under a five pasture rest-rotation grazing system. All study sites are used by cattle. In the Black Dragon (#23) area, also in the Horn Mountain allotment, part of the herd is grazed for a short period early in the season. There is little grazing pressure in the sagebrush flat where the trend study is located because of the distance to water.

Water also limits cattle use on three study sites in the Ferron cattle allotment. The Dry Mountain (#26) and the isolated bench south of Dry Wash show little sign of use by cattle. Cattle grazing was limited on the isolated Birch Creek chaining (#27) in 1988 and 1994, but was moderate to heavy in 1999 and 2004. The allotment is permitted for 1,607 cows, from June 21 to October 5. The plan follows a rest-rotation schedule utilizing eight pastures. The two other trend studies on the Ferron grazing allotment, Scab Hollow (#29) and Upper Hole Trail (#30), receive considerably more use by cows. Cattle trail up and down the old Hole Trail, but they should not hold over in the basin at the top of the trail where the study is located because there is no water. Cattle use to trail up Muddy Creek (#32), however there is not much livestock use on Forest Service land in the canyon anymore, except for some trespass from private land downstream. The new sites at Little Nelson Mountain (#33) and South Sage Flat (#34) also occur in the Ferron allotment.

The Emery cattle allotment is permitted for 1,387 cows from June 16 to September 30 in a six pasture rest rotation schedule. The area around Box Canyon Knolls (#31) is generally an early unit in the rest-rotation schedule.

The grazing programs for the BLM lands sampled on this unit are contained in the West Huntington and Wilberg Allotment Management Plans. Historically, there has been heavy cattle use on the West Huntington allotment. The deferred rotation system planned in 1968 was never implemented. A new plan was initiated in 1988, calling for closure of one pasture and a 50% reduction in spring AUM'S instead of the recommended elimination of all spring grazing permits. 177 cows use the unit from May 1 to June 26 and 140 cows from November 1 to December 15. Monitoring will continue and there is a possibility of more reductions if there is

no improvement in range conditions. The Wilberg allotment is also a cattle allotment, grazed in spring and late fall. Eighty-nine cows use the unit from November 1 to December 15 and April 16 to June 15. Fencing and water developments planned in 1969 were never completed so the two pastures are grazed on a continuous basis, one in winter and one in spring.

Herd Unit Management Objectives

There are no current specific management objectives for sub unit 16C, only unit wide objectives. The current target winter herd size for all of unit 16 is to achieve a target population size of 60,600 (38,000 wintering deer on the Wasatch Plateau or Manti Mountain Portion of the unit and 22,600 on the Nebo portion). A post season buck to doe ration of 15:100 is sought with 30% of these bucks being 3 point or better.

Trend Study Site Description

Unit 16C contains 27 trend study sites. Eighteen sites were originally established in 1988 and reread in 1994 and 1999. In the summer of 1994, it was determined at an Interagency meeting of DWR, Forest Service, and BLM personnel that five new key area studies were necessary. The new studies were established in July and August of 1994 and include; Little Nelson Mountain #33 (sagebrush/grass), South Sage Flat #34 (sagebrush/grass), Wildcat Knolls #35 (black sagebrush/grass), Danish Bench #36 (chaining), and Joe's Valley Overlook #37 (mixed mountain brush). The study at Danish Bench, was established to replace Church Mine Road #16, which was eliminated due to light utilization. Two trend studies, Cedar Mountain #40 and Trough Hollow #41, were originally in other herd units but are now part of the Manti-Nebo Manti South unit. These two studies were established in 1985 and reread in 1991 and 1999. In 2004, two study sites (Box Canyon Sage Grouse #42 and Olson Draw Sage Grouse # 43) were established to monitor sage grouse nesting and brooding habitat, both receive moderate elk use as well.

Trend Study 16C-13-04

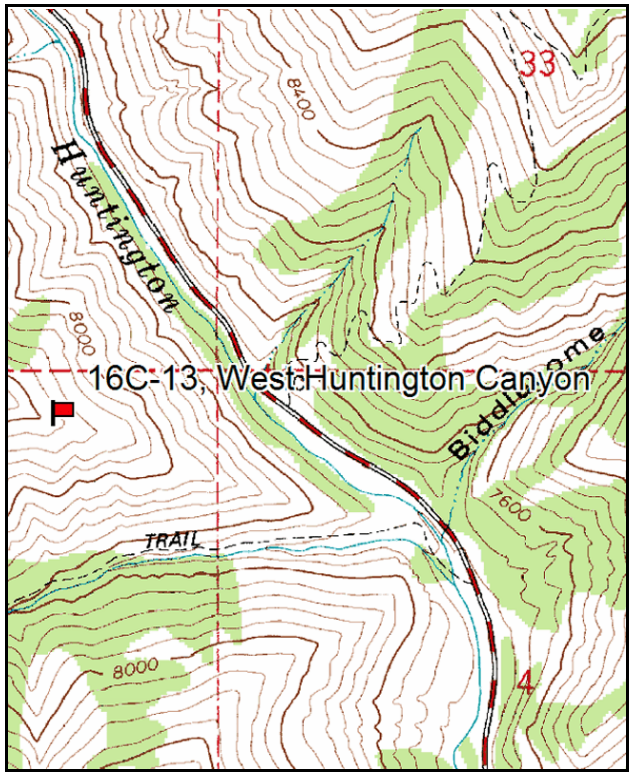
Study site name: West Huntington Canyon . Vegetation type: Curlleaf Mnt Mahogany .

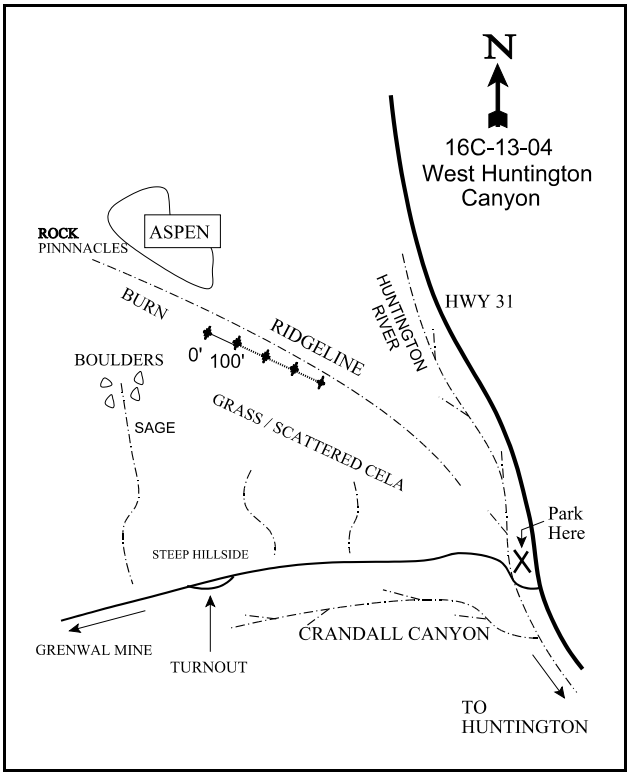
Compass bearing: frequency baseline 117 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 31, the Huntington Canyon road, turn onto the Crandall Canyon road. From the turnout, look up the ridge to the north. The study site is on the top of the ridge on the eastern edge of an old burn; now sagebrush/grass and scattered mahogany. The site can be reached by a 1/4 mile hike up the steep rocky face, or a 3/4 mile hike up the ridge starting by the Huntington River. Once the top of the ridge below the rock pinnacles is reached, the study stakes are not difficult to locate. The 0-foot baseline stake is marked by browse tag #902S.





Map Name: Rilda Canyon

Diagrammatic Sketch

Township 16S , Range 7E , Section 5

GPS: NAD 27, UTM 12S 4368314 N, 486550 E

DISCUSSION

West Huntington Canyon - Trend Study No. 16C-13

This trend study is located on the west side of Huntington Canyon along the top of the ridge, north of Crandall Canyon. The south-facing slopes and ridge tops in this area are used by elk in the winter. Clumps of aspen also provide summering habitat for deer. The study is within a curlleaf mountain mahogany type that burned many years ago. Along with the sparse mahogany over story, there is an understory of bluebunch wheatgrass, Salina wildrye, Oregon grape, and mountain big sagebrush. This area does not appear to be used by livestock, probably due to its inaccessibility and lack of water. Pellet group data from 1999 estimated 10 deer and 96 elk days use/acre (25 ddu/ha, 237 edu/ha). All pellet groups appeared to be from the previous winter. Elk use was high in 2004, estimated at 131 elk days use/acre (322 edu/ha).

The study is on the south side of the ridge, just below the ridge top with a southeast aspect. The elevation is 8,400 feet. The slope is very steep (45%) and rocky. Cliffs are formed by exposure of the underlying sandstone. The rocky nature of the site allows for generally shallow soils, but there are deep spots between rocks which provide good rooting sites for trees. Effective rooting depth is actually quite deep and is estimated at just over 16 inches. Soil texture is a clay with a slightly alkaline pH (7.4). Phosphorus is limited at only 5.5 ppm. Values less than 10 ppm may limit normal plant growth and development. In spite of severe pedestalling and exposed roots, the large bluebunch wheatgrass and Salina Wildrye play a major role in holding the soil in place. For the most part, the soil is moderately protected. Erosion is inevitable due to the steepness of the slope, but it does not appear to be excessive. The erosion condition class determined erosion as moderate due to severe pedestalling, and soil and litter movement down slope.

The dominant overstory on the site consists of a few scattered mature curlleaf mountain mahogany, some of which are large, tree like, and mostly unavailable due to height and highlining. Smaller, more available mahogany sampled on the site are heavily browsed. Mountain big sagebrush, the key browse species, provides more than half of the browse cover. The population has remained relatively stable since 1994 at a density of about 1,500 plants/acre. Sagebrush has been mostly light to moderately browsed over all sampling periods. Vigor has also been good on most plants during all readings and the number of decadent plants has remained low. Snowberry, low rabbitbrush, pinyon, and Rocky Mountain juniper are present on the mountainside but in low numbers.

Salina wildrye is the most abundant grass followed by bluebunch wheatgrass. It appears that there was an identification problem between bluebunch wheatgrass and Salina wildrye in 1994. Salina wildrye provided 87% of the grass cover in 1999, increasing to 98% in 2004. Bluebunch wheatgrass declined significantly in nested frequency since 1999. Forbs are not abundant and only a few species, aster, and longleaf phlox are common.

1994 TREND ASSESSMENT

Ground cover characteristics have changed somewhat since 1988. Percent litter cover has declined considerably due to drought conditions and percent bare ground has increased. However, the herbaceous understory is abundant and adequately protects the soil from erosion indicating a stable soil trend for the time being. The browse trend is stable for the key browse species, mountain big sagebrush, but down for seedlings, and young. Percent decadency rates are low. Overall, trend for browse is stable. Trend for herbaceous understory is slightly down even with some improvements in species composition. Nested frequency for perennial grasses moderately declined, while nested frequency of forbs increased. The key herbaceous component is the perennial grasses which contribute to about 90% of the herbaceous cover. The Desirable Components Index (see methods) rated this site as fair with a score of 53 due to no recruitment of young shrubs, low shrub cover, and low perennial forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 53 (fair) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil continues to be stable. Percent litter cover remains similar to 1994 estimates, but percent bare ground has declined. There is some enviable erosion occurring due to the steep slope. Pedestalling and terracing are evident, however the abundant herbaceous cover helps stabilize the soil. Trend for browse is stable. The key species, mountain big sagebrush has a relatively stable density of 1,760 plants/acre. Vigor is good, percent decadence is low, and use is light to moderate. The preferred curlleaf mountain mahogany occurs in low densities. It is moderately to heavily hedged where available. Trend for the herbaceous understory is stable. The dominate species is Salina wildrye which provides 87% of the grass cover, 74% of the herbaceous cover or 49% of the total vegetation cover. It appears that much of this grass was misidentified as bluebunch wheatgrass in 1994. Forbs are limited, yet they have increased slightly in nested frequency since 1994. Aster is the only abundant forb. The Desirable Components Index rated this site as good with a score of 69 due to low decadence, good shrub cover, and excellent perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 69 (good) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is down slightly due to a 56% increase in cover of bare ground and a 20% decline in vegetation cover. Litter cover also declined. Some erosion is occurring due to the steep slope but it does not appear to be excessive. Trend for the key browse species, mountain big sagebrush, is stable. Population density has declined slightly since 1999, but most plants display normal vigor, good leader growth and seed production. Trend for the herbaceous understory is considered down slightly. The dominant perennial grass, Salina wildrye, is stable but the more preferred bluebunch wheatgrass, declined significantly in nested frequency. Forbs are not abundant but have also declined in sum of nested frequency values. The Desirable Components Index rated this site as fair with a score of 63 due to low shrub cover, low perennial forb cover, but had a high amount of young shrubs.

TREND ASSESSMENT
soil - down slightly (2)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 63 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 13

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	$_{ab}$40	$_{c}$194	$_{b}$68	$_{a}$15	10.87	2.84	.34
G	Bromus tectorum (a)	-	-	-	3	-	-	.00
G	Carex spp.	$_{b}$15	$_{a}$5	$_{a}$5	$_{a}$4	.03	.06	.03
G	Elymus salina	$_{c}$279	$_{a}$80	$_{b}$229	$_{b}$232	3.08	19.46	22.56
G	Koeleria cristata	-	-	2	-	-	.00	-
G	Poa pratensis	-	-	1	-	-	.06	-
Total for Annual Grasses		0	0	0	3	0	0	0.00
Total for Perennial Grasses		334	279	305	251	13.98	22.43	22.93
Total for Grasses		334	279	305	254	13.98	22.43	22.93
F	Achillea millefolium	$_{a}$-	$_{a}$2	$_{b}$9	$_{a}$2	.03	.23	.03
F	Alyssum alyssoides (a)	-	-	-	2	-	-	.00
F	Antennaria microphylla	-	3	-	-	.03	-	-
F	Artemisia ludoviciana	$_{a}$-	$_{ab}$3	$_{b}$6	$_{ab}$3	.15	.07	.04
F	Astragalus convallarius	2	12	19	2	.07	.88	.03
F	Aster spp.	$_{a}$39	$_{b}$76	$_{b}$73	$_{a}$45	1.02	2.49	.68
F	Astragalus spp.	-	4	-	-	.18	-	-
F	Chenopodium album (a)	-	$_{ab}$2	$_{a}$-	$_{b}$9	.00	-	.05
F	Chaenactis douglasii	-	4	-	-	.01	-	-
F	Cirsium spp.	-	1	-	-	.03	.00	-
F	Descurainia pinnata (a)	-	$_{a}$-	$_{a}$-	$_{b}$59	-	-	.15
F	Hymenoxys richardsonii	1	-	-	-	-	-	-
F	Ipomopsis aggregata	-	-	1	-	-	.00	-
F	Lappula occidentalis (a)	-	$_{a}$-	$_{a}$-	$_{b}$30	-	-	.17
F	Machaeranthera canescens	4	5	11	1	.22	.13	.01
F	Phlox longifolia	$_{a}$-	$_{ab}$6	$_{b}$11	$_{b}$15	.01	.02	.05
F	Sanguisorba minor	-	-	-	-	-	.00	-
F	Schoencrambe linifolia	-	3	-	5	.00	-	.01
F	Taraxacum officinale	1	-	-	-	-	-	-
Total for Annual Forbs		0	2	0	100	0.00	0	0.38
Total for Perennial Forbs		47	119	130	73	1.77	3.86	0.87
Total for Forbs		47	121	130	173	1.78	3.86	1.25

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

BROWSE TRENDS --
Management unit 16C, Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata vaseyana	44	49	39	4.25	8.53	5.19
B	Cercocarpus ledifolius	7	5	4	.15	.00	.06
B	Chrysothamnus nauseosus	0	0	1	-	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	1	4	2	.00	.30	.15
B	Gutierrezia sarothrae	0	2	2	-	.03	.03
B	Juniperus osteosperma	0	0	1	.63	-	.41
B	Mahonia repens	65	60	69	2.47	3.85	1.87
B	Pachistima myrsinites	1	2	2	-	.09	.03
B	Sambucus cerulea	0	2	1	-	-	.00
B	Symphoricarpos oreophilus	6	5	3	.06	.53	.18
Total for Browse		124	129	124	7.58	13.34	7.98

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 13

Species	Percent Cover '04
Artemisia tridentata vaseyana	7.36
Gutierrezia sarothrae	.03
Juniperus osteosperma	.15
Mahonia repens	1.96
Sambucus cerulea	.16

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 13

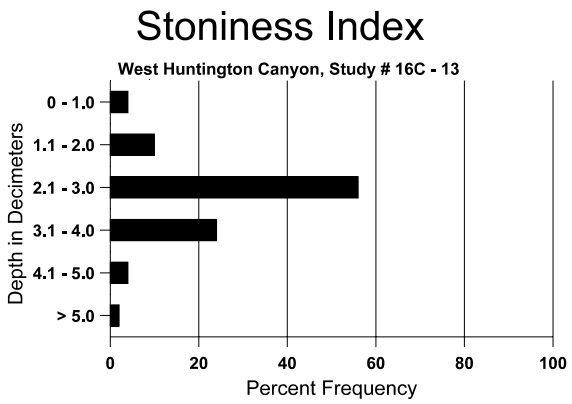
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.2
Cercocarpus ledifolius	5.4

BASIC COVER --
Management unit 16C, Study no: 13

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	10.25	24.57	40.22	32.04
Rock	10.00	9.04	10.68	10.93
Pavement	1.25	1.21	5.88	6.56
Litter	53.00	32.40	33.01	25.82
Cryptogams	0	.04	.00	.00
Bare Ground	25.50	30.77	25.76	40.09

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 13, Study Name: West Huntington Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.3	53.3 (10.9)	7.4	23.3	32.2	44.6	3.2	5.5	99.2	0.7



PELLET GROUP DATA --
Management unit 16C, Study no: 13

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	13	7	-
Elk	47	54	39
Deer	4	6	3

Days use per acre (ha)	
'99	'04
-	-
96 (237)	131(322)
10 (25)	27 (66)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
88	**3466**	1600	2000	1266	200	-	2	0	6	-	4	13/21
94	**1520**	-	120	1200	200	-	18	1	13	9	9	20/32
99	**1760**	40	220	1380	160	100	39	8	9	1	1	16/24
04	**1260**	300	40	1020	200	180	30	13	16	10	10	12/22
Cercocarpus ledifolius												
88	**66**	-	66	-	-	-	100	0	-	-	0	-/-
94	**260**	-	180	80	-	20	0	0	-	-	0	27/18
99	**140**	-	60	80	-	40	43	43	-	-	0	15/14
04	**100**	-	60	40	-	40	20	80	-	-	0	17/17
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	11/15
99	**0**	-	-	-	-	-	0	0	0	-	0	29/53
04	**20**	-	-	-	20	-	0	0	100	-	0	19/53
Chrysothamnus viscidiflorus												
88	**132**	-	66	66	-	-	0	0	-	-	0	10/10
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	10/15
99	**120**	-	-	120	-	-	0	0	-	-	0	9/14
04	**40**	-	-	40	-	-	0	0	-	-	0	7/18
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	-	-	80	-	-	0	0	-	-	0	8/12
04	**60**	-	-	60	-	-	0	0	-	-	0	7/8
Juniperus osteosperma												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
88	**43466**	12666	9533	33933	-	-	0	0	-	-	0	5/4
94	**16740**	-	1120	15620	-	-	0	0	-	-	0	9/12
99	**19420**	260	5980	13440	-	-	.20	0	-	-	0	4/5
04	**4620**	-	300	4320	-	-	0	0	-	-	0	3/5
Pachistima myrsinites												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	3/2
99	**60**	-	60	-	-	20	0	0	-	-	0	9/9
04	**40**	20	-	40	-	-	0	0	-	-	0	6/7
Sambucus cerulea												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	40/52
99	**240**	-	160	80	-	-	0	0	-	-	0	57/68
04	**20**	-	-	20	-	-	0	100	-	-	0	47/45
Symphoricarpos oreophilus												
88	**200**	-	200	-	-	-	0	0	0	-	0	-/-
94	**160**	-	-	160	-	-	0	0	0	-	0	11/26
99	**100**	-	-	100	-	-	0	0	0	-	0	14/26
04	**80**	-	-	60	20	-	0	0	25	25	25	11/26

Trend Study 16C-14-04

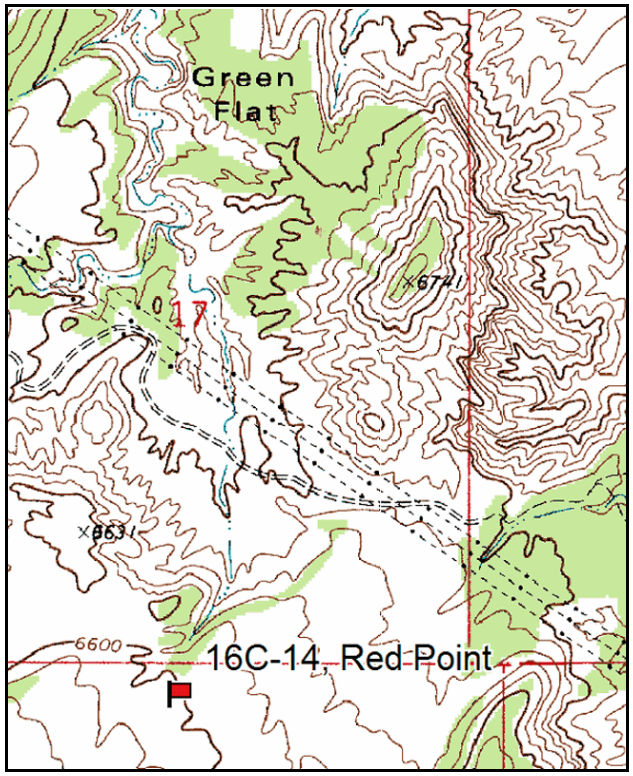
Study site name: Red Point . Vegetation type: Chained, Seeded P-J .

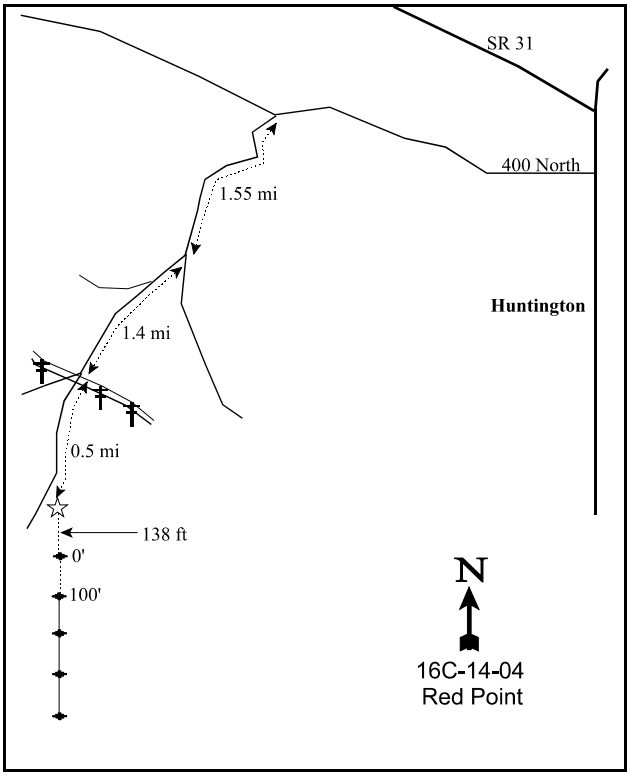
Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From Main Street in Huntington, go west on 400 North. Pass the old mill on the edge of town, cross the canal and continue 0.75 miles. Turn left off the old Huntington River road at a major fork. Proceed 1.55 miles, turn right, and go through a gate. Continue straight 0.2 miles to another fork and stay left for 1 mile. From here, stay straight, passing a trough, for an additional 0.2 miles to a two-way fork. Turn left and go 0.5 miles to a witness post on the left side of the road in the chaining. The frequency baseline start 138 feet south of the witness post. The 18" tall fencepost marking the 0-foot baseline has browse tag #9012 attached.





Map Name: Red Point

Township 17S , Range 8E , Section 20

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4353803 N, 495895 E

DISCUSSION

Red Point - Trend Study No. 16C-14

This trend study is located in a chaining at the base of East Mountain, below the prominent Red Point. The 300 acre bench was chained and seeded in 1973. The large bench where the study is located slopes gradually (8-9%) to the northeast. Elevation is 6,400 feet. Overall declining trends and poor range condition observed in the West Huntington allotment led the BLM to recommend changes in grazing, eventually resulting in a 50% reduction in spring AUMs and closure of one pasture. As part of the Huntington Canyon winter range, deer and elk utilize the area in winter. Pellet group data from 1999 estimated 25 deer, 55 elk, and 4 cow days use/acre (62 ddu/ha, 136 edu/ha, 10 cdu/ha). All cow sign appeared to be from the previous season. Some of the deer pellet groups were fresh and about 12 deer were observed near the site in 1999. All elk pellet groups appeared to be from winter use. Rabbits are common and several Cottontailes were seen. Pellet group data from 2004 estimated 38 elk and 31 deer days use/acre (94 edu/ha and 76 ddu/ha). Most of the pellet groups appeared to be from winter use. Cattle use was low, estimated at only 4 days use/acre (11 cdu/ha).

Soil at the site is relatively deep with the effective rooting depth estimated at 16 inches. Soil texture is a loam with a slightly alkaline pH of 7.6. Phosphorus is low at 4.1 ppm. Values below 10 ppm may limit normal plant growth and development. There are large numbers of boulders, smaller rocks, and pavement on the surface. These rocks are mostly sandstone and many have white calcite deposits. Rock and pavement had an average cover value of 27% in 1999 and 26% in 2004. Litter is moderately abundant and consists mostly of large chaining debris. Some localized soil erosion is occurring and soil pedestalling, litter movement, flow patterns and gullies are evident. The erosion condition class was determined to be slight in 2004.

An even-aged stand of surviving pinyon and juniper have regrown on the chained bench. Point-center quarter data from 1999 estimated 141 pinyon/acre and 99 juniper/acre. In 2004, density was estimated at 149 pinyon/acre and 90 juniper/acre. Average diameter of pinyon was estimated at 2.5 inches in 1999 and increased to 3.3 inches in 2004. Juniper diameter averaged 1.8 inches in 1999 and 2.6 inches in 2004. In 2004, about 60% of the pinyon and 68% of the juniper were in the 4 to 8 foot height range. Density of pinyon has slowly increased since 1994 while juniper has remained more stable. Average cover has steadily increased since 1994 and pinyon and juniper trees provided 47% of the total browse cover in 2004. Canopy cover for pinyon and juniper has gone from 4% in 1999 up to 11% by 004. It would be a good idea to do some kind of thinning of the trees because when canopy cover of 15% is attained, the trees begin to have a pronounced negative effect on the understory species, especially the herbaceous species.

Green ephedra, slenderbush eriogonum, true mountain mahogany, and antelope bitterbrush provide the bulk of the winter forage on this site, although none of these species are very abundant. Green ephedra had a density of 660 plants/acre in 2004. Mature plants are large with average heights of more than 3 feet with a crown diameter of 5 feet. Slenderbush eriogonum plants are small averaging only 3 inches in height. Both green ephedra and slenderbush eriogonum showed very light hedging in 1994, and moderate to heavy use in 1999. All slenderbush eriogonum encountered in 2004 were heavily browsed. True mountain mahogany provides about 6 to 7% of the total browse cover with a density of about 130 plants/acre. Mature plants are large, averaging 5 feet in height. They have received consistent moderate to heavy browsing since 1988, but vigor has remained normal. Yucca is the most abundant shrub with a density of 2,320 plants/acre in 2004. The yuccas stiff, sharp leaves also protect the closely associated grasses from use.

The herbaceous understory is poor. The predominant grass is crested wheatgrass which provided 95% of the grass cover in 1999 and 82% in 2004. A few other species are present but occur rarely. Grasses produced only 10% cover in 1994 and 12% in 1999. Drought conditions prior to the 2004 reading caused average cover to decline to only a little over 2%. Forbs are uncommon and provide very little cover or forage.

1994 TREND ASSESSMENT

Ground cover characteristics have improved on the site since 1988. Percent bare ground has declined considerably while litter cover has increased. The only negative aspect of the soil trend is the decline in nested frequency of the herbaceous understory. Trend for soil is considered slightly up. Browse are not very abundant on the site but the trend is stable. Changes in density of true mountain mahogany and slenderbush eriogonum are mostly due to the greatly increased sample size used in 1994. Trend for the herbaceous understory is slightly down due to a decline in sum nested frequency of grasses and forbs. However, the dominant grass, crested wheatgrass, did not decline significantly. The Desirable Components Index (see methods) rated this site as poor with a score of 38 due to moderate decadence, low shrub cover, and low perennial forb cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 38 (poor) Mountain big sagebrush type-chaining

1999 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground has remained similar to 1994 estimates, but litter cover declined and percent cover of rock and pavement increased. Some localized erosion is occurring, however it is not a serious problem due to the gentle terrain. Trend for browse is stable. Densities for the key species, true mountain mahogany and green ephedra, are stable and vigor is normal. Utilization of mahogany has remained moderate to heavy, while ephedra, dwarf rabbitbrush, and bitterbrush display heavier use compared to 1994. Trend for the herbaceous understory is stable yet poor. Sum of nested frequency for grasses has increased slightly, but nested frequency of forbs has declined slightly. Crested wheatgrass dominates the herbaceous understory by providing 91% of the herbaceous cover. Forbs are rare and have steadily declined in frequency since 1988. Overall, grasses and forbs provide only about 12% cover. The Desirable Components Index rated this site as poor to fair with a score of 50 due to decrease in decadence, increase in shrub cover since 1994, but still has low perennial forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 50 (poor to fair) Mountain big sagebrush type-chaining

2004 TREND ASSESSMENT

Trend for soil is slightly down. Relative cover for bare ground has increased from 16% to 24%, while relative vegetation cover dropped from 26% down to 22%. In addition, herbaceous vegetation cover declined four-fold from 12.4% to only 3.5%. There is some localized soil movement occurring and the erosion condition class determined erosion as slight. There are several preferred browse species present on the site but none are abundant. Trend for browse is stable but poor. Key species include true mountain mahogany and green ephedra. Mahogany numbers only 120 plants/acre. Mature plants are tall averaging 5 feet in height and utilization was very heavy on available portions. Vigor is good and annual leader growth averaged nearly 4 inches. Seed production appeared good this year as well. Green ephedra is more abundant with an estimated density of 660 plants/acre. Mature plants average just over 3 feet in height with a crown diameter of more than 5 foot. Ephedra provides 29% of the total browse cover with a canopy cover value of 7%. Utilization is mostly light but a few plants displayed moderate and heavy use. Slenderbush eriogonum is also abundant but

these plants are small, averaging only 3 inches in height and produced less than 1% cover. All plants sampled were heavily utilized. Pinyon and juniper dominate the browse component by providing nearly half of the total browse cover. Average tree cover has steadily increased and now averages 11%. This site needs to be retreated to reduce tree cover which is at a level that is beginning to suppress understory plants. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses declined. Crested wheatgrass provides nearly all of the grass cover. It declined significantly in nested frequency and average cover dropped nearly six-fold from 11% to 2%. The forb component is diverse but all forbs combined produce only 1% cover. The Desirable Components Index rated this site as poor with a score of 40 due to a major decline in perennial grasses cover since the last two readings, shrub cover continues to increase, and still low perennial forb cover.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - down (1)
winter range condition (DC Index) - 40 (poor) Mountain big sagebrush type-chaining

HERBACEOUS TRENDS --
Management unit 16C, Study no: 14

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{b}$270	$_{b}$265	$_{b}$284	$_{a}$89	8.66	11.28	1.90
G	Agropyron intermedium	$_{b}$50	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
G	Elymus junceus	$_{a}$2	$_{b}$16	$_{ab}$9	$_{ab}$11	.35	.25	.15
G	Oryzopsis hymenoides	24	25	20	20	.52	.37	.25
G	Sitanion hystrix	$_{b}$45	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		391	308	313	120	9.54	11.91	2.31
Total for Grasses		391	308	313	120	9.54	11.91	2.31
F	Arabis perennans	-	2	5	-	.00	.01	-
F	Caulanthus crassicaulis	-	1	-	-	.00	-	-
F	Chenopodium album (a)	-	1	-	-	.01	-	-
F	Chenopodium fremontii (a)	-	-	-	7	-	-	.02
F	Chenopodium leptophyllum(a)	-	-	-	4	-	-	.00
F	Cryptantha spp.	$_{c}$74	$_{b}$45	$_{a}$17	$_{a}$3	.65	.35	.00
F	Descurainia pinnata (a)	-	$_{a}$10	$_{a}$3	$_{b}$21	.02	.00	.21
F	Eriogonum alatum	-	-	-	-	.00	-	-
F	Erigeron spp.	4	-	-	-	-	-	-
F	Eriogonum spp.	-	4	2	-	.03	.01	-
F	Euphorbia spp.	$_{a}$137	$_{b}$41	$_{a}$20	$_{ab}$28	.17	.04	.46
F	Gilia spp. (a)	$_{a}$4	$_{a}$-	$_{a}$-	$_{b}$17	-	-	.23
F	Lappula occidentalis (a)	-	-	3	3	-	.00	.01

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Leucelene ericoides	-	3	3	-	.15	.03	-
F	Lepidium montanum	2	-	-	-	-	-	-
F	Malcolmia africana	-	-	-	1	-	-	.00
F	Machaeranthera canescens	-	-	-	3	-	-	.03
F	Machaeranthera grindelioides	-	1	-	-	.00	-	-
F	Medicago sativa	5	-	-	-	.00	-	-
F	Penstemon cyananthus	$_{b}$32	$_{a}$2	$_{a}$2	$_{a}$15	.03	.00	.03
F	Salsola iberica (a)	-	5	-	-	.01	-	-
F	Schoencrambe linifolia	10	4	4	8	.02	.04	.04
F	Taraxacum officinale	-	-	-	3	-	-	.00
F	Thelesperma subnudum	15	16	5	6	.08	.01	.04
F	Townsendia incana	6	6	5	16	.01	.01	.08
F	Unknown forb-perennial	3	-	-	-	-	-	-
Total for Annual Forbs		4	16	6	52	0.03	0.00	0.48
Total for Perennial Forbs		288	125	63	83	1.17	0.51	0.71
Total for Forbs		292	141	69	135	1.21	0.52	1.19

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

BROWSE TRENDS --
Management unit 16C, Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Cercocarpus montanus	6	6	6	.63	1.28	1.29
B	Chrysothamnus nauseosus hololeucus	0	1	0	-	-	-
B	Cowania mexicana stansburiana	0	0	2	-	-	-
B	Ephedra viridis	15	15	20	1.08	4.49	6.15
B	Eriogonum microthecum	11	4	8	.00	.03	.03
B	Juniperus osteosperma	0	6	7	.93	3.20	3.41
B	Opuntia spp.	1	0	0	-	-	-
B	Pinus edulis	0	13	10	3.31	4.06	6.72
B	Purshia tridentata	1	3	0	.03	-	-
B	Yucca harrimaniae	28	33	31	2.65	4.41	3.81
Total for Browse		62	81	84	8.65	17.49	21.44

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 14

Species	Percent Cover	
	'99	'04
Cercocarpus montanus	-	3.00
Cowania mexicana stansburiana	-	.11
Ephedra viridis	-	7.11
Juniperus osteosperma	2.00	3.25
Pinus edulis	2.20	7.71
Yucca harrimaniae	-	3.70

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 14

Species	Average leader growth (in)
	'04
Cercocarpus montanus	3.87
Cowania mexicana stansburiana	2.08

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 14

Species	Trees per Acre		
	‘94	'99	'04
Pinus edulis	109	141	149
Juniperus osteosperma	89	99	90

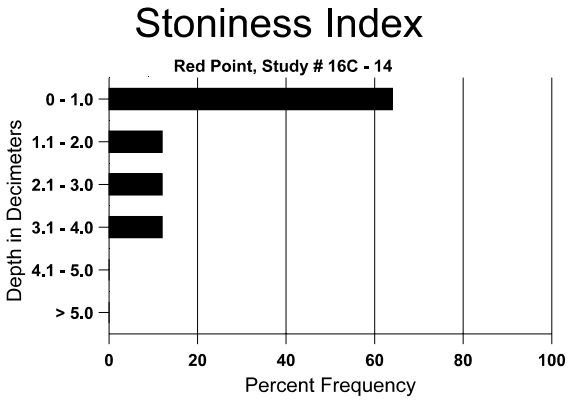
Average diameter (in)	
'99	'04
2.5	3.3
2.6	1.8

BASIC COVER --
Management unit 16C, Study no: 14

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	3.50	19.52	27.82	25.25
Rock	14.25	13.35	18.65	15.71
Pavement	7.00	4.23	8.49	9.98
Litter	37.25	41.90	34.64	38.46
Cryptogams	0	.02	1.52	0
Bare Ground	38.00	17.68	17.72	27.79

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 14, Study Name: Red Point

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.1	59.7 (14.4)	7.6	46.7	29.4	23.8	3.4	4.1	102.4	0.9



PELLET GROUP DATA --
Management unit 16C, Study no: 14

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	30	56	38
Elk	35	40	25
Deer	19	33	16
Cattle	-	4	-

Days use per acre (ha)	
'99	'04
-	-
55 (136)	38 (94)
25 (62)	31 (76)
4 (11)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ceratoides lanata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	13/11
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Cercocarpus montanus												
88	**400**	-	-	400	-	-	33	50	-	-	0	50/41
94	**120**	-	40	80	-	-	50	33	-	-	0	46/69
99	**140**	20	40	100	-	-	29	29	-	-	0	54/58
04	**120**	-	60	60	-	-	17	83	-	-	0	60/58

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	9/10
99	**20**	-	-	20	-	-	0	100	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	13/8
Cowania mexicana stansburiana												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**40**	-	-	20	20	-	0	100	50	-	50	28/34
Ephedra viridis												
88	**866**	-	466	400	-	-	85	8	0	-	0	24/30
94	**520**	-	80	440	-	60	0	0	0	-	0	38/56
99	**500**	-	60	440	-	60	52	4	0	-	0	37/54
04	**660**	-	80	540	40	20	6	3	6	3	3	37/62
Eriogonum microthecum												
88	**533**	-	200	333	-	-	0	0	0	-	0	2/2
94	**1280**	-	580	700	-	-	0	0	0	-	0	3/4
99	**320**	20	140	40	140	60	0	38	44	44	44	2/3
04	**800**	-	-	660	140	40	0	100	18	15	15	3/5
Juniperus osteosperma												
88	**200**	-	200	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	100	20	-	40	0	0	-	-	0	-/-
04	**140**	-	100	40	-	-	14	0	-	-	0	-/-
Opuntia spp.												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**40**	-	-	20	20	-	0	0	50	50	50	8/11
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Pinus edulis												
88	**400**	-	400	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**260**	-	100	160	-	-	0	0	0	-	8	23/26
04	**260**	-	40	180	40	-	0	0	15	-	8	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
88	**66**	-	66	-	-	-	0	0	0	-	0	-/-
94	**20**	-	-	20	-	-	0	0	0	-	0	19/20
99	**160**	-	20	120	20	-	0	25	13	-	0	22/29
04	**0**	-	-	-	-	-	0	0	0	-	0	14/28
Yucca harrimaniae												
88	**2133**	-	533	1600	-	-	0	0	0	-	0	17/15
94	**1680**	-	-	1680	-	20	0	0	0	-	2	14/21
99	**2100**	-	120	1940	40	100	0	0	2	.95	.95	14/18
04	**2320**	-	300	2020	-	220	0	0	0	-	0	13/17

Trend Study 16C-15-04

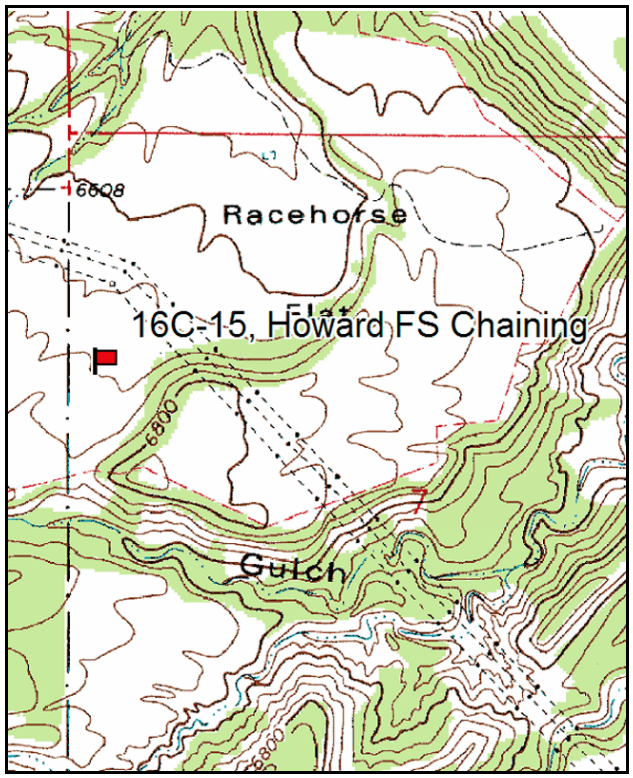
Study site name: Howard FS Chaining . Vegetation type: Chained, Seeded P-J .

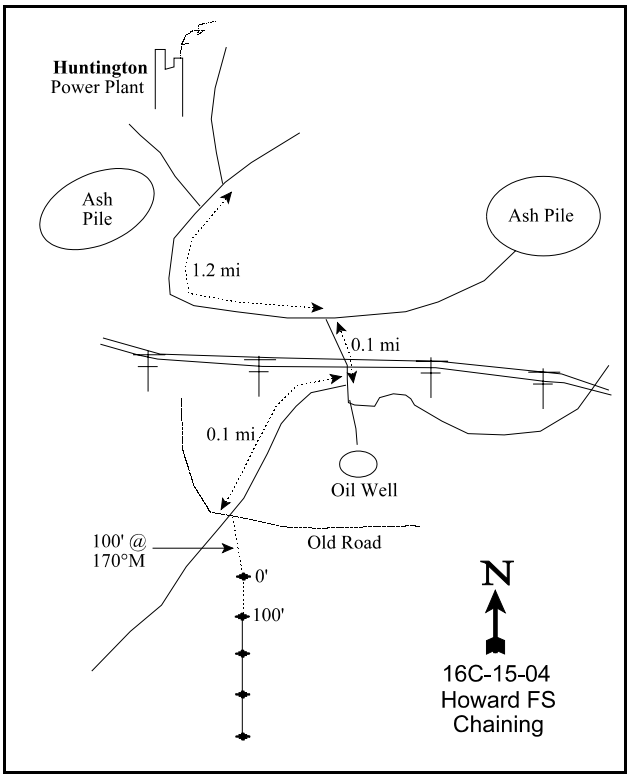
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

The shortest route to reach this study area is through the Huntington Power Plant. From the main building, go through the plant to the SE gate. Continue on the paved road 0.85 miles to a fork. The plant's ash pile is on the right. Bear left to a bridge or continue around the head of a small draw, following the road southeast towards the powerline. About 0.15 miles from the bridge there is an old fence. Go 0.1 miles to another fence. Continue up through the chaining, past the powerlines, for 0.25 miles to a large white rock with a red-painted spot, on the right side of the road. From the rock, walk 60 feet west to the first baseline stake. The fencepost is marked with browse tag #7881. The other study stakes run south at 100 foot intervals.





Map Name: Red Point

Diagrammatic Sketch

Township 17S , Range 8E , Section 7

GPS: NAD 27, UTM 12S 4356668 N, 493454 E

DISCUSSION

Howard FS Chaining - Trend Study No. 16C-15

Located on the BLM side of the fence on Racehorse Flat, by an area known as the Howard-Forest Service Chaining, this study site samples a pinyon-juniper/black sagebrush range site that was chained and seeded in the early 1970's. A variety of browse were seeded, including a palatable ecotype of basin big sagebrush. Like the previous study, it is in the West Huntington Cattle Allotment where reductions have been made in spring cattle grazing. This chaining appears to receive light use by cattle with abundant sign of deer winter use. Pellet group data from 1999 estimated 42 deer, 1 elk and 15 cow days use/acre (104 ddu/ha, 3 edu/ha, 37 cdu/ha). There was also some old sheep sign. A small percentage of the cow pats were fresh but most appeared to be from the previous grazing season. Deer use was estimated at 98 days use/acre (243 ddu/ha) in 2004. Elk use was estimated at 12 days use/acre (30 edu/ha) while cattle use was estimated at 16 days use/acre (39 cdu/ha). Most of the deer and elk pellet groups appeared to be from winter use while about 1/3 are from spring use. Cattle pats appeared to be from the previous grazing season.

The study site has a northwest aspect with a 3-5% slope and an elevation of 6,650 feet. The soil is relatively shallow and very rocky with a high percentage of boulders on the surface and below. Effective rooting depth is estimated at 13 inches. Soil texture is a sandy clay loam with a slightly alkaline pH (7.6). Phosphorus levels are marginal at 6.3 ppm. Values less than 10 ppm can limit normal plant growth and development. There are signs of localized erosion in the form of surface litter movement, soil pedestalling, rills, and gullies on the site. Herbaceous cover is very low and only the residual chaining litter prevents more serious soil movement. A soil erosion condition assessment classified erosion as moderate in 2004.

Pinyon and juniper trees dominate the site by providing 74% of the total shrub cover in 2004 with a canopy cover value of 20%. Thinning the pinyon-juniper trees should be a high priority for this site because when canopy cover approaches and exceeds 20%, the understory becomes severely reduced on average to only about 5% understory cover (Tausch 1994). Point-center quarter data from 1999 estimated 321 juniper and 90 pinyon trees/acre. In 2004 this increased to 381 juniper and 144 pinyon trees/acre. Average diameter was 2.1 inches for juniper and 5.0 for pinyon in 1999. This decreased in 2004 to 1.9 inches for juniper and 3.7 inches for pinyon, which indicates an increase in young trees. Approximately 55% of the juniper trees sampled were in the 1 to 4 foot height range, while an additional 45% were 4 to 8 feet tall. More than half of the pinyon trees sampled were large trees 8 to 12 feet tall.

The key browse species on the flat consist of a mixture of basin big sagebrush, black sagebrush, and Wyoming big sagebrush. There is apparently some hybridizing occurring between the Wyoming big sagebrush and the lower growing black sagebrush. All sagebrush species individually show evidence of moderate and some heavy use. The mature basin big sagebrush were tall, with good vigor, although there were few young or seedlings. Black sagebrush population also contains few seedling or young plants. Wyoming big sagebrush is the most common shrub on the site. It was identified as basin big sagebrush in 1988. Overall sagebrush density has decreased since 1988 due to a major decline in the number of young plants. Drought conditions combined with increasing competition with pinyon and juniper trees probably caused the majority of the mortality.

Other, less abundant preferred browse found on the site include, white rubber rabbitbrush, four-wing saltbush, and true mountain mahogany. True mountain mahogany is mostly unavailable, moderately to heavily used, and decadent. Although, this condition would be expected when the population is only 20 plants/acre and one of the most preferred browse species for deer. White rubber rabbitbrush is fairly abundant but appears to be declining. It displays moderate to heavy use, declining young recruitment, poor vigor, and increasing decadency.

The herbaceous understory is poor and produced less than 6% cover in 1999 and less than 3% in 2004. The seeded crested wheatgrass is the only abundant herbaceous species on the site. It provided 96% of the grass cover and 82% of the herbaceous cover in 1994. Intermediate wheatgrass, smooth brome, Indian ricegrass, bottlebrush squirreltail, and Russian wildrye were all encountered in 1988, however only Russian wildrye and a few Indian ricegrass plants were found in 1999. Native forbs are rare, except for a *Cryptantha* spp. and a few annual mustards.

1994 TREND ASSESSMENT

Ground cover characteristics are similar to those of 1988, with the exception of litter cover which has declined. This is primarily the result of diminishing chaining debris. Percent bare ground has remained fairly stable, although increasing slightly. Soil trend is still considered stable. The browse trend is down slightly due to the lack of seedlings and the large decline in young plants. This trend will most likely be reversed when normal precipitation patterns return. Trend for herbaceous plants is slightly down due to a decline in the sum of nested frequencies for grasses and forbs. The Desirable Components Index (see methods) rated this site as fair with a score of 35 due to high decadence and low perennial forb and grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 35 (fair) Wyoming/Basin big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to those of 1994. Trend for browse is stable with respect to sagebrush. Density of all sagebrush species combined has remained similar to 1994 estimates. Seedlings and young plants are still limited, but at slightly higher levels compared to 1994. It appears that the basin big sagebrush are not doing as well as the black and Wyoming big sagebrush. Nearly one-third of the basin big sagebrush sampled display poor vigor and percent decadence has increased from 10% in 1994 to 32% currently. Rubber rabbitbrush is also showing signs of decline. It's population density has declined 36%, with 34% of the population displaying poor vigor, and percent decadence increase from 11% to 54%. No seedlings have been found on the site since 1988 and the proportion of young plants has steadily declined from 90% in 1988, to 22% in 1994, and only 9% by 1999. Released pinyon and juniper trees appear to be increasing in size. They provided 52% of the browse cover in 1994 and 61% in 1999. Taking all of these factors into consideration, trend for browse is considered stable since the key species, Wyoming big sagebrush, appears to have a stable population. Use is heavier than in 1994, but vigor has improved slightly, young recruitment has improved, and percent decadence has remained similar (23% vs 21%). This trend will change for the worse as the pinyon and juniper trees increase in size and density. Trend for the herbaceous understory is up slightly for perennial grasses but down for forbs. Overall the herbaceous understory is poor with grasses and forbs producing only about 6% cover in 1994 and 1999. Crested wheatgrass is the dominant species. It currently provides 92% of the grass cover and 84% of the herbaceous cover. It declined significantly in nested frequency between 1988 and 1994, but it has increased significantly since 1994. Forbs are rare and provide less than 1% cover. Trend is considered up slightly. The Desirable Components Index rated this site as fair with a score of 30 due to increasing high decadence and low perennial forb and grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 30 (fair) Wyoming/Basin big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is down slightly. Cover of bare ground has increased and the ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground has declined since 1999. There is evidence of soil erosion in the form of soil pedestalling, rills, gullies, and soil movement. The erosion condition class determined soil erosion as moderate in 2004. Trend for the key browse species, black sagebrush, basin big sagebrush, and Wyoming big sagebrush combined is considered slightly down. Black sagebrush has increased slightly in density since 1999. It shows mostly light use, good vigor, and low decadence. Basin big sagebrush shows moderate to heavy use, poor reproduction, and increasing decadence. Wyoming big sagebrush is the most palatable sagebrush species on the site. Density has declined by 60% since 1999. Utilization remains moderate to heavy. Average vigor is poor on one-half of the plants sampled and 60% of the population was classified as decadent. Rubber rabbitbrush is another preferred browse species. It has declined in density 31% since 1999. Average vigor remained poor on about one-third of the population and percent decadence has remained high at 58%. Another negative factor is the increase in canopy cover for pinyon and juniper trees. Average cover has increased form 7% (1999) to 20% (2004), it has increased by 186%. Trend for the herbaceous understory is down. Crested wheatgrass is the only abundant perennial species on the site. It has declined significantly in nested frequency since 1999 and average cover has dropped 49% from a cover value of 5% to 2.5%. All perennial grasses were found growing within the protection of chaining litter or tree and shrub canopies. The forb component is diverse but all species are rare in their occurrence. The Desirable Components Index rated this site as poor with a score of 14 due to increasing high decadence, decreasing shrub cover, and decreasing perennial grass cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - down (1)
winter range condition (DC Index) - 14 (poor) Wyoming/Basin big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 15

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{c}$246	$_{b}$186	$_{c}$233	$_{a}$99	5.15	4.95	2.51
G	Agropyron intermedium	6	2	-	-	.00	-	-
G	Bromus inermis	4	-	-	-	-	-	-
G	Elymus junceus	$_{b}$35	$_{a}$9	$_{a}$11	$_{a}$14	.18	.42	.41
G	Oryzopsis hymenoides	7	5	3	-	.04	.01	.00
G	Poa fendleriana	-	1	-	-	.00	-	-
G	Sitanion hystrix	$_{b}$28	$_{a}$-	$_{a}$-	$_{a}$2	-	-	.00
Total for Annual Grasses		0	0	0	0	0	0	0

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
Total for Perennial Grasses		326	203	247	115	5.39	5.39	2.93
Total for Grasses		326	203	247	115	5.39	5.39	2.93
F	Arabis spp.	15	4	1	-	.01	.00	-
F	Chenopodium fremontii (a)	-	7	-	2	.01	-	.01
F	Chenopodium leptophyllum(a)	-	-	-	4	-	-	.01
F	Cirsium spp.	1	-	-	-	-	-	-
F	Cryptantha spp.	$_{c}$100	$_{bc}$67	$_{ab}$36	$_{a}$11	.58	.32	.20
F	Descurainia pinnata (a)	-	$_{b}$21	$_{a}$-	$_{b}$27	.05	-	.11
F	Draba spp. (a)	-	1	-	-	.00	-	-
F	Eriogonum umbellatum	16	18	8	8	.04	.04	.22
F	Gilia spp. (a)	-	-	-	11	-	-	.02
F	Ipomopsis aggregata	-	-	-	3	-	-	.00
F	Lappula occidentalis (a)	-	-	-	3	-	-	.01
F	Lactuca serriola	-	-	-	3	-	-	.00
F	Lepidium densiflorum (a)	-	-	-	1	-	-	.00
F	Medicago sativa	3	-	-	-	-	-	-
F	Penstemon carnosus	18	9	12	11	.03	.05	.07
F	Pedicularis centranthera	-	-	-	1	-	-	.03
F	Ranunculus testiculatus (a)	-	-	1	-	-	.00	-
F	Salsola iberica (a)	-	$_{b}$23	$_{a}$-	$_{a}$-	.09	-	-
F	Schoencrambe linifolia	$_{b}$16	$_{ab}$13	$_{a}$5	$_{a}$-	.05	.01	.00
F	Streptanthus cordatus	-	-	2	-	-	.00	-
F	Taraxacum officinale	2	-	-	-	-	-	-
F	Townsendia incana	2	-	-	-	-	-	-
F	Unknown forb-perennial	4	-	-	-	-	-	-
Total for Annual Forbs		0	52	1	48	0.16	0.00	0.16
Total for Perennial Forbs		177	111	64	37	0.72	0.44	0.53
Total for Forbs		177	163	65	85	0.89	0.44	0.70

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

BROWSE TRENDS --
Management unit 16C, Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	16	10	13	.45	.18	.48
B	Artemisia tridentata tridentata	10	16	17	.85	.75	2.67
B	Artemisia tridentata wyomingensis	39	34	16	2.58	2.59	.78
B	Atriplex canescens	1	0	1	-	-	-
B	Cercocarpus montanus	2	2	1	-	-	.00
B	Chrysothamnus nauseosus hololeucus	37	28	18	1.36	1.86	.81
B	Juniperus osteosperma	0	24	26	2.03	3.29	4.39
B	Opuntia spp.	2	0	0	-	-	-
B	Pinus edulis	0	8	10	3.84	5.18	9.03
Total for Browse		107	122	102	11.14	13.88	18.18

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 15

Species	Percent Cover	
	'99	'04
Artemisia nova	-	1.60
Artemisia tridentata tridentata	-	1.48
Artemisia tridentata wyomingensis	-	1.29
Chrysothamnus nauseosus hololeucus	-	1.16
Juniperus osteosperma	2.40	8.28
Pinus edulis	4.59	11.69

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 15

Species	Average leader growth (in)
	'04
Artemisia tridentata	1.6
Artemisia nova	3.6

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 15

Species	Trees per Acre		
	'94	'99	'04
Pinus edulis	-	90	144
Juniperus osteosperma	-	321	381

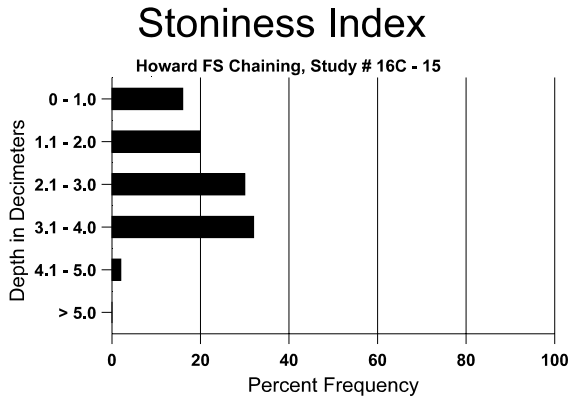
Average diameter (in)		
'94	'99	'04
-	5	3.68
-	2.1	1.91

BASIC COVER --
Management unit 16C, Study no: 15

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	3.25	17.63	18.36	20.39
Rock	12.25	10.96	8.97	10.26
Pavement	4.00	2.89	7.18	8.02
Litter	52.50	29.82	36.51	37.95
Cryptogams	0	.03	.81	.69
Bare Ground	28.00	29.45	30.02	36.27

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 15, Study Name: Howard FS Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.0	60.7 (13.9)	7.6	54.7	23.4	21.8	5.1	6.3	80.0	0.8



PELLET GROUP DATA --
Management unit 16C, Study no: 15

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'99	'04	'99	'04
Sheep	-	3	-	12 (30)	-
Rabbit	11	53	3	-	-
Elk	4	5	-	1 (2)	12 (30)
Deer	62	51	43	42 (104)	98 (243)
Cattle	1	5	2	15 (37)	16 (39)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
88	**66**	-	-	66	-	-	0	0	0	-	0	6/14
94	**1020**	-	-	820	200	-	47	16	20	4	4	8/20
99	**540**	-	40	420	80	40	63	26	15	-	0	6/16
04	**700**	-	-	620	80	40	11	9	11	9	9	8/18
Artemisia tridentata tridentata												
88	**5132**	1866	4466	466	200	-	19	4	4	-	5	30/28
94	**200**	-	40	140	20	-	20	0	10	-	0	41/46
99	**440**	-	100	200	140	40	27	5	32	27	27	31/34
04	**580**	-	-	240	340	80	52	34	59	17	17	33/36
Artemisia tridentata wyomingensis												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**1300**	20	20	980	300	260	25	3	23	18	22	21/25
99	**1720**	20	180	1180	360	80	44	19	21	9	10	17/24
04	**400**	-	80	80	240	240	35	20	60	50	50	21/22
Atriplex canescens												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**20**	-	-	20	-	-	0	0	0	-	0	30/29
99	**0**	-	-	-	-	-	0	0	0	-	0	25/18
04	**20**	-	-	-	20	-	0	100	100	100	100	30/22
Cercocarpus montanus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**40**	-	-	-	40	-	50	50	100	50	50	18/19
99	**40**	-	-	-	40	-	100	0	100	100	100	-/-
04	**20**	-	-	-	20	20	0	100	100	-	0	22/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	13/17
Chrysothamnus nauseosus hololeucus												
88	**1999**	466	1800	66	133	-	37	7	7	-	7	29/21
94	**1100**	-	240	740	120	-	5	5	11	2	2	23/25
99	**700**	-	60	260	380	100	40	40	54	29	34	37/36
04	**480**	20	40	160	280	80	33	17	58	29	38	24/27
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/13
Juniperus osteosperma												
88	**933**	-	933	-	-	-	0	0	-	-	21	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**540**	-	420	120	-	60	0	0	-	-	11	-/-
04	**680**	-	320	360	-	-	0	0	-	-	0	-/-
Opuntia spp.												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**80**	-	-	80	-	-	0	0	-	-	0	3/12
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	6/12
Pinus edulis												
88	**200**	-	200	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**160**	20	20	140	-	-	0	0	-	-	0	-/-
04	**220**	-	20	200	-	-	0	0	-	-	0	-/-
Pinus edulis chained												
88	**66**	-	-	-	66	-	0	0	100	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	16/32
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/35

Trend Study 16C-17-04

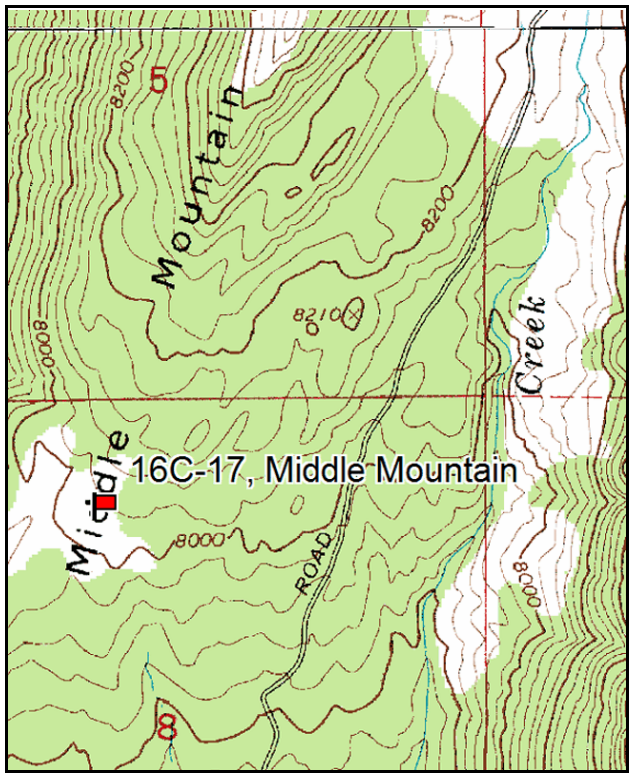
Study site name: Middle Mountain . Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 345 degrees magnetic.

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

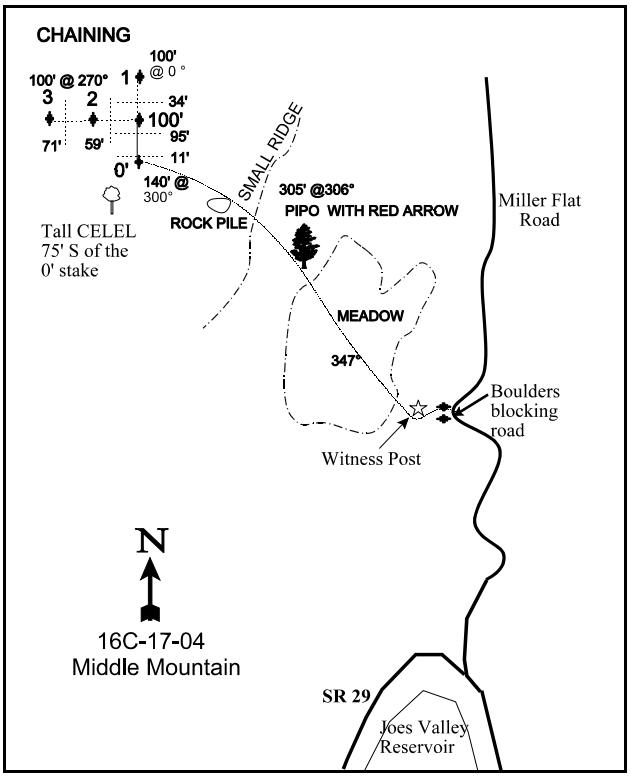
LOCATION DESCRIPTION

From the paved highway at the north end of Joes Valley Reservoir, proceed north on the Upper Joes Valley road (Millers Flat road) for 1.2 miles. Stay right at the fork and continue l.2 miles to another fork. Stay right (on the Indian Creek side) and go 1.1 miles to a faint turnoff to the left. Park by the witness post which is about 75 yards off the main road. From the witness post, walk NNW to the upper end of the meadow to the lighting-scarred Ponderosa with a red arrow painted on it. From the pine tree walk NW 100 yards to a pile of rocks painted red. From the rock pile, walk NW (300/) for 140 feet to the 0-foot baseline stake. The 1st stake has a red browse tag #9018 attached.



Map Name: Joes Valley Reservoir

Township 17S , Range 6E , Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4357009 N, 476952 E

DISCUSSION

Middle Mountain - Trend Study No. 16C-17

The Middle Mountain site is a diverse, productive area of high elevation range used by both deer and elk as winter-spring range. The study is located at the upper end of a small (approximately 200 acre) chaining on a slope where the pinyon and juniper trees were never very dense. It is more of a mixed mountain brush site. The gradual, southwest-facing slope allows for use during most winters. The slope is open, but nearby stands of Ponderosa pine, aspen, and mature curlleaf mountain mahogany on the ridge provide excellent cover and additional foraging opportunities. The elevation is 8,100 feet. The lower end of the chaining is dominated by grass, where there is less sign of big game use. Pellet group data from 1999 estimated 26 deer and 35 elk days use/acre (64 ddu/ha and 87 edu/ha). Sheep sign was also encountered and some animals could be heard in the area. One moose pellet group was also encountered on the site in 1999. Pellet group data from 2004 was very similar with 39 elk and 16 deer days use/acre estimated (96 edu/ha and 40 ddu/ha).

There are some sandstone rocks on the surface, but overall the soil is moderately deep and free of rocks. Effective rooting depth is estimated at just over 15 inches. Depth measurements were limited by a compacted soil horizon. The soil has a clay to sandy clay loam texture and a neutral pH (7.2). Phosphorus is very limited at just 2 ppm, the lowest reading of any site in 16C. Values less than 10 ppm can limit normal plant growth and development. There is little rock or pavement on the surface. Some localized soil movement is occurring on the site, including some small rills about 10 to 20 feet in length in places and soil pedestalling is evident around plants, although there are no gullies. A network of game trails that lack cover show signs of some active erosion. An erosion condition class was determined to be stable in 2004.

The site supports a variety of desirable browse species including, mountain big sagebrush, black sagebrush, Utah serviceberry, and true mountain mahogany. Mountain big sagebrush and black sagebrush display moderate to heavy use, good vigor, and low percent decadence. The population of black sagebrush has increased steadily from 599 plants/acre in 1988 to 3,000 in 2004. Mountain big sagebrush has remained relatively stable at about 2,000 plants/acre. Black sagebrush and mountain big sagebrush combine to provide nearly one-half of the total browse cover. Other key preferred browse species are true mountain mahogany and Utah serviceberry. The true mountain mahogany population was estimated at 580 plants/acre in 2004, which accounted for 17% of the total browse cover. Mature plants average about 2 feet in height, show moderate to heavy use, and are in good vigor. Leader growth was excellent in 1999 at about 9 inches, but some of the new leaves were withered due to insect damage.

Serviceberry is less abundant with an estimated density of 440 plants/acre in 1994, 620 in 1999, and 380 in 2004. Mature serviceberry are small averaging only 14 inches in height in 2004. These shrubs were extremely heavily browsed in 1988 but have displayed more moderate to heavy use since.

Some fair forage is provided by the numerous but small dwarf rabbitbrush whose population density was estimated at nearly 6,000 plants/acre in 2004. These shrubs provided 18% of the browse cover in 1994 and 20% in 2004. Additional forage is provided by small populations of curlleaf mahogany, antelope bitterbrush, and snowberry. Pinyon and juniper trees can be found scattered throughout the site in small numbers. Point center-quarter data from 1999 estimated 24 juniper and 20 pinyon trees/acre with average diameters of 3.1 and 1.6 inches respectively. A few white pine trees were also encountered.

The herbaceous understory is diverse and abundant. Salina wildrye is the dominant grasses. It provides about 80% of the grass cover. The only other common grass is prairie June grass. Forbs are also diverse and abundant. Common species include pussy toes, aster, bastard toadflax, Eaton fleabane, thistle, and desert phlox.

1994 TREND ASSESSMENT

Ground cover characteristics have changed considerably since 1988. Percent bare ground has more than tripled and litter cover has declined by 73%. Nested frequency of herbaceous vegetation has declined slightly, but it is still abundant. Trend for soil is down. The browse trend is currently stable. The key species display stable population densities, reduced heavy utilization and good vigor. The herbaceous understory trend is stable. Sum of nested frequency for grasses has increased slightly, while those of forbs has declined slightly. This decline is due to drought conditions during the spring of 1994 in which precipitation was only 60% of normal. The Desirable Components Index (see methods) rated this site as good with a score of 68 due to low decadence, fair shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - down (1)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 68 (good) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground from 44% to 39% and an increase in litter cover from 20% to 27%. Vegetative cover also increased from 30% to 39%. Trend for browse is up for serviceberry, black sagebrush, and true mountain mahogany. Densities of these key species have increased, vigor has improved, and percent decadence is lower. Heavy use is also lower on serviceberry and mahogany. Mountain big sagebrush is another key species which provides 23% of the shrub cover. Density has declined slightly since 1994, but vigor has improved and percent decadence has declined from 33% to 16%. Overall trend for browse is considered up slightly. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has increased slightly, but the frequency of the dominant species, Salina wildrye, is stable. The sum of nested frequency of perennial forbs has declined slightly, although cover of forbs has increased nearly three fold. However, 73% of the forb cover comes from pussy toes, thistle, and bastard toadflax. The Desirable Components Index rated this site as excellent with a score of 87 due to low decadence, increase in shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 87 (excellent) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of bare ground, litter, and vegetation are similar to 1999 estimates and herbaceous cover is stable. There is some localized erosion occurring but it is minimal. Trend for the key browse species, black sagebrush, mountain big sagebrush, and true mountain mahogany, is up slightly. Density of black sagebrush has increased slightly, use remains light to moderate, vigor good, and decadence low. Seedlings are abundant and young recruitment is good. Mountain big sagebrush rose 28% in density to 2,140 plants/acre. Utilization remains moderate to heavy, vigor good, and decadence low at 16%. Seedlings were very abundant in 2004 and young plants accounted for 23% of the population. True mountain mahogany is stable. Density has declined slightly, utilization is extremely heavy, but vigor remains normal and there are no decadent plants. Overall shrub cover has steadily increased from about 12% in 1994 to 27% in 2004. Many of the sagebrush seedlings were very small when the site was read on July 22 and may not survive the dry summer. Trend for the herbaceous understory is down slightly. Sum of nested frequency for

perennial grasses is down slightly with a significant decline in the frequency of Prairie June grass. The dominant grass, Salina wildrye, remained stable. Sum of nested frequency for perennial forbs declined 30% and average cover dropped by nearly two-fold. The forb composition is diverse but many of the more abundant forbs are less desirable species, Aster, thistle, bastard toadflax, and owl clover. The Desirable Components Index rated this site as excellent with a score of 90 due to low decadence, increase in shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 90 (excellent) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 17

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	44	50	33	39	1.40	.54	.79
G	Carex spp.	9	-	-	-	-	-	-
G	Elymus salina	244	258	264	237	11.48	11.38	11.82
G	Koeleria cristata	$_{ab}$52	$_{a}$27	$_{c}$110	$_{b}$77	.26	2.42	1.95
G	Poa fendleriana	$_{b}$56	$_{c}$76	$_{a}$24	$_{a}$10	.86	.26	.10
G	Poa secunda	$_{a}$-	$_{ab}$12	$_{b}$22	$_{a}$7	.24	.14	.18
G	Sitanion hystrix	-	-	2	-	-	.03	-
G	Stipa lettermani	-	7	-	5	.21	-	.06
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		405	430	455	375	14.47	14.80	14.92
Total for Grasses		405	430	455	375	14.47	14.80	14.92
F	Allium spp.	$_{b}$54	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Antennaria rosea	$_{a}$18	$_{a}$28	$_{b}$92	$_{a}$17	.35	1.83	.33
F	Androsace septentrionalis (a)	-	$_{a}$-	$_{b}$13	$_{a}$6	-	.13	.04
F	Arabis spp.	-	3	-	-	.00	-	-
F	Astragalus convallarius	-	2	-	1	.00	-	.00
F	Aster spp.	$_{a}$54	$_{b}$102	$_{a}$38	$_{b}$83	.56	.28	.92
F	Astragalus spp.	2	5	7	-	.02	.19	-
F	Castilleja linariaefolia	5	-	4	-	-	.01	-
F	Calochortus nuttallii	-	-	3	1	-	.00	.00
F	Chaenactis douglasii	-	-	-	1	-	-	.00
F	Cirsium spp.	$_{b}$105	$_{b}$94	$_{b}$98	$_{a}$53	.68	4.07	1.85
F	Comandra pallida	$_{b}$60	$_{a}$35	$_{c}$108	$_{bc}$70	.13	2.89	1.23
F	Collinsia parviflora (a)	-	-	-	3	-	-	.00

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Crepis acuminata	5	1	-	-	.00	-	-
F	Cryptantha spp.	2	4	-	-	.01	-	-
F	Cymopterus spp.	-	5	-	1	.01	-	.00
F	Erigeron eatonii	$_{c}$159	$_{b}$79	$_{b}$54	$_{a}$3	.42	.30	.09
F	Erigeron flagellaris	-	-	-	4	-	-	.03
F	Eriogonum umbellatum	2	7	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	-	2	-	-	.00
F	Hymenopappus filifolius	$_{a}$6	$_{ab}$20	$_{b}$24	$_{ab}$17	.30	.52	.38
F	Lesquerella spp.	-	-	2	-	-	.03	-
F	Lomatium grayi	$_{b}$38	$_{a}$2	$_{a}$-	$_{a}$-	.00	-	-
F	Machaeranthera canescens	-	-	-	4	-	-	.04
F	Microsteris gracilis (a)	-	-	-	1	-	-	.00
F	Orthocarpus spp. (a)	-	$_{a}$-	$_{b}$21	$_{c}$136	-	.18	4.03
F	Penstemon caespitosus	$_{c}$76	$_{c}$66	$_{a}$-	$_{b}$25	.66	-	.46
F	Penstemon lentus	4	-	-	5	-	-	.09
F	Phlox austromontana	14	34	28	35	.77	.82	.99
F	Phlox longifolia	-	-	-	1	-	-	.00
F	Polygonum douglasii (a)	-	$_{a}$3	$_{a}$-	$_{b}$36	.00	-	.10
F	Senecio multilobatus	3	-	-	-	-	-	-
F	Sphaeralcea coccinea	10	24	20	13	.10	.11	.11
F	Taraxacum officinale	$_{b}$8	$_{a}$-	$_{a}$-	$_{a}$-	-	.03	-
Total for Annual Forbs		0	3	34	184	0.00	0.31	4.19
Total for Perennial Forbs		625	511	478	334	4.08	11.12	6.57
Total for Forbs		625	514	512	518	4.09	11.43	10.77

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

BROWSE TRENDS --
Management unit 16C, Study no: 17

Type	Species	Percent Cover			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	20	14	17	.64	.86	1.28
B	Artemisia nova	41	61	55	2.90	4.92	5.35
B	Artemisia tridentata vaseyana	50	47	50	1.99	4.48	6.42
B	Cercocarpus ledifolius	2	1	2	-	-	-
B	Cercocarpus montanus	16	25	21	1.57	3.73	4.58
B	Chrysothamnus depressus	68	72	76	2.13	3.63	5.44
B	Chrysothamnus viscidiflorus viscidiflorus	59	4	25	.18	.03	.46
B	Gutierrezia sarothrae	118	26	41	1.48	.39	.93
B	Mahonia repens	-	-	-	-	-	-
B	Opuntia spp.	3	5	4	.01	.00	.03
B	Pinus edulis	0	3	1	-	.38	1.03
B	Purshia tridentata	2	2	2	-	.00	-
B	Quercus gambelii	0	0	0	-	-	-
B	Symphoricarpos oreophilus	13	10	16	.84	.82	1.32
B	Tetradymia canescens	0	0	0	-	-	-
Total for Browse		236	209	3763	11.76	19.25	26.88

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 17

Species	Percent Cover '04
Amelanchier utahensis	1.73
Artemisia nova	7.36
Artemisia tridentata vaseyana	5.48
Cercocarpus ledifolius	.51
Cercocarpus montanus	3.53
Chrysothamnus depressus	4.03
Chrysothamnus viscidiflorus viscidiflorus	.60
Gutierrezia sarothrae	2.06
Opuntia spp.	.03
Pinus edulis	2.51
Purshia tridentata	.13
Symphoricarpos oreophilus	1.41

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 17

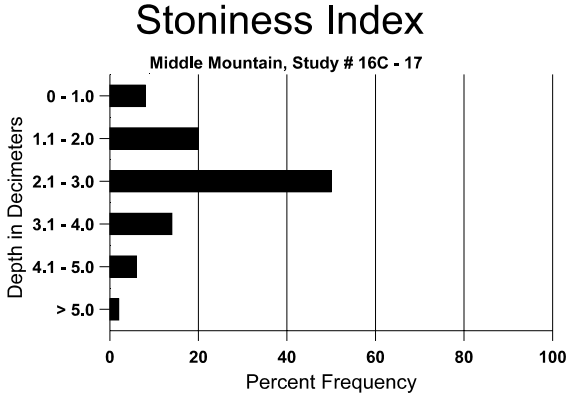
Species	Average leader growth (in) '04
Amelanchier utahensis	3.6
Artemisia nova	1.1
Artemisia tridentata vaseyana	2.4
Cercocarpus montanus	4.2

BASIC COVER --
Management unit 16C, Study no: 17

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	5.75	29.73	39.15	43.42
Rock	6.50	2.62	2.79	2.26
Pavement	0	.03	.09	.09
Litter	74.25	19.81	27.38	24.07
Cryptogams	0	.60	.55	2.79
Bare Ground	13.50	44.09	38.95	44.63

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 17, Study Name: Middle Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.2	52.0 (16.8)	7.2	44.4	13.8	41.8	1.4	2.0	76.8	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 17

Type	Quadrat Frequency '94	'99	'04
Sheep	-	2	-

Days use per acre (ha) '99	'04
-	-

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	9	30	30
Elk	43	21	23
Deer	18	9	20
Cattle	1	-	-

Days use per acre (ha)	
'99	'04
-	-
35 (87)	39 (96)
26 (64)	16 (40)
-	-

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**1200**	33	1200	-	-	-	3	67	0	-	11	-/-
94	**440**	-	40	360	40	-	27	32	9	5	5	11/15
99	**620**	-	460	160	-	-	26	6	0	-	0	35/30
04	**380**	-	120	240	20	-	32	26	5	-	0	14/20
Artemisia nova												
88	**599**	-	333	133	133	-	28	6	22	-	6	7/8
94	**1880**	-	540	1060	280	40	11	1	15	5	5	8/19
99	**2480**	120	280	1900	300	180	37	21	12	4	4	11/20
04	**3000**	1820	560	1960	480	260	28	14	16	7	7	8/18
Artemisia tridentata vaseyana												
88	**1933**	633	400	800	733	-	28	45	38	3	7	17/23
94	**2180**	40	100	1360	720	460	28	5	33	13	13	14/25
99	**1540**	40	260	1040	240	300	29	18	16	5	6	19/30
04	**2140**	2140	500	1300	340	320	28	26	16	7	7	14/27
Cercocarpus ledifolius												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**40**	-	-	40	-	-	50	0	-	-	0	14/18
99	**20**	-	-	20	-	-	0	0	-	-	0	38/32
04	**40**	-	-	40	-	-	0	100	-	-	0	35/34
Cercocarpus montanus												
88	**366**	-	300	66	-	-	9	82	0	-	0	28/37
94	**580**	-	20	500	60	-	21	66	10	10	10	19/37
99	**760**	20	120	640	-	-	50	26	0	-	0	28/36
04	**580**	480	60	520	-	-	3	90	0	-	0	23/32
Chrysothamnus depressus												
88	**3199**	-	1833	1300	66	-	26	18	2	-	1	4/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
94	**5240**	-	260	4620	360	40	3	0	7	1	3	3/8
99	**4760**	60	540	4080	140	60	17	6	3	.42	.42	4/11
04	**5980**	280	120	5760	100	20	19	12	2	-	0	4/10
Chrysothamnus nauseosus												
88	**33**	-	-	33	-	-	0	0	-	-	100	20/19
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**365**	-	133	166	66	-	18	9	18	-	0	9/12
94	**100**	-	-	80	20	-	0	0	20	20	20	7/8
99	**120**	-	-	120	-	-	0	0	0	-	0	11/17
04	**1360**	60	-	1360	-	-	0	0	0	-	0	9/13
Gutierrezia sarothrae												
88	**899**	-	200	666	33	-	4	0	4	2	4	5/4
94	**3220**	-	200	3020	-	20	0	0	0	-	0	6/7
99	**1500**	120	280	1220	-	-	0	0	0	-	0	6/7
04	**2540**	-	160	2380	-	-	0	0	0	-	0	7/10
Opuntia spp.												
88	**33**	-	-	-	33	-	0	0	100	61	100	-/-
94	**80**	-	40	40	-	-	0	0	0	-	0	2/12
99	**100**	-	40	40	20	-	0	0	20	20	20	2/8
04	**140**	-	20	120	-	-	0	0	0	-	0	3/3
Pinus edulis												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	20	40	-	-	0	0	-	-	0	-/-
04	**20**	60	-	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**140**	-	20	80	40	20	71	14	29	14	29	13/30
99	**60**	-	-	60	-	-	0	100	0	-	0	18/76
04	**40**	-	-	20	20	-	50	50	50	-	0	13/47

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Quercus gambelii												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**699**	66	500	133	66	-	24	57	9	-	0	11/19
94	**440**	-	20	420	-	-	59	0	0	-	0	8/16
99	**240**	-	40	200	-	-	17	0	0	-	0	12/25
04	**520**	-	60	440	20	-	0	0	4	-	0	11/22
Tetradymia canescens												
88	**33**	-	-	33	-	-	100	0	-	-	0	9/10
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 16C-18-04

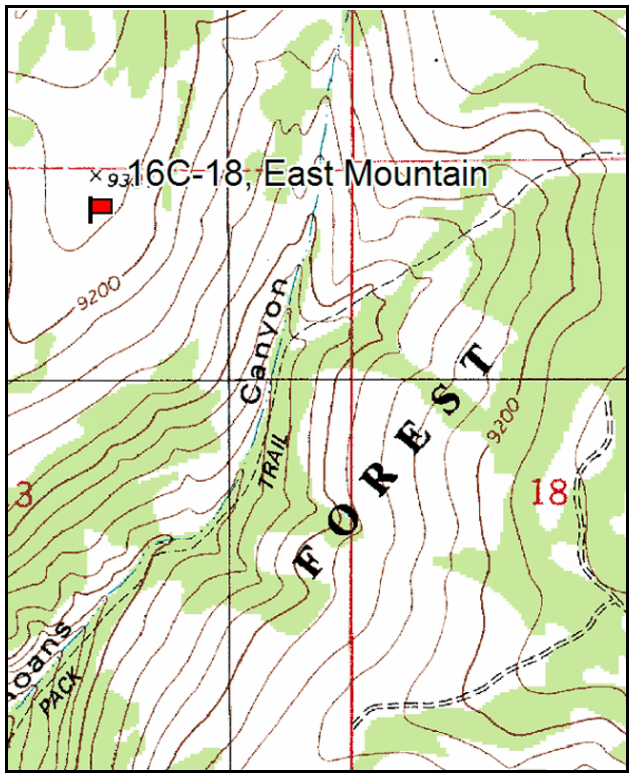
Study site name: East Mountain . Vegetation type: Mountain Big Sagebrush .

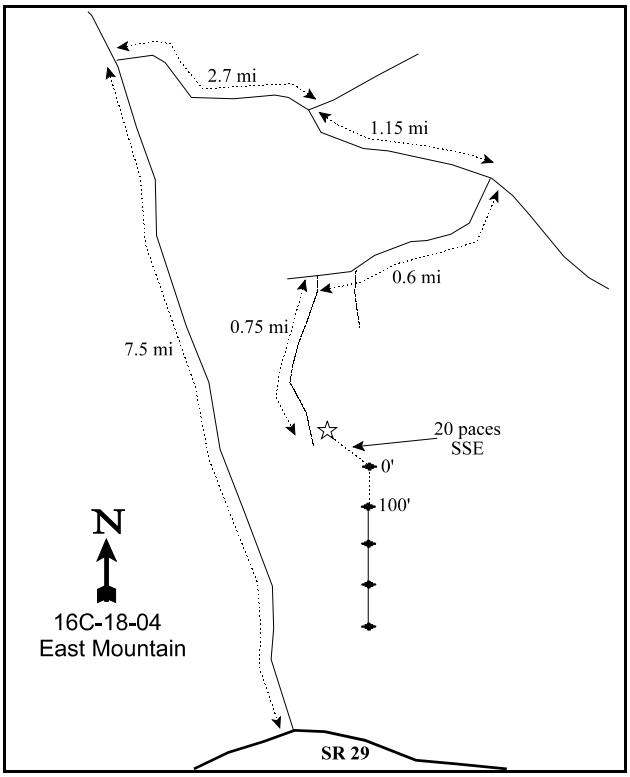
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Orangeville, go up Straight Canyon to a major fork at Cottonwood Creek. Bear right up Cottonwood Creek approximately 7.5 miles to Mill Canyon. Turn right and go up Mill Canyon 2.7 miles to a fork at the top of East Mountain. Bear right on the main road 0.6 miles to a fork to Pine Springs - Snow Lake. Continue on the main road 0.55 miles. Turn right here down off the main road. Go 0.15 miles to a spring. Continue 0.15 miles to the creek at the bottom of the dugway. Go 0.3 miles to a fork past the first patch of aspen clones to the second patch (2nd faint road), bear left on the 2nd faint road. Wind down through the trees and out onto the sage/grass ridge for 0.75 miles. There is a witness post on the left side of the road. From the witness post, walk 20 paces SSE to a 18" fencepost marked by a red browse tag, #7162. This is the 0-foot baseline stake.





Map Name: Mahogany Point

Diagrammatic Sketch

Township 17S , Range 6E , Section 13

GPS: NAD 27, UTM 12S 4355373 N, 483675 E

DISCUSSION

East Mountain - Trend Study No. 16C-18

The East Mountain trend study is located on a low point on the west side of the plateau above Roans Canyon and Cottonwood Creek. It is on Forest Service land, on the East Mountain allotment which is grazed by 341 cattle from June 21 to September 10. Much of the area was sprayed to kill sagebrush in the late 1960's. The site is located on a slope where the majority of the mountain big sagebrush was not affected. The lower end of the study baseline was affected more by the treatment and showed a lower density of mountain big sagebrush than the beginning of the transect line. The study site is on a south-southwest slope of 6-8%. The elevation is 9,200 feet. Elk winter on the points and windswept south-facing slopes. Deer sign was only occasionally observed. Pellet group data from 1999 estimated 17 deer and 55 elk days use/acre (42 ddu/ha and 136 edu/ha). Pellet group data from 2004 was very similar with 56 elk and 21 deer days use/acre estimated (137 edu/ha and 53 ddu/ha).

The loose surface soil has a clay loam texture and neutral pH (7.3). It is relatively deep with an effective rooting depth of just over 17 inches. There are few rocks in the profile, except near the rocky, shallow ridge top. Phosphorus is limited with a value of only 3.8 ppm. Values less than 10 ppm can limit normal plant growth and development. Scattered small gullies which begin on the upper portions of the slope converge and deepen on the steeper side hills. Bare spots on the study site show obvious soil movement with soil pedestalled around shrubs and bunch grasses. The erosion condition class determined erosion as slight in 2004.

The dominant browse species is mountain big sagebrush which provide about three-fourths of the browse cover on the site. The population has slowly increased in density from 3,060 plants/acre in 1994 to 3,700 by 2004. The rather small statured plants show good vigor with moderate use. The number of decadent plants has steadily increased from 22% in 1988, to 30% in 1999, and 43% by 2004. Recruitment for young plants is marginal and the proportion of the population that are dead has increased from 8% in 1994 to 15% by 2004. Some additional forage is available from species like low rabbitbrush, snowberry, and gray horsebrush, which show light to moderate hedging.

The herbaceous understory is abundant and diverse. Large bunches of Salina wildrye dominant the grass component. It provided 84% of the grass cover in 1994, 51% in 1999, and 44% in 2004. Associated grass species are mutton and Sandberg bluegrass, slender wheatgrass, and Carex. Twenty-three forb species were identified in 1994, 26 in 1999, and 24 in 2004. Desert phlox, looseflower milkvetch, silvery lupine, narrowleaf Indian paintbrush, and a penstemon are the most common species. Some of these forbs showed light use in 1999, while paintbrush was moderately to heavily utilized in 2004.

1994 TREND ASSESSMENT

Ground cover characteristics changed only slightly since 1988. Bare ground is nearly the same with only a slight increase. Litter has decreased, while rock and pavement have increased. There appears to be ample litter and vegetative cover, with the soil trend appearing stable. Mountain big sagebrush is the key browse. It exhibits a stable mature population. The small stature of the mountain big sagebrush may indicate that the site is marginal for this plant. There is a decrease in the number of seedling and young plants compared to 1988, but this is likely due to a lack of precipitation. The number of decadent plants has stayed relatively stable with more of the plants being moderately hedged. Trend for browse is stable. Herbaceous understory shows a decrease in sum of nested frequency for both grasses and forbs. Many of the grasses and forbs have significantly decreased in sum of nested frequency since 1988, which would indicate a slightly downward trend. The Desirable Components Index rated (see methods) this site as fair with a score of 59 due to high decadence, few young shrubs, and fair perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 59 (fair) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil continues to be stable. Percent cover of litter declined slightly since 1994, but cover bare ground also declined. Vegetation cover increased and herbaceous plants have a stable sum of nested frequency value. Trend for the key browse species, mountain big sagebrush, is stable. Population density has remained similar, although use is heavier and percent decadence has increased from 23% to 30%. Recruitment is marginal but there is just enough young plants to replace decadent & dying plants. The proportion of dead plants in the population has increased from 8% to 18% since 1994. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has gone done slightly, while frequency of perennial forbs increased slightly. Nested frequency of Salina wildrye declined significantly since 1994, but frequency of the more preferred western wheatgrass increased significantly. Cover of perennial grasses increased from 9% to 10%, with forb cover more than doubling (7% to 17%) since 1994. Currently forbs provide 62% of the herbaceous cover. The Desirable Components Index rated this site as fair with a score of 64 due to increasing high decadence, but young shrubs increased along with shrub cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 64 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is considered stable as the slight increase in bare ground does not warrant a downward change in trend. There were also some very minor changes in vegetation and litter cover. There are signs of ongoing erosion in the form of soil pedestalling, rills, and soil movement down slope but erosion is not severe and the erosion condition class was determined to be slight. Trend for the key browse species, mountain big sagebrush, is stable. Density increased slightly since 1999 but the number of shrubs displaying poor vigor rose slightly and the number of decadent plants increased to 43%. Young recruitment is good and adequate to replace most of the decadent sagebrush classified as dying. Utilization continues to be moderate to heavy but annual leader growth was fair, averaging about 2 inches. Seed production was also fair in 2004. Gray horsebrush and snowberry also provide some additional forage on the site. Many of these shrubs showed heavy use in 2004. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses rose slightly but frequency of perennial forbs declined by 30% and average cover dropped nearly two-fold. Preferred forbs, looseflower milkvetch, silvery lupine, Indian paintbrush, and dusty penstemon, declined more than three-fold in average cover since 1999. Drought conditions for the past 3 years, especially during the spring periods (April to June) of 2002 and 2003, are the likely cause of this downward trend in perennial forbs. A return to normal precipitation patterns should reverse this trend. The Desirable Components Index rated this site as fair with a score of 63 due to increasing high decadence, while young shrubs and shrub cover remained at previous levels.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 63 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 18

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{c}$69	$_{a}$13	$_{bc}$44	$_{ab}$34	.02	.55	.61
G	Agropyron spicatum	-	-	-	5	-	-	.06
G	Bromus anomalus	$_{ab}$12	$_{a}$-	$_{ab}$7	$_{b}$12	-	.09	.24
G	Bromus japonicus (a)	-	-	-	-	-	.00	-
G	Carex spp.	24	18	37	22	.38	1.39	1.61
G	Elymus salina	$_{a}$115	$_{b}$167	$_{a}$115	$_{a}$125	7.71	5.26	5.10
G	Oryzopsis hymenoides	-	-	2	-	-	.00	-
G	Poa fendleriana	68	80	63	97	.89	2.28	2.46
G	Poa pratensis	-	-	-	7	-	-	.53
G	Poa secunda	$_{b}$92	$_{a}$24	$_{a}$13	$_{a}$4	.06	.02	.03
G	Sitanion hystrix	-	-	-	1	-	-	.00
G	Stipa lettermani	15	7	14	17	.07	.69	.96
Total for Annual Grasses		0	0	0	0	0	0.00	0
Total for Perennial Grasses		395	309	295	324	9.14	10.31	11.63
Total for Grasses		395	309	295	324	9.14	10.31	11.63
F	Antennaria rosea	-	-	-	4	-	-	.01
F	Androsace septentrionalis (a)	-	9	14	3	.30	.05	.03
F	Arabis spp.	$_{b}$7	$_{a}$-	$_{ab}$3	$_{a}$-	-	.01	-
F	Astragalus convallarius	-	3	5	4	.00	.01	.03
F	Astragalus megacarpus	$_{b}$9	$_{a}$1	$_{ab}$4	$_{a}$-	.00	.03	.03
F	Astragalus tenellus	$_{a}$26	$_{a}$13	$_{b}$48	$_{a}$26	.72	3.22	1.52
F	Aster spp.	-	-	2	-	-	.00	-
F	Caulanthus crassicaulis	5	-	-	-	-	-	-
F	Castilleja linariaefolia	$_{a}$88	$_{ab}$59	$_{b}$79	$_{a}$27	.45	3.53	.76
F	Chaenactis douglasii	$_{b}$17	$_{ab}$4	$_{ab}$13	$_{a}$3	.01	.08	.00
F	Comandra pallida	$_{ab}$3	$_{a}$2	$_{b}$14	$_{ab}$9	.01	.12	.12
F	Crepis acuminata	1	-	-	-	-	-	-
F	Eriogonum alatum	$_{a}$-	$_{b}$11	$_{b}$10	$_{b}$7	.08	.24	.13
F	Eriogonum spp.	-	-	1	-	-	.00	-
F	Erigeron pumilus	12	6	3	5	.01	.00	.06

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Eriogonum racemosum	-	-	2	-	-	.03	-
F	Eriogonum umbellatum	14	17	16	20	.07	.40	.35
F	Hymenopappus filifolius	-	-	-	7	-	-	.33
F	Hymenoxys richardsonii	$_{a}$39	$_{b}$94	$_{a}$36	$_{a}$44	1.32	.61	.76
F	Ipomopsis aggregata	$_{b}$9	$_{a}$-	$_{ab}$1	$_{ab}$2	-	.00	.00
F	Lesquerella alpina	$_{a}$11	$_{ab}$20	$_{b}$35	$_{a}$13	.10	.22	.03
F	Linum lewisii	5	10	12	6	.02	.08	.22
F	Lupinus sericeus	$_{c}$71	$_{ab}$32	$_{b}$42	$_{a}$5	1.83	3.08	.42
F	Machaeranthera canescens	-	5	5	-	.01	.06	-
F	Machaeranthera grindelioides	11	4	3	3	.04	.03	.18
F	Penstemon comarrhenus	$_{ab}$23	$_{a}$10	$_{b}$38	$_{b}$39	.06	1.39	.60
F	Penstemon watsonii	$_{b}$13	$_{b}$14	$_{a}$-	$_{b}$7	.16	-	.31
F	Phlox austromontana	$_{b}$160	$_{a}$108	$_{a}$108	$_{a}$87	2.11	3.28	3.23
F	Phlox longifolia	$_{c}$42	$_{b}$10	$_{a}$-	$_{b}$18	.02	-	.06
F	Senecio multilobatus	11	1	8	5	.00	.02	.02
F	Taraxacum officinale	8	2	7	2	.00	.07	.01
F	Tragopogon dubius	1	2	-	-	.00	-	-
Total for Annual Forbs		0	9	14	3	0.30	0.05	0.03
Total for Perennial Forbs		586	428	495	343	7.10	16.60	9.24
Total for Forbs		586	437	509	346	7.41	16.65	9.27

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

BROWSE TRENDS --
Management unit 16C, Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia frigida	19	16	15	.08	.43	.55
B	Artemisia tridentata vaseyana	68	71	76	13.11	15.06	13.92
B	Chrysothamnus viscidiflorus	53	38	49	.65	.34	1.47
B	Gutierrezia sarothrae	28	23	31	.37	.43	.39
B	Rosa woodsii	0	1	1	-	-	-
B	Symphoricarpos oreophilus	21	22	30	1.24	.52	.60
B	Tetradymia canescens	25	30	34	1.64	1.42	1.44
Total for Browse		214	201	236	17.10	18.23	18.37

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 18

Species	Percent Cover '04
Artemisia frigida	.28
Artemisia tridentata vaseyana	13.19
Chrysothamnus viscidiflorus	1.53
Gutierrezia sarothrae	.55
Symphoricarpos oreophilus	1.01
Tetradymia canescens	1.63

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 18

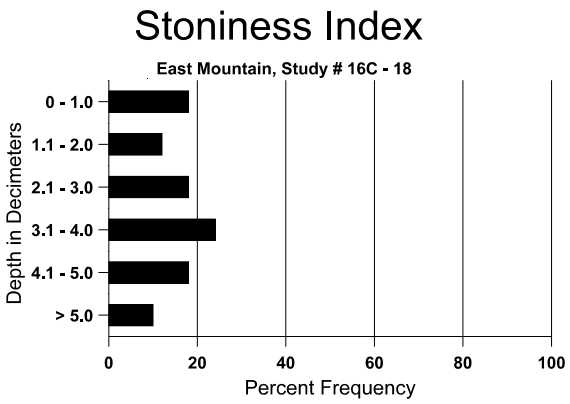
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.1

BASIC COVER --
Management unit 16C, Study no: 18

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	10.75	31.36	37.50	34.54
Rock	2.50	5.98	8.07	6.71
Pavement	0	1.34	1.92	1.00
Litter	45.25	34.56	29.52	28.28
Cryptogams	0	.43	.09	.03
Bare Ground	41.50	43.59	35.87	44.90

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 18, Study Name: East Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
17.4	51.3 (10.5)	7.3	40.0	27.4	32.6	2.8	3.8	99.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 18

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	20	10	8
Elk	36	24	45
Deer	2	4	4
Cattle	-	-	1

Days use per acre (ha)	
'99	'04
-	-
55 (136)	56 (137
17 (42)	21 (53)
-	-

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
88	**266**	-	-	200	66	-	25	25	25	-	25	4/2
94	**560**	-	60	500	-	-	0	0	0	-	0	5/4
99	**660**	40	140	520	-	-	0	0	0	-	0	5/7
04	**520**	-	20	500	-	-	12	4	0	-	0	6/7
Artemisia tridentata vaseyana												
88	**4265**	133	1266	2066	933	-	38	5	22	-	2	13/31
94	**3060**	40	160	2200	700	260	41	1	23	7	7	15/32
99	**3140**	140	220	1980	940	680	61	10	30	6	10	16/33
04	**3700**	160	420	1680	1600	640	42	15	43	14	14	14/31
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	16/28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus												
88	**2466**	333	933	1000	533	-	22	14	22	-	0	5/5
94	**2420**	-	60	2360	-	-	0	0	0	-	0	7/9
99	**1460**	20	280	1100	80	-	0	1	5	1	1	7/11
04	**2060**	20	60	1720	280	-	8	2	14	3	4	7/11
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**1480**	-	40	1320	120	-	0	0	8	-	0	6/6
99	**1240**	-	120	1120	-	-	0	0	0	-	0	7/8
04	**1240**	-	20	1220	-	-	0	0	0	-	0	7/9
Rosa woodsii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	10/18
99	**60**	-	-	60	-	-	0	0	-	-	0	9/12
04	**80**	-	80	-	-	-	0	0	-	-	0	5/4
Symphoricarpos oreophilus												
88	**866**	200	600	200	66	-	23	0	8	-	0	13/21
94	**1240**	60	520	700	20	-	15	0	2	-	0	10/20
99	**1060**	120	300	620	140	-	34	0	13	-	0	11/26
04	**1520**	-	200	1060	260	-	18	13	17	1	1	9/16
Tetradymia canescens												
88	**0**	66	-	-	-	-	0	0	0	-	0	-/-
94	**1440**	-	60	1320	60	-	0	0	4	1	1	7/11
99	**1120**	100	180	900	40	20	18	0	4	4	4	8/11
04	**1680**	-	140	1400	140	20	37	13	8	2	2	7/10

Trend Study 16C-19-04

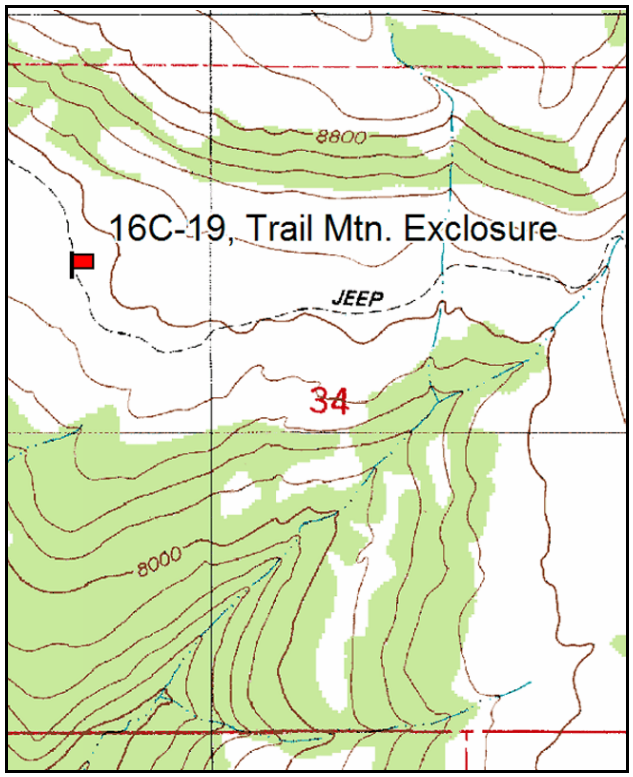
Study site name: Trail Mountain Exclosure . Vegetation type: Mixed Mountain Brush .

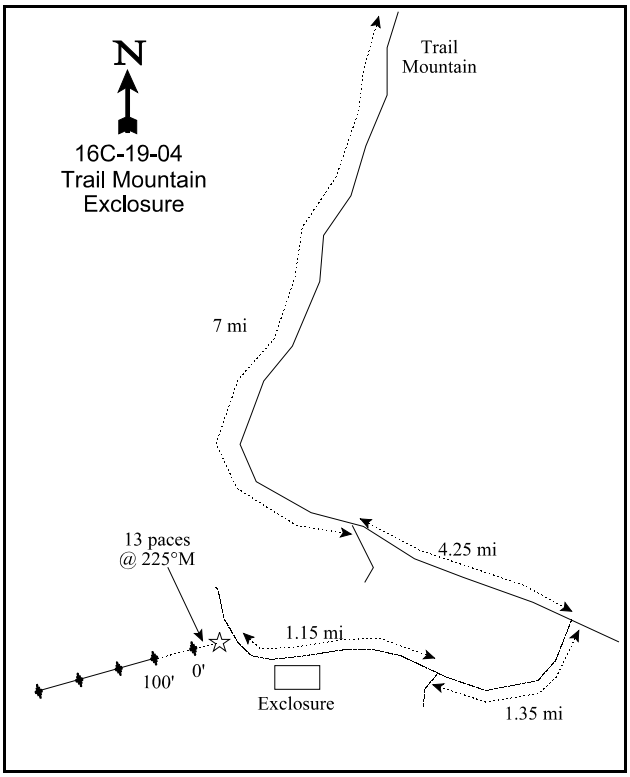
Compass bearing: frequency baseline 239 degrees magnetic.

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

LOCATION DESCRIPTION

From the pass between Upper Joes Valley and the head of Cottonwood Creek (Tl6S, R6E, sec 27), take the road south onto Trail Mountain. Go 7.0 miles on this road to a fork. Take the left fork, towards Miles Point. Go 4.25 miles to a fork. Bear right down the side of the mountain for 1.35 miles. Bear right at another fork and continue l.0 miles to the exclosure. Continue past the exclosure for 0.15 miles to just past where the road crosses a gully at a sharp bend in the terraces to a witness post. The 0 ft stake is located 13 paces away at 225°M, and is marked with a browse tag. There is rebar next to the 0 ft stake.





Map Name: Mahogany Point

Diagrammatic Sketch

Township 17S , Range 6E , Section 34

GPS: NAD 27, UTM 12S 4350365 N, 479671 E

DISCUSSION

Trail Mountain Exclosure - Trend Study No. 16C-19

The Trail Mountain Big Game Exclosure was constructed on the southwest end of Trail Mountain in the 1960's. Considerable watershed work, contour trenching and seeding, was done on this Forest Service land at that time. The area has since been closed to livestock grazing, although there is trespass use by cattle. This side of the mountain is occupied by a mixed mountain brush vegetation type. The trend study is on the same location as the 1980 line-intercept study #35-3. It starts near a sharp bend in a large contour furrow above an old gully. The bench has a gentle slope, but drops off steeply to the west and south. The aspect is south-southwest and the elevation is 8,350 feet. Sign of deer and elk winter use is scattered. Pellet group data from the site in 1999 estimated 15 deer, 44 elk, and 8 cow days use/acre (37 ddu/ha, 109 edu/ha, and 20 cdu/ha). Most of the deer and elk pellet groups were from winter use. Most of the cow pats encountered were older, however some fresh pats were observed on the site. Pellet group data from 2004 estimated moderate elk use at 53 days use/acre (131 edu/ha). Deer use was light, but trespass livestock has increased to 12 day use/acre (29 cdu/ha).

The soil is a moderately deep, clay loam with a slightly alkaline pH (7.6). Like all of the other sites in the unit, the soil here is deficient in phosphorus at just 2.9 ppm. Values less than 10 ppm can inhibit normal plant growth and development. Effective rooting depth was estimated at almost 14 inches. Soil pentrometer readings were limited by a heavy compacted soil horizon. This is not apparently a continuous rooting barrier due to the abundance of deeper rooted shrubs on the site. A large gully by the site is vegetated and stable. Litter and vegetation is abundant and the contour trenches remain effective in slowing erosion.

The mixed brush type on this site is composed largely of mountain big sagebrush with a significant population of Utah serviceberry and true mountain mahogany. Other common species include dwarf rabbitbrush, snowberry, curlleaf mountain mahogany, and a few antelope bitterbrush. Mountain big sagebrush provided 51% of the browse cover in 1994, declined to 38% in 1999, and leveled off at 34% in 2004. It has displayed light to moderate use since 1988 with a few individuals heavily browsed. Vigor is generally good and percent decadence has declined from a high of 50% in 1988, to 23% in 2004. Population is stable with excellent recruitment of young plants.

Utah serviceberry, a preferred species, provided 15% of the browse cover in 2004. The available plants have been heavily browsed since 1999. In 1999, some of the large serviceberry plants in the vicinity appeared to have been knocked down in what appeared to be a mechanical treatment to promote more available growth. True mountain mahogany, another preferred browse species, displayed moderate to heavy use in 1994 and 1999 and extremely heavy use in 2004, but the population remains stable with relatively good vigor. The small population of curlleaf mahogany was moderately utilized in 1994 and 1999. Utilization increased in 2004 and density remained stable at about 200 plants/acre. Population densities for these species are low, but they are important forage species. Many of the curlleaf mountain mahogany are large highlined trees. This is a marginal site for true mountain mahogany since it is at its upper elevational range.

Native species such as mutton bluegrass, Salina wildrye, Letterman needlegrass, and bluebunch wheatgrass comprise the bulk of the herbaceous understory, except for the terraces where smooth brome and other introduced species are found. A wide variety of forbs were encountered which produced as much cover as the grasses in 1999. However, most species provide little forage due to their low growing growth form.

1994 TREND ASSESSMENT

Litter cover on the site has decreased by 35% since 1988 although bare ground has stayed nearly the same. Trend for soil is stable. Mountain big sagebrush offers the most browse forage and has a stable mature population with a large decrease in percent decadency. Utah serviceberry shows good recruitment with a decline in percent decadency as well. Trend for browse is currently stable. The herbaceous understory trend is slightly down. Summed nested frequency for perennial grasses and forbs have declined with many species significantly declining. The Desirable Components Index (see methods) rated this site as good with a score of 77 due to moderate decadence, good shrub cover, and excellent perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 77 (good) Mountain brush type

1999 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1994. Trend for browse is considered stable. Key species serviceberry, mountain big sagebrush, and true mountain mahogany appear to be relatively stable. Some of the changes in density of mahogany is due to a realignment of the study site baseline in 1999. Utilization of these shrubs is heavier compared to 1994, but vigor is generally good and percent decadence low. Trend for the herbaceous understory is considered stable. Sum of nested frequency of perennial grasses and forbs increased slightly but not enough to warrant an upward change in trend. Cover has increased slightly for grasses and more so for the perennial forbs. The nearby three-way exclosure visually has a lot more Indian paintbrush in the total and livestock exclosure compared to outside. Grass abundance appears to be higher in the total exclosure than in the livestock exclosure or outside. The Desirable Components Index rated this site as good with a score of 78 due to low decadence, good shrub cover, and excellent perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 78 (good) Mountain brush type

2004 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in bare ground and a decrease in herbaceous understory cover. Litter cover has remained relatively stable. Some localized erosion is occurring, but is minimal and protective ground cover is adequate to protect the soil. Trend for the key browse species, mountain big sagebrush, true mountain mahogany, and service berry are stable. Utilization for all key species has increased since 1999, but population densities have remained similar, vigor is normal, decadence low, and young recruitment is good. Trend for herbaceous understory is down slightly. Sum of nested frequency of perennial grasses has declined slightly due primarily to a significant decline in mutton bluegrass. However, perennial grass cover has remained similar to 1999 estimates at about 10%. Sum of nested frequency of perennial forbs has also declined and cover has dropped nearly 50%. The Desirable Components Index rated this site as good with a score of 72 due to moderate decadence, decreasing shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 72 (good) Mountain brush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 19

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	-	-	2	-	-	.15	-
G	Agropyron intermedium	7	1	4	-	.00	.01	.00
G	Agropyron smithii	a-	a1	a-	b37	.03	-	.43
G	Agropyron spicatum	61	60	84	70	1.59	1.99	2.61
G	Bromus inermis	32	26	38	35	.46	.91	.79
G	Carex spp.	-	1	2	1	.00	.03	.00
G	Elymus salina	a79	a78	b127	ab93	1.92	3.73	3.65
G	Oryzopsis hymenoides	a-	b13	a2	a5	.59	.38	.18
G	Poa fendleriana	d173	c134	b77	a31	4.10	2.00	.86
G	Sitanion hystrix	-	5	7	-	.01	.06	-
G	Stipa comata	-	-	4	8	-	.03	.12
G	Stipa pinetorum	60	63	53	55	.89	.92	1.34
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		412	382	400	335	9.63	10.23	10.01
Total for Grasses		412	382	400	335	9.63	10.23	10.01
F	Antennaria parvifolia	b25	b12	b10	a-	.29	.36	-
F	Androsace septentrionalis (a)	-	a-	a3	b15	-	.00	.54
F	Arabis spp.	b12	a-	a-	a-	-	-	-
F	Arenaria spp.	-	-	-	1	-	-	.00
F	Astragalus calycosus	-	1	6	-	.00	.22	-
F	Aster chilensis	-	3	-	-	.01	-	-
F	Astragalus convallarius	-	6	-	3	.01	-	.01
F	Astragalus miser	-	-	-	8	-	-	.42
F	Astragalus tenellus	c25	b12	a-	a-	.22	-	-
F	Aster spp.	c43	b20	bc26	a-	.08	.31	-
F	Castilleja linariaefolia	11	7	17	5	.16	.35	.02
F	Calochortus nuttallii	7	-	-	-	-	-	-
F	Cirsium spp.	6	3	2	-	.03	.15	-
F	Comandra pallida	34	28	41	20	.13	.44	.15
F	Crepis acuminata	4	-	-	2	-	-	.03

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Eriogonum alatum	-	1	2	3	.01	.03	.03
F	Erigeron eatonii	$_{b}$52	$_{a}$2	$_{a}$8	$_{a}$-	.00	.01	-
F	Eriogonum umbellatum	$_{a}$17	$_{b}$41	$_{b}$43	$_{ab}$24	.77	1.75	.60
F	Hedysarum boreale	3	-	6	-	-	.09	-
F	Hymenoxys acaulis	10	5	4	1	.06	.06	.00
F	Ipomopsis aggregata	-	-	6	-	-	.04	-
F	Lesquerella spp.	$_{ab}$7	$_{a}$2	$_{a}$4	$_{b}$12	.01	.03	.26
F	Lupinus spp.	$_{b}$50	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Machaeranthera canescens	$_{a}$10	$_{a}$7	$_{b}$40	$_{ab}$24	.06	.83	.54
F	Machaeranthera grindelioides	$_{a}$-	$_{ab}$4	$_{a}$-	$_{b}$12	.06	-	.27
F	Orthocarpus spp. (a)	-	-	2	-	-	.15	-
F	Penstemon caespitosus	$_{b}$131	$_{b}$143	$_{ab}$126	$_{a}$91	3.50	4.37	1.35
F	Pedicularis centranthera	$_{a}$-	$_{a}$-	$_{b}$12	$_{c}$24	-	.15	.21
F	Penstemon spp.	$_{b}$41	$_{a}$6	$_{a}$-	$_{a}$-	.06	-	-
F	Penstemon watsonii	$_{ab}$4	$_{a}$-	$_{ab}$7	$_{b}$13	-	.03	.25
F	Phlox austromontana	$_{b}$116	$_{a}$80	$_{a}$63	$_{a}$63	1.06	.97	1.24
F	Potentilla gracilis	$_{a}$-	$_{b}$16	$_{b}$26	$_{b}$12	.06	.16	.06
F	Senecio multilobatus	$_{b}$15	$_{a}$1	$_{ab}$6	$_{ab}$4	.00	.07	.03
F	Taraxacum officinale	4	-	-	-	-	-	-
F	Unknown forb-perennial	$_{b}$7	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Zigadenus paniculatus	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	5	15	0	0.15	0.54
Total for Perennial Forbs		635	400	455	322	6.63	10.46	5.52
Total for Forbs		635	400	460	337	6.63	10.61	6.06

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

BROWSE TRENDS --
Management unit 16C, Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	27	22	22	3.47	2.79	3.03
B	Artemisia nova	12	8	5	.51	.94	.03
B	Artemisia tridentata vaseyana	76	65	71	10.94	9.55	7.03
B	Cercocarpus ledifolius	7	8	10	1.38	.03	.33
B	Cercocarpus montanus	14	16	16	1.13	3.36	2.85
B	Chrysothamnus depressus	26	27	41	1.24	.66	1.54
B	Chrysothamnus nauseosus	14	1	0	.13	-	-
B	Chrysothamnus viscidiflorus	10	16	3	.69	.55	.03
B	Eriogonum microthecum	-	-	-	-	.03	-
B	Gutierrezia sarothrae	6	22	44	.06	1.13	1.85
B	Opuntia spp.	0	0	2	.03	-	-
B	Pinus edulis	0	1	2	.03	.15	.41
B	Purshia tridentata	1	3	1	.15	.30	.00
B	Sambucus cerulea	0	0	0	-	.00	.03
B	Symphoricarpos oreophilus	20	30	27	1.39	5.60	3.23
B	Tetradymia canescens	15	10	11	.09	.01	.03
Total for Browse		228	229	255	21.28	25.14	20.44

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 19

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	-	5.33
Artemisia nova	-	.31
Artemisia tridentata vaseyana	-	8.39
Cercocarpus ledifolius	1.60	.56
Cercocarpus montanus	-	2.66
Chrysothamnus depressus	-	1.53
Gutierrezia sarothrae	-	1.51
Pinus edulis	-	.26
Purshia tridentata	-	.18
Symphoricarpos oreophilus	-	4.81
Tetradymia canescens	-	.15

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 19

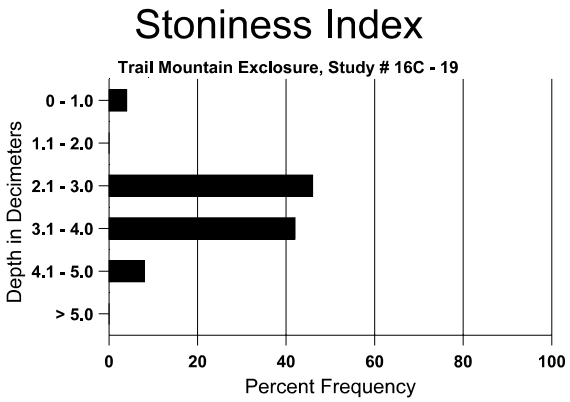
Species	Average leader growth (in) '04
Amelanchier utahensis	5.0
Artemisia tridentata vaseyana	2.3
Cercocarpus ledifolius	6.8
Cercocarpus montanus	8.3
Purshia tridentata	6.8

BASIC COVER --
Management unit 16C, Study no: 19

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	9.00	34.87	40.61	35.56
Rock	0	3.90	6.11	5.07
Pavement	2.25	1.14	3.62	2.82
Litter	59.00	38.39	37.47	38.21
Cryptogams	1.00	.27	.31	.48
Bare Ground	28.75	28.70	23.38	38.52

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 19, Study Name: Trial Mountain Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.9	49.0 (12.8)	7.6	38.7	27.4	33.8	3.0	2.9	131.2	0.5



PELLET GROUP DATA --
Management unit 16C, Study no: 19

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	16	10	9
Elk	12	20	30
Deer	17	7	6
Cattle	1	1	4

Days use per acre (ha)	
'99	'04
-	-
44 (109)	53 (131)
15 (37)	2 (5)
8 (20)	12 (29)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**399**	133	333	-	66	-	67	0	17	-	17	-/-
94	**960**	20	460	460	40	-	10	4	4	-	4	27/29
99	**760**	20	180	500	80	40	42	21	11	11	11	38/44
04	**580**	-	120	420	40	20	31	59	7	-	0	27/32
Artemisia nova												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**540**	-	-	240	300	220	19	4	56	22	22	11/20
99	**420**	-	40	340	40	20	57	0	10	10	10	9/19
04	**340**	-	100	240	-	40	0	0	0	-	0	10/38
Artemisia tridentata vaseyana												
88	**4532**	733	466	1800	2266	-	43	4	50	-	0	22/28
94	**3380**	-	440	2060	880	600	3	1	26	7	7	19/26
99	**3040**	440	820	1740	480	580	24	9	16	7	7	22/27
04	**3700**	100	940	1900	860	220	55	19	23	9	9	16/25
Ceratoides lanata												
88	**265**	-	66	66	133	-	0	0	50	-	0	3/3
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Cercocarpus ledifolius												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**140**	-	40	100	-	-	43	0	-	-	0	20/21
99	**180**	-	140	40	-	-	56	0	-	-	0	26/27
04	**200**	-	80	120	-	-	20	60	-	-	0	17/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus montanus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**380**	-	100	260	20	-	21	37	5	5	5	24/29
99	**680**	-	80	600	-	20	41	59	0	-	0	22/32
04	**620**	-	80	500	40	-	3	97	6	3	3	30/30
Chrysothamnus depressus												
88	**3599**	-	200	3066	333	-	30	2	9	-	0	4/9
94	**2120**	-	60	2040	20	-	25	0	1	.94	.94	3/7
99	**1360**	60	-	1340	20	20	19	68	1	1	1	2/7
04	**2480**	-	-	2440	40	20	40	34	2	.80	.80	5/9
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**460**	-	20	400	40	-	4	0	9	9	9	6/9
99	**40**	-	40	-	-	-	0	0	0	-	0	10/15
04	**0**	-	-	-	-	-	0	0	0	-	0	8/11
Chrysothamnus viscidiflorus												
88	**533**	-	-	533	-	-	0	0	0	-	0	6/7
94	**300**	-	-	260	40	-	0	13	13	13	13	5/9
99	**940**	20	80	860	-	-	2	0	0	-	0	6/7
04	**80**	-	-	80	-	-	0	0	0	-	0	6/9
Cowania mexicana stansburiana												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	32/40
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**160**	-	-	160	-	-	0	0	-	-	0	5/6
99	**1240**	20	140	1100	-	20	0	0	-	-	0	6/8
04	**3600**	20	580	3020	-	-	0	0	-	-	0	7/8
Juniperus osteosperma												
88	**66**	-	-	66	-	-	0	0	-	-	0	69/72
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	5/4
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	4/12
Pinus edulis												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	60	20	-	-	-	0	0	-	-	0	-/-
04	**40**	-	40	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	9/32
99	**80**	-	20	60	-	-	0	75	-	-	0	7/15
04	**80**	-	-	80	-	-	0	0	-	-	0	14/44
Sambucus cerulea												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	24/33
99	**0**	-	-	-	-	-	0	0	-	-	0	32/31
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**0**	66	-	-	-	-	0	0	0	-	0	-/-
94	**760**	-	260	500	-	-	3	0	0	-	0	13/25
99	**1220**	60	300	880	40	-	7	0	3	-	0	14/28
04	**920**	-	80	820	20	-	20	0	2	-	0	10/22
Tetradymia canescens												
88	**199**	-	66	133	-	-	33	0	0	-	0	12/7
94	**440**	-	60	300	80	-	23	14	18	-	0	5/8
99	**360**	-	-	260	100	-	56	0	28	11	11	6/9
04	**320**	-	40	260	20	-	13	6	6	6	6	9/10

Trend Study 16C-20-04

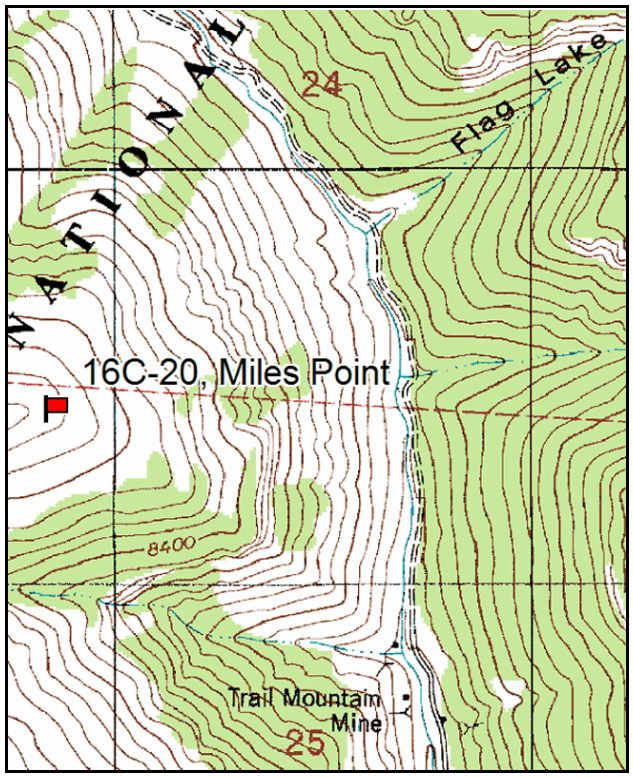
Study site name: Miles Point . Vegetation type: Mountain Big Sagebrush .

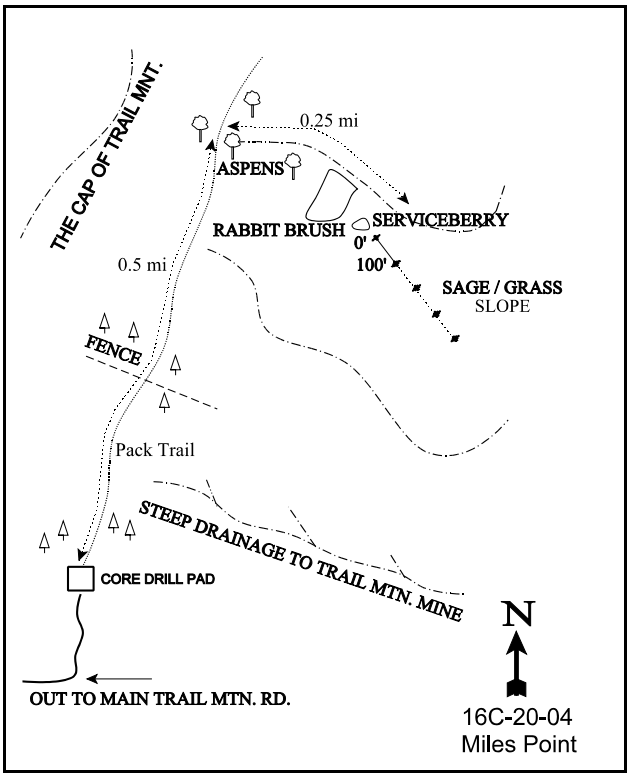
Compass bearing: frequency baseline 112 degrees magnetic.

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

LOCATION DESCRIPTION

From the pass at the top of the Cottonwood Canyon Road (10.15 miles from Straight Canyon), take the Trail Mountain road southeast for approximately 9.5 miles to the south end of the Cap of Trail Mountain. The study site is to the NE, on the other side of this high cap. A new road takes off to the east from the main road just past the southern point of the cap. Follow this road for 0.65 miles and stop before you enter the thick timber. From here, a pack trail takes off to the north along the edge of Trail Mountain. Follow this trail for about 1/2 miles to an open ridge. Turn east and hike down this ridge to the SE for 1/4 mile. The study is located on a sage-grass slope on the SE side of the ridge. The 0-foot baseline stake, marked by browse tag #9030, is adjacent to a large clump of serviceberry. The area has a view of lower Cottonwood Canyon and the fields in Straight Canyon.





Map Name: Mahogany Point

Diagrammatic Sketch

Township 17S , Range 6E ,Section 25

GPS: NAD 27, UTM 12S 4352383 N, 482834 E

DISCUSSION

Miles Point - Trend Study No. 16C-20

This study is not actually situated on Miles Point, but on a similar sagebrush/grass point above the Trail Mountain mine in Cottonwood Canyon. This study samples a typical high elevation elk winter range, which mule deer use in the summer. The study is on a moderately steep slope (35%) with a southeast aspect. The elevation is 8,800 feet. There is moderate elk sign on the open, south-facing ridge. Nearby aspen, curlleaf mountain mahogany, and conifer stands also show evidence of elk winter use. The study site is in the Trail Mountain summer cattle allotment, but actually receives little use by cattle. Pellet group data from 1999 estimated 70 elk, 3 deer, and 2 cow days use/acre (173 edu/ha, 7 ddu/ha, and 5 cdu/ha). Nearly all of the elk pellet groups were from the previous winter, although a few were more recent. Cattle pats were old. Pellet group data from 2004 estimated 56 elk, 5 deer, and 8 days use/acre (139 edu/ha, 13 ddu/ha, and 20 cdu/ha).

Soil on the site is moderately deep with an effective rooting depth estimated at almost 17 inches. Soil texture is a clay loam with a slightly alkaline pH (7.5). Phosphorus levels are marginal at 6 ppm. Values less than 10 ppm can limit normal plant growth and development. Soil parent material is limestone with rocks common within the profile. Vegetation and litter cover are adequate to protect the soil on the slope from excessive movement, but some soil pedestaling and terracing is evident. On the downhill side of terraces there are some plant roots exposed. The abundant grasses provide over half of vegetative cover. Litter is also abundant. Rocks and pavement occur in the interspaces leaving little exposed bare soil.

The key browse on the sagebrush/grass slope is mountain big sagebrush. Sagebrush cover along the baseline is higher near the zero foot stake and decreases as you reach the 400 foot stake. Sagebrush provided 66% of the browse cover in 1994, 80% in 1999, and 57% in 2004. The mountain big sagebrush population has shifted from predominantly young plants in 1988 to a more mature/decadence stand in 2004. Percent decadency has increased from 14% in 1999 to 57% in 2004. The number of dead plants has more than doubled from 800 dead plants/acre in 1999 to 1,920 dead plants/acre in 2004. The increase of decadent/dead plants is mostly due to severe drought conditions since 2002 and competition from perennial grasses. Annual precipitation has been below average since 2001 and annual spring precipitation (April, May, and June) has been below normal since 2000. Most plants were vigorous with good annual leader growth averaging about 3 inches in 2004. This site is used predominantly by elk, which do not rely as heavily on sagebrush as deer. Browsing on sagebrush has increased slightly from light to moderate in 1988 and 1999 to moderate to heavy in 2004.

Other common shrubs include dwarf rabbitbrush, low rabbitbrush, and snowberry. Dwarf rabbitbrush (*Chrysothamnus depressus*) has displayed consistent moderate to heavy use since 1988. Vigor is good and percent decadence low. The large decline in density of dwarf rabbitbrush between 1988 and 1994 is mostly due to the much larger sample used in 1994. The scattered Utah serviceberry shows light use and good vigor. Snowberry also shows light use with a stable population density, although shifting towards a more mature stand.

Bluebunch wheatgrass and Salina wildrye provide most the herbaceous understory cover due to their large bunchgrass stature. Bluebunch wheatgrass increased significantly between 1988 to 1999 and slightly declined in 2004. Other grass species are uncommon. Grasses showed light utilization overall, but some were moderately utilized in 1999 and 2004. Forbs are rare with timber poison vetch the only common species.

1994 TREND ASSESSMENT

Bare ground has decreased slightly although there was a decrease in litter cover. Herbaceous vegetative cover is abundant and provides a majority of the ground cover. Trend for soil is considered stable. The key browse is mountain big sagebrush. It has a low number of seedlings and young plants this year, but most of the young

sampled in 1988 appear to have survived and are now mature. Utilization is light, although percent decadency has increased. The trend for browse is stable. Summed nested frequency for perennial grasses has increased substantially since 1988. Summed nested frequency for forbs has decreased greatly and is mostly due to one plant, timber poisonvetch. Because the perennial grass component contributes to about 99% of the herbaceous cover, trend for herbaceous understory is considered slightly up. The Desirable Components Index (see methods) rated this site as good with a score of 67 due to moderate decadence, few young shrubs, and excellent perennial grass cover, although forb cover is almost nonexistent.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 67 (good) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil continues to be stable due to similar ground cover characteristics compared to 1994. There is some localized soil movement occurring yet the abundance of herbaceous vegetation cover has stabilized the slope. Trend for the key browse, mountain big sagebrush, is stable. Sagebrush density has increased slightly, vigor is normal, and percent decadence has declined slightly. However, utilization is heavier and reproduction is marginally low. In addition, 42% (220 plants/acre) of the decadent plants appear to be dying. Currently, there are enough young plants within the population to replace the decadent and dying sagebrush. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has remained stable while frequency of forbs has increased slightly. Nested frequency of Salina wildrye declined significantly with the more preferred, bluebunch wheatgrass increased significantly. There may have been some confusion in the identification between these two species in 1994. The Desirable Components Index rated this site as good with a score of 76 due to good shrub cover, increase in young shrubs, and excellent perennial grass cover, although forb cover is still low.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 76 (good) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is down slightly due to a decrease in protective cover (vegetation, litter, and cryptogams) and an increase in exposed bare ground since 2004. Herbaceous cover has decreased slightly and steep slopes continue to allow some soil movement. Trend for key browse, mountain big sagebrush, is down. Sagebrush densities have decreased, percent decadency has increased, utilization is heavier, and young recruitment is minimal. In addition, 43% (520 plants/ acre) of the decadent plants appear to be dying. Currently, there is not enough young plants within the population to replace the decadent and dying plants. Trend for herbaceous understory is slightly down. Sum of nested frequency for both perennial grasses and forbs have decreased slightly. Nested frequency of bluebunch wheatgrass has decreased significantly since 1999, while Salina wildrye has remained stable. The Desirable Components Index rated this site as poor with a score of 48 due to a decrease in shrub cover, a large increase in decadent shrubs, with continued excellent perennial grass cover, although forb cover is still low.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 48 (poor) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 20

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	$_{a}$212	$_{ab}$234	$_{c}$313	$_{b}$271	14.05	19.32	15.14
G	Elymus salina	$_{a}$64	$_{b}$123	$_{a}$59	$_{a}$47	8.85	3.98	3.20
G	Poa fendleriana	7	12	6	9	.03	.09	.04
G	Stipa lettermani	21	15	6	13	.13	.18	.62
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		304	384	384	340	23.06	23.57	19.01
Total for Grasses		304	384	384	340	23.06	23.57	19.01
F	Androsace septentrionalis (a)	-	-	3	-	-	.00	-
F	Astragalus convallarius	$_{b}$147	$_{a}$14	$_{a}$29	$_{a}$22	.04	.77	.33
F	Aster spp.	2	2	-	2	.00	-	.01
F	Astragalus spp.	-	-	3	-	-	.03	-
F	Castilleja linariaefolia	$_{b}$13	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Calochortus nuttallii	1	2	1	-	.00	.01	-
F	Chaenactis douglasii	-	-	5	3	-	.03	.00
F	Cirsium neomexicanum	4	-	2	-	-	.03	-
F	Crepis acuminata	7	-	-	-	-	-	-
F	Cymopterus spp.	-	-	-	3	-	-	.00
F	Hedysarum boreale	-	-	2	-	-	.15	-
F	Hymenoxys richardsonii	-	-	-	-	.00	.00	-
F	Machaeranthera canescens	$_{b}$9	$_{a}$2	$_{ab}$4	$_{ab}$5	.00	.06	.04
F	Penstemon caespitosus	-	-	5	1	-	.06	.00
F	Phlox longifolia	3	-	1	-	-	.00	-
F	Polygonum douglasii (a)	-	-	-	2	-	-	.00
F	Tragopogon dubius	4	-	-	-	-	-	-
F	Unknown forb-perennial	4	3	-	-	.00	-	-
Total for Annual Forbs		0	0	3	2	0	0.00	0.00
Total for Perennial Forbs		194	23	52	36	0.06	1.15	0.39
Total for Forbs		194	23	55	38	0.06	1.15	0.39

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

BROWSE TRENDS --
Management unit 16C, Study no: 20

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	2	0	1	-	-	-
B	Artemisia tridentata vaseyana	86	85	64	12.65	15.80	9.22
B	Chrysothamnus depressus	12	20	20	.84	.79	.84
B	Chrysothamnus nauseosus	0	0	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	70	67	62	2.86	1.28	3.64
B	Sambucus cerulea	0	1	1	.15	.15	.15
B	Symphoricarpos oreophilus	39	39	30	2.54	1.69	1.97
B	Tetradymia canescens	7	8	10	-	-	.24
Total for Browse		216	220	189	19.06	19.73	16.08

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 20

Species	Percent Cover '04
Artemisia tridentata vaseyana	8.89
Chrysothamnus depressus	1.45
Chrysothamnus viscidiflorus viscidiflorus	5.23
Symphoricarpos oreophilus	1.76
Tetradymia canescens	.50

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 20

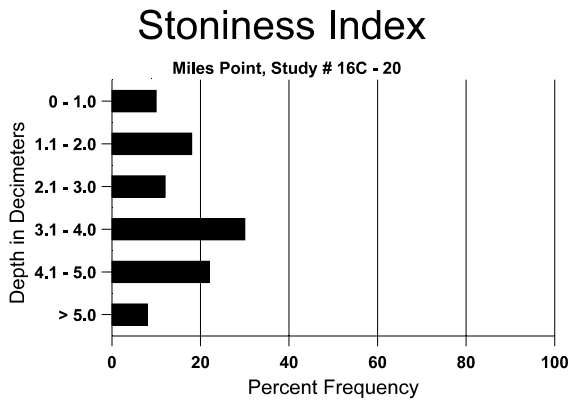
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.9

BASIC COVER --
Management unit 16C, Study no: 20

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	13.50	44.13	44.77	36.15
Rock	3.75	7.74	6.75	9.15
Pavement	3.50	1.18	6.38	5.17
Litter	58.75	42.52	43.77	33.15
Cryptogams	0	.03	.18	.96
Bare Ground	20.50	18.95	16.36	34.59

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 20, Study Name: Miles Point

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.9	48.5 (18.0)	7.5	24.7	29.4	45.8	3.1	6.0	128.0	0.5



PELLET GROUP DATA --
Management unit 16C, Study no: 20

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	11	10	29
Moose	-	-	1
Elk	31	24	36
Deer	9	2	4
Cattle	-	2	1

Days use per acre (ha)	
'99	'04
-	-
-	-
70 (173)	56 (139)
3 (7)	5 (13)
2 (5)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**40**	-	-	40	-	-	0	0	-	-	0	33/40
99	**0**	-	-	-	-	-	0	0	-	-	0	36/20
04	**20**	-	-	20	-	-	0	100	-	-	0	31/36
Artemisia tridentata vaseyana												
88	**2799**	66	1866	733	200	-	33	7	7	-	0	22/32
94	**3600**	-	220	2640	740	600	19	.55	21	7	7	21/33
99	**3840**	100	360	2960	520	800	32	1	14	6	8	22/32
04	**2120**	60	80	840	1200	1920	55	25	57	25	25	17/27
Chrysothamnus depressus												
88	**4732**	-	266	3800	666	-	42	17	14	-	3	3/7
94	**920**	20	-	840	80	-	20	22	9	-	0	4/8
99	**1480**	-	40	1340	100	60	18	34	7	4	4	4/7
04	**1200**	-	-	1120	80	180	25	37	7	-	0	4/10
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	19/19
Chrysothamnus viscidiflorus viscidiflorus												
88	**5666**	-	1466	4200	-	-	0	0	0	-	0	10/12
94	**4780**	-	60	4620	100	-	.83	0	2	-	.83	10/16
99	**4100**	100	360	3420	320	-	15	0	8	2	2	12/15
04	**3860**	-	-	3780	80	20	8	5	2	2	2	9/14
Sambucus cerulea												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	26/30
99	**20**	-	-	20	-	-	0	0	-	-	0	22/24
04	**20**	-	20	-	-	-	0	0	-	-	0	31/22
Symphoricarpos oreophilus												
88	**1800**	200	1200	600	-	-	41	30	0	-	4	13/33
94	**1600**	-	60	1480	60	-	0	8	4	1	1	11/32
99	**1720**	20	280	1360	80	-	26	0	5	2	2	11/23
04	**1320**	-	40	1280	-	-	2	2	0	-	0	10/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
88	**332**	-	66	266	-	-	40	20	0	-	0	7/10
94	**180**	-	-	160	20	-	0	0	11	-	0	9/9
99	**320**	-	20	300	-	-	31	0	0	-	0	8/9
04	**320**	-	-	300	20	-	63	0	6	-	0	9/13

Trend Study 16C-22-04

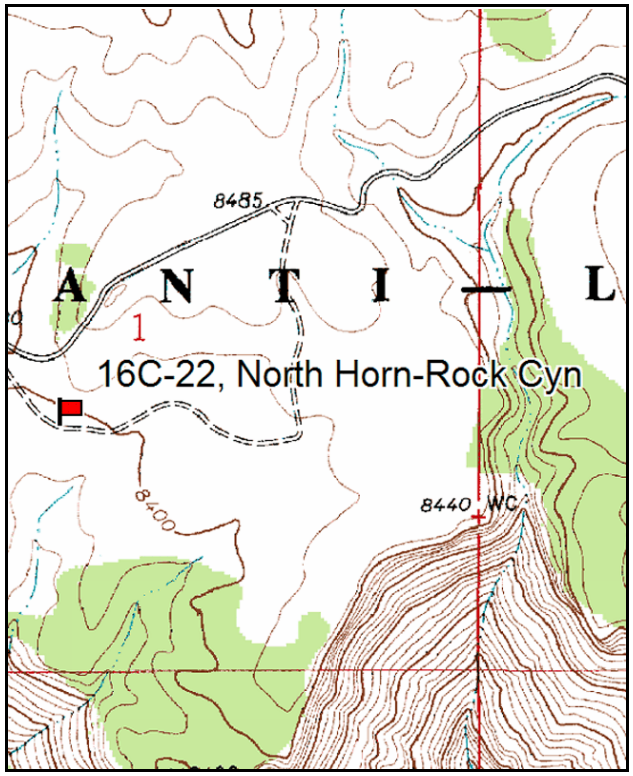
Study site name: North Horn-Rock Canyon . Vegetation type: Mountain Big Sagebrush .

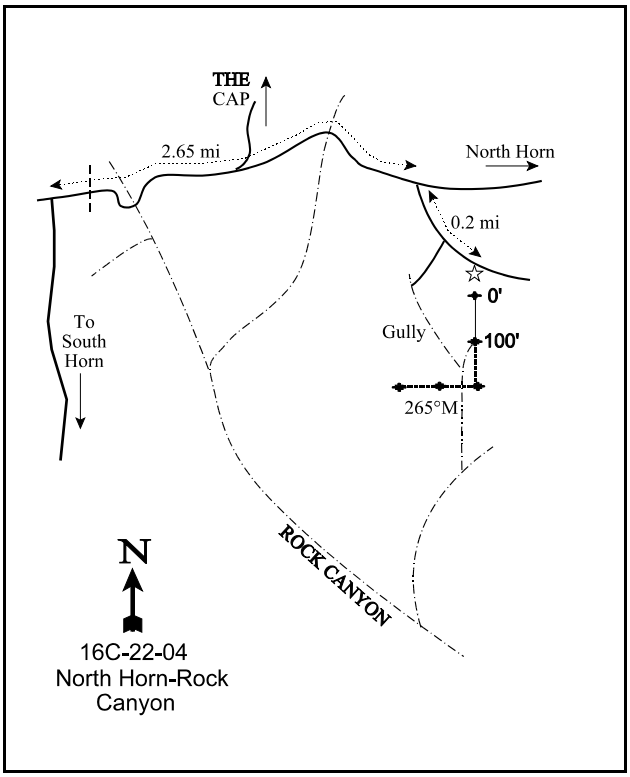
Compass bearing: frequency baseline 173 degrees magnetic-lines 1 & 2; 265 degrees magnetic-lines 3 & 4.

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

LOCATION DESCRIPTION

From the intersection of the North Horn and South Horn roads, continue on the graded North Horn road. Go 0.8 miles and cross the upper end of Rock Canyon. Continue on main road 1.85 miles to a small fork. Bear right onto the dirt road (#130), and proceed 0.2 miles to a witness post on the right hand side of the road. The frequency baseline starts 40 feet south of the tall witness post. The 0-foot baseline stake is marked by a red browse tag #9008.





Map Name: The Cap ,

Diagrammatic Sketch

Township l9S , Range 6E , Section 1

GPS: NAD 27, UTM 12S 4338260 N, 482827 E

DISCUSSION

North Horn-Rock Canyon - Trend Study No. 16C-22

The North Horn-Rock Canyon study is located in a small basin at the head of Rock Canyon. The Rock Canyon drainage is a migration route from the high elevation range on North Horn and South Horn mountains down to pinyon-juniper and desert shrub winter range. The range type at the study site is sagebrush/grass, containing a mixture of mountain big sagebrush and black sagebrush with scattered mountain brush on the hillsides. Ponderosa pine, pinyon, and juniper trees are found in the drainages and along the canyon edge. The site has a southwest aspect on a slope that varies from 3-5% with an elevation of 8,400 feet. The small basin has never been terraced or seeded. The study site shows evidence of moderate to heavy use from both deer and elk. Cattle sign is relatively infrequent, possibly because grasses are more limited here than on surrounding terraced and seeded areas. Pellet group data from 1999 estimate 13 elk, 29 deer, and 15 cow days use/acre (32 edu/ha, 72 ddu/ha, and 37 cdu/ha) Pellet group data from 2004 estimate 66 elk, 38 deer, and 9 cow days use/acre (164 edu/ha, 94 ddu/ha, 23 cdu/ha). Most of the cattle pats were from the previous season.

Sandstone bedrock is exposed near the canyon edge. Up the slope where sagebrush dominates, the soil appears to be relatively shallow. There are some more shallow spots of underlying bedrock favoring the more shallow rooted black sagebrush. Effective rooting depth is estimated at a little over 12 inches over the site. The sandy clay loam soil has a fairly high concentration of pavement and rock fragments in upper horizons and on the surface. Phosphorus is low at 5.5 ppm, where values less than 10 ppm can limit normal plant growth and development. Bare ground is fairly abundant in the shrub interspaces, but there is little erosion occurring on the site.

A mixture of mountain big sagebrush and black sagebrush provides most of the forage on this site. Some individuals were difficult to identify and are most likely hybrids. Black sagebrush is more numerous and provided 50% of the shrub cover in 1994, 44% in 1999, and 40% in 2004. Percent decadence was moderately low at 24% in 1994, 22% in 1999, and has increased slightly to 35% in 2004. An increasing proportion of the these decadent shrubs have been classified as dying, rising from 18% in 1994 to 55% in 2004. Recruitment was abundant at 1,780 seedling/acre in 2004, but differentiating between some of the black sagebrush and mountain big sagebrush was difficult. Hedging on black sagebrush continues to be light to moderate.

Mountain big sagebrush provided 25% of the shrub cover in 1994 and 26% in 2004. Density has dropped since 1999 with 2,520 plants/acre compared to 2,040 plants/acre in 2004. Seedling production was high this year at 500 seedlings/acre. Hedging has been light to moderate in the past, but has increased to moderate to heavy hedging in 2004. Vigor is normal on most plants, yet percent decadence is high and has remained high since 1988 at an average of 41%. Decadent shrubs that were classified as dying declined since 1999 at 40% to 29% in 2004.

The site supports two species of rabbitbrush, dwarf (*Chrysothamnus depressus*), and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*). All of the rabbitbrush was called dwarf rabbitbrush in 1988 and 1994, but most of the rabbitbrush is actually stickyleaf low rabbitbrush. Dwarf rabbitbrush had a population density of 1,320 plants/acre in 1999 and decreased to 1,240 plants/acre in 2004. These shrubs are very low growing, averaging only 3 inches in height. Use was light to moderate and vigor good with percent decadence low. Stickyleaf low rabbitbrush is much more numerous at an estimated 7,700 plants/acre in 1999 and increased to 7,920 plants/acre in 2004. These plants are mostly mature and unutilized. Other palatable browse species include Utah serviceberry and antelope bitterbrush, although these species occur infrequently.

Grasses on average compose a majority of the herbaceous understory (90%). Western wheatgrass, muttongrass, and blue grama are the dominant grass species on this site. Bottlebrush squirreltail and needle-and-thread grass were common in 1988 but have nearly disappeared from the site. Salina wildrye was picked

up in the 1999 sample and has remained stable in 2004. A variety of low-growing forbs were sampled, but they do not provide much forage due to their low numbers.

1994 TREND ASSESSMENT

Relative percent bare ground has increased from 35% to 42%. Over half of the vegetative cover is from browse with the rest coming from grasses. Soil trend is considered stable, for the slight increase in bare soil is not enough to warrant a change in trend. Key browse are mountain big sagebrush and black sagebrush. This appears to be a marginal site for mountain big sagebrush evidenced by mountain big sagebrush having nearly the same stature as black sagebrush. The mature mountain big sagebrush population declined by 41%, while the black sagebrush population declined by 54%. Most of these declines would be due to the much larger sample size utilized in 1994 which now gives much more accurate browse densities. Due to the dry conditions, very few seedling or young were encountered in 1994 for either species. Browse trend is slightly down. Summed nested frequency for perennial grasses and forbs decreased since 1988 leading to a slightly down herbaceous trend. The Desirable Components Index (see methods) rated this site as poor with a score of 40 due to moderate shrub cover, no young shrubs, and fair perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 40 (poor) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil appears to be stable. Percent cover of bare ground has declined with pavement cover increasing and litter cover declining slightly. Trend for browse is also stable for the time being. The black sagebrush population has increased slightly and percent decadence has declined from 24% to 22%. However, reproduction is still poor with few seedlings and young plants encountered. Another negative aspect of the black sagebrush population is an increase in the proportion of decadent plants which appear to be dying (from 18% to 28%). There is currently not enough young plants to maintain the population. If recruitment does not improve in the future, the population will most likely decline. Density of mountain big sagebrush declined slightly since 1994. Utilization is similar to 1994 levels, but the proportion of shrubs displaying poor vigor have increased. Percent decadence is high at 48%, a slight increase from 1994. In addition, the proportion of decadent plants classified as dying has increased from 29% to 40%. Recruitment for mountain big sagebrush is also inadequate to maintain the current population. Dwarf rabbitbrush is abundant and provides some additional forage. During the 1999 reading, most of what was called dwarf rabbitbrush (*Chrysothamnus depressus*) was actually stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*). The dwarf rabbitbrush displays moderate to heavy use while the stickyleaf low rabbitbrush is not utilized. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses and forbs. Nested frequency of western wheatgrass declined significantly whereas frequency for mutton bluegrass increased significantly. Forbs are diverse but produce less than 2% cover. The Desirable Components Index rated this site as fair with a score of 54 due an increase in perennial grass cover, an increase in young shrubs, but still high decadency.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 54 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Percent of bare ground has increased slightly, but not enough to permit a downward change in trend. Pavement and rock cover, and vegetation/litter cover remains fairly stable. Trend for browse is down slightly. Since 1994, the density of mountain big sagebrush has continued to decrease from 2,940 plants/acre in 1994 to 2040 plant/acre in 2004. Seedling reproduction was high in 2004, but many showed signs of dying due to lack of moisture. Young plant recruitment (40 plants/acre) is not enough to compensate for the portion of decadent plants that are classified as dying (238 plants/acre). The density of decadent mountain big sagebrush plants has decreased, but the density of dead plants has increased. Utilization increased to moderate and heavy use. The percentage of plants that are decadent continues to be high (40%). Black sagebrush density has decreased from 5,580 plants/acre in 1999 to 4,620 plants/acre in 2004. Seedling production was very high, but were lacking moisture. Young recruitment (80 plants/acre) is low and is not producing enough plants to compensate for the decadent plants (880 plants/acre). Over one-half (55%) of the decadent black sagebrush plants classified as dying. Density of low rabbitbrush continues to decrease, while the density of stickyleaf low rabbitbrush continues to increase. Trend for herbaceous understory is considered stable. There was a slightly decrease in strip frequency of western wheatgrass and mutton bluegrass, but it was not significant. Forbs still have low production of less than 2% cover. The Desirable Components Index (see methods) rated this site as fair with a score of 54 due to an increase in shrub cover, a decrease in young shrubs, and still high decadency.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 54 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 22

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	bc206	c217	ab173	a135	4.14	3.12	2.78
G	Agropyron spicatum	-	-	-	4	-	-	.21
G	Bouteloua gracilis	66	93	90	98	1.56	2.65	3.67
G	Elymus salina	a-	a-	c74	b52	-	1.41	1.04
G	Oryzopsis hymenoides	a-	ab5	ab5	b11	.07	.16	.61
G	Poa fendleriana	a89	ab109	b131	ab100	1.37	3.34	2.25
G	Poa secunda	-	4	3	4	.03	.00	.01
G	Sitanion hystrix	b85	a3	a27	a26	.00	.67	.29
G	Stipa comata	c47	ab1	a-	b14	.00	.00	.16
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		493	432	503	444	7.19	11.38	11.05
Total for Grasses		493	432	503	444	7.19	11.38	11.05
F	Allium spp.	3	-	-	-	-	-	-
F	Androsace septentrionalis (a)	-	-	4	-	-	.03	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Antennaria spp.	-	1	-	-	.03	-	-
F	Arabis spp.	1	1	-	-	.00	-	-
F	Astragalus convallarius	-	2	-	-	.00	-	-
F	Astragalus spp.	-	3	2	-	.00	.03	-
F	Castilleja linariaefolia	$_{b}$36	$_{a}$4	$_{a}$3	$_{a}$-	.03	.00	-
F	Chaenactis douglasii	$_{b}$19	$_{a}$-	$_{b}$18	$_{a}$-	-	.16	-
F	Chenopodium leptophyllum(a)	-	-	-	1	-	-	.00
F	Crepis acuminata	$_{c}$22	$_{a}$-	$_{b}$6	$_{bc}$8	-	.10	.13
F	Cryptantha spp.	-	2	-	4	.00	-	.16
F	Eriogonum alatum	-	-	1	-	-	.00	-
F	Erigeron eatonii	$_{ab}$7	$_{bc}$24	$_{c}$26	$_{a}$-	.13	.16	.00
F	Erigeron pumilus	7	4	3	4	.01	.01	.03
F	Eriogonum racemosum	14	13	23	23	.04	.29	.23
F	Eriogonum umbellatum	-	-	2	2	-	.03	.15
F	Gayophytum ramosissimum(a)	-	$_{a}$-	$_{a}$-	$_{b}$17	-	-	.04
F	Haplopappus acaulis	$_{a}$4	$_{b}$12	$_{a}$-	$_{a}$1	.18	-	.03
F	Hymenoxys acaulis	-	-	-	5	-	-	.06
F	Ipomopsis aggregata	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$-	-	.03	-
F	Lappula occidentalis (a)	-	-	-	8	-	-	.01
F	Lupinus argenteus	-	-	7	5	-	.06	.03
F	Machaeranthera canescens	$_{b}$31	$_{ab}$11	$_{ab}$16	$_{a}$3	.02	.09	.03
F	Penstemon spp.	-	1	-	-	.01	-	-
F	Penstemon watsonii	2	7	6	8	.02	.05	.09
F	Phlox austromontana	$_{b}$18	$_{a}$3	$_{ab}$11	$_{ab}$11	.01	.39	.07
F	Phlox longifolia	-	-	-	5	-	-	.01
F	Polygonum douglasii (a)	-	-	-	18	-	-	.03
F	Senecio multilobatus	$_{ab}$29	$_{a}$6	$_{b}$49	$_{b}$41	.01	.24	.32
F	Sphaeralcea coccinea	1	-	-	-	-	-	-
F	Trifolium spp.	-	-	1	3	-	.00	.03
F	Unknown forb-perennial	1	-	2	-	-	.00	-
Total for Annual Forbs		0	0	4	44	0	0.03	0.10
Total for Perennial Forbs		195	94	188	123	0.52	1.69	1.41
Total for Forbs		195	94	192	167	0.52	1.72	1.51

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

BROWSE TRENDS --
Management unit 16C, Study no: 22

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	0	2	1	-	.03	.15
B	Artemisia nova	74	76	73	7.72	8.48	9.07
B	Artemisia tridentata vaseyana	71	58	57	3.87	4.39	5.97
B	Chrysothamnus depressus	85	41	38	3.50	.64	.79
B	Chrysothamnus viscidiflorus viscidiflorus	0	81	89	-	5.10	5.85
B	Gutierrezia sarothrae	22	34	23	.16	.52	.22
B	Pediocactus simpsonii	1	3	2	.03	.03	-
B	Pinus edulis	0	2	2	-	-	-
B	Purshia tridentata	0	5	4	-	.30	.53
B	Symphoricarpos oreophilus	0	1	1	-	-	-
Total for Browse		253	303	290	15.29	19.51	22.60

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 22

Species	Percent Cover '04
Artemisia nova	10.08
Artemisia tridentata vaseyana	5.78
Chrysothamnus depressus	.71
Chrysothamnus viscidiflorus viscidiflorus	6.34
Gutierrezia sarothrae	1.50
Pinus edulis	.08
Purshia tridentata	.95

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 22

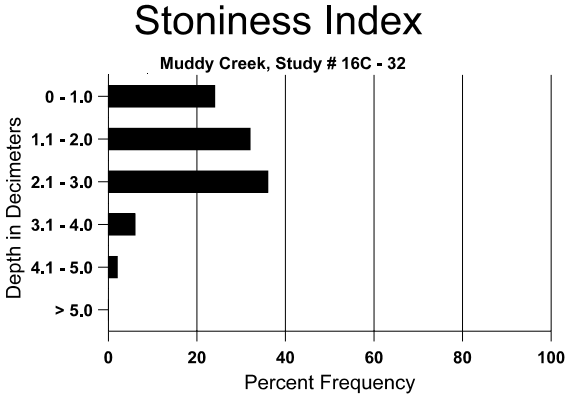
Species	Average leader growth (in) '04
Artemisia nova	1.0
Artemisia tridentata vaseyana	2.0
Purshia tridentata	3.6

BASIC COVER --
Management unit 16C, Study no: 22

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	6.25	23.82	32.56	35.23
Rock	.25	5.92	2.12	3.84
Pavement	12.25	2.67	11.30	8.62
Litter	45.00	20.31	16.80	21.46
Cryptogams	1.50	2.53	4.10	2.96
Bare Ground	34.75	40.54	35.50	43.04

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 22, Study Name: North Horn - Rock Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.3	49.3 (8.3)	7.2	60.4	17.8	21.8	1.7	5.5	73.6	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 22

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	28	18	18
Elk	23	12	48
Deer	16	12	4
Cattle	-	3	2

Days use per acre (ha)	
'99	'04
-	-
13 (32)	66 (164)
29 (72)	38 (94)
15 (37)	9 (23)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**533**	-	200	333	-	-	50	25	0	-	0	19/12
94	**0**	-	-	-	-	-	0	0	0	-	0	14/14
99	**40**	-	-	20	20	-	0	100	50	50	50	24/40
04	**20**	-	-	20	-	20	0	100	0	-	0	12/16
Artemisia nova												
88	**11266**	400	933	6200	4133	-	6	.59	37	.53	12	7/11
94	**5160**	40	-	3940	1220	180	16	2	24	4	4	9/19
99	**5580**	20	120	4260	1200	180	25	11	22	6	6	7/17
04	**4620**	1780	80	2940	1600	480	19	.43	35	19	21	7/19
Artemisia tridentata vaseyana												
88	**5132**	466	866	2600	1666	-	21	12	32	.38	8	10/15
94	**2940**	20	40	1540	1360	140	31	2	46	14	14	9/20
99	**2520**	20	100	1220	1200	240	35	21	48	19	19	11/24
04	**2040**	500	40	1180	820	540	56	29	40	12	16	12/27
Chrysothamnus depressus												
88	**6332**	600	866	4866	600	-	18	3	9	-	4	3/6
94	**6900**	-	280	6600	20	-	12	3	0	-	0	3/8
99	**1320**	-	80	1160	80	-	33	33	6	2	2	3/7
04	**1240**	-	20	1100	120	-	16	15	10	2	3	4/9
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**7700**	-	400	6820	480	-	0	0	6	-	0	5/11
04	**7920**	80	520	7300	100	160	.25	0	1	.75	.75	5/11
Gutierrezia sarothrae												
88	**399**	-	133	266	-	-	0	0	-	-	0	6/7
94	**960**	-	100	860	-	20	0	0	-	-	0	4/23
99	**2020**	-	60	1960	-	-	0	0	-	-	0	6/8
04	**1040**	-	40	1000	-	20	0	0	-	-	0	6/8
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	2/2
99	**80**	-	-	80	-	-	0	0	-	-	0	3/4
04	**40**	-	-	40	-	-	0	0	-	-	0	2/4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**40**	-	40	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	7/53
99	**200**	-	-	200	-	-	20	80	-	-	0	10/52
04	**100**	-	-	100	-	-	0	100	-	-	0	10/36
Symphoricarpos oreophilus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	6/10

Trend Study 16C-23-04

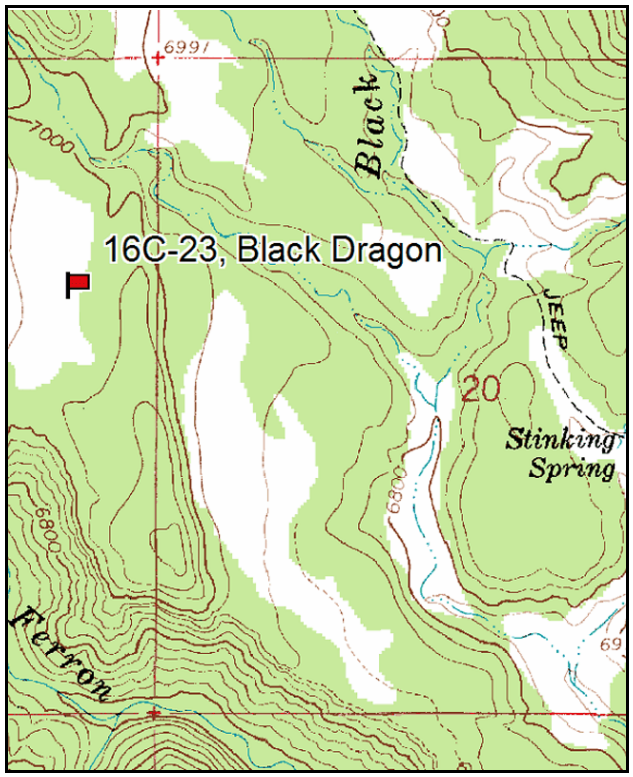
Study site name: Black Dragon . Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 239 degrees magnetic.

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

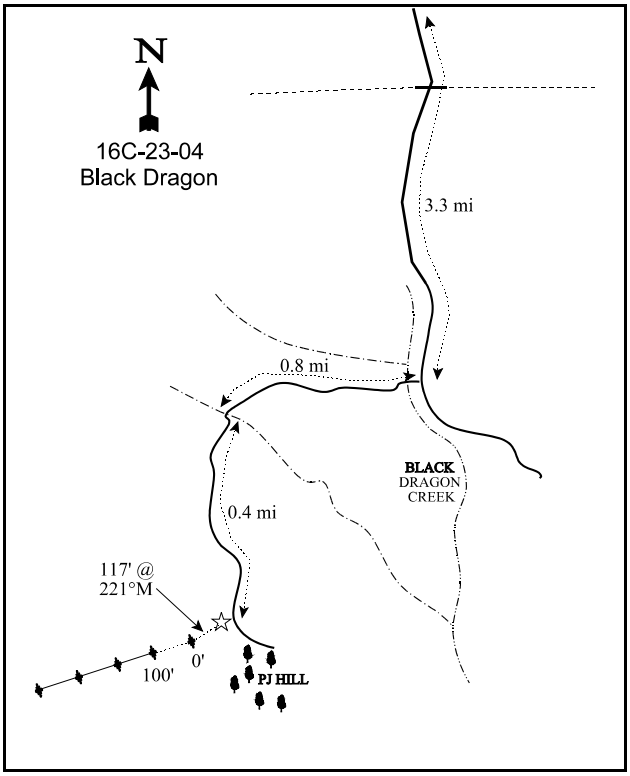
LOCATION DESCRIPTION

From the junction near the fence at the top of North Dragon Creek above Joes Valley, take the middle road (F.S. #170). Go down the Black Dragon trail 0.5 miles to a gate. Continue driving down the canyon 2.8 miles to a fork. Bear right across the creek. Proceed 0.8 miles through a chaining and down into a dry creek bottom. Cross and continue across a seeded sage flat for 0.4 miles to where the road turns to the left towards a P-J hill. There is a green fencepost on the right side of the road as a witness post. From the post, the 0-foot baseline stake is 117 feet bearing 221°, and is marked by tag #484.



Map Name: Ferron Canyon ,

Township l9S , Range 6E , Section 19



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4333919 N, 475543 E

DISCUSSION

Black Dragon - Trend Study No. 16C-23

The Black Dragon study site is located between Joe's Valley and Ferron Canyon. The Black Dragon area is important winter range for deer and increasingly important for elk. The pinyon-juniper type in the valley was chained and seeded. There are naturally open sagebrush flats, one of which was sampled by this trend study. The area was contour-trenched and seeded in 1965. It is now occupied by sagebrush and seeded grasses. The study site has an elevation of 7,000 feet with a slope of 5%. Drainage is generally south down Black Dragon Creek into Ferron Creek. On the study site, drainage is to the north and the aspect is more to the northeast. Like the two preceding studies, it is part of the Horn Mountain Allotment. Since it is a small unit, it is grazed by only a portion of the livestock in early spring. Use by cattle at the site is minimal due to lack of water in the area. Deer and elk appear to use the area moderately. Pellet group data from 1999 estimate 40 deer, 53 elk and 10 cow days use/acre (99 ddu/ha, 131 edu/ha, 25 cdu/ha) All of the cattle pats were from last season. Most of the elk and deer pellet groups were from winter, although a few of the elk pellet groups were from the spring. Pellet group data from 2004 estimated 17 deer, 50 elk and 11 cow days use/acre (43 ddu/ha, 124 edu/ha, 27 cdu/ha). All of the cattle pats were from last season, while most of deer and elk use was from winter. A few elk pellet groups were from early spring use.

The soil appears to moderately deep but strongly compacted, with a hardpan about 10-12 inches below the surface. The hard pan appears to be a calcium carbonate layer of cemented gravel. The soil is a fine-textured sandy clay loam with small gravel on the surface and within the profile. Parent material is a combination of limestone, sandstone, and quartz. The amount of phosphorus is marginal at 6.9 ppm and potassium is low at 60.8 ppm. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. At intervals of 30 to 40 feet, there are contour-furrows which have effectively eliminated most problems from erosion. There is some bare soil exposed, especially on the top edges of the furrows, but generally there is adequate ground and vegetative cover. Between the evenly distributed shrubs and bunch grasses there are large patches of bare soil with a diffused covering of rocks and pavement. There is some localized erosion occurring, yet it is not serious due to the contour-furrows treatment.

A small statured mountain big sagebrush is the key browse species, most likely some hybridizing with black sagebrush. It provided 40% of the browse cover in 1994, 43% in 1999, and 60% in 2004. Density was extremely high in 1988 with an estimated 49,799 plants/acre, but 90% of these were very young plants. In 1994, there were 9,040 plants/acre estimated, 10,180 in 1999, and 8,900 in 2004. Young plants accounted for 28% of the population in 1994, increasing to 54% in 1999 and decreasing to only 5% in 2004. Utilization of the sagebrush has been increasingly heavy in the past with 74% of the sagebrush sampled displaying heavy use in 1999. Utilization has dropped from heavy to moderate use. Nevertheless, vigor is good and percent decadence is low at only 10% in 2004.

Another palatable browse species on the site consists of low growing winterfat. It showed moderate to heavy use in 1999 and heavy use in 2004. Its small size is typical for a high elevation ecotype even if it was not heavily utilized. The population is almost entirely mature with a few young. Rabbitbrush was the most abundant shrub on the site with an estimated density of 18,780 plants/acre in 1994, 19,680 in 1999, and has decreased to 6,520 plants/acre in 2004. This population has shifted from mostly young plants in 1988 to mostly mature plants by 2004. The number of dead plants has increased from only 20 plants/acre in 1999 to 1,220 plants/acre in 2004 or 12% are dead.

Herbaceous plants are moderately abundant. Crested wheatgrass provided 61% of grass cover in 1994 and now provides 88% of the grass cover. It is especially dense within the contour furrows. Native needle-and-thread, bluebunch wheatgrass, bottlebrush squirreltail, and Indian ricegrass have decreased and are only producing roughly 2% of the total cover. Forbs are rare, producing only 6% total cover and producing

little useful forage. The most common species include prickly phlox and scarlet globemallow.

1994 TREND ASSESSMENT

Percent bare ground has decreased, although due to drought litter has decreased as well. Most of the ground cover is provided by grasses and browse. Soil trend is stable at this time. Mountain big sagebrush shows an expanding population with 28% of the population consisting of young plants. Most of the sagebrush is lightly to moderately hedged. Percent decadency is low at 16%. Rabbitbrush also shows an expanding population with many of the young sampled in 1988 surviving to maturity by 1994. Browse trend is stable, although it could be considered slightly up if not for the abundance of the less desirable low rabbitbrush. Trend for herbaceous understory is considered stable because the perennial grass component went slightly up and the grasses contribute to about 97% of the herbaceous understory cover. Sum of nested frequency for perennial forbs actually dropped dramatically, yet they contribute little to herbaceous cover. The Desirable Components Index (see methods) rated this site as fair with a score of 60 due to fair shrub cover, several young shrubs, and moderate decadency. Grass cover is good, but forb cover is almost nonexistent.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 60 (fair) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable with similar “relative percent” cover estimates for bare ground and litter. There is some localized erosion occurring between the contour furrows, but the treatment keeps erosion to a minimum. Trend for browse is also stable. Density of mountain big sagebrush has increased slightly and the proportion of young plants has increased. Percent decadence has remained stable although utilization is currently very heavy with 74% of the sagebrush sampled displaying heavy use. The population of the less desirable stickyleaf low rabbitbrush has increased slightly. It currently provides 56% of the shrub cover. The population is mostly mature (93%). Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has declined slightly, while nested frequency of the dominant crested wheatgrass has increased slightly. Both Indian ricegrass and needle-and-thread declined significantly in nested frequency. Forbs are rare and unimportant on this site. Nested frequency and cover for forbs has remained similar to 1994 levels. The Desirable Components Index rated this site as fair with a score of 58 due to an increase in shrub cover, several young shrubs, and moderate decadency. Grass cover is decreased slightly and forb cover is still almost nonexistent.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 58 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soils is stable. Protective cover (vegetation, litter, and cryptograms) combined has increased, but rock and pavement cover has increased suggesting that some erosion is still occurring. Trend for browse is stable. Mature big sagebrush density have increased from 3,160 plants/acre in 1999 to 7,540 plants/acre in 2004. It is currently 60% of the shrub cover, which is now greater than stickyleaf low rabbitbrush cover. Percent decadence is low at 10% and the proportion of young plants are enough to compensate for those that

are dying. In addition, seedling production was fairly abundant this year. The population of the less desirable stickyleaf low rabbitbrush has remained fairly stable. It provides 29% of the shrub cover, which is a decrease from 56% in 1999. Trend for herbaceous understory is slightly down. Native grasses such was Indian rice grass and needle-and-thread, and bottlebrush squirreltail continue to decline with the associated drought. They currently provide only 4% of the grass cover. Crested wheatgrass continues to dominate the understory. Forbs are rare and unimportant on this site. Nested frequency and cover did increase for longleaf phlox. The Desirable Components Index rated this site as fair with a score of 58 due to an increase in shrub cover, large decrease in young shrubs, and low decadency. Grass cover is decreased slightly and forb cover increased.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 58 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 23

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	256	234	245	232	7.96	6.82	9.41
G	Agropyron intermedium	b63	a4	a8	a8	.03	.07	.10
G	Agropyron spicatum	6	6	16	2	.16	.45	.06
G	Bouteloua gracilis	a-	b31	b27	b25	.90	.93	.61
G	Oryzopsis hymenoides	b51	c77	a20	ab29	1.24	.33	.22
G	Sitanion hystrix	a17	a29	b49	a11	.30	.55	.04
G	Sporobolus cryptandrus	-	1	4	1	.03	.01	.00
G	Stipa comata	ab50	b78	ab48	a33	2.33	.71	.24
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		443	460	417	341	12.97	9.90	10.69
Total for Grasses		443	460	417	341	12.97	9.90	10.69
F	Arabis spp.	-	-	-	4	-	-	.03
F	Astragalus calycosus	b19	a2	ab7	b27	.01	.03	.06
F	Calochortus nuttallii	3	-	1	-	-	.00	-
F	Chenopodium leptophyllum(a)	-	a6	a-	b58	.01	-	.18
F	Descurainia pinnata (a)	-	-	-	-	-	-	.00
F	Erigeron pumilus	b21	a-	ab8	a4	-	.07	.01
F	Lappula occidentalis (a)	-	-	-	8	-	-	.02
F	Machaeranthera canescens	b37	a4	a3	a7	.01	.06	.02
F	Microsteris gracilis (a)	-	-	3	4	-	.00	.01
F	Phlox longifolia	c164	b50	a17	c142	.15	.06	.78
F	Senecio multilobatus	1	-	-	-	-	-	-
F	Sphaeralcea coccinea	66	44	45	64	.24	.22	.68

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Unknown forb-perennial	1	-	-	-	-	-	-
Total for Annual Forbs		0	6	3	70	0.01	0.00	0.22
Total for Perennial Forbs		312	100	81	248	0.41	0.45	1.60
Total for Forbs		312	106	84	318	0.42	0.46	1.83

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

BROWSE TRENDS --
Management unit 16C, Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata vaseyana	95	96	94	5.84	7.78	12.13
B	Ceratoides lanata	17	16	18	.09	.12	.28
B	Chrysothamnus viscidiflorus viscidiflorus	95	92	93	7.64	10.25	7.76
B	Opuntia spp.	7	13	12	.04	.01	.01
B	Sclerocactus	0	0	1	-	-	-
Total for Browse		214	217	218	13.62	18.17	20.19

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 23

Species	Percent Cover '04
Artemisia tridentata vaseyana	12.58
Ceratoides lanata	.13
Chrysothamnus viscidiflorus viscidiflorus	5.90
Opuntia spp.	.03
Pinus edulis	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 23

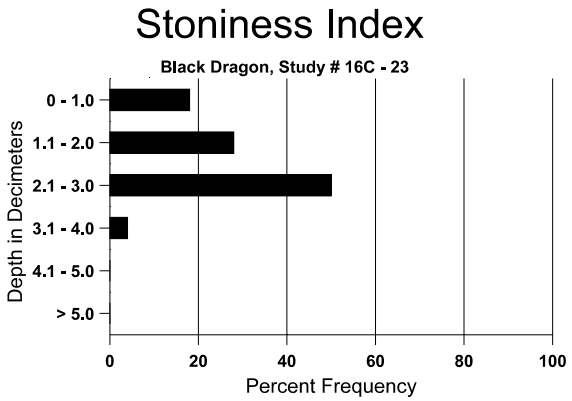
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	1.6

BASIC COVER --
Management unit 16C, Study no: 23

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	6.75	24.96	27.18	31.84
Rock	.75	4.69	.76	1.27
Pavement	10.00	.74	7.55	7.59
Litter	37.25	19.30	17.26	23.89
Cryptogams	1.00	.08	.11	1.31
Bare Ground	44.25	37.02	40.47	45.37

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 23, Study Name: Black Dragon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.4	60.7 (12.6)	7.1	57.4	16.7	25.8	1.7	6.9	60.8	0.7



PELLET GROUP DATA --
Management unit 16C, Study no: 23

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	36	14	31
Elk	29	44	41
Deer	38	22	23
Cattle	4	2	2

Days use per acre (ha)	
'99	'04
-	-
53 (131)	50 (124)
40 (99)	17 (43)
10 (25)	11 (27)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
88	**199**	-	66	133	-	-	0	0	-	-	33	6/15
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
88	**49799**	4333	44600	2266	2933	-	3	6	6	.20	1	8/12
94	**9040**	-	2540	5040	1460	320	19	.66	16	7	7	9/18
99	**10180**	320	5460	3160	1560	640	18	74	15	3	4	11/22
04	**8900**	3760	440	7540	920	1220	59	14	10	4	6	12/19
Ceratoides lanata												
88	**1466**	-	200	1266	-	-	36	59	-	-	0	4/3
94	**520**	-	40	480	-	-	19	0	-	-	0	3/4
99	**620**	-	20	600	-	-	74	13	-	-	0	7/7
04	**580**	20	60	520	-	-	7	83	-	-	0	6/7
Chrysothamnus viscidiflorus viscidiflorus												
88	**13933**	1933	11733	2200	-	-	1	0	0	-	0	5/8
94	**18780**	-	2240	16500	40	-	0	0	0	-	0	4/9
99	**19680**	80	1280	18400	-	20	7	.20	0	-	0	6/12
04	**6520**	820	100	6140	280	1220	.61	0	4	3	3	5/9
Opuntia spp.												
88	**999**	133	533	400	66	-	0	0	7	2	27	3/7
94	**140**	-	-	140	-	-	0	0	0	-	0	3/6
99	**300**	-	40	240	20	-	0	0	7	7	7	3/14
04	**260**	20	60	180	20	20	0	0	8	8	8	2/9
Pinus edulis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	20	-	-	-	-	0	0	-	-	0	-/-
Sclerocactus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 16C-24-04

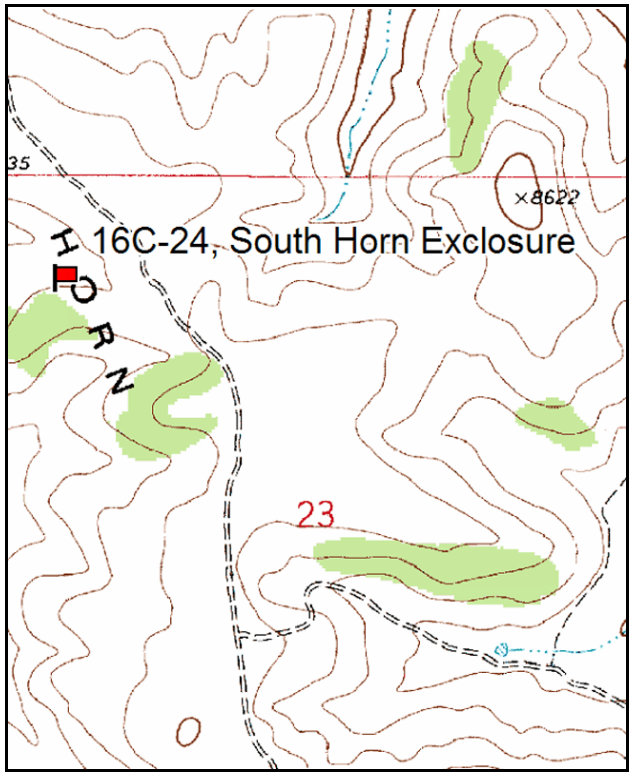
Study site name: South Horn Exclosure . Vegetation type: Mixed Mountain Brush .

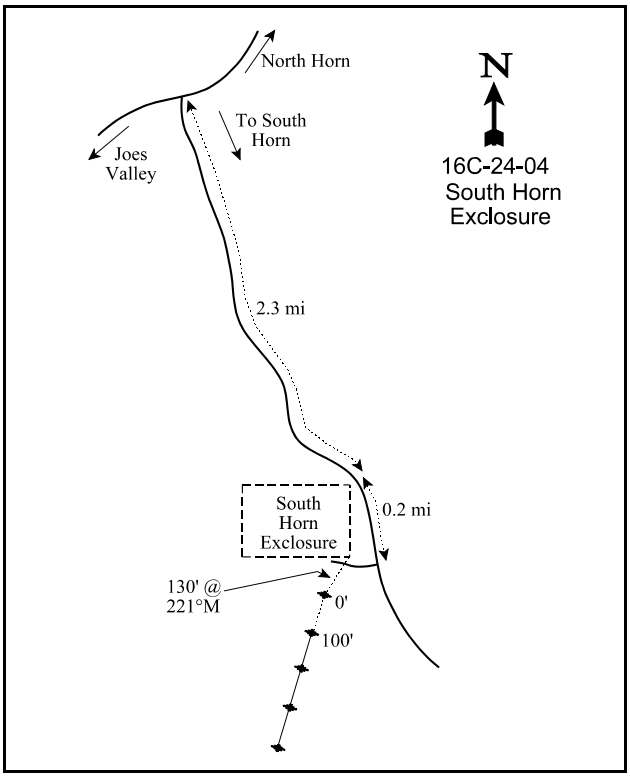
Compass bearing: frequency baseline 206 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of the North Horn and South Horn roads, turn right (south) onto the South Horn road (#21). Proceed 2.3 miles to the NE corner of an exclosure. Continue 0.2 miles past the exclosure to a faint road. Turn right onto this faint road and go 0.15 miles to the SE corner of the exclosure. The 0-foot baseline stake is approximately 130 feet southwest (221°M) of the SE corner.





Map Name: The Cap

Diagrammatic Sketch

Township l9S , Range 6E , Section 23

GPS: NAD 27, UTM 12S 4334205 N, 480762 E

DISCUSSION

South Horn Exclosure - Trend Study No. 16C-24

The South Horn Exclosure study samples a mixed mountain brush community dominated by true mountain mahogany and scattered old pinyon pine. The study is located on the south side of the South Horn Mountain Exclosure. It has a gradual 5% slope and a northwest aspect with an elevation of 8,500 feet. The site is representative of north slopes in the area which support a higher density of true mountain mahogany. The area is primarily used by elk in the winter, although sign of mule deer is also frequent. Rabbit sign is abundant. Grazed in the summer by cattle on the Horn Mountain allotment, this particular area receives less cattle use than the seeded sagebrush flats. Pellet group data from 1999 estimate 32 deer, 33 elk and only 3 cow days use/acre (79 ddu/ha, 82 edu/ha, and 7 cdu/ha). All cow pats were from last season. All of the deer and elk pellet groups appeared to be from the last winter. Pellet group data from 2004 estimated 23 deer, 29 elk and 5 cow day use/acre (56 ddu/ha, 73 edu/ha, and 13 cdu/ha). Elk and deer pellet groups appear to be from last winter and spring. Cow use were from this year.

Soil on the site is relatively shallow (effective rooting depth of just over 9 inches) and very rocky throughout the profile. The upper 6 inches is a visibly darker soil, beyond this, it is a light colored fine sand. Overall soil texture is a sandy loam with a neutral pH (6.8). Phosphorus and potassium are limited at just 4.2 ppm and 32 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. The majority of the soil surface is protected by vegetation and associated litter. The bare shrub interspaces do experience some soil loss and runoff, but the problem is not widespread or severe.

The site supports a variety of browse species. The key species include true mountain mahogany, serviceberry, and mountain big sagebrush. Mountain mahogany is represented by a small population of mostly mature plants which average a little over four feet in height, making some plants partly unavailable. They number an estimated 1,800 plants/acre in 1988 and only 200 plants/acre by 1994. The change in density is a reflection of the much larger sample taken in 1994, which gives a more representative sample of aggregated and/or clumped shrub populations with discontinuous distributions. Density increased slightly to 320 plants/acre in 1999 to 340 plants/acre in 2004. The true mountain mahogany are in good vigor and display moderate to heavy hedging.

Mountain big sagebrush is the most common shrub on the site and some of the more open areas are completely dominated by it. It provided 36% of the shrub cover in 1994, 47% in 1999, and 43% in 2004. The sagebrush population in 2004 numbered 1,680 plants/acre with fair vigor and light to moderate hedging. Snowberry and Utah serviceberry are present at low densities. Mature serviceberry are fairly large averaging 4.5 feet in heigh making some plants partly unavailable. There are also some large tree-like curlleaf mountain mahogany. Both serviceberry and curlleaf mountain mahogany display moderate to heavy use on forage that is available. Large and very old pinyon and juniper trees are scattered throughout the site. Point quarter data from 2004 estimate 34 pinyon trees/acre. Average diameter of pinyon is estimated at 14 inches. Overhead canopy cover is variable, but averages 17% for pinyon and 3% for juniper.

The herbaceous understory is diverse but not very abundant, but expected with pinyon-juniper canopy cover at 20% (Tausch 1994). At this cover value, it has a negative effect on the herbaceous understory. Eleven species of grasses were encountered in 2004 and produced less than 2% cover. Twenty-one species of forbs provided only an additional 5% cover. The most abundant grasses include, Salina wildrye, mutton bluegrass, and Indian ricegrass. Common forbs include annual stickseed, little flower collinsia, and Douglas knotweed.

1994 TREND ASSESSMENT

Litter cover has decreased but is still extensive at 61%. Bare ground increased slightly with browse offering

most of the vegetative cover. Soil trend is still considered stable. Mountain big sagebrush has a stable mature population that is being effected by the associated pinyon-juniper canopy cover and extended drought. Percent decadence is moderately high at 38%. Recruitment of young into the population is down. However, the other associated browse species are doing well considering the drought. Therefore, trend for browse is considered stable. Perennial grasses and forbs have significantly decreased in nested frequency values indicating a slightly downward herbaceous understory trend. The Desirable Components Index rated this site as very poor with a score of 35 due to few young shrubs, high decadency, and low grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 35 (very poor) Mountain brush type

1999 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in relative percent bare ground from 22% to 15% and an improved ratio of bare soil to protective cover. Vegetation cover has gone up, but most of the improvement comes from shrubs and trees, which increased in cover from 14% in 1994 to 24% in 1999. Herbaceous plants, which are more effective at holding soil in place, increased in cover from 6% to 9%. Localized erosion is occurring, although it is not a problem. Trend for browse is up slightly. Density of mountain big sagebrush has increased, recruitment is improved, and percent decadence has declined from 38% to 6%. True mountain mahogany is more heavily hedged but density has increased slightly, vigor is normal, and reproduction has improved. Serviceberry has also increased in density. Most of the plants are very large and partially unavailable to browsing. Available portions of these shrubs display moderate to heavy use. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has remained similar to 1994 estimates, although nested frequency of perennial forbs increased slightly. Composition is diverse and very similar to 1994 with herbaceous plants only producing about 9% cover. The Desirable Components Index rated this site as fair with a score of 59 due to an increase in shrub cover, a decrease in decadency, and an increase in grass and forb cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 59 (fair) Mountain brush type

1999 exclosure observations:

The nearby exclosure has more of a western aspect than the trend study site. The total exclosure contains a lot of curlleaf mountain mahogany which are about 4 to 6 foot in height. They do not appear to be producing seed and they contain many yellow leaves. There are a few decadent tree-like curlleaf. Visually, there appears to be little difference between outside and inside of the total exclosure with regard to sagebrush and grass cover and health. The livestock exclosure also appears to have similar health and vigor for sagebrush compared to outside. Grass composition and abundance also look similar. There are no curlleaf mountain mahogany in the livestock exclosure. A few large highlined serviceberry plants occur in the livestock exclosure.

2004 TREND ASSESSMENT

Trend for soil is stable. Bare ground has declined since 1999 (28%), but remains similar to 1994 relative cover

of 22%. Litter still provides 55% of relative cover as it did in 1994 and vegetation has decreased from 28% in 1999 to 19% relative cover in 2004 (same as 1994). Trend for browse is down slightly. Density of mountain big sagebrush has decreased, recruitment has declined, and percent decadence has increased from 6% in 1999 to 27 % in 2004. In addition, 70% (320 plants/ acre) of the decadent plants appear to be dying. Density of true mountain mahogany has remained relativity stable at 320 plants/acre in 1999 to 340 plants/acre in 2004. Utilization has increased to heavy use and young recruitment remains very low. Trend for herbaceous understory is down slightly. Composition of grasses and forbs is diverse, but account for very little cover. Perennial grasses and forbs have decreased in nested frequency, while annual forbs have increased in nested frequency. The Desirable Components Index rated this site as poor with a score of 44 due to an decrease in shrub cover and an decrease in grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 44 (poor) Mountain brush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 24

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron intermedium	b144	a7	a3	a-	.01	.00	-
G	Agropyron smithii	a-	a2	b84	a17	.03	.50	.11
G	Carex spp.	c46	ab14	bc23	a2	.11	.82	.04
G	Elymus salina	a-	c70	b43	b20	.71	1.59	.32
G	Festuca ovina	a-	b33	a3	a2	.36	.03	.03
G	Koeleria cristata	a-	b37	a6	a3	.33	.06	.04
G	Oryzopsis hymenoides	a-	b17	b21	b16	.57	.79	.13
G	Poa fendleriana	a-	b38	b58	b38	.29	.81	.81
G	Poa secunda	b60	a30	a13	a8	.52	.22	.18
G	Sitanion hystrix	-	6	-	6	.01	-	.01
G	Stipa comata	b56	a26	a5	a7	.50	.04	.10
G	Stipa lettermani	b11	a-	b9	a3	-	.12	.03
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		317	280	268	122	3.48	5.02	1.82
Total for Grasses		317	280	268	122	3.48	5.02	1.82
F	Androsace septentrionalis (a)	-	a-	b49	a-	-	.18	.00
F	Arabis spp.	61	64	57	46	.29	.35	.24
F	Chenopodium album (a)	-	a-	a-	b35	-	-	.10
F	Chenopodium fremontii (a)	-	5	-	-	.01	-	-
F	Comandra pallida	29	24	20	31	.52	.60	.20
F	Collinsia parviflora (a)	-	a15	a10	b129	.05	.02	1.50

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Crepis acuminata	$_{b}$57	$_{a}$6	$_{a}$16	$_{a}$1	.04	.10	.03
F	Cryptantha spp.	$_{b}$38	$_{a}$11	$_{a}$16	$_{ab}$33	.16	.27	.18
F	Delphinium nuttallianum	$_{b}$13	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Eriogonum alatum	$_{b}$23	$_{ab}$20	$_{ab}$15	$_{a}$4	.34	.31	.18
F	Eriogonum cernuum (a)	-	5	2	-	.01	.03	-
F	Erigeron eatonii	$_{b}$75	$_{a}$48	$_{a}$42	$_{a}$22	.37	.24	.13
F	Erigeron spp.	-	5	-	-	.01	-	-
F	Erigeron pumilus	-	-	-	2	-	-	.00
F	Eriogonum umbellatum	$_{b}$13	$_{a}$1	$_{a}$1	$_{a}$2	.00	.03	.03
F	Gayophytum ramosissimum(a)	-	9	-	4	.06	-	.01
F	Heterotheca villosa	-	-	5	6	-	.21	.09
F	Lappula occidentalis (a)	-	$_{a}$-	$_{a}$5	$_{b}$29	-	.01	.70
F	Lupinus spp.	4	-	-	-	-	-	-
F	Machaeranthera canescens	$_{b}$18	$_{a}$2	$_{a}$-	$_{a}$-	.03	.03	-
F	Oenothera spp.	-	-	-	8	-	-	.33
F	Penstemon humilis	$_{b}$25	$_{a}$2	$_{a}$5	$_{a}$-	.01	.03	-
F	Penstemon spp.	-	-	-	7	-	-	.02
F	Penstemon watsonii	-	-	5	-	-	.12	-
F	Phlox austromontana	$_{b}$49	$_{a}$9	$_{a}$11	$_{a}$15	.21	.21	.34
F	Polygonum douglasii (a)	-	$_{b}$85	$_{a}$21	$_{c}$148	.14	.04	.38
F	Potentilla spp.	-	3	-	1	.00	-	.00
F	Schoencrambe linifolia	$_{a}$-	$_{b}$13	$_{c}$46	$_{b}$21	.05	.40	.08
F	Senecio multilobatus	$_{bc}$24	$_{a}$4	$_{c}$31	$_{ab}$10	.01	.19	.10
F	Sphaeralcea coccinea	-	4	9	-	.00	.02	-
F	Townsendia spp.	$_{b}$24	$_{a}$2	$_{a}$-	$_{a}$-	.03	-	-
Total for Annual Forbs		0	119	87	345	0.28	0.29	2.70
Total for Perennial Forbs		453	218	279	209	2.11	3.14	1.99
Total for Forbs		453	337	366	554	2.40	3.43	4.69

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

BROWSE TRENDS --
Management unit 16C, Study no: 24

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	2	6	5	2.32	1.83	2.03
B	Artemisia tridentata vaseyana	54	59	53	5.16	11.05	7.18
B	Cercocarpus ledifolius	3	4	4	-	.48	.18
B	Cercocarpus montanus	10	15	15	4.22	4.55	4.12
B	Chrysothamnus viscidiflorus viscidiflorus	18	16	26	.28	.24	.71
B	Gutierrezia sarothrae	7	5	6	.04	.21	.04
B	Juniperus osteosperma	-	-	-	.15	-	-
B	Leptodactylon pungens	11	11	10	.10	.54	.13
B	Mahonia repens	0	0	1	-	-	.06
B	Opuntia spp.	7	12	15	.07	.29	.26
B	Pinus edulis	0	1	1	1.46	2.76	.84
B	Purshia tridentata	2	2	1	-	-	-
B	Symphoricarpos oreophilus	13	16	14	.58	1.76	1.29
B	Tetradymia canescens	1	0	2	-	-	-
Total for Browse		128	147	153	14.41	23.74	16.87

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 24

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	1.79	3.00
Artemisia tridentata vaseyana	-	8.76
Cercocarpus ledifolius	2.40	2.28
Cercocarpus montanus	2.00	7.73
Chrysothamnus viscidiflorus viscidiflorus	-	2.76
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	2.79	3.00
Leptodactylon pungens	-	.33
Opuntia spp.	-	.33
Pinus edulis	15.39	17.20
Purshia tridentata	-	.33
Symphoricarpos oreophilus	-	1.68

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 24

Species	Average leader growth (in) '04
Amelanchier utahensis	3.2
Artemisia tridentata vaseyana	1.8
Cercocarpus montanus	5.6

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 24

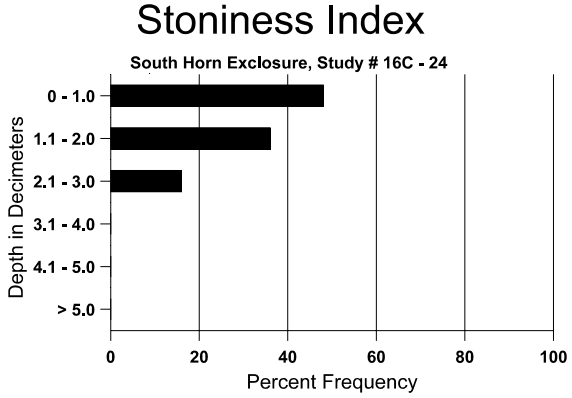
Species	Trees per Acre '99	Trees per Acre '04	Average diameter (in) '99	Average diameter (in) '04
Juniperus osteosperma	13	-	20.7	-
Pinus edulis	30	34	15.4	13.9

BASIC COVER --
Management unit 16C, Study no: 24

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	2.50	20.51	31.71	22.03
Rock	.75	.44	.89	.67
Pavement	.75	.05	.66	.72
Litter	75.00	61.38	62.79	62.39
Cryptogams	1.00	.54	.46	2.36
Bare Ground	20.00	22.79	17.32	25.20

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 24, Study Name: South Horn Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
9.3	47.7 (10.9)	6.8	76.7	11.4	11.8	0.8	4.2	32.0	0.5



PELLET GROUP DATA --
Management unit 16C, Study no: 24

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	52	55	22
Elk	30	13	16
Deer	23	26	14
Cattle	1	-	-

Days use per acre (ha)	
'99	'04
-	-
33 (82)	29 (73)
32 (79)	23 (56)
3 (7)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**333**	200	200	133	-	-	40	0	0	-	0	42/31
94	**40**	-	-	20	20	-	0	0	50	-	0	82/103
99	**120**	480	20	80	20	-	50	17	17	17	17	93/90
04	**200**	-	100	80	20	-	0	50	10	10	10	55/54
Artemisia nova												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	13/38
Artemisia tridentata vaseyana												
88	**1866**	533	200	1266	400	-	14	4	21	1	4	16/22
94	**1820**	20	40	1080	700	760	3	0	38	10	10	28/35
99	**2540**	160	360	2020	160	880	33	0	6	.78	5	21/31
04	**1680**	20	120	1100	460	660	29	7	27	19	19	18/27
Cercocarpus ledifolius												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**80**	-	60	-	20	-	50	25	25	-	0	76/53
99	**100**	-	40	60	-	20	20	20	0	-	0	15/20
04	**100**	-	60	20	20	-	0	80	20	-	0	41/41
Cercocarpus montanus												
88	**1800**	1333	800	1000	-	-	48	7	0	-	0	51/58
94	**220**	-	-	200	20	20	45	0	9	-	0	55/60
99	**320**	40	-	240	80	20	50	50	25	6	6	50/54
04	**340**	-	-	340	-	60	0	71	0	-	0	52/57

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
88	**1599**	66	733	666	200	-	8	0	13	1	4	8/11
94	**640**	-	-	600	40	40	6	3	6	-	16	20/28
99	**580**	-	80	500	-	-	0	0	0	-	0	11/14
04	**1020**	-	20	960	40	-	4	4	4	-	4	11/16
Cowania mexicana stansburiana												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	24/43
Gutierrezia sarothrae												
88	**1733**	400	733	800	200	-	4	0	12	1	15	3/4
94	**400**	60	120	220	60	-	0	0	15	-	0	5/5
99	**380**	-	-	380	-	20	0	0	0	-	0	7/9
04	**440**	-	80	360	-	-	0	0	0	-	0	6/8
Leptodactylon pungens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**620**	-	80	540	-	-	0	0	-	-	0	5/8
99	**640**	-	-	640	-	-	0	0	-	-	0	4/5
04	**520**	-	-	520	-	-	0	0	-	-	0	6/8
Mahonia repens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	3/5
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**160**	-	160	-	-	-	0	0	-	-	0	2/6
Opuntia spp.												
88	**7533**	133	1800	5133	600	-	0	0	8	1	39	2/4
94	**180**	-	40	140	-	-	0	0	0	-	0	2/5
99	**480**	40	80	400	-	-	0	0	0	-	0	2/5
04	**780**	-	20	760	-	-	0	0	0	-	0	3/9
Pinus edulis												
88	**0**	66	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	40	-	20	-	-	0	0	-	-	0	-/-
04	**20**	20	-	20	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**80**	-	-	80	-	-	75	0	-	-	0	9/16
99	**80**	-	20	60	-	-	0	100	-	-	0	17/25
04	**60**	-	-	60	-	-	0	0	-	-	0	13/22
Sambucus racemosa												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	21/49
99	**0**	-	-	-	-	-	0	0	-	-	0	33/52
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Sclerocactus whipplei												
88	**66**	-	-	66	-	-	0	0	-	-	0	1/3
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**1666**	266	1400	266	-	-	12	8	-	-	0	15/9
94	**500**	-	20	480	-	-	12	0	-	-	0	9/19
99	**860**	60	600	260	-	-	0	0	-	-	0	14/22
04	**760**	-	240	520	-	-	11	0	-	-	0	10/25
Tetradymia canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	10/11
99	**0**	-	-	-	-	-	0	0	-	-	0	7/24
04	**40**	-	-	40	-	-	0	0	-	-	0	8/15

Trend Study 16C-25-04

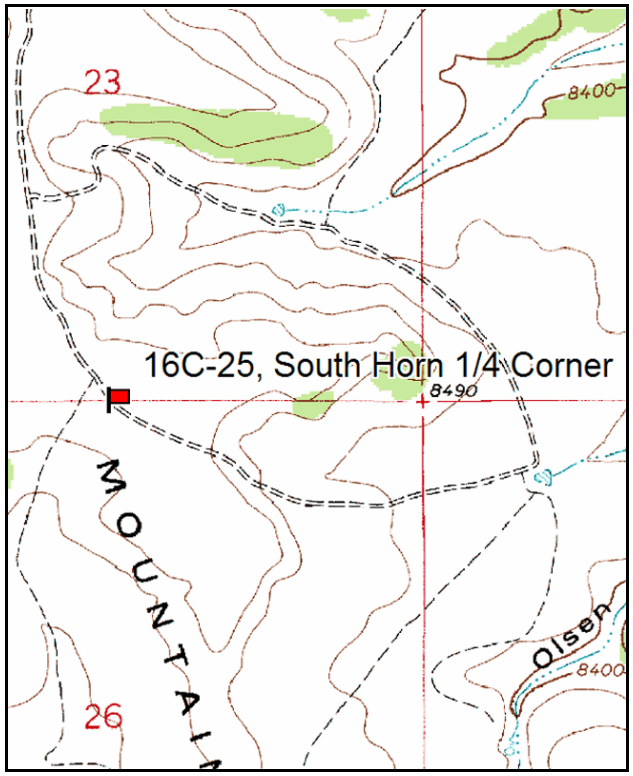
Study site name: South Horn 1/4 Corner . Vegetation type: Mountain Big Sagebrush .

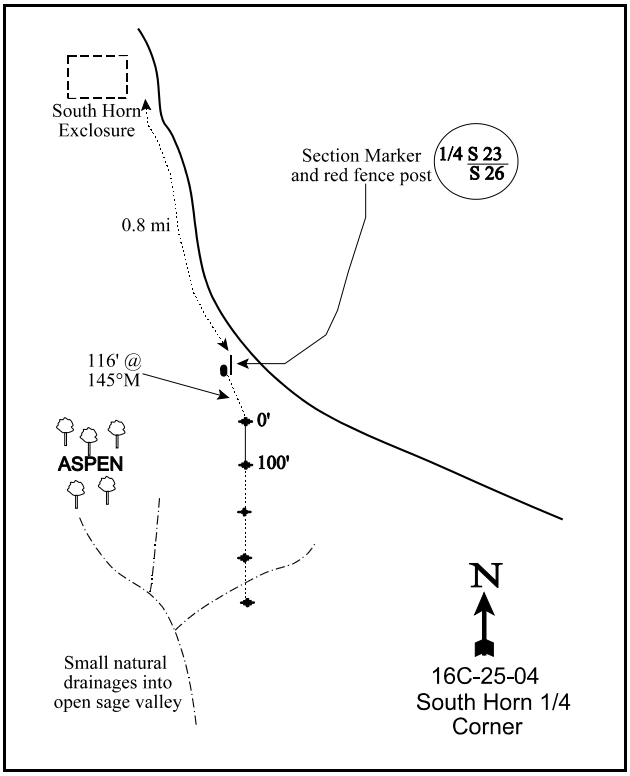
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the South Horn exclosure (by study #16C-24), continue south on the main USGS road for 0.8 miles to a USGS landline marker by a tall red fencepost on the right side of the road. This is the witness post for the transect. From the witness post walk SE (145°M) for 116 feet to the 0-foot end of the baseline. The 18" green fencepost is marked by browse tag #9011.





Map Name: The Cap

Diagrammatic Sketch

Township l9S , Range 6E , Section 26

GPS: NAD 27, UTM 12S 4332839 N, 481397 E

DISCUSSION

South Horn 1/4 Corner - Trend Study No. 16C-25

The South Horn 1/4 Corner trend study samples an area of mountain big sagebrush/grass which is representative of a large expanse of open sagebrush slopes and flats on South Horn Mountain. On top of this large open plateau, the country is flat or gently rolling. The study is located on a southwest-facing slope (5%) with an elevation of 8,550 feet. The rocky ridges and barren rock outcrops support black sagebrush due to the shallow soils. Down the slope, mountain big sagebrush is dominate on the deeper soils. Elk utilize this area in winter and into early spring. Scattered clumps of pinyon-juniper and Utah serviceberry offer cover and forage, with a stand of aspen 300 yards to the west. The Forest Service permits for summer cattle grazing as part of the Horn Mountain allotment. On this particular site, there is little sign of cattle because there is little water available in the summer. Pellet group data from 1999 estimate 9 deer, 71 elk, and 3 cow days use/acre (22 ddu/ha, 175 edu/ha, 7 cdu/ha). All of the cow pats were old. Deer and elk pellet groups appeared to be from the previous winter. Pellet group data from 2004 estimate 5 deer, 84 elk, and 9 cow days use/acre (12 ddu/ha, 207 edu/ha, and 21 cdu/ha). Deer and elk use appears to be from the previous winter. Cows were on the site in 2004 when it was sampled.

The soil is relatively shallow with an estimated effective rooting depth of just over 12 inches. At that depth there is a clay/sand hardpan layer that could restrict root development. Soil texture is a sandy loam with a neutral pH (6.8). Parent material is sandstone. Phosphorus is limited at just 2.5 ppm. Values less than 10 ppm can limit normal plant growth and development. There is some evidence of localized soil movement, although there are no active gullies and herbaceous vegetation cover is abundant.

The dominant browse species is mountain big sagebrush, although this may be a marginal site for it. There is also a few black sagebrush mixed in. There were an estimated 10,132 mountain big sagebrush plants/acre reported in 1988. In 1994, the baseline was lengthened to provide a much larger sample. This larger sample is largely responsible for the differences in population densities between 1988 and 1994. The density of mountain big sagebrush was estimated at 4,140 plants/acre in 1994, 4,840 plants/acre in 1999, and has decreased to 2,820 plants/acre by 2004. The mountain big sagebrush is heavily hedged, especially near the top of the slope. However, this is where site potential would also be at its lowest. Vigor was poor and percent decadence was its highest in 1994 at 54%. Conditions improved in 1999 to 13%, but increased again in 2004 to 28%. Vigor is fairly good, although recruitment of young plants is not adequate to compensate for the 45% of decadent plants that were classified as dying.

Dwarf rabbitbrush is an abundant, predominately mature, population that shows light use. Smaller shrubs and half-shrubs like prickly phlox and low rabbitbrush are fairly common but are seldom utilized as forage. A few Utah serviceberry, were sampled and displayed only light hedging and good vigor. Other species on the site include Pediocactus, snowberry, fringed sagebrush, broom snakeweed, and gray horsebrush. All are present in low densities and do not provide much cover or forage.

The herbaceous understory is moderately abundant and diverse. Needle-and-thread, mutton and sandberg bluegrass are the most common species. Needle-and-thread increased significantly in 2004, while both mutton and sandberg have decreased significantly in nest frequency. Other species on the site include bottlebrush squirreltail, western wheatgrass, and Indian ricegrass. The forb population is exceptionally diverse. Twenty five species were identified in 1994, 27 in 1999 and 31 in 2004. The most common species include tapertip hawksbeard, hairy golden aster, penstemon, and desert phlox.

1994 TREND ASSESSMENT

Bare ground has remained about the same since 1988, while litter cover has decreased. However, soil trend is

still considered stable. The mountain big sagebrush population has greatly decreased since 1988, but most of the change is due to the lengthening of the baseline to get a more representative sample for browse species. Fifty seven percent of the population is now decadent which is an increase from 44% in 1988. More of the plants have been heavily hedged and show reduced vigor. The black sagebrush population also has a high percent of decadent plants at 45%, but provides only about 18% of the browse cover. Trend for browse is slightly down. Summed nested frequency for grasses and forbs combined has decreased greatly since 1988. Most of the decrease is from the forb composition while grasses actually increased slightly. Herbaceous understory trend is down for forbs but stable for grasses. The Desirable Components Index (see methods) rated this site as poor with a score of 44 due to an low shrub cover, high decadence, and moderate grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 44 (poor) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil continues to be stable. Percent cover for bare ground has declined, although litter cover is also down compared to 1994 estimates. Relative total vegetative cover has increased from 25% to 33%. Trend for the key browse species, mountain big sagebrush, slightly up. Use is heavier, yet vigor and recruitment have improved, and percent decadence has declined from 58% to 13%. Trend for the herbaceous understory is down slightly for grasses and stable for forbs. Cover for grasses and forbs have increased nearly two-fold compared to 1994. The most abundant grass, mutton bluegrass, has remained stable, but Sandberg bluegrass declined significantly in frequency. Overall, the herbaceous trend is considered stable. The Desirable Components Index rated this site as good with a score of 70 due to an increase in shrub cover, decrease decadence, and an increase in grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - slightly up (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 70 (good) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil continues to be stable. Percent cover for bare ground and litter have increased slightly, while relative vegetation cover has decreased slightly from 33% in 1999 to 28%. Trend for key browse is down. The mountain big sagebrush density decreased from 4,840 plants/acre in 1999 to 2,820 plants/acre in 2004, a 42% drop in the population. Recruitment is low, percent decadency increased from 13% in 1999 to 28% in 2004, and the young age class is not compensating for the amount of decadent plants that are dying. Utilization has decreased slightly and shows reduced vigor. Density of broom snakeweed increased from 740 plants/acre in 1999 to 2,220 plants/acre in 2004. Trend for herbaceous understory is slightly down. Nested frequency decreased significantly for Mutton and Sandberg grass, but needle-and-thread has increased significantly, yet not to the level it was in 1988. Overall perennial grasses have gone down slightly. Perennial forbs decreased substantially from 1999 values. Annual forbs were almost nonexistent in 1994 and 1999, but increased in 2004. Forbs continue to be very diverse, but percent cover decreased from 36% in 1999 to just under 21% in 2004. The Desirable Components Index rated this site as fair with a score of 58 due to an increase in decadence, decrease in young shrubs, and a small decrease in grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 58 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 25

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	a-	a-	a5	b39	-	.03	.34
G	Agropyron spicatum	-	-	-	7	-	-	.16
G	Bouteloua gracilis	9	26	15	12	.39	.40	.15
G	Carex spp.	a-	a-	b14	a-	-	.42	-
G	Elymus salina	19	8	25	14	.33	.47	.10
G	Koeleria cristata	b91	b66	a37	a17	.42	.95	.10
G	Oryzopsis hymenoides	-	2	3	9	.00	.15	.16
G	Poa fendleriana	c254	b192	b190	a113	3.29	6.55	1.98
G	Poa secunda	a64	d200	c131	b94	1.75	1.45	2.10
G	Sitanion hystrix	52	44	51	52	.22	.64	.51
G	Stipa comata	b143	b118	a53	b134	2.07	.96	4.63
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		632	656	524	491	8.49	12.04	10.27
Total for Grasses		632	656	524	491	8.49	12.04	10.27
F	Allium spp.	b14	a-	a-	a-	-	-	.00
F	Antennaria rosea	4	-	-	3	-	-	.00
F	Arabis spp.	b73	a12	a18	a18	.03	.04	.05
F	Astragalus convallarius	-	5	6	7	.15	.18	.01
F	Aster spp.	a1	a-	a-	b19	-	-	.19
F	Astragalus spp.	1	4	4	-	.03	.03	-
F	Castilleja chromosa	c183	b36	a-	a-	.15	-	-
F	Castilleja linariaefolia	a3	a6	b22	a2	.02	.62	.03
F	Chenopodium spp. (a)	-	-	-	6	-	-	.01
F	Cirsium calcareum	-	-	1	-	-	.03	-
F	Collomia linearis (a)	-	a-	a-	b126	-	-	.44
F	Crepis acuminata	b169	a55	a64	a66	.30	2.25	1.12
F	Cryptantha spp.	b51	a7	a1	a22	.04	.00	.20
F	Delphinium nuttallianum	b14	b9	a-	a-	.02	-	-
F	Draba spp. (a)	-	3	-	-	.00	-	-
F	Eriogonum alatum	a-	b15	b17	b17	.06	.18	.32

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Erigeron eatonii	$_{b}$113	$_{b}$113	$_{b}$125	$_{a}$32	.80	1.80	.17
F	Erigeron pumilus	$_{a}$16	$_{b}$48	$_{a}$10	$_{a}$12	.18	.07	.06
F	Eriogonum racemosum	$_{a}$19	$_{b}$42	$_{ab}$33	$_{ab}$28	.19	.76	.45
F	Eriogonum umbellatum	$_{b}$166	$_{a}$15	$_{a}$28	$_{a}$11	.35	.61	.42
F	Gilia spp. (a)	-	6	3	-	.01	.03	-
F	Heterotheca villosa	$_{a}$-	$_{a}$3	$_{b}$36	$_{b}$29	.15	1.74	.81
F	Lappula occidentalis (a)	-	-	-	4	-	-	.01
F	Linum lewisii	1	-	-	-	-	-	-
F	Lithospermum ruderale	8	1	2	3	.00	.00	.03
F	Lupinus spp.	-	-	-	2	-	-	.00
F	Lygodesmia spp.	-	-	-	5	-	-	.06
F	Machaeranthera canescens	-	-	-	-	-	-	.03
F	Machaeranthera grindelioides	$_{b}$22	$_{b}$26	$_{b}$11	$_{a}$-	.09	.40	-
F	Oxytropis lambertii	-	-	-	1	-	-	.00
F	Penstemon comarrhenus	$_{a}$-	$_{a}$-	$_{b}$58	$_{b}$33	-	1.83	.32
F	Penstemon humilis	$_{b}$36	$_{b}$37	$_{a}$4	$_{a}$14	.66	.15	.39
F	Phlox austromontana	$_{c}$121	$_{ab}$74	$_{bc}$99	$_{a}$61	1.49	2.34	.93
F	Phlox longifolia	-	1	-	-	.00	-	-
F	Polygonum douglasii (a)	-	$_{a}$12	$_{a}$6	$_{b}$115	.05	.01	.32
F	Potentilla gracilis	-	-	7	1	-	.06	.03
F	Schoencrambe linifolia	-	-	3	-	-	.03	-
F	Senecio integerrimus	-	6	8	3	.04	.04	.03
F	Senecio multilobatus	$_{b}$23	$_{ab}$15	$_{ab}$12	$_{a}$7	.03	.03	.05
F	Townsendia spp.	2	-	-	-	-	-	-
F	Trifolium spp.	$_{c}$75	$_{ab}$21	$_{a}$5	$_{b}$36	.09	.01	.09
F	Zigadenus paniculatus	$_{b}$15	$_{a}$-	$_{a}$1	$_{a}$3	-	.00	.01
Total for Annual Forbs		0	21	9	251	0.07	0.04	0.78
Total for Perennial Forbs		1130	551	575	435	4.94	13.27	5.86
Total for Forbs		1130	572	584	686	5.01	13.31	6.65

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

BROWSE TRENDS --
Management unit 16C, Study no: 25

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	5	2	0	1.18	-	-
B	Artemisia frigida	1	2	2	-	-	.03
B	Artemisia nova	0	2	5	-	.30	-
B	Artemisia tridentata vaseyana	84	77	66	7.41	8.27	8.61
B	Ceratoides lanata	0	3	1	-	-	-
B	Chrysothamnus depressus	50	49	47	1.20	1.92	2.67
B	Chrysothamnus viscidiflorus viscidiflorus	31	28	25	.46	.60	1.05
B	Eriogonum corymbosum	170	-	-	.03	-	-
B	Gutierrezia sarothrae	18	15	43	.21	.19	1.81
B	Leptodactylon pungens	32	24	23	.51	.61	.42
B	Pediocactus simpsonii	1	1	0	.00	-	-
B	Symphoricarpos oreophilus	3	3	6	.15	-	.00
B	Tetradymia canescens	6	5	5	.03	.15	.18
Total for Browse		401	211	223	11.23	12.06	14.80

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 25

Species	Percent Cover '04
Artemisia frigida	.06
Artemisia nova	.68
Artemisia tridentata vaseyana	9.44
Chrysothamnus depressus	1.88
Chrysothamnus viscidiflorus viscidiflorus	1.21
Gutierrezia sarothrae	1.08
Leptodactylon pungens	.58
Symphoricarpos oreophilus	.36
Tetradymia canescens	.36

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 25

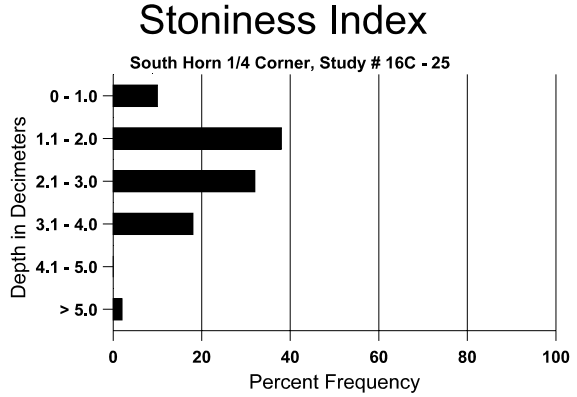
Species	Average leader growth (in) '04
Amelanchier utahensis	6.6
Artemisia tridentata vaseyana	2.0

BASIC COVER --
Management unit 16C, Study no: 25

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	12.50	25.56	32.70	31.19
Rock	.25	.42	3.50	2.20
Pavement	1.50	.37	1.58	3.03
Litter	44.25	33.93	24.04	32.25
Cryptogams	4.00	2.63	3.77	2.83
Bare Ground	37.50	38.25	33.43	41.58

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 25, Study Name: South Horn 1/4 Corner

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.5	50.7 (14.8)	6.8	57.4	28.7	13.8	1.3	2.5	115.2	0.5



PELLET GROUP DATA --
Management unit 16C, Study no: 25

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	23	14	4
Elk	38	34	48
Deer	6	19	4
Cattle	-	3	4

Days use per acre (ha)	
'99	'04
-	-
71 (175)	84 (207)
9 (22)	5 (12)
3 (7)	9 (22)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 25

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**180**	-	-	180	-	-	11	0	-	-	0	27/36
99	**40**	-	-	40	-	-	50	50	-	-	0	36/45
04	**0**	-	-	-	-	-	0	0	-	-	0	34/50
Artemisia frigida												
88	**0**	133	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	5/7
99	**40**	-	-	40	-	-	0	0	-	-	0	9/9
04	**40**	-	-	40	-	-	50	0	-	-	0	7/12
Artemisia nova												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	-	0	0	-	-	0	6/18
04	**200**	-	20	180	-	-	0	0	-	-	0	5/13
Artemisia tridentata vaseyana												
88	**10132**	133	3333	2266	4533	-	33	14	45	.98	10	10/13
94	**4180**	-	280	1660	2240	1120	22	20	54	36	36	12/22
99	**4840**	60	1000	3220	620	720	30	65	13	4	6	16/25
04	**2820**	2140	200	1820	800	800	50	21	28	13	13	19/31
Ceratoides lanata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**100**	-	20	80	-	-	60	0	-	-	0	-/-
04	**40**	-	-	40	-	-	100	0	-	-	0	6/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus depressus												
88	**4399**	133	1866	1600	933	-	21	15	21	-	8	3/5
94	**2500**	-	20	2440	40	-	11	2	2	-	0	3/7
99	**3060**	40	100	2920	40	20	5	0	1	-	0	3/8
04	**2500**	-	-	2260	240	140	10	8	10	2	2	4/9
Chrysothamnus viscidiflorus viscidiflorus												
88	**1666**	-	1266	400	-	-	12	20	-	-	0	6/6
94	**1200**	-	20	1180	-	-	15	0	-	-	0	5/8
99	**1260**	-	60	1200	-	-	0	0	-	-	0	6/9
04	**1040**	-	-	1040	-	-	0	0	-	-	0	8/13
Gutierrezia sarothrae												
88	**266**	-	133	133	-	-	0	0	0	-	0	3/4
94	**580**	-	-	580	-	-	0	0	0	-	0	4/6
99	**740**	-	100	640	-	20	0	0	0	-	0	5/7
04	**2220**	160	220	1980	20	-	0	5	1	-	7	6/10
Leptodactylon pungens												
88	**9599**	466	1733	7400	466	-	.69	0	5	.41	1	4/4
94	**1380**	-	20	1320	40	-	0	0	3	-	0	3/6
99	**1320**	20	120	1200	-	-	0	0	0	-	0	4/5
04	**880**	-	60	820	-	-	0	0	0	-	0	5/7
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	1/2
99	**20**	-	-	20	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	1/3
Symphoricarpos oreophilus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**80**	-	-	40	40	-	25	0	50	-	25	13/28
99	**80**	-	-	80	-	-	0	0	0	-	0	13/20
04	**160**	-	20	100	40	-	0	0	25	-	0	7/10
Tetradymia canescens												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**180**	-	40	140	-	-	22	0	0	-	0	4/6
99	**100**	-	20	80	-	20	40	0	0	-	0	6/8
04	**120**	-	20	80	20	-	17	17	17	17	17	6/10

Trend Study 16C-26-04

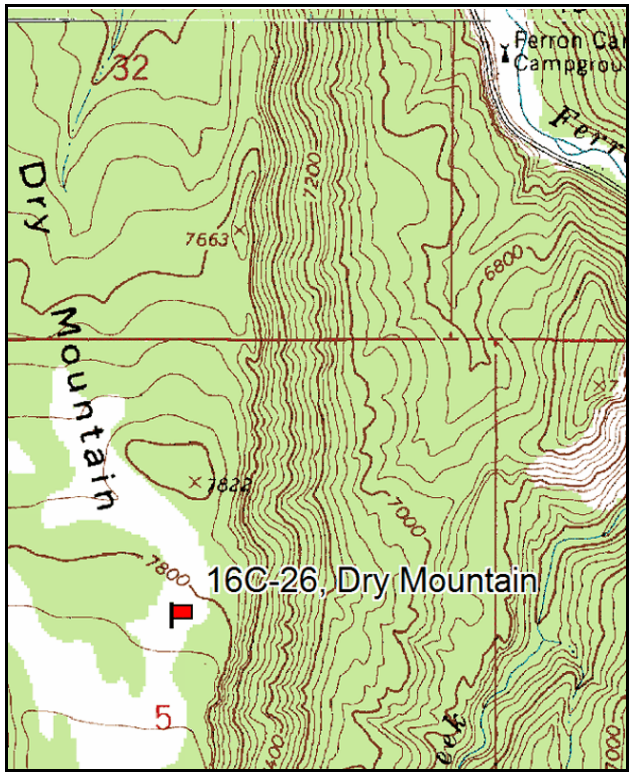
Study site name: Dry Mountain . Vegetation type: Chained, Seeded P-J .

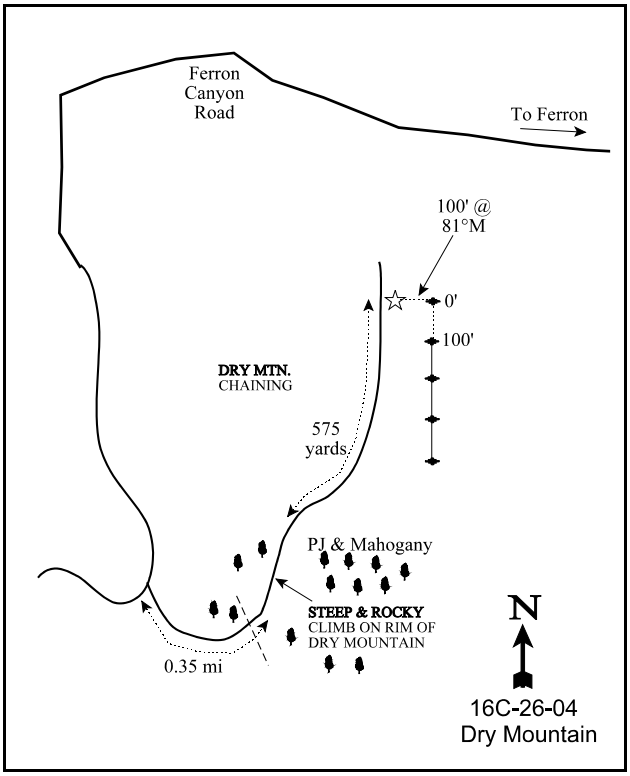
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of Highway U-10 and Canyon Road in Ferron, proceed west up Ferron Canyon toward Ferron Reservoir for 12.85 miles. At this point, bear left (SE) and go 0.35 mile to the base of Dry Mountain, where the road becomes impassably steep and rocky. From the top of this steep section, hike north down the road approximately 575 yards to a witness post on the right side of the road. From the witness post walk east at 81° M about 100 feet to the 0-foot baseline stake. The study stakes are short green fenceposts.





Map Name: Flagstaff Peak ,

Township 20S , Range 6E , Section 5

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4328949 N, 476649 E

DISCUSSION

Dry Mountain - Trend Study No. 16C-26

The Dry Mountain study site is on the north-facing Dry Mountain plateau which provides excellent winter range for deer and elk in mild to normal winters. The plateau was chained and seeded in 1967 and now supports a vigorous stand of mountain big sagebrush and antelope bitterbrush. Along the edges are mature pinyon-juniper and curlleaf mountain mahogany populations. The trend site has a gentle 5% slope and a north aspect. The whole plateau slopes to the north, and ends in high cliffs above Ferron Creek. The only access is on the south end. Elevation is 7,850 feet. Deer pellet groups are abundant while elk sign is scarce. There is little cattle sign on this part of the Ferron grazing allotment. Summer cattle use is restricted by the lack of water and access to the plateau. Pellet group data from 1999 estimate 72 deer, 1 elk and 2 cow days use/acre (178 ddu/ha, 3 edu/ha, and 5 cdu/ha). About 90% of the deer pellet groups encountered were from the previous winter and the remainder from this spring. Rabbit pellets are very abundant. Pellet group data from 2004 estimate 110 deer and 3 cow days use /acre (271 ddu.ha and 7 cdu/ha). Cow pats were old and most of the deer pellets were from the previous winter.

The soil is very sandy and moderately deep, but sandstone bedrock is found at an average depth of 14 inches. There are scattered sandstone rock outcrops near the 0 ft stake. The soil has a loamy sand texture with a neutral to slightly alkaline pH (7.3). Phosphorus and potassium are limited at 2.9 and 41.6 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. Erosion is slight due to good vegetative, litter cover, and lack of significant slope. There are few rocks or pavement on the surface.

Both mountain big sagebrush and antelope bitterbrush are abundant on the site and provide valuable forage. Mountain big sagebrush is the most abundant shrub with a density of 7,199 plants/acre in 1988, 3,840 in 1994, 3,940 in 1999, and 3,640 in 2004. Most of the differences in population density between 1988 and 1994 is due to the much larger sample taken beginning in 1994, but some of the change is due to the lack of young plants being sampled in 1994. Seedlings and young sagebrush were numerous in 1988 due to the wet years in the mid 1980's. Most of these plants did not survive the drought years that followed causing a large decline in population densities. The number of mature sagebrush on the site have decreased slightly from the previous years (3,000 plants/acre in 1988 to 2,260 in 2004). The mature plants show moderate to heavy use and good vigor. The percent of decadent plants in 1999 was 22% of the population and has increased to 33% in 2004. The proportion of decadent plants that are classified as dying increased from 20% in 1999 to 35% in 2004. Recruitment of young into the population continues to be low.

The highly palatable antelope bitterbrush is moderately abundant and produces 23% of the browse cover in 1999 and 16% in 2004. It displayed moderate use in 1988 and 1994, with more heavy utilization in 1999 and 2004. Estimated density was 1,500 plants/acre in 1994, increasing slightly to 1,720 by 1999, and declining to 1,300 in 2004. Those classified with poor vigor has increased to 18%. Percent decadence has increased from 9% in 1999 to 48% in 2004. Rabbitbrush is also present and exhibits a mostly mature population. Juniper and pinyon tree density in 1994 was estimated at 52 and 25 trees/acre according to point-center quarter data. In 1999, many pinyon and juniper trees were thinned-out by hand as a chaining maintenance treatment. Point quarter data estimates surviving trees at 9 trees/acre for juniper and 13 for pinyon. Average diameter of juniper is 6.6 inches while that of pinyon is 2.2 inches.

The understory is diverse but not very abundant due to the dominance of shrubs. The most abundant grass species include, western wheatgrass, blue grama, and needle-and-thread. Some use was seen on grass species. Eleven species of forbs were identified in 1994, 17 in 1999, and 16 in 2004. Combined cover for the forbs accounts for less than 1% cover in 1994, 3% in 1999, and 2% in 2004. Forbs are obviously a minor component for this sagebrush community.

1994 TREND ASSESSMENT

Soil trend is considered stable because relative cover for bare soil only increased by only one percent. There are minimal signs of erosion basically because vegetative cover comes almost entirely from browse. Although the overall mountain big sagebrush population has decreased, the mature population is apparently stable. However, most of the decrease is due to high numbers of young plants sampled in 1988 and the much larger sample size used in 1994 which gives improved estimates for shrub species. The rate of decadency is moderately high and there is reduced vigor on the decadent plants. Mature antelope bitterbrush have increased in density but the population shows increased decadency (13% to 23%). This is still low for a bitterbrush stand. Overall browse trend is stable. There is a poor composition of forbs and they offer very little forage. Grasses dominant the herbaceous understory. Sum of nested frequency of perennial grasses has remained stable while the sum of nested frequency for perennial forbs has declined. Overall the herbaceous understory trend is stable for the perennial forb component contributes to only three tenths of one percent total cover. The Desirable Components Index (see methods) rated this site as poor with a score of 47 due to high decadence, few young shrubs, and low grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 47 (poor) Mountain big sagebrush type - chaining

1999 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1994. Trend for browse is up slightly for the key species, mountain big sagebrush and antelope bitterbrush. Mountain big sagebrush displays a stable population with mostly moderate use, improved vigor, and reduced decadence. Bitterbrush shows more heavy use, but improved recruitment and reduced decadence. Trend for the herbaceous understory is mixed. Sum of nested frequency of perennial grasses has declined slightly, while nested frequency of perennial forbs has increased dramatically and where they provide one-third of the herbaceous cover. Overall trend for the herbaceous understory is considered stable. The Desirable Components Index rated this site as fair with a score of 59 due to slightly decrease in decadence, an increase in young shrubs, and an increase in forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 59 (fair) Mountain big sagebrush type - chaining

2004 TREND ASSESSMENT

Trend for soils is stable with similar protective cover characteristics compared to 1999. Trend for mountain big sagebrush and antelope bitterbrush is down slightly. Mountain big sagebrush decadency increased from 22% in 1999, to 33% in 2004. Although this value is similar to that estimated in 1988 and 1994. Utilization increased and is moderate to heavy. Young recruitment is low and is not compensating for dying plants. Bitterbrush shows heavy use and 48% of the bitterbrush plants are decadent. Young recruitment is not producing enough to compensate for the dying plants. Trend for herbaceous understory is slightly down. Needle-and-thread grass has significantly declined in nested frequency, which was previously one of the most abundant grasses. Forbs are diverse but provide less than 1% cover on the site and have decreased in nested frequency. The Desirable Components Index rated this site as poor with a score of 44 due to high decadence,

few young shrubs, and continued low grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 44 (poor) Mountain big sagebrush type - chaining

HERBACEOUS TRENDS --
Management unit 16C, Study no: 26

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron intermedium	-	-	-	4	-	-	.03
G	Agropyron smithii	$_{b}$105	$_{b}$98	$_{ab}$68	$_{a}$42	.35	.40	.47
G	Bouteloua gracilis	64	47	42	34	1.86	1.60	1.16
G	Carex spp.	1	4	4	-	.03	.15	.03
G	Elymus salina	-	-	3	5	-	.03	.37
G	Oryzopsis hymenoides	$_{a}$6	$_{b}$26	$_{ab}$16	$_{ab}$15	.69	.43	.29
G	Poa fendleriana	12	15	10	7	.05	.02	.18
G	Sitanion hystrix	$_{a}$-	$_{b}$11	$_{ab}$6	$_{b}$9	.02	.02	.08
G	Sporobolus cryptandrus	3	3	2	5	.00	.15	.06
G	Stipa comata	$_{c}$117	$_{bc}$97	$_{b}$75	$_{a}$19	1.76	1.34	.52
G	Stipa lettermani	-	-	6	-	-	.18	.03
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		308	301	232	140	4.78	4.34	3.24
Total for Grasses		308	301	232	140	4.78	4.34	3.24
F	Androsace septentrionalis (a)	-	$_{a}$-	$_{b}$14	$_{a}$-	-	.06	-
F	Antennaria spp.	2	-	-	-	-	-	-
F	Arabis spp.	$_{b}$23	$_{a}$3	$_{b}$22	$_{ab}$9	.01	.05	.03
F	Arabis perennans	$_{b}$13	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
F	Astragalus convallarius	2	-	-	2	-	-	.03
F	Aster spp.	$_{a}$-	$_{a}$-	$_{b}$30	$_{a}$-	-	.17	-
F	Astragalus spp.	-	1	4	2	.00	.03	.03
F	Chaenactis douglasii	$_{ab}$12	$_{ab}$3	$_{b}$16	$_{a}$3	.01	.08	.00
F	Chenopodium spp. (a)	-	-	-	3	-	-	.00
F	Crepis acuminata	4	-	1	-	-	.00	-
F	Cryptantha spp.	$_{a}$-	$_{ab}$15	$_{b}$27	$_{a}$7	.09	.72	.18
F	Descurainia pinnata (a)	-	-	1	3	-	.00	.00
F	Eriogonum cernuum (a)	-	-	-	2	-	-	.00
F	Erigeron pumilus	$_{a}$3	$_{a}$-	$_{b}$15	$_{ab}$11	-	.14	.03

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Eriogonum racemosum	4	2	3	7	.01	.04	.09
F	Gaillardia pinnatifida	-	1	-	-	.00	-	-
F	Gayophytum ramosissimum(a)	-	2	-	3	.00	-	.01
F	Heterotheca villosa	-	-	-	1	-	-	.03
F	Ipomopsis aggregata	-	-	1	-	-	.00	-
F	Lygodesmia spp.	-	1	3	-	.03	.15	-
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$11	$_{ab}$1	-	.08	.01
F	Oenothera spp.	3	-	1	-	-	.00	-
F	Polygonum douglasii (a)	-	3	-	-	.00	-	-
F	Schoencrambe linifolia	22	23	12	10	.08	.03	.07
F	Senecio multilobatus	$_{a}$36	$_{a}$10	$_{b}$118	$_{a}$36	.06	1.24	.33
F	Trifolium spp.	-	-	2	1	-	.01	.00
Total for Annual Forbs		0	5	15	11	0.00	0.07	0.02
Total for Perennial Forbs		124	60	266	90	0.31	2.77	0.86
Total for Forbs		124	65	281	101	0.31	2.84	0.88

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

BROWSE TRENDS --
Management unit 16C, Study no: 26

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata vaseyana	88	86	88	19.94	21.67	22.86
B	Chrysothamnus viscidiflorus viscidiflorus	53	55	56	1.53	2.07	2.45
B	Echinocereus triglochidatus	0	4	1	-	-	-
B	Gutierrezia sarothrae	7	8	9	.00	.02	.21
B	Juniperus osteosperma	15	13	0	.66	-	-
B	Leptodactylon pungens	19	18	16	.13	.25	.78
B	Opuntia spp.	5	9	11	-	.05	.18
B	Pinus edulis	0	3	1	.44	.18	-
B	Purshia tridentata	43	51	46	5.56	7.15	4.94
Total for Browse		230	247	228	28.28	31.39	31.43

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 26

Species	Percent Cover '04
Artemisia tridentata vaseyana	25.98
Chrysothamnus viscidiflorus viscidiflorus	3.90
Gutierrezia sarothrae	.26
Leptodactylon pungens	.33
Purshia tridentata	6.93

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 26

Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	1.6
Purshia tridentata	3.6

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 26

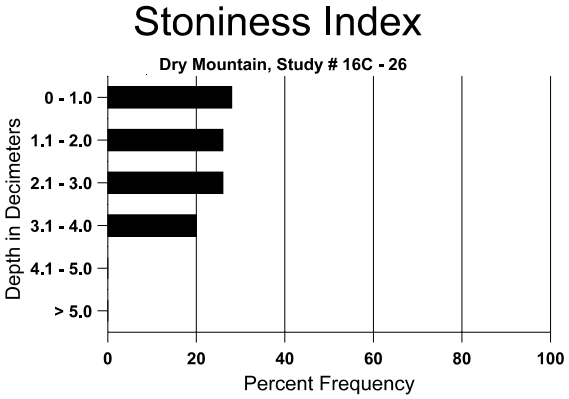
Species	Trees per Acre '94	Trees per Acre '99	Average diameter (in) '99
Juniperus osteosperma	52	9	6.6
Pinus edulis	25	13	2.2

BASIC COVER --
Management unit 16C, Study no: 26

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	5.75	37.89	34.27	36.88
Rock	2.25	2.88	3.32	3.91
Pavement	.25	.52	.63	.79
Litter	69.50	46.47	49.09	54.00
Cryptogams	2.50	3.01	2.12	2.16
Bare Ground	19.75	24.49	26.34	22.61

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 26, Study Name: Dry Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.0	54.3 (16.4)	n/a	83.6	5.8	10.6	1.0	2.9	41.6	0.7



PELLET GROUP DATA --
Management unit 16C, Study no: 26

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	21	42	13
Elk	2	-	-
Deer	64	34	38
Cattle	-	-	-

Days use per acre (ha)	
'99	'04
-	-
1 (3)	-
72 (178)	110 (271)
2 (5)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
88	**7199**	1000	1933	3000	2266	-	61	7	31	.55	2	19/29
94	**3840**	20	80	2440	1320	380	42	8	34	21	21	20/36
99	**3940**	20	200	2880	860	700	53	10	22	4	5	23/36
04	**3640**	100	80	2360	1200	280	66	19	33	12	12	20/36
Chrysothamnus viscidiflorus viscidiflorus												
88	**5066**	133	1266	3600	200	-	1	1	4	-	0	8/9
94	**1960**	-	-	1940	20	-	9	3	1	1	1	11/14
99	**2120**	160	340	1740	40	20	9	0	2	.94	.94	14/16
04	**2280**	20	40	1920	320	-	3	.87	14	3	4	13/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Echinocereus triglochidatus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**80**	-	20	60	-	-	0	0	0	-	0	1/3
04	**80**	-	-	-	80	-	0	0	100	-	0	-/-
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**360**	-	20	340	-	-	0	0	-	-	0	5/6
99	**400**	20	120	280	-	-	0	0	-	-	0	7/6
04	**580**	20	240	340	-	-	0	0	-	-	0	9/10
Juniperus osteosperma												
88	**66**	-	66	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
88	**2465**	133	933	1466	66	-	0	0	3	-	0	5/5
94	**800**	-	-	800	-	-	0	0	0	-	0	6/6
99	**1040**	180	220	740	80	80	0	0	8	4	6	5/7
04	**720**	20	60	600	60	-	0	0	8	3	3	7/10
Opuntia spp.												
88	**200**	-	-	200	-	-	0	0	0	-	0	2/2
94	**120**	-	20	100	-	-	0	0	0	-	0	3/11
99	**280**	-	60	200	20	-	0	0	7	7	7	2/6
04	**340**	-	40	300	-	-	0	0	0	-	12	2/9
Pinus edulis												
88	**266**	133	266	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	60	-	-	100	0	0	-	-	33	-/-
04	**20**	20	20	-	-	-	0	100	-	-	0	-/-
Purshia tridentata												
88	**999**	66	266	600	133	-	67	0	13	-	0	14/28
94	**1500**	-	40	1120	340	100	51	7	23	5	5	15/40
99	**1720**	60	340	1220	160	240	12	23	9	1	1	19/39
04	**1300**	-	60	620	620	140	20	77	48	18	18	15/38

Trend Study 16C-27-04

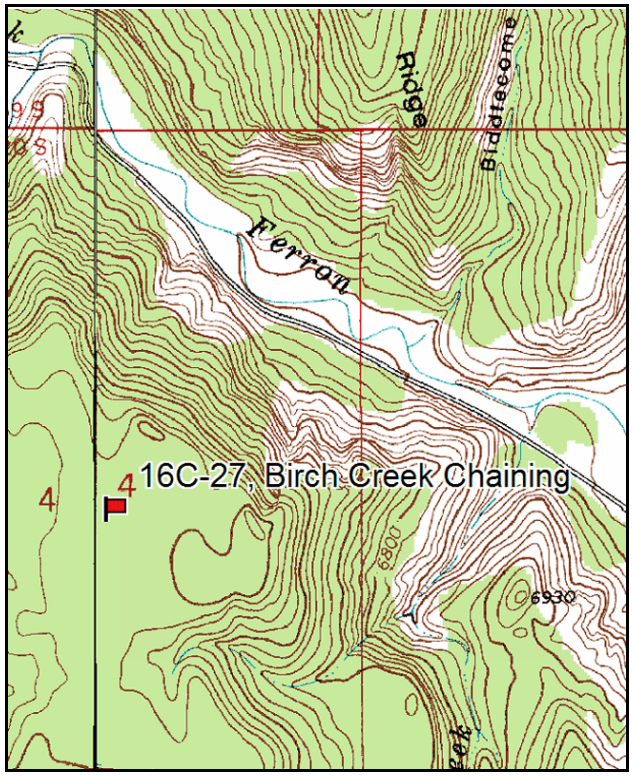
Study site name: Birch Creek Chaining . Vegetation type: Chained, Seeded-PJ .

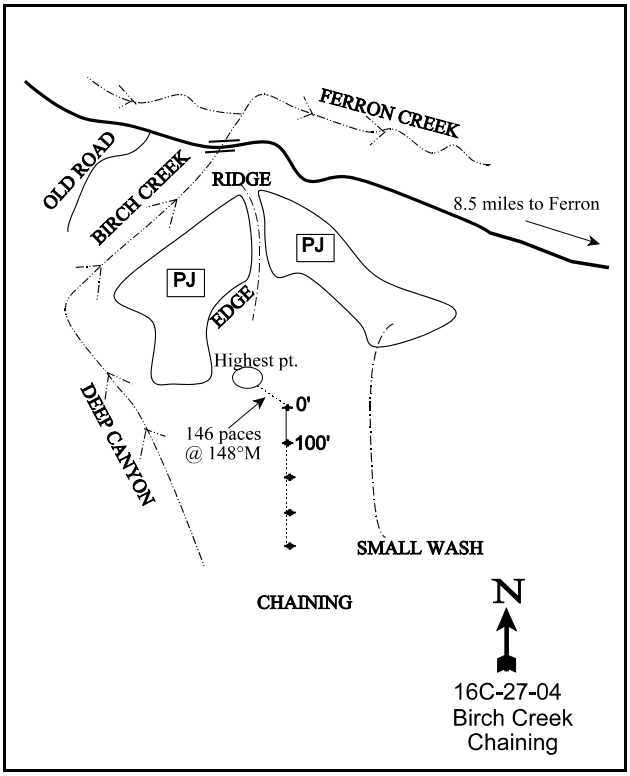
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Ferron, go west up the Ferron Canyon Road approximately 8.5 miles, past Millsite Reservoir and the FS boundary, to a bridge over Birch Creek, a tributary of Ferron Creek (2.1 miles from forest boundary). The Birch Creek chaining is located on top of the bench to the south. The easiest way to the study site is to hike up along the steep and rocky ridge to the P-J on top. Continue south up through the P-J to the edge of the chaining. The study site is in the middle of the chaining, marked by 18" fenceposts. From the highest point along the edge of the P-J, walk south (148° M) for 146 paces to the 0-foot baseline stake. This stake is marked by browse tag #9026.





Map Name: Flagstaff Peak Diagrammatic Sketch

Township 20S , Range 6E , Section 4 GPS: NAD 27, UTM 12S 4328632 N, 478417 E

DISCUSSION

Birch Creek Chaining - Trend Study No. 16C-27

The Birch Creek Chaining trend study is located on the remote, north end of a bench on Forest Service land above Ferron Creek. A large area was chained, trenched on contour, and seeded in 1972. Mountain big sagebrush is the dominant vegetation over much of the area with grasses fairly abundant within the chaining. On this side of the mesa, general exposure is to the west and the terrain is gently sloping (5%). The study is located in the center of the chaining at an elevation of 7,950 feet. Elk and deer pellet groups are moderately abundant. Pellet group data from 1999 estimate 11 deer, 35 elk and 23 cow days use/acre (27 ddu/ha, 87 edu/ha, and 57 cdu/ha). Rabbit pellets are very abundant. Cows were on the site during the 1999 reading and had heavily utilized much of the grass. This site is part of the Ferron allotment, which is managed by the Forest Service. Pellet group data from 2004 estimate 17 deer, 67 elk, and 22 cow days use/acre (41 ddu/ha, 165 edu/ha, and 56 cdu/ha).

Soil on the site is moderately deep with an effective rooting depth estimated at 15 inches. It is actually deeper, but due to soil compaction, deeper penetrometer readings were not possible. Soil texture is a sandy clay loam with a slightly alkaline pH (7.4). Phosphorus is marginal and potassium is limited at 9.6 ppm and 51.2 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. The surface layer is loose and slightly rocky. Shrubs and grasses provides good soil protection, along with abundant litter, but large bare ground spots still exists. The well-vegetated trenches prevent most erosion on this gentle slope. The steeper slopes are more closely terraced and no erosion is evident.

Mountain big sagebrush provided 61% of the browse cover in 1994, 75% in 1999, and 74% in 2004. The population density was estimated at 3,132 plants/acre in 1988, 3,660 in 1999, and 3,540 in 2004. They show moderately use with good vigor. The number of decadent plants has increased from 13% in 1988 and 1999, to 25% in 2004. Recruitment of young have steadily declined since 1988, but in 2004 there are enough young plants to maintain the population. Seedlings were in high production in 2004. The only other common browse consist of released pinyon and juniper trees from the original chaining. Twenty percent of the pinyon and 30% of the juniper consist of surviving chained trees. Point quarter data from 1999 estimate 53 pinyon and 76 juniper trees/acre with average diameters of 3.6 and 3.4 inches respectively. Point quarter data for 2004 estimate 54 pinyon and 77 juniper trees/acre with an average diameter of 4.3 and 3.8 inches. Mature stands of pinyon-juniper were left on the edges and steeper slopes. Valuable browse species such as curlleaf and true mountain mahogany, serviceberry, ephedra, and bitterbrush are found on the undisturbed slopes.

Grasses are a very important forage resource on this chained site. Seeded species include: crested wheatgrass, intermediate wheatgrass, and smooth brome which are the dominate grasses. Crested wheatgrass accounted for 70% of the grass cover in 1994, 74% in 1999, and 87% in 2004. Only a few forbs were found and they provide little forage and provide less than 2% cover.

1994 TREND ASSESSMENT

Bare ground has decreased since 1988 from 29% to 27%. Litter cover has also decreased to only 44% cover with rock and pavement cover combined remained nearly the same. Vegetation cover is split nearly equally between grasses and browse. Soil trend is stable. The key browse is mountain big sagebrush. It displays a stable population with a good recruitment (proportion of young) and a low percent decadency rate. Browse trend is stable. The herbaceous understory trend is slightly down. Sum of nested frequency of both perennial grasses and forbs declined since 1988. However, forbs are very rare and offer little to the community. The majority of the grasses are seeded species with a few natives. The Desirable Components Index rated this site as fair with a score of 59 due to moderate shrub cover, several young shrubs, and low forb cover, although

grass cover was good.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 59 (fair) Mountain big sagebrush type - chaining

1999 TREND ASSESSMENT

Trend for soil continues to be stable due to only a minor increase in litter cover and a slight decline in percent cover of bare ground. There is no significant erosion occurring due to the abundant protective ground cover combined with the gentle terrain and the contour furrow treatment. Trend for the key browse species, mountain big sagebrush, is stable. Use is heavier compared to 1994, but vigor is still good, and percent decadence is low at only 13%. Young recruitment has declined steadily since 1988, but there is still appears to be adequate numbers of young plants to maintain the population. Trend for the herbaceous understory is up slightly for grasses. Forbs are very limited and none were encountered in 1999. Nested frequency of crested wheatgrass and smooth brome have both increased significantly. The Desirable Components Index rated this site as fair with a score of 63 due to an increase in shrub cover, increase in young shrubs, and continued high grass cover, but low forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 63 (fair) Mountain big sagebrush type - chaining

2004 TREND ASSESSMENT

Trend for soil is down slightly. Relative percent bare ground increased from 21% in 1999 to 33% in 2004. Relative percent litter cover decreased from 49% in 1999 to 38% in 2004. Protective cover is still sufficient to hold soil from significant erosion. Trend for key browse species, mountain big sagebrush, is stable. Use was moderate and vigor is good (lots of seedheads). Percent decadence increased from 13% in 1999 to 25% in 2004, but strip frequency and quadrat cover both increased. Young recruitment is down compared to the previous years, but still is producing enough to compensate for the decadent plants that are dying. Trend for herbaceous understory is down slightly. Sum nested frequency for grasses has decreased significantly for crested wheatgrass, intermediate wheatgrass, and smooth brome. Forbs increased in nested frequency, but they are so few that they add very little to the total cover. Forb increase was predominately all annual species. The Desirable Components Index rated this site as poor with a score of 49 due to an increase in shrub cover, increase in decadence, and a decrease in grass cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 49 (poor) Mountain big sagebrush type - chaining

HERBACEOUS TRENDS --
Management unit 16C, Study no: 27

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{a}$159	$_{a}$154	$_{b}$191	$_{a}$131	8.27	10.18	7.07
G	Agropyron intermedium	$_{c}$162	$_{b}$77	$_{b}$56	$_{a}$15	1.88	.99	.11
G	Bromus inermis	$_{bc}$77	$_{ab}$53	$_{c}$90	$_{a}$25	1.08	1.47	.28
G	Elymus salina	-	2	-	-	.00	-	.00
G	Oryzopsis hymenoides	37	18	23	15	.61	1.00	.59
G	Sitanion hystrix	$_{b}$23	$_{a}$3	$_{a}$7	$_{a}$5	.00	.04	.03
G	Sporobolus cryptandrus	-	1	-	3	.00	-	.03
G	Stipa pinetorum	$_{b}$9	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		467	308	367	194	11.88	13.69	8.13
Total for Grasses		467	308	367	194	11.88	13.69	8.13
F	Arabis spp.	-	2	-	-	.03	-	-
F	Chenopodium spp. (a)	-	$_{a}$-	$_{a}$-	$_{b}$12	-	-	.19
F	Chenopodium fremontii (a)	-	-	-	2	-	-	.03
F	Chenopodium glaucum (a)	$_{b}$9	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
F	Cryptantha spp.	1	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	$_{a}$5	$_{a}$-	$_{b}$30	.01	-	.22
F	Ipomopsis aggregata	3	3	-	-	.00	-	-
F	Penstemon caespitosus	5	5	-	-	.03	-	-
F	Senecio multilobatus	$_{b}$11	$_{a}$-	$_{a}$-	$_{ab}$1	-	-	.03
Total for Annual Forbs		9	6	0	44	0.01	0	0.45
Total for Perennial Forbs		20	10	0	1	0.07	0	0.03
Total for Forbs		29	16	0	45	0.09	0	0.48

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

BROWSE TRENDS --
Management unit 16C, Study no: 27

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	0	1	1	-	-	-
B	Artemisia tridentata vaseyana	56	68	71	7.80	11.05	13.35
B	Gutierrezia sarothrae	2	5	4	-	.16	-
B	Juniperus osteosperma	0	1	2	2.36	1.62	1.64
B	Opuntia spp.	1	1	3	-	-	.03
B	Pinus edulis	0	2	2	2.64	1.85	2.99
B	Symphoricarpos oreophilus	0	0	1	-	-	-
Total for Browse		59	78	84	12.81	14.69	18.01

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 27

Species	Percent Cover	
	'99	'04
Artemisia tridentata vaseyana	-	17.36
Juniperus osteosperma	2.00	1.70
Opuntia spp.	-	.05
Pinus edulis	-	4.15

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 27

Species	Average leader growth (in)
	'04
Artemisia tridentata vaseyana	2.9

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 27

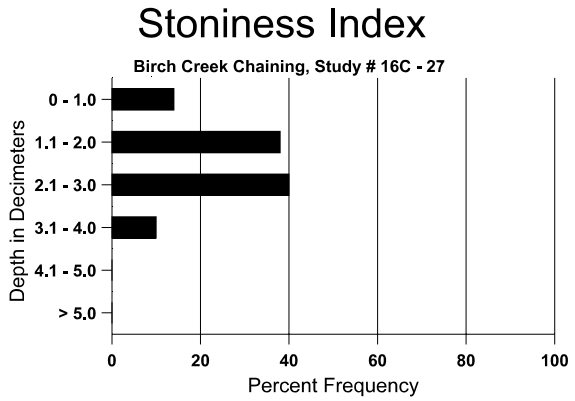
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	76	77	3.4	4.3
Pinus edulis	53	54	3.6	3.8

BASIC COVER --
Management unit 16C, Study no: 27

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	2.50	25.13	27.78	25.98
Rock	1.75	2.50	2.96	2.81
Pavement	2.00	.49	1.72	1.97
Litter	65.00	44.10	56.28	44.98
Cryptogams	0	.09	.04	1.07
Bare Ground	28.75	26.70	24.94	38.90

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 27, Study Name: Birch Creek Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.0	52.0 (12.6)	7.4	72.7	5.4	21.8	1.7	9.6	51.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 27

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	31	40	10
Elk	23	18	32
Deer	24	14	9
Cattle	-	3	1

Days use per acre (ha)	
'99	'04
-	-
35 (87)	67 (165)
11 (27)	17 (41)
23 (57)	22 (56)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 27

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	100	0	-	-	0	17/13
Artemisia tridentata vaseyana												
88	**3132**	600	1066	1666	400	-	43	28	13	-	4	12/18
94	**3000**	40	700	1960	340	160	31	8	11	1	1	17/27
99	**3660**	-	540	2660	460	160	26	21	13	2	2	17/27
04	**3540**	560	340	2320	880	140	38	14	25	10	10	15/32
Gutierrezia sarothrae												
88	**66**	-	-	66	-	-	0	0	-	-	0	27/11
94	**40**	-	-	40	-	-	0	0	-	-	0	5/7
99	**100**	-	-	100	-	-	0	0	-	-	0	6/7
04	**140**	-	40	100	-	-	0	0	-	-	0	6/11
Juniperus osteosperma												
88	**132**	-	66	66	-	-	0	0	-	-	0	47/19
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	20	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Opuntia spp.												
88	**66**	-	-	-	66	-	0	0	100	-	100	-/-
94	**20**	-	-	20	-	-	0	0	0	-	0	2/4
99	**20**	-	-	20	-	-	0	0	0	-	0	5/11
04	**60**	-	-	60	-	-	0	0	0	-	0	4/12
Pinus edulis												
88	**332**	-	266	66	-	-	0	0	-	-	20	43/57
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	20	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	31/80
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	9/10

Trend Study 16C-28-04

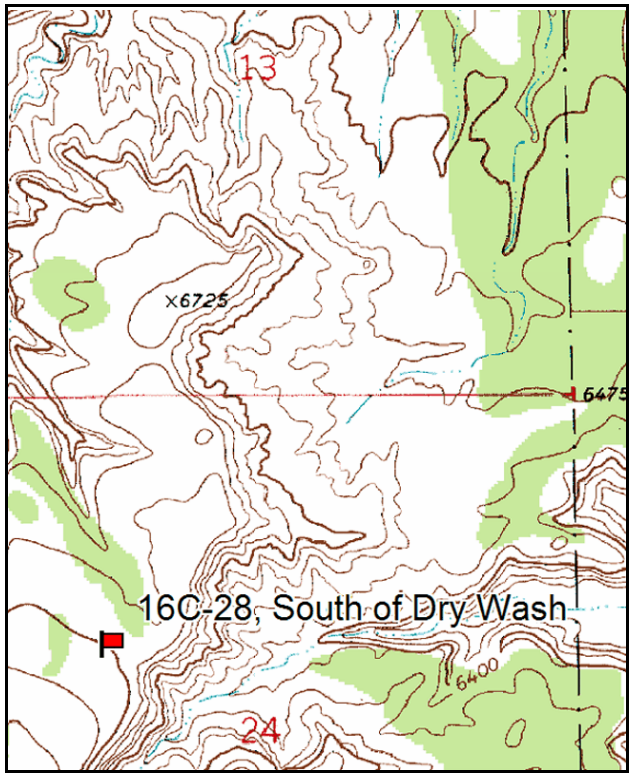
Study site name: South of Dry Wash . Vegetation type: Chained, Seeded P-J .

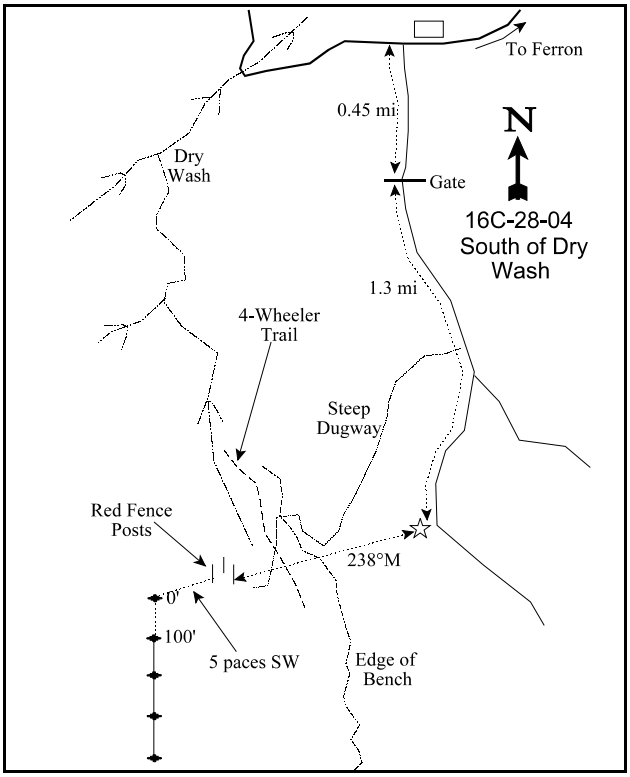
Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Ferron, proceed west up Canyon Road for 3.7 miles. 300 ft after the entrance to Millsite Golf Course, turn left onto a dirt road. Go south on the dirt road 0.45 miles to a gate. Continue 1.3 miles to a witness post on F.S. Road #118. From the witness post, walk up the ridge to the west. There is a game trail going to the top at a bearing of 238°M. Take this trail southwest along the edge of the chained area. The road continues up into the east edge of the chaining, where FS photo study plots and the trend study are located. The FS study is marked by tall red fenceposts. The range trend study, marked by 2 foot fenceposts, is adjacent.





Map Name: Ferron

Township 20S , Range 6E , Section 24

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4323868 N, 482672 E

DISCUSSION

South of Dry Wash - Trend Study No. 16C-28

This trend study samples a chaining on a bench below Nelson Mountain, south of Dry Wash. The 35 acre chaining and seeding was done in 1972 as a Forest Service wildlife habitat enhancement project. This study site is on a north aspect with a gently slope (5-7%) at 6,800 feet. A rather isolated site, it receives little use by cattle. It produces an abundance of quality forage for wintering big game and appears to be used into the spring by deer. Pellet group data from 1999 estimated 85 deer and 11 elk days use/acre (209 ddu/ha and 27 edu/ha). Pellet group data from 2004 estimated 41 deer and 8 elk days use/acre (20 edu/ha and 101 ddu/ha). Most of the deer pellet groups were from winter use but about 35% of the deer pellet groups encountered appeared to be from spring use.

The site is on a gentle slope (7%) with a slight north aspect and an elevation of 6,800 feet. Effective rooting depth is estimated at 13 inches, although at about 4 inches in depth a compacted soil horizon is encountered which contains a lot of clay. The soil surface and profile are very rocky. Overall, soil texture is a sandy clay loam with a slightly alkaline pH (7.5). Phosphorus and potassium are low at only 3 ppm and 38.4 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. Even with the gentle slope, there is a fair amount of soil movement. This erosion causes gullies, sedimentation, and concentrations of erosion pavement in open areas.

Black sagebrush is the most numerous browse species with a steadily increasing population of 3,440 plants/acre estimated in 1994, 3,800 in 1999 and 4,280 by 2004. It provided 32% of the browse cover in 1994, 34% in 1999, and 35% in 2004. These low growing shrubs were moderately to heavily hedged in 1994, while use was light to moderate in 1999 and 2004. Vigor is generally good but many decadent plants sampled in 1994, 1999, and 2004 appeared to be dying.

True mountain mahogany is also fairly abundant and produces additional valuable forage. It produced 34% of the browse cover in 1994, 33% in 1999, and 29% in 2004. The population was estimated at 600 plants/acre in 1999 increasing to 720 plants/acre in 2004. Mature mahogany averages 4 to 5 feet in height. Available portions of these shrubs show moderate to heavy use. Vigor is good and percent decadence low. Green ephedra is another palatable shrub found on the sight. It has been moderately hedged and has good vigor.

Other palatable browse include four-wing saltbush and slender buckwheat. Released pinyon and juniper trees are abundant and provide about one-third of the browse cover. Total canopy cover was estimated at 13 percent in 2004 and point-center quarter data estimated a density of 156 pinyon and 144 juniper trees/acre. Average diameter of pinyon was estimated at 2.4 inches while that of juniper was 3.4 inches. About one-third of the juniper trees sampled were knocked down by the chaining but still living. The knocked down juniper trees had an average diameter of nearly 8 inches.

The herbaceous understory is not very abundant. The most common grass is the native Indian ricegrass. It provided 77% of the grass cover in 1994, 79% in 1999, and 50% in 2004. Individuals were very robust and vigorous in 1999, with mature plants as tall as 17 inches. Salina wildrye, a bunchgrass that is slightly rhizomatous, is present but not abundant. Forbs are rare, typically small, and don't offer much forage or cover.

1994 TREND ASSESSMENT

Litter cover has decreased but still provides moderate cover for the soil. There is a decrease in rock and pavement cover. Relative percent bare ground has remained almost the same. Sixty-seven percent of the vegetative cover is provided by browse and 30% of the browse cover is from pinyon and juniper trees which

do not provide as much soil protection as cover of herbaceous plants. However, the soil trend is considered stable. Black sagebrush shows an increasing mature population and an increasing decadency rate. True mountain mahogany also shows an increasing mature population, but a decreasing rate of decadency. Both species currently have poor recruitment. Browse trend is still considered stable. Herbaceous understory trend is stable as well. Sum of nested frequency for perennial grasses has remained constant, while perennial forb nested frequency has declined only slightly. However, perennial forbs only contribute to only about 15% of the herbaceous cover. The only down side to the trend is the significant decrease in Indian ricegrass combined with the appearance of Salina wildrye, not a preferred forage species. The increased sample size taken in 1994 may be responsible for these changes. The new lengthened baseline likely picked up some Salina wildrye which was formally outside the study area. Forbs combined provide just over 1% cover and have slightly decreased in nested frequency. They provide little forage and are not an important aspect of the vegetative composition. The Desirable Components Index (see methods) rated this site as fair with a score of 61 due to good shrub cover, several young shrubs, and moderate grass cover, but low forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 61 (fair) Black big sagebrush type - chaining

1999 TREND ASSESSMENT

The soil trend is up slightly. Relative percent cover for bare ground has declined from 23% to 16% and litter cover has increased slightly from 36% to 40%. However, there is still some erosion occurring. Trend for browse is up slightly for the key species black sagebrush. Density has increased slightly, use is lighter, recruitment improved, and percent decadence has declined from 30% to only 17%. True mountain mahogany shows a stable trend. The only negative aspect to the browse trend is the increase in cover of released pinyon and juniper trees that escaped the chaining treatment. Trend for the herbaceous understory is stable but still limited in productivity. Sum of nested frequency for perennial grasses increased slightly, but not enough to warrant an upward change in trend. There was a significant increase in the nested frequency of Indian ricegrass. Nested frequency for perennial forbs declined although they were never very abundant. The Desirable Components Index rated this site as good with a score of 69 due to good shrub cover, increase in young shrubs, and moderate grass cover, but low forb cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 69 (good) Black big sagebrush type - chaining

2004 TREND ASSESSMENT

Trend for soil is slightly down. Relative percent cover for bare ground has increased from 16% to 24% and litter cover declined 6%. There is some localized erosion occurring but it is minimal due to the gentle terrain. The soil erosion condition assessment rated soil as stable. Trend for the key browse species, black sagebrush and true mountain mahogany, is slightly up. Density of both populations has increased, vigor has remained good, and decadence is relatively low. One negative aspect of the browse trend is the abundance of pinyon and juniper trees which have steadily increased in cover. Total canopy cover was estimated at 13% in 2004. When pinyon-juniper canopy cover starts approaching 15%, it starts to exhibit its negative effect on the herbaceous understory. About 60% of the juniper and 65% of the pinyon trees are small trees 1 to 4 foot in height released by the chaining. A continued increase in canopy cover will suppress understory species. The

herbaceous understory is poor, producing only about 4% total cover in 2004. Trend is down slightly. Sum of nested frequency of perennial grasses declined slightly but frequency of Indian rice grass, which is the most abundant species in the understory, declined significantly. The forb composition is diverse but all species are rare in the occurrence. Drought conditions are likely responsible for the decline in perennial grass abundance and cover and a downward soil trend. A return to normal precipitation patterns will likely reverse this trend. The Desirable Components Index rated this site as fair with a score of 60 due to good shrub cover, several young shrubs, and a decrease in grass cover.

TREND ASSESSMENT
soil - slightly down (2)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 60 (fair) Black big sagebrush type - chaining

HERBACEOUS TRENDS --
Management unit 16C, Study no: 28

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	4	5	1	13	.03	.00	.10
G	Bromus tectorum (a)	-	-	-	1	-	-	.00
G	Elymus junceus	-	-	-	6	-	-	.45
G	Elymus salina	$_{a}$-	$_{c}$34	$_{b}$30	$_{b}$10	1.88	1.61	1.07
G	Oryzopsis hymenoides	$_{b}$116	$_{a}$84	$_{ab}$113	$_{a}$79	7.11	6.82	1.72
G	Sitanion hystrix	$_{b}$20	$_{ab}$17	$_{ab}$17	$_{a}$7	.19	.16	.08
Total for Annual Grasses		0	0	0	1	0	0	0.00
Total for Perennial Grasses		140	140	161	115	9.22	8.61	3.44
Total for Grasses		140	140	161	116	9.22	8.61	3.44
F	Artemisia ludoviciana	-	3	-	-	.00	-	-
F	Chenopodium fremontii (a)	-	-	-	7	-	-	.01
F	Cryptantha spp.	$_{ab}$45	$_{b}$52	$_{ab}$29	$_{a}$19	1.48	.42	.12
F	Descurainia pinnata (a)	-	-	3	2	-	.00	.00
F	Eriogonum ovalifolium	4	6	2	-	.01	.01	-
F	Gilia spp. (a)	-	3	-	5	.00	-	.01
F	Lepidium spp. (a)	-	-	5	5	-	.06	.22
F	Machaeranthera canescens	2	-	-	-	-	-	-
F	Penstemon carnosus	$_{b}$23	$_{a}$9	$_{a}$3	$_{a}$2	.02	.01	.00
F	Phlox austromontana	4	-	-	-	-	-	-
F	Schoencrambe linifolia	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$12	-	.00	.03
F	Thelypodiopsis saggittata	12	5	-	-	.01	-	.00
F	Thelesperma subnudum	$_{b}$14	$_{a}$2	$_{a}$-	$_{a}$2	.00	-	.00
F	Townsendia incana	$_{a}$3	$_{a}$3	$_{a}$-	$_{b}$19	.00	-	.10

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
Total for Annual Forbs		0	3	8	19	0.00	0.06	0.24
Total for Perennial Forbs		107	80	36	54	1.55	0.44	0.27
Total for Forbs		107	83	44	73	1.55	0.50	0.51

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

BROWSE TRENDS --
Management unit 16C, Study no: 28

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	69	74	73	7.10	8.23	10.03
B	Cercocarpus montanus	26	26	32	7.46	7.96	8.09
B	Chrysothamnus nauseosus	2	0	0	-	-	-
B	Chrysothamnus viscidiflorus	0	1	0	-	-	-
B	Ephedra viridis	15	15	13	.78	.96	2.11
B	Eriogonum microthecum	21	15	20	.02	.01	.03
B	Gutierrezia sarothrae	0	0	1	-	-	-
B	Juniperus osteosperma	0	8	8	1.58	2.04	3.14
B	Opuntia polyacantha	4	4	3	.03	.18	.18
B	Pinus edulis	0	13	10	4.87	5.03	4.67
Total for Browse		137	156	160	21.87	24.42	28.27

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 28

Species	Percent Cover	
	'99	'04
Artemisia nova	-	8.64
Cercocarpus montanus	3.40	9.21
Ephedra viridis	-	2.29
Juniperus osteosperma	-	4.26
Pinus edulis	-	8.69

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 28

Species	Average leader growth (in) '04
Artemisia nova	1.3
Cercocarpus montanus	4.3

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 28

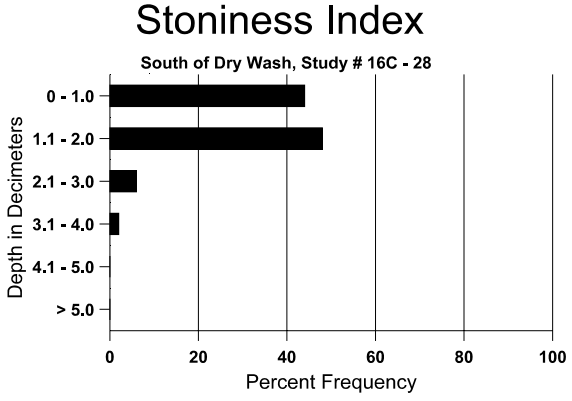
Species	Trees per Acre '99	Trees per Acre '04	Average diameter (in) '99	Average diameter (in) '04
Juniperus osteosperma	108	144	3.3	3.4
Pinus edulis	185	156	2	2.4

BASIC COVER --
Management unit 16C, Study no: 28

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	2.25	29.27	32.51	31.79
Rock	6.00	10.97	8.50	8.25
Pavement	16.25	4.17	12.60	9.40
Litter	52.00	39.35	48.24	40.99
Cryptogams	.25	.16	.75	.48
Bare Ground	23.25	24.50	19.09	28.55

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 28, Study Name: South of Dry Wash

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.1	66.0 (11.5)	7.5	54.7	21.4	23.8	3.9	3.0	38.4	0.7



PELLET GROUP DATA --
Management unit 16C, Study no: 28

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	17	18	19
Elk	-	6	8
Deer	34	27	24

Days use per acre (ha)	
'99	'04
-	-
11 (27)	8 (20)
85 (209)	41 (101)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	6/7
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
88	**2332**	233	833	1233	266	-	19	0	11	-	3	8/17
94	**3440**	-	60	2360	1020	40	47	20	30	6	6	7/21
99	**3800**	20	320	2820	660	140	23	2	17	8	9	8/20
04	**4280**	-	120	3660	500	440	39	4	12	7	7	8/19
Atriplex canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	19/20
99	**0**	-	-	-	-	-	0	0	-	-	0	28/35
04	**0**	-	-	-	-	-	0	0	-	-	0	21/26
Cercocarpus montanus												
88	**232**	1166	66	133	33	-	0	0	14	9	14	45/47
94	**540**	-	120	400	20	20	56	15	4	-	0	52/64
99	**620**	60	300	280	40	20	35	6	6	-	0	59/67
04	**720**	20	340	360	20	-	11	56	3	-	0	55/74
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**40**	-	-	20	20	-	50	50	50	50	50	11/13
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	100	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/11
Ephedra viridis												
88	**832**	100	166	433	233	-	4	8	28	-	4	27/22
94	**340**	20	20	280	40	-	18	12	12	6	6	34/43
99	**340**	-	40	240	60	-	53	12	18	-	0	39/46
04	**500**	-	20	420	60	20	32	4	12	4	4	40/49
Eriogonum microthecum												
88	**966**	66	133	800	33	-	0	0	3	-	0	2/2
94	**580**	-	20	540	20	-	3	14	3	3	3	1/3
99	**540**	20	200	320	20	-	19	7	4	-	0	2/4
04	**600**	-	80	520	-	-	43	10	0	-	0	2/3
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
88	**199**	33	166	33	-	-	0	0	-	-	0	63/41
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**160**	-	140	20	-	20	0	0	-	-	0	-/-
04	**160**	20	80	80	-	-	0	0	-	-	0	-/-
Opuntia polyacantha												
88	**399**	-	133	233	33	-	0	0	8	5	8	2/5
94	**80**	-	-	60	20	-	0	0	25	-	0	3/13
99	**80**	-	20	60	-	-	0	0	0	-	0	3/12
04	**60**	-	-	60	-	20	0	0	0	-	0	3/10
Pinus edulis												
88	**399**	166	333	66	-	-	0	0	-	-	8	44/52
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**260**	40	140	120	-	20	0	0	-	-	0	-/-
04	**220**	-	80	140	-	20	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Yucca harrimaniae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/12

Trend Study 16C-29-04

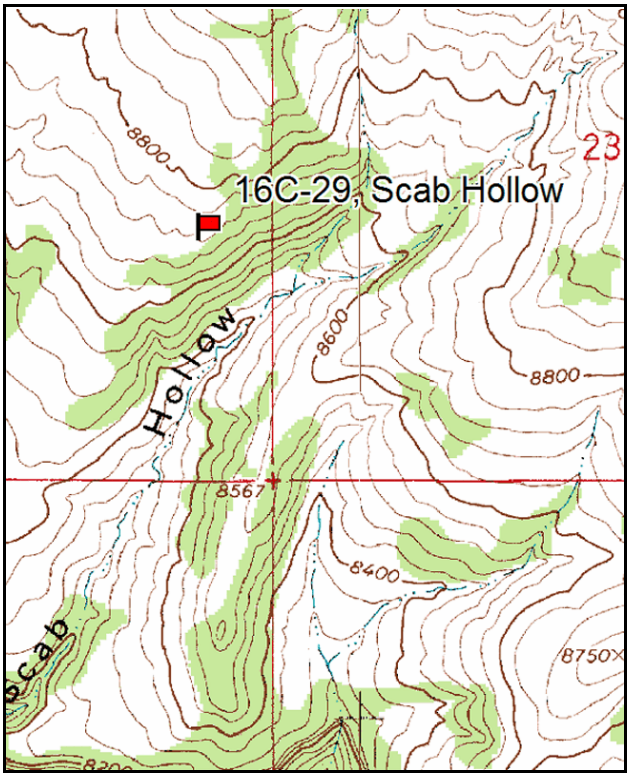
Study site name: Scab Hollow . Vegetation type: Curlleaf Mtn Mahogany .

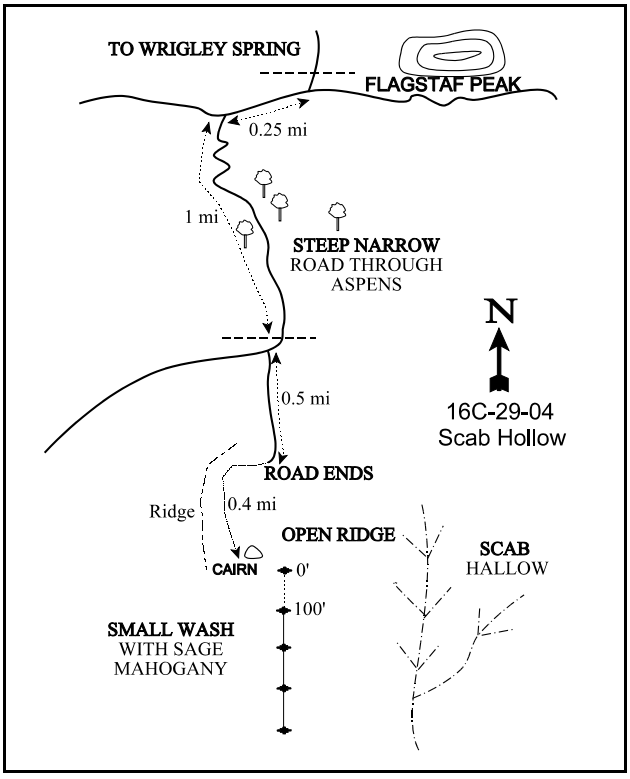
Compass bearing: frequency baseline 183 degrees magnetic.

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

LOCATION DESCRIPTION

From the Forest Service boundary up Ferron Canyon, travel 7.8 miles to Wrigley Reservoir. From Wrigley Springs Reservoir on F.S. Road #43, continue on the main road SW to Wrigley Spring. Proceed south 0.9 miles to a T-intersection. Turn right toward Twelve Mile Flat. Go 0.25 miles and turn left onto a dirt road (F.S. Road #274). Go 1.0 miles down through the aspens on the steep narrow road to a fence. Just past the fence, bear left at a faint fork. Continue 0.5 miles to the end of the road. It is possible to continue driving down the ridge. Turn right down the small hill then go down the ridge bearing left through the clearings for .4 miles to the SE edge of the small, open ridge above Scab Hollow. There is a rock cairn along the edge to mark the study site. From the cairn, it is 15 feet SE to the 0-foot baseline stake, identified by a red browse tag #9027 on the short fencepost. The study runs down across the slope.





Map Name: Flagstaff Peak

Diagrammatic Sketch

Township 20S ,Range 5E , Section 22

GPS: NAD 27, UTM 12S 4322385 N, 470771 E

DISCUSSION

Scab Hollow - Trend Study No. 16C-29

The Scab Hollow study is located in the upper end of Scab Hollow, a small drainage on the north side of Muddy Creek. The study samples a curlleaf mountain mahogany and grass slope at 8,700 feet. The site has south exposure with a moderate slope of 23-25%. Further up the slope are some large, old individuals of curlleaf mountain mahogany. The area is considered important elk winter range. Little elk sign was observed in 1994, but pellet group data from 1999 estimated 10 deer, 61 elk, and 2 cow days use/acre (25 ddu/ha, 151 edu/ha, and 5 cdu/ha). Pellet group data from 2004 estimated 88 elk and less than 1 cow days use/acre (218 edu/ha and 2 cdu/ha). Cow use was from last summer. Cattle graze this Forest Service land in summer as part of the Ferron allotment.

The soil is derived from a limestone parent material. It has a clay texture with a slightly alkaline pH (7.6). The soil is rocky and loose in the surface layer and easily disturbed. It is moderately deep with an effective rooting depth estimated at almost 16 inches. Phosphorus is limited at only 2.6 ppm. Values less than 10 ppm can limit normal plant growth and development. Rock in the profile consists mainly of gravel, although some large rocks are present in the profile and on the surface. Many of the rocks in the profile have a white coating of calcium carbonate. Open areas have high amounts of pavement cover. Erosion potential is high, yet current erosion is moderate. There is evidence of soil movement, pedestaling, and terracing on the steeper slopes. There are no active gullies on the site and grasses provide good overall soil protection.

The slope is dominated by a mature stand of curlleaf mountain mahogany that is moderately to heavily hedged. Some of the mature plants are large trees which are highlined and mostly unavailable to browsing. Average height of mature curlleaf was 6.5 feet in 1994, 7 feet in 1999, and almost 8 feet in 2004. Overhead canopy cover was estimated at 14% in 1999 and 15% in 2004. None of the plants sampled in 1994 or 1999 were decadent, but in 2004 10% were classified as decadent. Many of the mature plants contained numerous dead branches which is normal for curlleaf mountain mahogany. Young plants are common. Curlleaf mountain mahogany provided 42% of the browse cover in 1994, 63% in 1999, and 54% in 2004.

There are pockets of mountain big sagebrush and black sagebrush on the ridge which show light to moderate hedging. Other browse species which occur infrequently include rabbitbrush, buckwheat, broom snakeweed, Oregon grape, snowberry, and gray horsebrush. A few scattered pinyon and juniper trees occur on the site.

The herbaceous understory is abundant and provides the majority of the vegetation cover on the site. The dominant grass species is Salina wildrye which made up 93% of the herbaceous cover in 1994, 72% by 1999, and 81% in 2004. There is also some bluebunch wheatgrass and Indian ricegrass present in small numbers. A variety of forbs are present on the site but all species combined made up only 5% of the herbaceous cover in 2004. This is a decrease from contributing 23% of the herbaceous cover in 1999. Nested frequency decreased as well. However two species, annual stickseed and bastard toadflax , are the most common.

1994 TREND ASSESSMENT

Litter cover has decreased, while relative percent bare ground has only increased from 24% to 28%. Most of the ground cover is provided by Salina wildrye, which is a slightly rhizomatous bunchgrass, and often leaves bare interspaces between individual plants. These minor changes do not warrant changes in trend. Therefore, trend for soil is stable. Curlleaf mountain mahogany is the key browse on this site. It is a vigorous stand with a small, but expanding, population. The increase in density of curlleaf mahogany and changes in density of other species are mostly due to the lengthening of the baseline in 1994 in order to sample a larger area. Browse trend is stable. Here again, herbaceous understory trend is considered stable, because sum of nested frequency for perennial grasses decreased slightly, but not enough to get a change in trend. The sum of nested

frequency for perennial forbs decreased greatly, but they only contribute to only 3% of the herbaceous cover. The Desirable Components Index (see methods) rated this site as fair with a score of 67 due to low shrub cover, several young shrubs, and a excellent grass cover, although forb cover is minimal.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 67 (fair) Mountain brush type

1999 TREND ASSESSMENT

Trend for soil stable for the slight improvement in relative percent bare ground has not improved enough to warrant a change in trend. Relative percent cover of bare ground has declined from 28% to 19% while percent cover of litter has increased slightly. There is some erosion occurring and rock-pavement relative cover increased from 26% to 31% which would indicate some soil loss. Terracing and pedestaling are common on the steeper slopes. However, there are no active gullies on site and it appears that soil movement is localized. Trend for the key browse species, curlleaf mountain mahogany, is considered stable. The stand has a balanced population of young and mature plants which display moderate to heavy use. Vigor is normal and there were no decadent plants sampled. Trend for the herbaceous understory is stable for grasses and up slightly for forbs. Nested frequency of the dominant grass, Salina wildrye, has remained stable since 1988. Other grasses are infrequent. Sum of nested frequency of perennial forbs has increased and cover has gone up from 0.6% in 1994 to almost 6% in 1999. Sixty six percent of the forb cover comes from bastard toadflax. Overall herbaceous trend is still considered stable. The Desirable Components Index rated this site as good with a score of 79 due to moderate shrub cover, low decadence, and many young shrubs. Grass and forb cover is also moderately high.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 79 (good) Mountain brush type

2004 TREND ASSESSMENT

Trend for soils is stable. Protective cover has slightly gone up while bare ground cover increased from 22% in 1999 to 30% in 2004, which was similar to 1994 estimates. There is some erosion occurring, but rock-pavement cover has decreased from 37% in 1999 to 31% in 2004. Trend for key browse, curlleaf mountain mahogany, is stable. Percent decadence slightly increased to 60 plants/acre, but young recruitment is still good. Utilization has increased to heavy use, but vigor remains good, most mature plants are highlined. Trend for herbaceous understory is stable. Nested frequency for Salina wildrye has remained stable since 1988. Other grasses remain infrequent. Forbs continue to provide minimal cover. Forbs nested frequency has decreased from 1999 estimates, most lightly due to drought conditions. Over half of forb cover came from annual stickseed and the other half from bastard toadflax. The Desirable Components Index rated this site as fair with a score of 67 due to moderate shrub cover, low decadence, and many young shrubs. Grass cover is still high, but forb cover decrease.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 67 (fair) Mountain brush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 29

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	a-	a-	a2	b24	-	.02	.76
G	Agropyron trachycaulum	b18	a5	ab21	a-	.18	.65	-
G	Carex spp.	4	-	2	-	-	.03	-
G	Elymus salina	286	276	268	262	20.00	17.11	15.33
G	Oryzopsis hymenoides	27	33	19	15	.84	.37	1.11
G	Poa spp.	3	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		338	314	312	301	21.03	18.19	17.20
Total for Grasses		338	314	312	301	21.03	18.19	17.20
F	Astragalus convallarius	3	-	-	3	-	-	.00
F	Castilleja linariaefolia	3	-	2	-	-	.03	-
F	Calochortus nuttallii	1	-	3	-	-	.00	-
F	Chaenactis douglasii	a3	a-	b20	a-	-	.25	-
F	Chenopodium fremontii (a)	-	a-	a-	b11	-	-	.02
F	Chenopodium leptophyllum(a)	-	a-	a-	b11	-	-	.03
F	Comandra pallida	bc61	a25	c82	ab48	.06	3.60	.46
F	Cymopterus spp.	-	-	1	-	-	.00	-
F	Eriogonum alatum	-	1	7	4	.00	.06	.01
F	Erigeron eatonii	-	-	2	-	-	.00	-
F	Erigeron spp.	2	-	-	-	-	-	-
F	Erigeron pumilus	-	-	3	3	-	.03	.00
F	Hymenopappus filifolius	8	5	-	-	.01	-	-
F	Hymenoxys richardsonii	12	2	3	8	.03	.18	.30
F	Lappula occidentalis (a)	-	a2	a-	b17	.00	-	.72
F	Lesquerella spp.	b28	ab4	ab8	a-	.01	.10	-
F	Linum lewisii	-	4	3	-	.03	.04	-
F	Lithospermum ruderale	3	-	-	-	-	-	-
F	Machaeranthera canescens	9	-	3	3	-	.00	.00
F	Madia glomerata (a)	-	-	-	-	-	-	.03
F	Machaeranthera grindelioides	b51	a21	a20	a4	.32	.67	.07

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Penstemon caespitosus	6	1	8	2	.00	.04	.00
F	Petradoria pumila	8	4	9	-	.06	.33	-
F	Phlox hoodii	$_{b}$14	$_{b}$6	$_{b}$4	$_{a}$-	.03	.06	-
F	Senecio multilobatus	1	-	-	-	-	-	-
F	Tragopogon dubius	-	-	2	3	-	.03	.00
Total for Annual Forbs		0	2	0	39	0.00	0	0.81
Total for Perennial Forbs		213	73	180	78	0.58	5.47	0.87
Total for Forbs		213	75	180	117	0.59	5.47	1.68

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

BROWSE TRENDS --
Management unit 16C, Study no: 29

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	0	0	1	-	-	-
B	Artemisia nova	3	3	7	.30	.18	.44
B	Artemisia tridentata vaseyana	2	2	0	-	.00	-
B	Cercocarpus ledifolius	19	22	20	3.09	5.56	5.12
B	Chrysothamnus viscidiflorus viscidiflorus	1	2	4	-	.06	.03
B	Eriogonum corymbosum	18	9	13	.52	.48	.24
B	Gutierrezia sarothrae	13	20	28	.05	.44	1.06
B	Juniperus scopulorum	0	1	1	2.25	2.00	2.23
B	Mahonia repens	10	11	13	.04	.06	.18
B	Pediocactus simpsonii	0	0	1	-	-	-
B	Pinus flexilis	0	1	0	.98	-	-
B	Symphoricarpos oreophilus	2	1	4	-	-	.00
B	Tetradymia canescens	2	2	2	.15	.03	.15
Total for Browse		70	74	94	7.40	8.84	9.48

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 29

Species	Percent Cover	
	'99	'04
Artemisia nova	-	.58
Cercocarpus ledifolius	13.60	15.25
Eriogonum corymbosum	-	.03
Gutierrezia sarothrae	-	1.85
Juniperus scopulorum	2.79	3.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 29

Species	Average leader growth (in)
	'04
Cercocarpus ledifolius	3.6

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 29

Species	Trees per Acre	
	'99	'04
Cercocarpus ledifolius	93	68

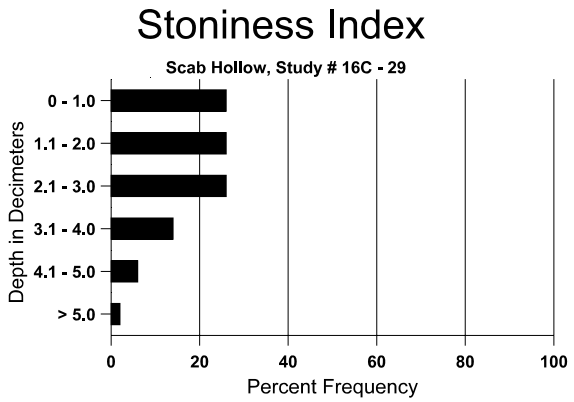
Average diameter (in)	
'99	'04
9.7	7.8

BASIC COVER --
Management unit 16C, Study no: 29

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	5.50	29.47	30.78	29.20
Rock	6.50	19.67	16.20	14.73
Pavement	13.25	9.30	20.36	15.73
Litter	51.00	22.71	28.31	22.69
Cryptogams	0	.00	.04	.24
Bare Ground	23.75	30.78	21.73	30.37

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 29, Study Name: Scab Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.7	51.7 (12.9)	7.6	34.0	24.2	41.8	2.9	2.3	89.6	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 29

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	27	15	10
Elk	11	29	34
Deer	7	6	5
Cattle	1	-	-

Days use per acre (ha)	
'99	'04
-	-
61 (151)	88 (218)
10 (25)	-
2 (5)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 29

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	21/22
Artemisia nova												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**200**	-	120	60	20	-	60	0	10	10	10	10/22
99	**140**	-	-	120	20	60	57	43	14	-	0	8/19
04	**320**	-	60	200	60	-	0	0	19	13	13	8/21
Artemisia tridentata vaseyana												
88	**66**	-	-	66	-	-	0	0	0	-	0	12/15
94	**40**	-	-	40	-	-	50	0	0	-	0	6/10
99	**40**	-	-	20	20	-	0	50	50	-	0	15/17
04	**0**	-	-	-	-	-	0	0	0	-	0	25/22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus ledifolius												
88	**165**	33	66	66	33	-	20	0	20	-	0	119/116
94	**580**	20	300	280	-	40	17	0	0	-	0	77/67
99	**660**	80	340	320	-	-	24	12	0	-	0	84/78
04	**620**	20	280	280	60	20	35	52	10	3	3	66/61
Chrysothamnus viscidiflorus viscidiflorus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**20**	-	-	20	-	-	100	0	0	-	0	7/11
99	**40**	-	-	20	20	-	100	0	50	-	0	7/9
04	**160**	-	20	140	-	-	0	0	0	-	0	10/15
Eriogonum corymbosum												
88	**66**	-	33	-	33	-	0	0	50	-	0	-/-
94	**920**	-	360	520	40	-	17	9	4	4	4	10/13
99	**420**	20	-	380	40	-	29	0	10	-	0	7/9
04	**380**	-	80	240	60	-	5	16	16	-	0	5/9
Gutierrezia sarothrae												
88	**1499**	-	133	1366	-	-	0	0	0	-	0	8/10
94	**380**	-	160	200	20	20	0	0	5	5	5	11/11
99	**1720**	-	200	1500	20	-	0	0	1	-	0	6/8
04	**1900**	-	140	1760	-	-	0	0	0	-	0	7/8
Juniperus scopulorum												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	20	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Mahonia repens												
88	**899**	-	866	-	33	-	0	0	4	-	0	-/-
94	**580**	80	380	200	-	-	0	0	0	-	0	3/4
99	**900**	20	520	380	-	-	0	0	0	-	0	2/4
04	**600**	-	20	580	-	-	0	0	0	-	0	3/4
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**66**	-	66	-	-	-	0	0	0	-	0	-/-
94	**120**	-	80	40	-	-	0	33	0	-	0	7/13
99	**40**	40	20	20	-	-	0	0	0	-	0	7/11
04	**160**	-	20	120	20	-	0	0	13	-	0	6/11
Tetradymia canescens												
88	**66**	33	33	33	-	-	0	0	0	-	0	8/11
94	**80**	-	-	80	-	-	25	0	0	-	0	7/13
99	**40**	-	-	20	20	-	50	0	50	-	0	7/18
04	**40**	-	-	40	-	-	50	0	0	-	0	9/21

Trend Study 16C-30-04

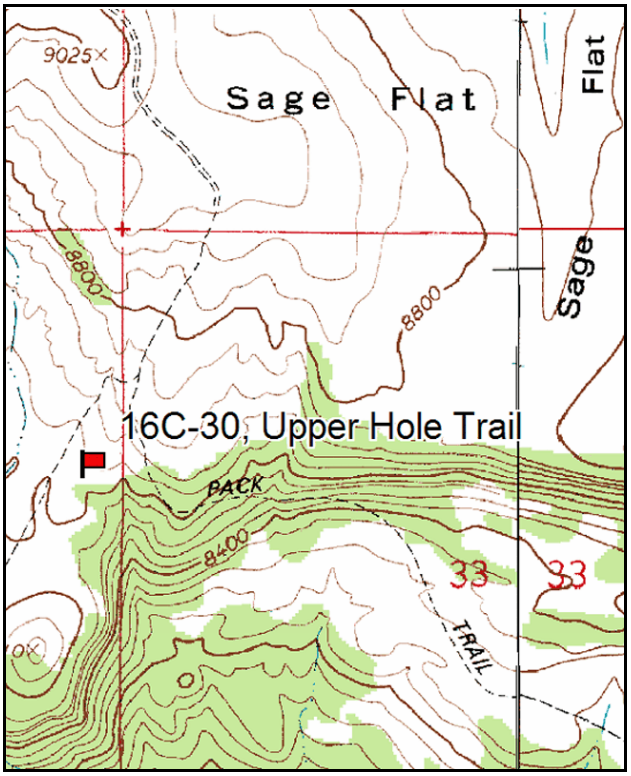
Study site name: Upper Hole Trail . Vegetation type: Mixed Mountain Brush .

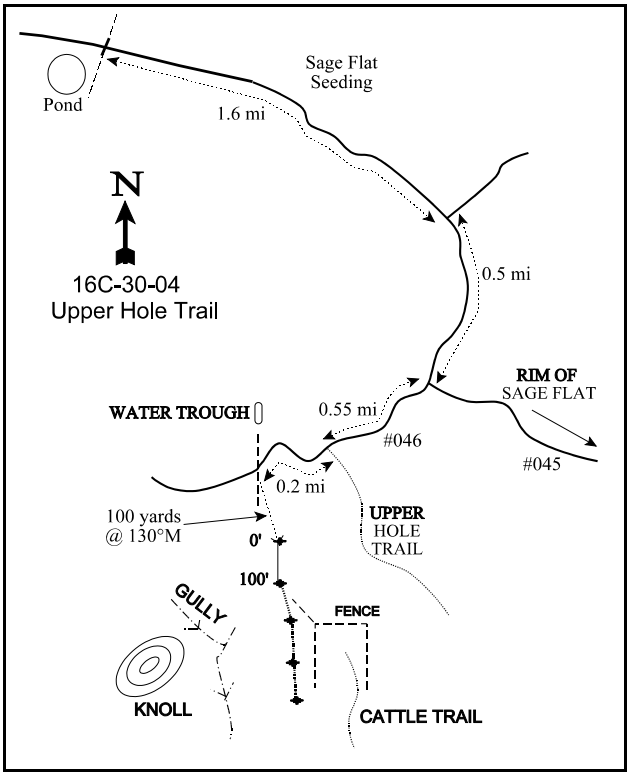
Compass bearing: frequency baseline 181 degrees magnetic.

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

LOCATION DESCRIPTION

From Wrigley Springs Reservoir, continue SE 3.0 miles to the T-intersection by Flagstaff Peak. Turn left towards Sage Flat. Go 1.65 miles and cross a cattleguard. Continue straight 0.9 miles to a fence and cattleguard by a pond. Continue SE 1.0 miles to the Sage Flat seeding. Go 0.6 miles to a fork. Continue straight on the main road about 0.5 miles to a fork. At this point, a road that runs along the rim of Sage Flat takes off to the left (#045). Turn right at 0.35 miles on F.S. Road #046. Continue south 0.2 miles to the Hole Trail. Go another 0.2 miles on the main road to an old fence line by an unused water trough. The study starts about 100 yards south of the road at 130° M. The first baseline stake, a 2' green fencepost with browse tag #9020 attached, is along an old fence line.





Map Name: Flagstaff Peak , Diagrammatic Sketch

Township 20S , Range 6E , Section 32 GPS: NAD 27, UTM 12S 4320736 N, 477351 E

DISCUSSION

Upper Hole Trail - Trend Study No. 16C-30

The Upper Hole Trail trend study is located near Sage Flat. The area around Sage Flat and South Sage Flat on the southeast side of Ferron Mountain is listed as important elk winter range although there was little elk sign encountered in 1994, but sign increased substantially in 1999. It is an open sagebrush community with scattered mountain brush, mostly on the slopes. The study itself is located in a low saddle between the large sagebrush flats, in a mixed mountain brush type near the edge of the cliffs where the Upper Hole Trail climbs up from the pinyon-juniper country below. At the study site, slope is 12% with a southern exposure. The elevation is 8,600 feet. This Forest Service land is in the Ferron allotment and is grazed by 1,607 cattle in the summer from June 21 to October 5. Pellet group data from 1999 estimate 5 deer, 32 elk and 31 cow days use/acre (12 ddu/ha, 79 edu/ha, and 77 cdu/ha). Rabbit pellet groups are very numerous. Cattle were in the area during the 1999 reading. Pellet group data from 2004 estimate 15 deer, 30 elk, and 8 cow days use/acre (36 ddu/ha, 73 edu/ha, and 20 cdu/ha). Most of the elk pellet groups were from last winter, but some are from this spring. Cattle pats were from last season.

The soil has a clay loam texture with a neutral pH (7.3). The soil depth is moderately deep with an effective rooting depth estimated at almost 16 inches. Phosphorus and potassium are limited at just 2.6 ppm and 54.4 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. There is some rock on the surface and within the profile and there is a compacted layer at about 10 to 12 inches in depth. Although there is substantial soil movement and gullying on surrounding areas, especially on cattle and game trails, vegetative cover is generally adequate to prevent serious erosion on the study site.

The mountain brush slope is extremely diverse with 17 browse species encountered. The dominant species on the site include curleaf mountain mahogany, antelope bitterbrush, mountain big sagebrush, and Utah serviceberry. Wood's rose and snowberry are also common. Curlleaf mountain mahogany made up 25% of the shrub cover in 1994, 28% in 1999, and 26% in 2004. This stand is predominantly mature (88%) with a mixture of shrub-like and tree-like forms. The average height is 62 inches by 57 inches wide and the treelike forms are highlined and partially unavailable. There was estimated 420 plants/acre in 2004 and percent decadency is low. Utilization has been light in the past, but use has been moderate to heavy since 1999. There is also a small population of heavily hedged true mountain mahogany. This is about 2,000 feet above its optimal elevational limit and it would be expected for true mountain mahogany to do poorly at this elevation. This along with rabbitbrush, Wood's rose, and snowberry provide some additional browse forage. A few scattered pinyon and limber pine are also found on the site.

Antelope bitterbrush had a density of 2,720 plants/acre, mostly mature, in 1994, 1,980 in 1999, and 2,080 in 2004. Utilization was light to moderate in 1994, since 1999 utilization is moderate to heavy with nearly half of the population showing heavy use with a clubbed growth form. Vigor is good and there were few decadent individuals. The mature shrubs averaged about 1 foot in height with a three foot crown. There were a few young and no seedlings reported in 1988 or 1994. A few seedlings were estimated in 1999 and 2004 and young plants are at the lowest rate of recruitment, estimating only 3% of the bitterbrush population in 2004. Some of the difference in density between 1994 estimates and 1999 counts may be caused by the difficulty in counting this large, prostrate shrub. In some instances, it is hard to tell where one plant stops and another starts.

Mountain big sagebrush populations have remained at a moderately constant level of about 2,300 plants/acre. Utilization is light, recruitment is adequate and percent decadency has continued to decrease since 1994 (10%) to only 4% in 2004. Black sagebrush has increased in density from 300 plants/acre in 1994 to 1,280 in 1999 and 1,760 in 2004. This site appears to be a marginal one for mountain big sagebrush. Poor vigor was

common in 1988 for both species and a few mountain big sagebrush plants sampled in 1999 were chlorotic. Recall the very low amounts of phosphorus in the soil. The compaction layer found in the soil profile at 10 to 12 inches in depth may be a partial rooting barrier for the deeper rooted mountain big sagebrush. It prefers soils that are generally about 14 inches in depth.

Serviceberry had a population density of 4,799 plants/acre in 1988. Nearly all (98.6%) of these shrubs were classified as young plants. Seedlings were also abundant. This artificially inflated the population, but it returned to a more sustainable level by 1994 when 1,180 mostly mature plants were estimated. Mature plants averaged 2.5 feet in height with a crown diameter of almost three feet. Utilization was mostly light with a few individuals displaying moderate to heavy use. The population in 1999 declined to 500 plants/acre. Use was mostly moderate to heavy, vigor normal, and percent decadence low at only 12%. Some of the differences in density between years is mostly due to the much larger sample used since 1994 and a sampling error counting stems instead of whole plants. The population in 2004 increased slightly from 1999 estimates to 640 plants/acre. Vigor is good, recruitment is adequate, and percent decadence is low. Utilization has increased from moderate to heavy use.

Diversity is also high in the herbaceous component of the community. Ten species of grass were identified in 2004. Although combined together they only provided 8% total cover in 1994, 7% in 1999, and 9% in 2004. Of these grasses, Salina wildrye is the most abundant. It accounted for 59% of the grass cover in 1994, 57% in 1999, and 52% in 2004. Diversity of forbs is excellent with 31 different species found in 1994, 28 in 1999, and 33 in 2004. Many are valuable forage species. Indian paintbrush, penstemon, redroot and sulfur eriogonum, and Oregon fleabane are most often utilized. Two low value forbs, rock goldenrod and desert phlox, provide nearly half of the forb cover.

1994 TREND ASSESSMENT

Relative percent bare ground cover has decreased from 31% to 25%. This is not enough improvement to show a change in trend, therefore, soil trend is considered stable. At this time vegetative cover offers as much protection to the soil as does the litter. Most of the vegetative cover (58%) comes from browse, but there is also an abundant herbaceous component which has increased in nested frequency since 1988. Most preferred browse species appear to have stable mature populations, although mountain big sagebrush and black sagebrush have increased decadency rates. Several additional species were picked up in the shrub density strips due to the lengthening of the baseline in 1994. This new larger sample gives a better, more representative sample of the area. The browse trend is stable. Grasses are shifting toward more native and palatable species for both livestock and big game. Sum nested frequency for perennial grasses increased slightly since 1988. There was a large increase in summed nested frequency for perennial forbs, most of which offer moderate ground cover. The herbaceous understory trend is slightly up. The Desirable Components Index (see methods) rated this site as good with a score of 72 due to good shrub cover, low decadence, many young shrubs, and good grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 72 (good) Mountain brush type

1999 TREND ASSESSMENT

Trend for soil is up slightly. Percent cover of bare ground has declined and litter cover has increased. Vegetation cover has also increased but the improvement comes entirely from shrub cover which is less effective at protecting the soil. Rock and pavement cover have doubled since 1994 which may indicate some

soil loss. Trend for the key browse species, serviceberry, mountain big sagebrush and curlleaf mountain mahogany, are considered stable. Utilization is moderate to heavy on serviceberry and curlleaf, but vigor remains good and percent decadence low. Mountain big sagebrush shows mostly light use. Vigor has improved and percent decadence has declined from 23% to 10%. Trend for the herbaceous is stable. Sum of nested frequency for perennial grasses and forbs have declined slightly but the dominant species, Salina wildrye, rock goldenrod, and desert phlox which provide 53% of the herbaceous cover, have remained stable. The Desirable Components Index rated this site as good with a score of 79 due to an increase in shrub cover, low decadence, and an increase in young shrubs. Grass cover decrease lightly, but forb cover remains good.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 79 (good) Mountain brush type

2004 TREND ASSESSMENT

Trend for soil is stable. Percent cover for bare ground increased slightly and litter cover decreased slightly. Vegetation cover increased in grasses, forbs, and shrubs, but predominately in the shrubs. Rock and pavement cover has decreased suggesting a halt in soil loss. Trend for key browse species, curlleaf mountain mahogany, serviceberry, mountain big sagebrush, and antelope bitterbrush, is stable. Utilization is moderate to heavy on bitterbrush, curleaf mountain mahogany, and serviceberry, while mountain big sagebrush has light use. Vigor remains good and percent decadence is low for all species. Trend for herbaceous understory is slightly down. Sum of nested frequency for perennial grasses and forbs decreased enough to show a slightly downward change in trend. The Desirable Components Index rated this site as good with a score of 79 due to good shrub cover, low decadence, several young shrubs, and good grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 79 (good) Mountain brush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 30

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	-	1	4	4	.03	.03	.18
G	Agropyron dasystachyum	-	-	-	8	-	-	.04
G	Agropyron smithii	$_{b}$32	$_{b}$52	$_{b}$41	$_{a}$6	1.06	.26	.03
G	Agropyron spicatum	-	-	-	7	-	-	.18
G	Aristida purpurea	-	-	1	-	-	.00	-
G	Bouteloua gracilis	-	1	-	-	.00	-	-
G	Carex spp.	$_{a}$6	$_{b}$35	$_{ab}$16	$_{b}$21	.41	.37	.36
G	Elymus salina	$_{b}$251	$_{a}$173	$_{a}$169	$_{a}$146	5.05	4.10	4.52

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Koeleria cristata	10	5	1	-	.06	.00	-
G	Oryzopsis hymenoides	10	12	10	8	.10	.09	.02
G	Poa fendleriana	$_{a}$63	$_{ab}$85	$_{a}$76	$_{b}$129	1.14	1.08	2.49
G	Sitanion hystrix	1	7	3	10	.04	.00	.09
G	Stipa comata	$_{b}$7	$_{ab}$8	$_{ab}$2	$_{a}$-	.04	.00	-
G	Stipa lettermani	$_{a}$-	$_{b}$31	$_{c}$66	$_{b}$44	.57	1.25	.76
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		380	410	389	383	8.53	7.24	8.69
Total for Grasses		380	410	389	383	8.53	7.24	8.69
F	Antennaria rosea	-	-	3	-	-	.03	-
F	Arenaria fendleri	-	5	9	10	.03	.24	.12
F	Astragalus convallarius	2	13	1	1	.11	.01	.03
F	Astragalus minthorniae	-	-	-	2	-	-	.00
F	Astragalus miser	$_{a}$-	$_{b}$7	$_{a}$-	$_{a}$-	.15	-	-
F	Astragalus tenellus	$_{a}$10	$_{ab}$19	$_{b}$33	$_{ab}$19	.16	.99	1.46
F	Aster spp.	$_{a}$-	$_{a}$-	$_{ab}$4	$_{b}$10	-	.01	.07
F	Caulanthus crassicaulis	3	-	-	-	-	-	-
F	Castilleja linariaefolia	$_{c}$62	$_{bc}$29	$_{b}$28	$_{a}$4	.19	.22	.09
F	Calochortus nuttallii	-	3	-	-	.00	-	-
F	Chaenactis douglasii	$_{b}$23	$_{a}$1	$_{ab}$19	$_{a}$-	.00	.06	-
F	Cirsium spp.	1	6	8	4	.04	.10	.03
F	Crepis acuminata	13	6	4	8	.01	.01	.13
F	Cryptantha spp.	1	-	-	-	-	-	-
F	Cymopterus spp.	2	2	-	-	.01	-	.00
F	Erigeron eatonii	$_{b}$40	$_{b}$48	$_{b}$35	$_{ab}$6	.33	.18	.03
F	Erigeron flagellaris	-	-	3	4	-	.00	.06
F	Erigeron spp.	-	-	9	-	-	.04	-
F	Erigeron pumilus	8	8	4	10	.02	.15	.05
F	Eriogonum racemosum	$_{a}$-	$_{b}$42	$_{b}$36	$_{b}$33	.27	.26	.63
F	Erigeron speciosus	$_{b}$16	$_{c}$29	$_{a}$-	$_{a}$-	.33	-	-
F	Eriogonum umbellatum	$_{a}$-	$_{b}$9	$_{b}$14	$_{b}$8	.22	.30	.33
F	Hymenopappus filifolius	$_{b}$10	$_{a}$-	$_{a}$2	$_{a}$2	-	.03	.18
F	Hymenoxys richardsonii	28	25	17	28	.08	.14	.36
F	Ipomopsis aggregata	-	-	-	3	-	-	.03
F	Lesquerella spp.	7	18	20	13	.05	.09	.06
F	Lithospermum incisum	-	5	-	-	.01	-	.03

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Linum lewisii	-	2	-	-	.01	-	-
F	Lupinus argenteus	2	10	8	6	.08	.16	.10
F	Lygodesmia grandiflora	-	-	-	3	-	-	.03
F	Machaeranthera canescens	$_{b}$46	$_{ab}$18	$_{a}$11	$_{a}$7	.10	.10	.10
F	Machaeranthera grindelioides	$_{b}$37	$_{a}$11	$_{a}$8	$_{a}$9	.08	.07	.04
F	Oxytropis lambertii	$_{b}$22	$_{a}$1	$_{a}$-	$_{a}$5	.00	-	.03
F	Penstemon carnosus	$_{b}$34	$_{ab}$39	$_{b}$33	$_{a}$10	.18	.68	.14
F	Penstemon spp.	$_{b}$33	$_{b}$39	$_{b}$35	$_{a}$-	1.21	.81	-
F	Petradoria pumila	$_{a}$19	$_{b}$63	$_{b}$56	$_{b}$73	2.26	2.49	2.96
F	Penstemon watsonii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$11	-	-	.84
F	Phlox austromontana	$_{a}$-	$_{c}$71	$_{c}$71	$_{b}$56	1.92	2.25	2.23
F	Phlox longifolia	-	-	-	2	-	-	.00
F	Polygonum douglasii (a)	-	11	6	12	.02	.01	.05
F	Senecio multilobatus	$_{a}$3	$_{ab}$5	$_{b}$14	$_{ab}$4	.01	.07	.01
F	Taraxacum officinale	4	-	3	2	-	.01	.03
F	Zigadenus paniculatus	-	-	-	3	-	-	.03
Total for Annual Forbs		0	11	6	12	0.01	0.00	0.05
Total for Perennial Forbs		426	558	488	356	8.32	9.57	10.31
Total for Forbs		426	569	494	368	8.35	9.59	10.36

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

BROWSE TRENDS --
Management unit 16C, Study no: 30

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	29	23	26	3.84	2.87	4.01
B	Artemisia nova	7	21	31	.42	.91	2.83
B	Artemisia tridentata vaseyana	66	50	48	2.99	5.00	5.60
B	Cercocarpus ledifolius	24	26	20	5.79	7.88	9.30
B	Cercocarpus montanus	5	5	4	.00	.21	.33
B	Chrysothamnus depressus	19	17	15	.28	.37	.45
B	Chrysothamnus viscidiflorus viscidiflorus	21	19	14	.69	.45	.63
B	Eriogonum corymbosum	171	2	1	.15	.03	-
B	Gutierrezia sarothrae	14	12	31	.21	.10	.71
B	Juniperus osteosperma	0	0	1	.15	-	.03
B	Leptodactylon pungens	8	8	6	.15	.36	.60
B	Pediocactus simpsonii	0	0	2	-	-	.00
B	Pinus edulis	0	1	1	.15	-	-
B	Purshia tridentata	33	37	40	4.69	4.87	6.39
B	Rosa woodsii	13	13	16	.82	.96	1.37
B	Symphoricarpos oreophilus	36	41	36	3.26	4.06	3.30
B	Tetradymia canescens	1	1	3	.03	-	-
B	Yucca baileyi navajoa	7	7	5	.09	.16	.19
Total for Browse		454	283	300	23.03	28.29	35.79

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 30

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	2.79	7.46
Artemisia nova	-	1.43
Artemisia tridentata vaseyana	-	8.39
Cercocarpus ledifolius	10.60	17.46
Cercocarpus montanus	-	.85
Chrysothamnus depressus	-	.33
Chrysothamnus viscidiflorus viscidiflorus	-	.85
Eriogonum corymbosum	-	.08
Gutierrezia sarothrae	-	.73
Juniperus osteosperma	-	.61
Leptodactylon pungens	-	.30
Pinus edulis	2.00	2.00
Purshia tridentata	-	8.69
Rosa woodsii	-	2.06
Symphoricarpos oreophilus	-	6.34
Yucca baileyi navajoa	-	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 30

Species	Average leader growth (in)
	'04
Amelanchier utahensis	3.4
Cercocarpus ledifolius	4.9
Cercocarpus montanus	5.3
Purshia tridentata	4.2

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 30

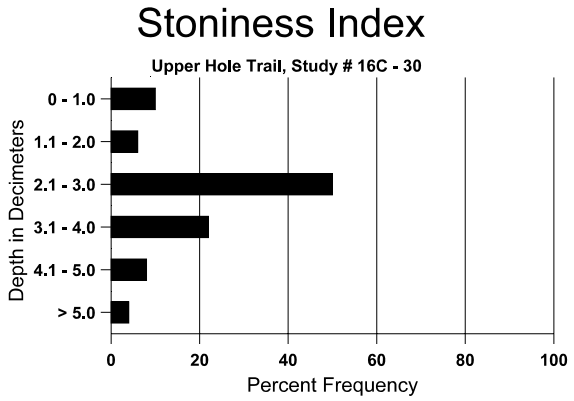
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Cercocarpus ledifolius	119	92	3.8	4.9
Pinus edulis	20	-	12.3	-
Pinus flexilis	19	-	13.8	-

BASIC COVER --
Management unit 16C, Study no: 30

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	13.25	38.02	42.09	51.63
Rock	.50	3.47	5.51	5.17
Pavement	0	.59	2.87	1.95
Litter	55.50	38.12	52.62	45.40
Cryptogams	.25	.03	.03	0
Bare Ground	30.50	26.51	21.57	23.04

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 30, Study Name: Upper Hole Trail

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.1	49.0 (11.9)	7.3	44.0	22.2	33.8	2.6	2.6	54.4	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 30

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	15	48	21
Elk	3	14	17
Deer	3	3	5
Cattle	5	8	7

Days use per acre (ha)	
'99	'04
-	-
32 (79)	29 (72)
5 (12)	15 (36)
31 (77)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**4799**	1333	4733	66	-	-	7	0	0	-	0	27/12
94	**1180**	-	260	900	20	20	8	2	2	-	0	29/31
99	**680**	120	300	300	80	-	50	24	12	6	6	80/81
04	**640**	-	200	360	80	-	19	44	13	3	3	42/44
Artemisia nova												
88	**265**	-	66	133	66	-	0	0	25	-	25	7/8
94	**300**	-	-	180	120	20	0	0	40	33	33	11/19
99	**1280**	140	280	820	180	140	22	2	14	6	11	8/15
04	**1760**	40	660	680	420	120	1	0	24	10	10	8/18
Artemisia tridentata vaseyana												
88	**2132**	800	866	933	333	-	9	3	16	-	38	20/21
94	**2420**	40	420	1440	560	260	7	0	23	14	14	17/21
99	**2200**	980	660	1320	220	240	9	0	10	.90	5	19/27
04	**2300**	140	620	1580	100	120	13	3	4	2	2	19/25
Cercocarpus ledifolius												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**720**	-	80	640	-	-	3	6	0	-	0	46/47
99	**800**	40	100	640	60	140	33	28	8	-	0	68/57
04	**480**	20	40	420	20	40	4	50	4	-	0	62/57
Cercocarpus montanus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**240**	-	60	180	-	-	67	0	-	-	0	25/37
99	**220**	40	20	200	-	-	9	73	-	-	0	20/24
04	**200**	-	40	160	-	-	0	80	-	-	0	18/22
Chrysothamnus depressus												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**1000**	-	-	920	80	-	18	0	8	2	2	5/6
99	**660**	-	80	420	160	-	45	18	24	3	3	3/12
04	**700**	-	-	700	-	-	3	0	0	-	0	5/10
Chrysothamnus viscidiflorus viscidiflorus												
88	**1065**	-	333	666	66	-	6	6	6	-	56	2/4
94	**780**	-	40	700	40	-	5	0	5	-	0	6/10
99	**560**	-	20	440	100	-	54	11	18	7	18	12/13
04	**660**	-	-	660	-	-	0	0	0	-	15	11/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum corymbosum												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**140**	-	-	140	-	-	14	0	-	-	0	9/15
99	**40**	-	-	40	-	-	0	0	-	-	0	7/18
04	**20**	20	20	-	-	-	0	0	-	-	0	7/12
Gutierrezia sarothrae												
88	**66**	-	-	66	-	-	0	0	-	-	0	6/2
94	**480**	-	40	440	-	-	0	0	-	-	0	6/6
99	**680**	20	140	540	-	-	0	0	-	-	0	6/6
04	**1200**	-	-	1200	-	-	0	0	-	-	0	8/8
Juniperus osteosperma												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**600**	-	20	580	-	-	0	0	0	-	0	13/8
99	**800**	-	40	720	40	-	0	0	5	-	0	6/7
04	**660**	-	20	540	100	20	0	0	15	3	3	7/6
Pediocactus simpsonii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Pinus edulis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**1132**	-	600	466	66	-	41	0	6	-	0	12/39
94	**2720**	-	160	2540	20	-	18	.73	1	-	0	11/36
99	**1980**	60	440	1480	60	80	44	47	3	2	2	16/38
04	**2080**	60	60	1920	100	-	30	63	5	-	0	16/40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**3060**	-	540	2520	-	-	0	0	-	-	0	8/5
99	**2080**	780	1340	740	-	-	0	0	-	-	0	17/10
04	**960**	-	200	760	-	-	0	0	-	-	0	9/8
Symphoricarpos oreophilus												
88	**1532**	733	1466	66	-	-	0	0	0	-	0	64/43
94	**2360**	-	160	2160	40	-	8	4	2	-	0	12/24
99	**1740**	140	520	1200	20	-	5	0	1	-	0	17/27
04	**1560**	40	100	1460	-	-	19	0	0	-	0	15/28
Tetradymia canescens												
88	**666**	-	466	200	-	-	0	0	-	-	0	5/6
94	**40**	-	40	-	-	-	0	0	-	-	0	4/6
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**80**	-	40	40	-	-	0	0	-	-	0	4/7
Yucca baileyi navajoa												
88	**66**	-	-	66	-	-	0	0	-	-	0	9/10
94	**320**	-	220	100	-	-	0	0	-	-	0	8/10
99	**320**	-	180	140	-	20	0	0	-	-	0	6/12
04	**140**	-	20	120	-	-	0	0	-	-	0	7/9

Trend Study 16C-31-04

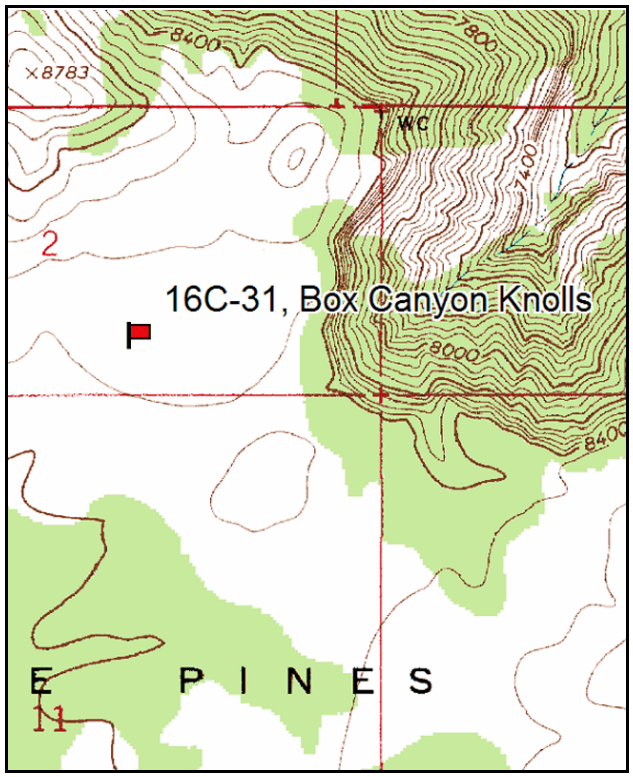
Study site name: Box Canyon Knolls . Vegetation type: Black Sagebrush .

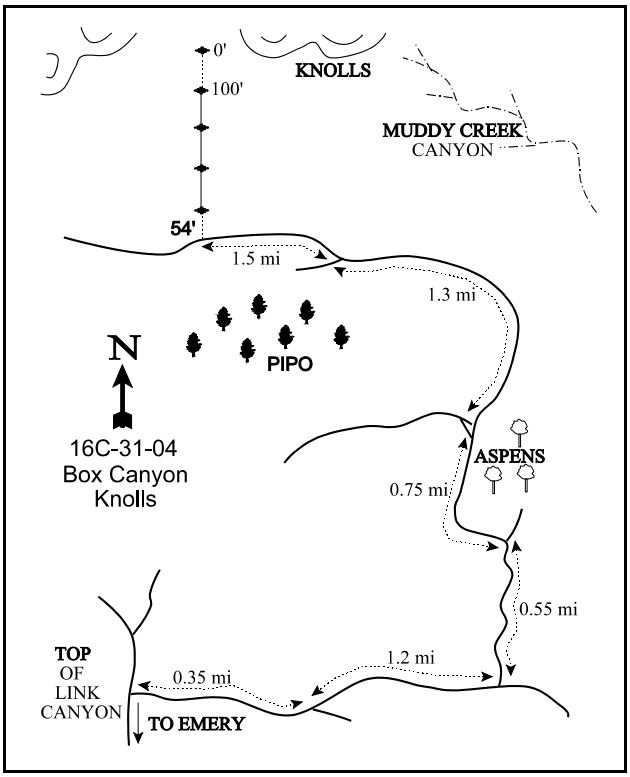
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Center Street in the town of Emery, continue south on Highway 10 for 1.2 miles. Turn right onto a dirt road and go 0.6 miles. Turn left and travel up Link Canyon 7 miles (4WD road) to the top. Turn right at the fork and proceed 0.35 miles. Bear left and continue 1.2 miles. Turn left off the jeep trail and go 0.55 miles to a faint fork. Bear left onto F.S. Road #28 and go 0.75 miles to a junction. Bear right and continue northwest 1.3 miles to another fork. Stay right on F.S. #278. Travel 1.5 miles and stop just past a lone limber pine. In the sage flat on the right side of the road, the study is marked by short fenceposts. The 400-foot baseline stake is 54 feet north of the road. The 0-foot baseline stake is 400 feet further north, and is marked by browse tag #9028.





Map Name: Flagstaff Peak

Diagrammatic Sketch

Township 21S , Range 5E , Section 2

GPS: NAD 27, UTM 12S 4318002 N, 472029 E

DISCUSSION

Box Canyon Knolls - Trend Study No. 16C-31

The Box Canyon Knolls site is located on the south side of the steep Muddy Creek canyon. This remote area is used by elk in the winter. The study site is located in the open black sagebrush/grass type that covers most the flats. Elevation is 8,500 feet. The slope on the flat is very gentle with a southern aspect. The area is managed by the Forest Service, usually as an early unit in the summer rest-rotation system on the Emery cattle allotment. Abundant elk sign was encountered in 1994 and 1999. Pellet group data from 1999 estimate 5 deer, 108 elk and 9 cow days use/acre (12 ddu/ha, 267 edu/ha, and 22 cdu/ha). Pellet group data from 2004 estimate 87 elk and 25 cow days use/acre (215 edu/ha and 61 cud/ha). Most of the elk pellet groups are from spring and early summer. Cattle pats were from this season and a few appear to be from last season.

Soil on the site is moderately shallow with an effective rooting depth of almost 14 inches. Texture is a clay loam with a neutral pH (6.8). There is very little rock in the profile or on the surface. The soil is very dense with a compacted horizon which varies in depth from 8 to 12 inches. This moderately shallow soil is what identifies this as a black sagebrush site. The 1% slope precludes most soil movement and erosion is minimal, although bare spots are frequent. Some soil pedestaling is evident around shrubs and grasses. The surface of the clay loam soil shows expansion and/or contraction cracking which would indicate the presence of shrink/swell clays. Soil parent material appears to be limestone.

The dominant key browse species is a low-growing dense population of black sagebrush. Black sagebrush densities have decreased dramatically since 1999, mostly likely due to drought conditions. In 1999, black sagebrush was estimated at 12,680 plants/acre and in 2004 it was estimated at 3,220. The majority of the plants have light to moderate hedging. The age class structure indicates a declining population with poor young recruitment. The average recruitment for 1988 - 1999 was 35%, now it is at only 1%. The ratio of dead to live plants is only 1:1.75. One dead for almost every three plants. A small population of stunted mountain big sagebrush also occurs on the site, densities have decreased from 1,060 plants/acre in 1999 to 140 plans/acre in 2004. These shrubs show light to moderate use and dead plants have about 1:2.4 ratio. One dead for about every three plants.

Low rabbitbrush is extremely abundant on the site. These shrubs are small, measuring only 6 x 10 inches and have an estimated population density of 22,420 plants/acre in 1994, 19,220 in 1999, and decreased to 6,300 in 2004. They are lightly hedged, in good vigor, and have low decadence. Other species on the site include small numbers of Utah serviceberry, fringed sagebrush, dwarf rabbitbrush, rubber rabbitbrush, broom snakeweed, and gray horsebrush.

Grasses have decreased significantly on the site. Pinewoods needlegrass was the most dominant species providing 72% of the grass cover in 1994, 41% in 1999, and is no longer dominate at 5% in 2004. Mutton bluegrass is dominate on the site followed by slender wheatgrass and western wheatgrass. All grasses combined provided 14% cover in 1994, 11% in 1999, and 6% in 2004. Forbs are diverse and have increased from 2% cover in 1994, 3% in 1999, to 7% in 2004. Increase in forbs were largely due to an increase in annual forbs and tend to be low growing species.

1994 TREND ASSESSMENT

Trend for soil is slightly up due mostly to a decrease in relative percent bare ground from 54% to 35%. Litter cover has increased slightly and provides well dispersed protective cover. The key browse on this site is black sagebrush. The mature plants in the population have increased while the number of decadent plants have decreased. There are many young plants in the population but few seedlings. Trend for browse is slightly up. Sum of nested frequency of grasses have increased since 1988, while those of forbs declined. Sum of nested

frequency for perennial grasses and forbs combined have remained similar indicating a stable herbaceous understory trend. The Desirable Components Index (see methods) rated this site as good with a score of 72 due to fair shrub cover, low decadence, many young shrubs, and good grass and forb cover.

TREND ASSESSMENT
soil - slightly up (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 72 (good) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable. Percent cover of litter has declined but cover of bare ground has remained fairly stable. There is some soil pedestaling apparent around plants but erosion is minimal due to the level terrain. Trend for browse is stable. Density of the key species, black sagebrush, has increased slightly and there are abundant seedlings and young. Utilization is slightly higher, but still mostly light use. Vigor is normal on most plants. Percent decadency has increased slightly but it is still low at 14%. The small stand of stunted mountain big sagebrush has increased slightly in density. It displays moderate to heavy use, good vigor and increased decadence since 1994. Rabbitbrush is still the most abundant numerous shrub on the site. This increaser, has declined steadily in density since 1988 from 32,599 plants/acre to 19,220 by 1999. The population is mostly mature with a moderate amount of young plants sampled. Trend for the herbaceous understory is stable, even though sum of nested frequency for perennial grasses and forbs has declined slightly. It is not enough change to show a downward trend. Both slender wheatgrass and pinewoods needlegrass have declined, but was compensated by increases in other grasses. The Desirable Components Index rated this site as good with a score of 68 due to fair shrub cover, increase in decadence, several young shrubs, and a decrease in grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 68 (good) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is down slightly. Percent cover of litter and vegetation have declined and cover of bare ground has increased. Erosion is minimal mostly due to flat characteristics of the site. Trend for key browse is down. Density of black sagebrush has decreased, while dead plants increased from 1,220 plants per acre in 1999 to 4,320 in 2004. The small stand of stunted mountain big sagebrush decreased from 1,060 plants/acre in 1999 to 100 plants/acre in 2004. Recruitment of young for both species is minimal while hedging continues to be light. Rabbitbrush is still the most abundant shrub on the site, but it has also decreased. Density of rabbitbrush decreased from 22,420 plants/acre in 1994, 19,220 in 1999, to 6,300 in 2004. Rabbitbrush seedlings were abundant this year estimated at 4,740 seedlings/acre. Trend for herbaceous understory is down because of the magnitude of decrease for both perennial grasses and forbs. Grasses have steadily decreased in sum of nested frequency and cover since 1994. The dominate grass, Pinewoods needlegrass, decreased significantly in nested frequency. In 1994, it contributed 72% of the grass cover and decreased to only 5% by 2004. Slender wheatgrass and western wheatgrass both increased in percent cover. Sum of nested frequency for perennial forbs has decreased substantially. The Desirable Components Index rated this site as poor with a score of 40 due to large decrease in shrub cover, few young shrubs, and a decrease in grass cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 40 (poor) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 31

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	a-	a-	a-	b63	-	-	1.36
G	Agropyron trachycaulum	b121	b128	a72	a39	1.15	.84	1.56
G	Festuca ovina	a26	a15	b110	a18	.10	2.92	.07
G	Poa fendleriana	a130	b157	b140	a79	2.85	2.59	2.28
G	Poa pratensis	-	-	-	3	-	-	.15
G	Sitanion hystrix	b27	a1	ab19	b28	.00	.13	.57
G	Stipa comata	-	-	-	3	-	-	.15
G	Stipa pinetorum	c236	d281	b208	a32	10.37	4.43	.31
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		540	582	549	265	14.49	10.93	6.47
Total for Grasses		540	582	549	265	14.49	10.93	6.47
F	Antennaria parvifolia	5	16	18	1	.65	.84	.03
F	Androsace septentrionalis (a)	-	a-	b33	c66	-	.15	.36
F	Arabis spp.	b18	a-	a3	a4	-	.00	.01
F	Artemisia frigida	-	2	-	-	.00	-	-
F	Astragalus agrestis	ab8	ab16	b19	a1	.03	.17	.00
F	Astragalus convallarius	-	3	2	6	.01	.00	.09
F	Castilleja linariaefolia	b46	a3	a7	a-	.00	.10	-
F	Calochortus nuttallii	b20	a-	ab8	a3	-	.02	.00
F	Chaenactis douglasii	b21	a-	a1	a-	-	.00	-
F	Chenopodium spp. (a)	-	a-	a-	b186	-	-	2.72
F	Crepis acuminata	11	5	4	4	.01	.06	.06
F	Cryptantha spp.	-	2	-	-	.00	-	-
F	Descurainia pinnata (a)	-	-	-	2	-	-	.00
F	Eriogonum alatum	-	3	3	-	.00	.03	-
F	Erigeron eatonii	d197	c141	b67	a2	.54	.59	.00
F	Erigeron pumilus	a7	b22	a5	a-	.21	.04	-
F	Eriogonum racemosum	a72	a64	a70	b133	.25	.92	2.25
F	Eriogonum umbellatum	24	33	16	12	.15	.09	.23
F	Hymenoxys richardsonii	9	7	3	2	.02	.00	.15

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Lappula occidentalis (a)	-	-	-	3	-	-	.00
F	Linum lewisii	-	-	-	1	-	-	.03
F	Lupinus argenteus	$_{ab}$3	$_{a}$-	$_{b}$9	$_{ab}$1	-	.08	.03
F	Lupinus spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	-	-	.10
F	Machaeranthera canescens	9	-	-	-	-	-	-
F	Penstemon caespitosus	$_{b}$31	$_{a}$7	$_{a}$-	$_{a}$4	.04	-	.04
F	Penstemon carnosus	$_{a}$-	$_{ab}$1	$_{b}$10	$_{ab}$2	.00	.05	.18
F	Polygonum douglasii (a)	-	$_{a}$1	$_{a}$-	$_{b}$52	.00	-	.11
F	Senecio multilobatus	$_{a}$-	$_{a}$3	$_{a}$8	$_{b}$38	.00	.04	.86
F	Sphaeralcea coccinea	-	-	2	1	-	.00	.03
F	Taraxacum officinale	-	-	-	3	-	-	.03
F	Townsendia incana	1	-	-	-	-	-	-
F	Tragopogon dubius	$_{ab}$2	$_{a}$-	$_{ab}$6	$_{b}$11	-	.01	.11
Total for Annual Forbs		0	1	33	309	0.00	0.15	3.21
Total for Perennial Forbs		484	328	261	244	1.96	3.09	4.26
Total for Forbs		484	329	294	553	1.97	3.24	7.47

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

BROWSE TRENDS --
Management unit 16C, Study no: 31

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia frigida	3	4	5	.00	.01	.41
B	Artemisia nova	97	94	53	5.50	9.05	2.78
B	Artemisia tridentata vaseyana	22	29	3	1.80	1.95	.30
B	Ceratoides lanata	0	1	9	.03	.03	.15
B	Chrysothamnus depressus	3	6	2	.18	.16	-
B	Chrysothamnus viscidiflorus viscidiflorus	93	93	80	5.15	7.64	5.67
B	Gutierrezia sarothrae	8	8	0	.04	.09	-
B	Tetradymia canescens	6	9	11	.18	.24	.53
Total for Browse		232	244	163	12.90	19.17	9.86

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 31

Species	Percent Cover '04
Artemisia frigida	.50
Artemisia nova	3.53
Artemisia tridentata vaseyana	.23
Ceratoides lanata	.25
Chrysothamnus depressus	.40
Chrysothamnus viscidiflorus viscidiflorus	5.25
Tetradymia canescens	.36

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 31

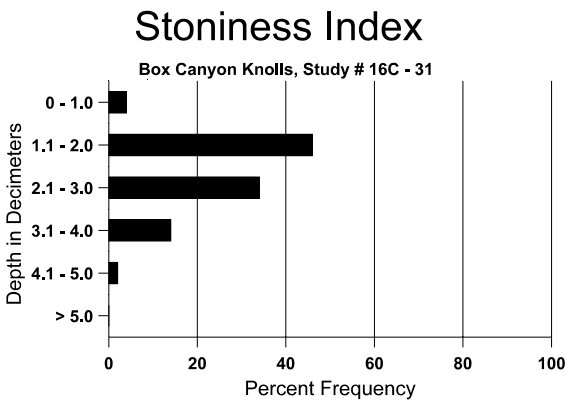
Species	Average leader growth (in) '04
Artemisia nova	2.3

BASIC COVER --
Management unit 16C, Study no: 31

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	8.75	35.04	34.84	23.34
Rock	1.25	1.14	.76	.84
Pavement	.25	.70	1.35	.59
Litter	35.75	37.44	27.93	26.64
Cryptogams	.50	.23	.82	.75
Bare Ground	53.50	40.24	39.54	62.15

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 31, Study Name: Box Canyon Knolls

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.8	49.3 (16.4)	6.8	42.0	25.4	32.6	2.9	13.2	137.6	0.4



PELLET GROUP DATA --
Management unit 16C, Study no: 31

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	16	7	3
Elk	62	55	40
Deer	11	5	4
Cattle	1	7	1

Days use per acre (ha)	
'99	'04
-	-
108 (267)	87 (215)
5 (12)	-
9 (22)	25 (61)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	16/20
99	**0**	-	-	-	-	-	0	0	-	-	0	14/36
04	**0**	-	-	-	-	-	0	0	-	-	0	16/38
Artemisia frigida												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**80**	-	-	80	-	-	0	0	0	-	0	2/5
99	**100**	-	40	60	-	-	60	0	0	-	0	6/6
04	**160**	80	-	140	20	-	13	13	13	-	0	15/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
88	**10332**	6133	3733	3066	3533	-	17	2	34	.19	9	8/13
94	**10260**	20	3800	5740	720	480	14	0	7	6	6	6/13
99	**12680**	1140	3980	6920	1780	1220	28	5	14	2	2	7/15
04	**3220**	740	20	2860	340	4320	15	0	11	4	4	8/13
Artemisia tridentata vaseyana												
88	**333**	-	200	-	133	-	40	0	40	-	0	-/-
94	**820**	-	80	720	20	20	0	0	2	2	2	11/18
99	**1060**	60	80	720	260	60	34	23	25	2	4	15/24
04	**140**	-	-	100	40	100	14	0	29	14	14	13/19
Ceratoides lanata												
88	**1266**	66	200	1000	66	-	0	0	5	-	0	6/6
94	**0**	-	-	-	-	-	0	0	0	-	0	5/7
99	**40**	-	-	40	-	-	100	0	0	-	0	4/5
04	**820**	560	560	260	-	-	15	73	0	-	0	4/9
Chrysothamnus depressus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**100**	-	-	100	-	-	0	0	-	-	0	4/9
99	**160**	-	20	140	-	-	0	0	-	-	0	3/9
04	**40**	-	-	40	-	-	0	0	-	-	0	4/5
Chrysothamnus nauseosus												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	21/24
99	**0**	-	-	-	-	-	0	0	-	-	0	18/24
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**32599**	1200	7266	20800	4533	-	7	0	14	.06	4	3/6
94	**22420**	-	8080	14340	-	20	1	0	0	-	0	3/7
99	**19220**	80	2920	15520	780	140	3	0	4	.31	.41	4/8
04	**6300**	4740	140	6000	160	440	2	0	3	.31	.31	6/10
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**220**	-	20	200	-	-	0	0	0	-	0	3/6
99	**460**	-	-	420	40	-	0	0	9	4	4	4/8
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia polyacantha												
88	**133**	-	-	133	-	-	0	0	-	-	0	2/6
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	3/15
04	**0**	-	-	-	-	-	0	0	-	-	0	5/10
Tetradymia canescens												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**160**	-	20	140	-	-	13	0	-	-	0	6/8
99	**240**	-	-	240	-	-	42	25	-	-	0	6/8
04	**300**	-	-	300	-	-	0	20	-	-	0	9/13

Trend Study 16C-32-04

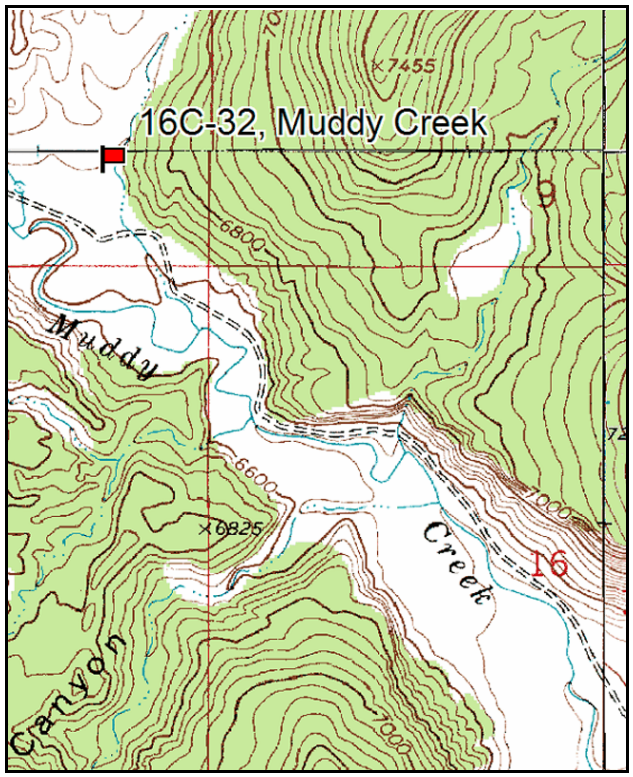
Study site name: Muddy Creek . Vegetation type: Mountain Big Sagebrush .

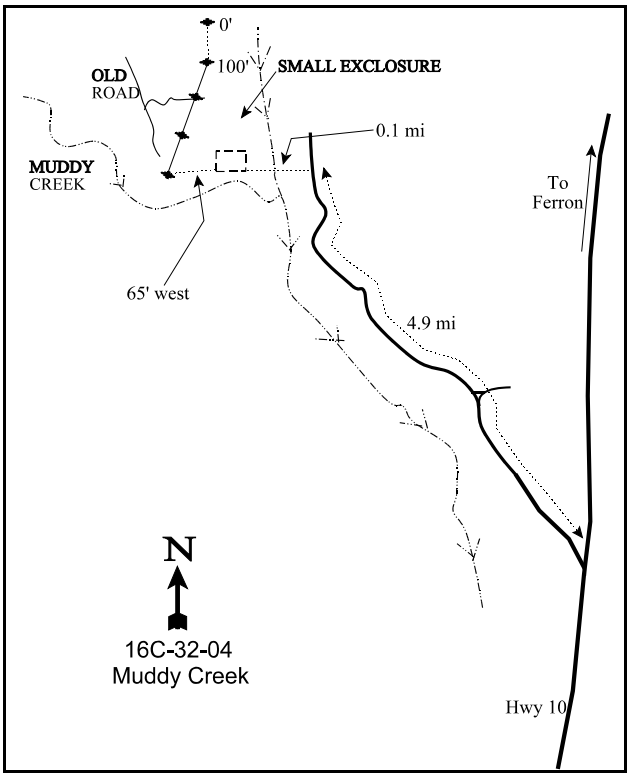
Compass bearing: frequency baseline 162 degrees magnetic-line 1; 168 degrees magnetic-lines 2-4.

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

LOCATION DESCRIPTION

From Ferron, proceed south on Highway U-10 for 12 miles to the turnoff to Muddy Creek, which is just across from the southern Moore Road. Turn right and go 4.9 miles. Once you reach Muddy Creek, take a left across the creek for 0.1 miles to the site. From the small fenced exclosure, the 400-foot baseline stake is 65 feet west of the SW corner of the exclosure. The baseline start 400 feet north of this stake, and the 18 inch green fencepost marking the 0-foot end of the baseline has a red browse tag, #9029, attached.





Map Name: Emery West

Diagrammatic Sketch

Township 21S , Range 6E , Section 17

GPS: NAD 27, UTM 12S 4316546 N, 477156 E

DISCUSSION

Muddy Creek - Trend Study No. 16C-32

This trend study samples a unique area within the Muddy Creek drainage. A small flat (approximately 30 acres) in the bottom of the canyon supports a stand of Wyoming big sagebrush mixed with more typical desert shrubs. Large basin big sagebrush grow in the riparian areas, while pinyon-juniper woodland and mountain mahogany dominate the surrounding slopes. The study site is adjacent to a small Forest Service exclosure. Terrain is nearly level and drainage is to the southwest into Muddy Creek. Elevation is 6,600 feet. The flat is heavily used by deer and elk and to a lesser extent, trespass cattle from private land below the Forest Service fence. Pellet group data from 1999 estimate 12 deer and 70 elk days use/acre (30 ddu/ha and 173 edu/acre). Pellet group data from 2004 estimated 19 deer, 73 elk, and 6 cow days use/acre (46 ddu/ha, 180 edu/ha, and 14 cdu/ha). Cow pats encountered were from last season. Most of the elk and deer pellet groups were from winter and spring, although a few were more recent.

Soil is dense and moderately shallow with an effective rooting depth estimated at just over 10 inches. Texture is a sandy clay loam with a slightly alkaline pH (7.6). Phosphorus is limited at 5.9 ppm. Values less than 10 ppm can limit normal plant growth and development. Soil temperature is high at 72.2°F at an average depth of almost 10 inches. Percent organic matter was the lowest of all sites within this management unit (0.7%). Rock and pavement are rare on the surface or within the profile. Stoniness index measurements did not hit rock but instead, a compacted hard pan which varies in depth and is sometimes exposed on the surface because of eroded soils. Beyond the hardpan, soil would be considered deep on this alluvial plain. Numerous gullies flow from the flat into the deeply cut washes. Even with the level terrain, there is obvious erosion, pedestaled plants, and large bare areas. Much of the soil on the site has eroded away. Pedestaling between plants varied from 2 to 8 inches in height.

Wyoming big sagebrush is the key browse species in this area. The population has continued to decline since 1998 which was estimated at 7,532 plants/acre, 3,120 in 1994, 3,200 in 1999, and 400 in 2004. This sagebrush stand is decadent and old, vigor is poor, and utilization is heavy. Mortality rates continue to increase while very little young recruitment is coming back into the population. In 2004, no young or seedlings were sampled while approximately 90% of the remaining sagebrush are decadent and 70% of the sagebrush population were classified as dying in 2004. Average precipitation has been below normal average since 1999 (59% in 2002 and 69% in 2003) and spring precipitation has been even lower (9% in 2002 and 51% in 2003). This would be considered a marginal site for Wyoming big sagebrush because of the co-dominance of shadscale, indicating precipitation is normally significantly less than 10 inches per year. With the extended drought, this would be much less than what is normally received.

Shadscale is co-dominant with sagebrush. This spiny plant shows light hedging with good vigor, but it also has steadily decreased in density since 1994. The highly palatable bud sagebrush was also fairly common in 1988 and 1994 but was not encountered in 1999 and 2004. Use is difficult to determine on these small prostrate shrubs and most were classified as lightly hedged. Low rabbitbrush was very common and has continually declined since 1988 estimates of 9,466 plants/acre, 4,540 in 1994, 4,080 in 1999, and 960 by 2004. These shrubs are small and generally not utilized as forage. Like sagebrush, many of the young counted in 1988 did not survive to maturity (drought and high soil temperatures). Other shrubs encountered on the site include a small number of winterfat, broom snakeweed, greasewood, and spiny horsebrush.

The herbaceous understory is typical for a mixed salt desert shrub community. All grasses combined had a cover value of only 5% in 1994, 7% in 1999, and 3% in 2004. Nested frequency has not changed significantly, but plants are smaller due to drought. Forbs are rare and produced only about 1% cover in 1994 and 1999, but increased slightly to 4% in 2004. However, more than one-half of this cover was contributed by annual forbs. Mostly by one species, annual stickseed. Grasses include bottlebrush squirreltail, Indian

ricegrass, needle-and-thread, and blue grama. Blue grama distribution is patchy, but where it occurs it dominates the surface as large mats. It provided 42% of the grass cover in 1994, 45% in 1999, and less than 1% in 2004. This species is severely effected by the lack of summer precipitaton. Indian ricegrass is also common and produced 47% of the grass cover in 1999 and 74% in 2004, although the actual percent cover decreased. The only common forbs are annuals, which include annual stickseed and wooly plantain.

1994 TREND ASSESSMENT

Ground cover characteristics have improved somewhat since 1988. Percent bare ground has declined from 67% to 57%. This is still a high amount of bare soil. With the lack of herbaceous vegetation, erosion is still an ongoing process. The browse trend is stable for the time being with stable populations of mature shrubs. Many young shrubs died off since the 1988 reading and few seedlings were encountered in 1994. This is likely due to the drought conditions of the past several years. Recruitment of desirable shrubs have declined on the site, but a return to normal precipitation patterns should reverse this trend. The herbaceous understory is lacking on the site, although sum of nested frequencies for perennial grasses and forbs have increased slightly indicating a slightly upward trend. The Desirable Components Index (see methods) rated this site as fair with a score of 39 due to moderate shrub cover, a few young shrubs, and moderate grass cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - stable (3)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 39 (fair) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable even with the slight improvement in relative percent bare soil has decreased from 57% to 53% and an increase in litter and cryptogamic relative cover. These minor changes do not warrant a change in trend. Erosion is still a major problem. Trend for browse is down slightly for the key species, Wyoming big sagebrush. Density has remained stable, but recruitment is down, utilization is mostly heavy, and percent decadence has increased from 25% to 50%. There are currently more decadent/dying sagebrush than young to replace them, indicating a most likely population decline in the future. Trend for the herbaceous understory is stable with similar sum of nested frequency values for grasses and forbs compared to 1994. The Desirable Components Index rated this site as fair with a score of 36 due to large increase in decadence, increase in young shrubs, and a increase in grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 36 (fair) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable, even with the slight increase in relative percent bare soil. This change is not enought to show a downward change in trend. It continues to be in very poor condition and erosion is still a major problem. Relative percent cover for bare ground increased from 53 % in 1999 to 59% in 2004. Vegetation cover continues to decline and the majority of the cover is now shrub cover, which is not as effective at stabilizing the soil as herbaceous cover. Trend for key browse is down. Density of Wyoming big sagebrush has decreased to only 400 plants/acre and no recruitment was shown in 2004. The majority of the population is decadent and dying and most likely will no longer exist on this marginal site in the future. Trend for

herbaceous understory stable. The slight decrease in perennial grass nested frequency, coupled with the increase in perennial forb nested frequency adjusts the trend to basically stable, but still very poor. Forbs overall, doubled in nested frequency, but the increase was due mostly to small annuals such as annual stickseed. The Desirable Components Index rated this site as fair with a score of 29 due to decrease in shrub cover, few young shrubs, and a decrease in grass cover, but an increase in forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 29 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 32

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	-	-	3	1	-	.03	.03
G	Agropyron smithii	-	-	2	-	-	.15	-
G	Agropyron spicatum inerme	-	1	-	-	.15	-	-
G	Bouteloua gracilis	$_{a}$2	$_{ab}$36	$_{b}$55	$_{b}$31	2.23	3.11	.28
G	Bromus tectorum (a)	-	$_{a}$-	$_{b}$10	$_{a}$-	-	.02	-
G	Oryzopsis hymenoides	$_{a}$64	$_{b}$112	$_{ab}$113	$_{b}$113	2.57	3.27	1.92
G	Sitanion hystrix	$_{b}$94	$_{a}$51	$_{a}$33	$_{a}$30	.39	.27	.15
G	Sporobolus cryptandrus	$_{ab}$5	$_{a}$-	$_{b}$13	$_{b}$20	-	.10	.21
Total for Annual Grasses		0	0	10	0	0	0.02	0
Total for Perennial Grasses		165	200	219	195	5.34	6.95	2.60
Total for Grasses		165	200	229	195	5.34	6.98	2.60
F	Arabis spp.	1	-	-	-	-	-	-
F	Astragalus spp.	23	32	14	36	.12	.04	.17
F	Calochortus nuttallii	-	-	4	5	-	.01	.01
F	Castilleja spp.	-	2	-	-	.00	-	-
F	Collinsia parviflora (a)	-	-	-	3	-	-	.00
F	Descurainia pinnata (a)	-	1	7	2	.00	.01	.01
F	Draba spp. (a)	-	6	-	-	.01	-	-
F	Eriogonum spp.	-	2	-	-	.00	-	-
F	Erigeron pumilus	$_{ab}$7	$_{ab}$5	$_{b}$10	$_{a}$-	.01	.02	-
F	Lappula occidentalis (a)	-	$_{a}$43	$_{a}$18	$_{b}$190	.07	.03	1.77
F	Malcolmia africana	-	-	-	1	-	-	.01
F	Machaeranthera canescens	$_{ab}$11	$_{b}$19	$_{a}$-	$_{a}$1	.11	-	.03
F	Oenothera spp.	-	-	-	4	-	-	.16
F	Plantago patagonica (a)	-	$_{a}$104	$_{b}$191	$_{a}$97	.45	1.08	.46
F	Sphaeralcea coccinea	$_{a}$5	$_{a}$11	$_{a}$8	$_{b}$49	.05	.03	.68
F	Townsendia incana	$_{b}$54	$_{b}$34	$_{a}$8	$_{b}$44	.25	.07	.87

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Trifolium spp.	-	-	-	3	-	-	.00
F	Unknown forb-annual (a)	-	2	-	-	.00	-	-
Total for Annual Forbs		0	156	216	292	0.54	1.13	2.25
Total for Perennial Forbs		101	105	44	143	0.56	0.18	1.95
Total for Forbs		101	261	260	435	1.11	1.31	4.21

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

BROWSE TRENDS --
Management unit 16C, Study no: 32

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia spinescens	31	0	0	.51	-	-
B	Artemisia tridentata wyomingensis	69	72	17	3.58	4.68	.66
B	Atriplex confertifolia	81	69	70	5.55	3.45	6.32
B	Ceratoides lanata	6	4	5	.06	.00	.21
B	Chrysothamnus nauseosus	-	-	-	-	-	.00
B	Gutierrezia sarothrae	64	70	25	-	-	-
B	Chrysothamnus viscidiflorus	1	0	0	2.06	1.99	.46
B	Opuntia spp.	17	21	14	.40	.36	.07
B	Sarcobatus vermiculatus	12	14	16	1.61	1.35	2.06
B	Sclerocactus	2	8	0	.03	.15	-
B	Tetradymia spinosa	13	14	0	.19	.36	-
Total for Browse		296	272	147	14.03	12.38	9.80

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 32

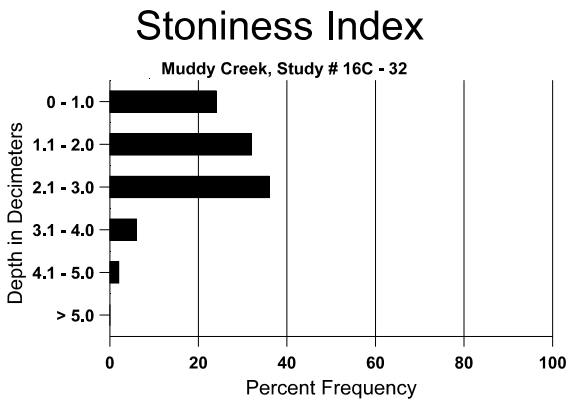
Species	Percent Cover '04
Artemisia tridentata wyomingensis	.95
Atriplex confertifolia	7.31
Ceratoides lanata	.08
Chrysothamnus viscidiflorus	.91
Opuntia spp.	.23
Sarcobatus vermiculatus	3.96

BASIC COVER --
Management unit 16C, Study no: 32

Cover Type	Average Cover %			
	'88	'94	'99	'04
Vegetation	2.50	22.87	19.34	16.51
Rock	0	.91	.50	.52
Pavement	.75	.21	.46	.33
Litter	20.00	14.56	17.69	22.10
Cryptogams	10.00	3.65	7.27	5.55
Bare Ground	66.75	56.71	52.81	64.86

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 32, Study Name: Muddy Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
10.6	72.2 (9.4)	7.6	56.0	23.4	20.6	0.7	5.9	89.6	3.4



PELLET GROUP DATA --
Management unit 16C, Study no: 32

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	10	12	5
Elk	35	55	44
Deer	33	9	3
Cattle	3	-	1

Days use per acre (ha)	
'99	'04
-	-
70 (173)	73 (180)
12 (30)	19 (46)
1 (2)	6 (14)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 32

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia spinescens												
88	**1399**	66	800	533	66	-	0	0	5	-	0	3/5
94	**1560**	-	20	1100	440	20	46	0	28	8	10	4/9
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata wyomingensis												
88	**7532**	666	3933	2533	1066	-	25	11	14	-	0	15/19
94	**3120**	-	220	2120	780	1140	32	3	25	8	10	13/17
99	**3200**	20	180	1420	1600	1240	33	48	50	12	12	13/19
04	**400**	-	-	40	360	1480	15	75	90	70	70	15/25
Atriplex confertifolia												
88	**7866**	1000	3600	2866	1400	-	11	6	18	-	0	9/10
94	**5580**	-	280	4820	480	40	.35	0	9	2	2	8/15
99	**4340**	20	720	2760	860	220	10	.92	20	5	5	7/13
04	**3480**	360	80	2860	540	1440	3	0	16	9	12	10/20
Ceratoides lanata												
88	**600**	-	200	400	-	-	11	33	0	-	0	6/6
94	**140**	-	-	120	20	-	43	0	14	-	0	6/6
99	**120**	20	-	20	100	-	0	100	83	-	0	4/5
04	**120**	120	-	120	-	-	33	17	0	-	33	9/11
Chrysothamnus viscidiflorus												
88	**9466**	66	4800	4666	-	-	4	.70	0	-	.70	7/9
94	**4540**	-	280	4220	40	-	0	0	1	-	.88	9/11
99	**4080**	40	460	3440	180	60	15	.98	4	.49	10	7/12
04	**960**	20	40	660	260	520	0	0	27	23	29	10/16
Gutierrezia sarothrae												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	20	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
88	**133**	-	-	133	-	-	0	0	0	-	0	6/16
94	**460**	-	-	460	-	-	0	0	0	-	0	4/16
99	**760**	120	140	580	40	100	0	0	5	-	5	5/13
04	**420**	-	20	400	-	20	0	0	0	-	0	4/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sarcobatus vermiculatus												
88	**399**	-	333	66	-	-	0	17	0	-	0	19/31
94	**440**	-	20	400	20	-	0	0	5	-	0	17/27
99	**640**	-	80	460	100	40	0	0	16	13	13	16/30
04	**580**	-	40	460	80	200	4	0	14	7	7	18/37
Sclerocactus												
88	**666**	-	-	666	-	-	0	0	-	-	0	3/0
94	**120**	-	-	120	-	20	0	0	-	-	0	3/4
99	**220**	-	-	220	-	-	0	0	-	-	0	3/4
04	**0**	-	-	-	-	80	0	0	-	-	0	-/-
Tetradymia spinosa												
88	**66**	-	-	66	-	-	0	0	0	-	0	12/16
94	**440**	-	20	380	40	-	5	5	9	5	5	11/18
99	**600**	-	80	480	40	280	0	3	7	-	97	4/11
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-

Trend Study 16C-33-04

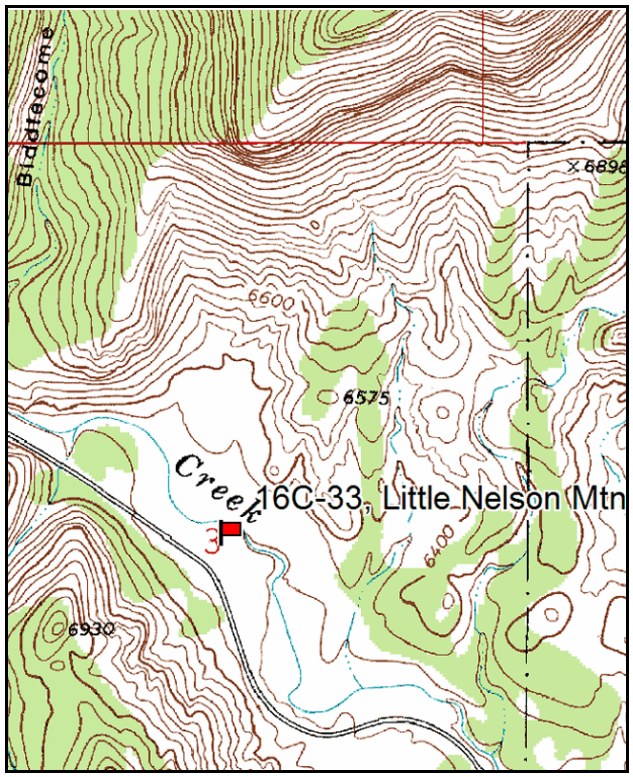
Study site name: Little Nelson Mountain . Vegetation type: Wyoming Big Sagebrush .

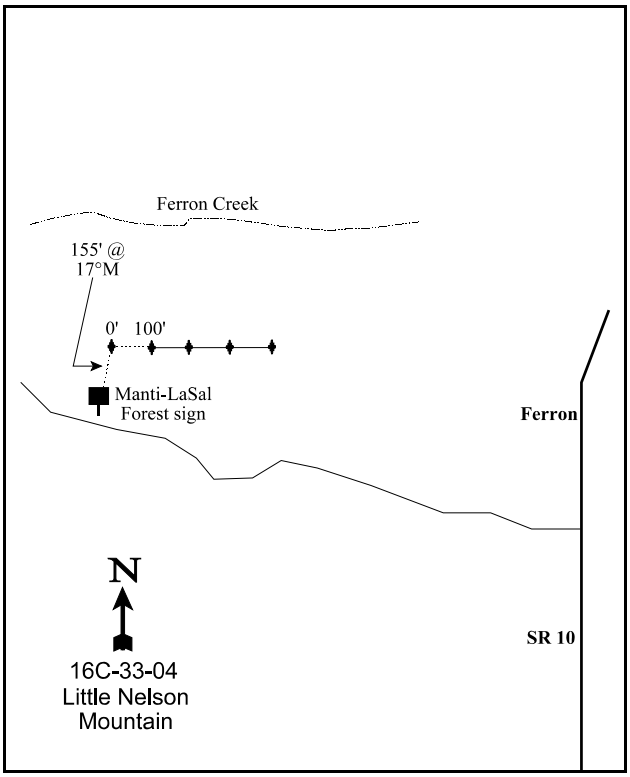
Compass bearing: frequency baseline 127 degrees magnetic.

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

LOCATION DESCRIPTION

From Ferron, proceed up Ferron Canyon past Millsite State Park. Continue 0.7 miles past the forest boundary to the Manti-LaSal Forest sign. The 0-foot baseline stake is on the right hand side of the road approximately 155 feet away at a bearing of 17°M.





Map Name: Ferron

Diagrammatic Sketch

Township 20S , Range 6E , Section 3

GPS: NAD 27, UTM 12S 4328645 N, 479915 E

DISCUSSION

Little Nelson Mountain - Trend Study No. 16C-33

The Little Nelson Mountain study in Ferron Canyon was established in 1994. It samples a dry Wyoming big sagebrush site along the banks of Ferron creek, just up stream from Millsite reservoir. The terrain at the site gently slopes north toward the creek. Elevation is approximately 6,340 feet. The area receives concentrated use from wintering deer. Pellet group data from 1999 estimated 22 deer and 17 cow days use/acre (54 ddu/ha and 42 cdu/ha). All cattle pats were from the previous grazing season ('98). The site is within the Ferron allotment but is grazed only as cattle are trailed up the road to higher pastures. Pellet group data from 2004 show very light use, estimated at only 4 deer and 3 cattle days use/acre (10 ddu/ha and 7 cdu/ha).

The soils are alluvially deposited and deep with some river cobble on the surface and within the profile. Effective rooting depth is estimated at just over 26 inches. Texture is a loam with a slightly alkaline pH (7.6). Soil temperature is moderately high averaging 63°F in 2004 at an average depth of nearly 17 inches. Phosphorus is limited at only 3.5 ppm and potassium is marginal at 67.2 ppm. Phosphorus levels less than 10 ppm and potassium levels less than 70 ppm can limit normal plant growth and development. There is a considerable amount of exposed bare ground between individual shrubs. Percent bare ground was estimated at 52% in 1994 and 51% in 2004. Soil pedestaling is evident to a height of 4 to 6 inches in some areas. Herbaceous vegetation is marginal with grasses and forbs providing only 17% cover in 2004. The erosion condition class determined the soil to be stable in 2004. Most erosion in the area comes from high intensity thunderstorm events. One such event on the day following study site establishment in 1994, washed out the road just past the reservoir.

The key browse species on the site consists of a moderately dense population of Wyoming big sagebrush. Density was estimated at nearly 3,000 plants/acre in 1994, increasing slightly in 1999, but then dropping by 68% by 2004 to 1,100 plants/acre due to drought. Approximately 40% of the remaining sagebrush are decadent and 68% of the decadent plants sampled were classified as dying in 2004. However, mature plants numbering about 600 plants/acre are vigorous and producing excellent annual leader growth, averaging about 3 inches. Seed heads were also numerous, sagebrush seedlings were moderately abundant, but no young plants were sampled in 2004.

Shadscale is also abundant with an estimated population of 2,700 plants/acre in 1994 declining to 1,660 by 2004. Use of these small shrubs was primarily light to moderate. Several other shrubs occurred in small numbers.

The herbaceous understory is diverse and moderately abundant for this type of site. The most common grass is blue grama which accounted for 81% of the grass cover in 1994 and 76% in 1999. Other fairly common grasses include Indian ricegrass and bottlebrush squirreltail. Perennial forbs are diverse but when all are combined, account for less than one percent cover in 1994, increasing to 4% by 2004. The most abundant species include an Astragalus, hoary aster, and scarlet globemallow. Annual forbs, annual stickseed and wooly plantain, have increased in abundance and cover since 1994.

1994 APPARENT TREND ASSESSMENT

Protective ground cover is lacking on this site primarily due to the lack of herbaceous species. Percent bare ground is quite high and there are large areas of exposed soil. Pedestaling is evident and during high intensity rain events there is little protective cover to hold the soil in place. A return to normal precipitation patterns will improve the herbaceous cover on the site. The key browse consists of Wyoming big sagebrush. Apparent trend for these shrubs appears stable currently. There is an adequate number of seedlings and young to replace most of the dying plants. Percent decadency is low at 32% but utilization is fairly heavy. The herbaceous

understory is in poor condition. The dominant grass consists of the low growing blue grama. Forbs are scarce. The Desirable Components Index rated this site as fair with a score of 36 due to low shrub cover, high decadence, and moderate grass cover.

winter range condition (DC Index) - 36 (fair) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is slightly up due to a decline in relative percent cover of bare ground from 58% to 39%. Litter cover remained about the same, while relative vegetative cover increased from 19% to 27%. Relative cryptogamic cover increased slightly as well. There is still a considerable amount of unprotected bare soil on the site and erosion continues to occur. Trend for the key species, Wyoming big sagebrush, is up slightly. Utilization is still moderate to heavy but vigor has improved, percent decadence has declined, and young recruitment is up. Shadscale, which is also abundant, appears to be stable. Trend for the herbaceous understory is slightly up as sum of nested frequency of perennial grasses has increased slightly while frequency of perennial forbs has increased substantially. However, perennial forbs only contribute 2% of the perennial herbaceous cover. Cover of both grasses and forbs has also increased since 1994. Blue gramma is stable and currently provides 76% of the grass cover and 60% of the total herbaceous cover. Indian ricegrass and bottlebrush squirreltail are also fairly abundant and combined they produce 18% of the grass cover. Indian ricegrass has increased significantly in sum of nested frequency since 1994, while bottlebrush squirreltail has remained stable. The Desirable Components Index rated this site as excellent with a score of 70 due to an increase in shrub cover, moderate decadence, many young shrubs, and good grass and forb cover.

TREND ASSESSMENT
soil - slightly up (4)
browse - up slightly (4)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 70 (excellent) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is considered stable because the increase in relative bare soil is not enough to warrant a downward trend for soil. Some erosion is occurring but the erosion condition class was determined to be stable. Trend for the key browse species, Wyoming big sagebrush, is down. Density has declined from 3,480 down to 1,100 plants/acre, a 68% drop in the sagebrush population. About 40% of the remaining sagebrush were classified as decadent and 68% of the decadent plants were rated as dying. However, mature plants are vigorous and producing excellent leader growth averaging about 3 inches. No young plants were sampled but seedlings are moderately abundant and seed production is excellent. Density of shadscale declined 35% but the remaining population appears healthy. Trend for the herbaceous understory is stable because perennial grass nested frequency has not dropped enough to warrant a change in trend. Sum of nested frequency for perennial forbs has remained fairly stable. The most abundant perennial grass, the warm season blue grama, declined significantly in nested frequency and cover dropped four-fold from nearly 12% to only 3%. Nested frequency and cover for the cool season, Indian ricegrass and bottlebrush squirreltail, remained stable. Summer drought would effect blue grama more than the cool season species. The Desirable Components Index rated this site as fair with a score of 43 due to a slight decrease in shrub cover, moderate decadence, and a decrease in grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 43 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 33

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Bouteloua gracilis	ab143	b160	a109	7.73	11.74	2.79
G	Bromus tectorum (a)	a-	b75	a7	-	.40	.02
G	Elymus salina	b18	a-	a-	.08	-	-
G	Hilaria jamesii	1	5	14	.00	.03	.59
G	Oryzopsis hymenoides	a57	b79	ab62	.86	1.37	1.34
G	Sitanion hystrix	78	70	57	.68	1.37	1.39
G	Sporobolus cryptandrus	12	43	37	.12	.52	.23
G	Stipa comata	a6	a1	b27	.03	.03	.79
Total for Annual Grasses		0	75	7	0	0.40	0.01
Total for Perennial Grasses		315	358	306	9.52	15.08	7.15
Total for Grasses		315	433	313	9.52	15.48	7.17
F	Astragalus consobrinus	a8	b91	b89	.02	.77	.96
F	Aster spp.	b15	a-	a-	.02	-	-
F	Calochortus nuttallii	-	-	2	-	-	.00
F	Castilleja spp.	1	-	1	.00	-	.00
F	Chenopodium fremontii (a)	-	-	10	-	-	.02
F	Cryptantha spp.	2	-	-	.00	-	-
F	Draba spp. (a)	a-	b25	a-	-	.07	-
F	Erigeron spp.	2	14	-	.00	.07	-
F	Eriogonum spp.	-	-	8	-	-	.02
F	Gilia spp. (a)	a-	a-	b75	-	-	.22
F	Halogeton glomeratus (a)	2	-	9	.00	-	.09
F	Lappula occidentalis (a)	a9	b46	c242	.02	.11	2.71
F	Lepidium densiflorum (a)	a-	a-	b17	-	-	.08
F	Malcolmia africana	-	-	2	-	-	.03
F	Machaeranthera canescens	a4	b36	a-	.01	1.70	-
F	Microsteris gracilis (a)	-	-	1	-	-	.00
F	Navarretia intertexta (a)	a-	a-	b51	-	-	.38
F	Plantago patagonica (a)	a32	b95	b110	.07	.91	2.69
F	Salsola iberica (a)	9	-	3	.01	-	.00

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Sphaeralcea coccinea	$_{a}$13	$_{a}$11	$_{b}$42	.06	.10	2.13
F	Sphaeralcea grossulariaefolia	-	-	-	-	-	.03
F	Townsendia incana	$_{a}$15	$_{b}$47	$_{b}$45	.04	.31	.72
F	Unknown forb-perennial	4	-	-	.01	-	-
Total for Annual Forbs		52	166	518	0.11	1.09	6.22
Total for Perennial Forbs		64	199	189	0.18	2.96	3.91
Total for Forbs		116	365	707	0.29	4.05	10.13

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

BROWSE TRENDS --
Management unit 16C, Study no: 33

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	0	1	0	-	-	-
B	Artemisia spinescens	1	3	0	-	.06	-
B	Artemisia tridentata wyomingensis	64	66	32	3.45	6.78	3.00
B	Atriplex canescens	0	0	0	.54	-	-
B	Atriplex confertifolia	50	53	44	1.08	3.03	4.65
B	Atriplex gardneri	-	-	-	.98	-	-
B	Ceratoides lanata	4	3	4	.00	.00	.33
B	Chrysothamnus nauseosus	3	0	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	3	8	0	.03	-	-
B	Eriogonum microthecum	1	0	0	.00	-	-
B	Gutierrezia sarothrae	0	0	1	-	-	-
B	Juniperus osteosperma	0	1	0	-	-	-
B	Leptodactylon pungens	3	6	0	.03	.15	-
B	Opuntia polyacantha	36	36	36	.84	1.57	.21
B	Sarcobatus vermiculatus	1	1	1	.38	.38	.66
B	Sclerocactus	0	4	2	-	.01	-
B	Tetradymia spinosa	0	2	0	-	-	-
Total for Browse		166	184	120	7.36	12.00	8.86

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 33

Species	Percent Cover '04
Artemisia tridentata wyomingensis	4.90
Atriplex confertifolia	3.00
Ceratoides lanata	.65
Opuntia polyacantha	.91

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 33

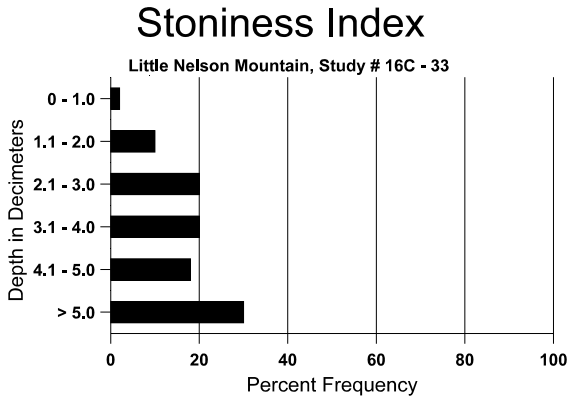
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.9
Ceratoides lanata	5.9

BASIC COVER --
Management unit 16C, Study no: 33

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	16.88	30.04	25.68
Rock	3.92	4.51	2.88
Pavement	1.43	8.14	6.36
Litter	13.36	16.00	20.45
Cryptogams	2.23	9.79	2.85
Bare Ground	51.92	43.53	50.60

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 33, Study Name: Little Nelson Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
26.1	63.0 (16.8)	7.6	48.0	33.4	18.6	1.5	3.5	67.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 33

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	-	11	5
Elk	-	-	-
Deer	42	43	7
Cattle	2	3	3

Days use per acre (ha)	
'99	'04
-	-
-	-
22 (54)	4 (10)
17 (42)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 33

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia spinescens												
94	**20**	-	-	20	-	-	0	0	0	-	0	-/-
99	**140**	-	-	60	80	-	0	0	57	-	0	3/7
04	**0**	-	-	-	-	60	0	0	0	-	0	4/9
Artemisia tridentata wyomingensis												
94	**2860**	100	220	1720	920	1000	31	38	32	20	23	11/20
99	**3480**	180	880	1840	760	960	42	30	22	7	7	12/20
04	**1100**	240	-	660	440	1820	53	7	40	27	27	19/35

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex canescens												
94	**0**	-	-	-	-	-	0	0	-	-	0	8/17
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	17/30
Atriplex confertifolia												
94	**2700**	20	80	2100	520	80	20	7	19	8	9	8/16
99	**2540**	320	620	1100	820	160	16	9	32	16	18	8/16
04	**1660**	-	-	1480	180	280	4	0	11	6	6	10/19
Ceratoides lanata												
94	**80**	-	-	60	20	-	0	25	25	-	0	6/11
99	**160**	20	-	160	-	-	13	0	0	-	0	5/9
04	**80**	20	-	80	-	-	25	25	0	-	0	13/18
Chrysothamnus nauseosus												
94	**60**	-	20	40	-	-	0	33	-	-	0	9/7
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
94	**60**	-	-	60	-	-	0	0	-	-	0	8/9
99	**160**	-	20	140	-	20	0	0	-	-	0	6/12
04	**0**	-	-	-	-	-	0	0	-	-	0	10/12
Eriogonum microthecum												
94	**20**	20	-	20	-	-	0	0	-	-	0	2/3
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	8/6
Juniperus osteosperma												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	20	0	0	-	-	0	-/-
Leptodactylon pungens												
94	**140**	20	20	120	-	-	0	0	-	-	0	7/10
99	**240**	-	-	240	-	-	0	0	-	-	0	5/7
04	**0**	-	-	-	-	60	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia polyacantha												
94	**1120**	-	40	1060	20	-	0	0	2	-	0	4/17
99	**1080**	160	80	800	200	-	0	0	19	9	15	4/18
04	**1020**	-	20	640	360	160	0	0	35	27	31	5/14
Sarcobatus vermiculatus												
94	**20**	-	-	20	-	-	0	0	-	-	0	16/21
99	**20**	-	-	20	-	-	100	0	-	-	0	16/23
04	**20**	-	-	20	-	-	100	0	-	-	0	27/33
Sclerocactus												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	20	20	60	-	-	0	0	-	-	0	2/2
04	**40**	-	-	40	-	-	0	0	-	-	0	2/4
Tetradymia spinosa												
94	**0**	-	-	-	-	-	0	0	-	-	0	12/25
99	**60**	-	-	60	-	-	0	0	-	-	0	3/7
04	**0**	-	-	-	-	-	0	0	-	-	0	15/22

Trend Study 16C-34-04

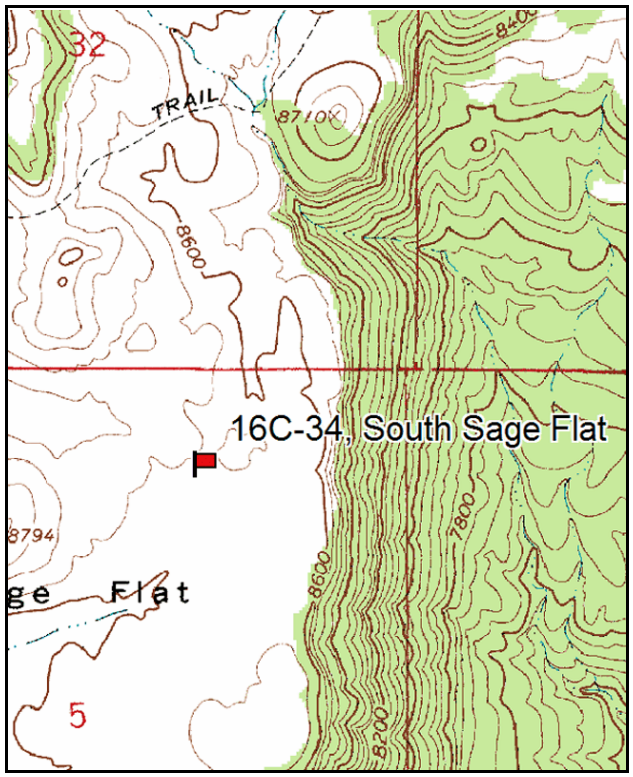
Study site name: South Sage Flat . Vegetation type: Black Sagebrush-Grass .

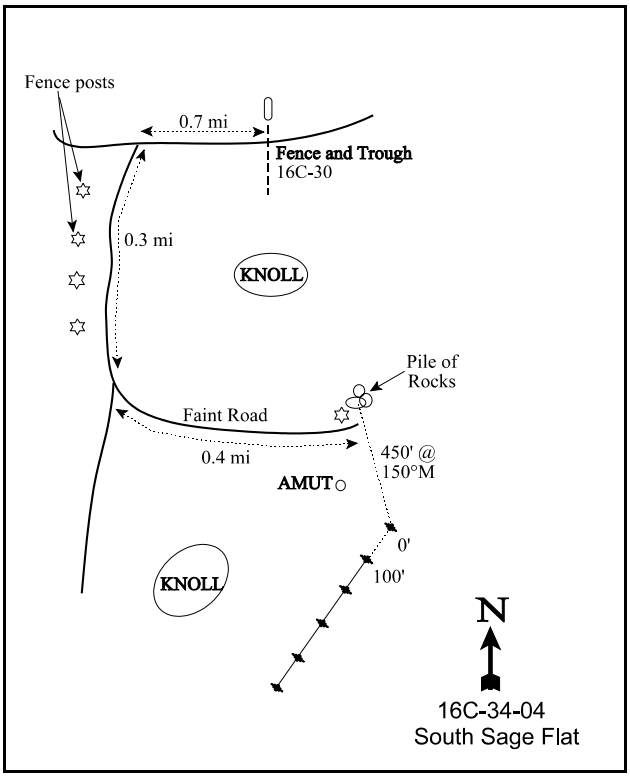
Compass bearing: frequency baseline 203 degrees magnetic.

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

LOCATION DESCRIPTION

From the fence and trough at site # 16C-30 (Upper Hole Trail), proceed west 0.7 miles. Turn left and travel along a road with fenceposts marking a water line for 0.3 miles. Turn left on a faint road and travel 0.4 miles to a fencepost and a pile of rocks on the left. From the rock pile, walk 450 ft at 150/ magnetic to the 0 ft baseline stake.





Map Name: Flagstaff Peak

Diagrammatic Sketch

Township 21S , Range 6E , Section 5

GPS: NAD 27, UTM 12S 4319441 N, 476883 E

DISCUSSION

South Sage Flat - Trend Study No. 16C-34

The South Sage Flat study was established in 1994 at South Sage Flat. It samples a black sagebrush-mountain big sagebrush/grass community south-west of Little Nelson Mountain on Forest Service land. Elevation at the site is 8,650 feet with a general east aspect and nearly level terrain. It was added to monitor the increasing elk population on the unit. Cattle use the area as part of the Ferron grazing allotment which is grazed from June 21 to October 5 by 1,607 cattle on an 8 pasture rest rotation system. There is a water trough about one-quarter of a mile to the north of the site. Pellet group data from 1999 estimate 1 deer, 85 elk and 31 cow days use/acre (3 ddu/ha, 210 edu/ha, 77 cdu/ha). Pellet group data from 2004 estimate 9 deer, 58 elk, and 14 cow days use/acre (22 ddu/ha, 144 edu/ha, and 34 cdu/ha). Cattle use was from the previous year and elk and deer use is from winter.

Soil on the site is moderately shallow with an effective rooting depth of just over 12 inches. There is a clay layer at 10 inches. Soil texture is a sandy clay loam with a neutral pH (6.9). Pavement sized rock is common on the surface and throughout the profile, with a few larger rocks scattered on the surface. Many of the rocks have a calcium carbonate coating. There is quite a bit of relative bare ground exposed (42% in 1994, 35% in 1999, and 34% in 2004) and light soil pedestaling evident. Erosion is minimal due mostly to the level terrain.

The key browse species on the site consists of a dense population of relatively small statured black sagebrush. Density has averaged about 14,000 plants/acre for 1994 and 1999, but decreased to only 6,440 in 2004. The large die off is most likely due to drought conditions for at most they were only lightly utilized. Seedlings were fairly abundant, but young recruitment is not enough to replace the portion that has died or is going to die. Utilization has been light and vigor is generally good. There is a small population of mountain big sagebrush on the site, indicating areas of deeper soil. Mountain big sagebrush density averaged 1,640 plants/acre in 1994 and 1999, but decreased to 240 plants/acre by 2004. No young recruitment was sampled in 2004, but could have been misidentified as black sagebrush seedlings or young. Utilization is moderate to heavy and vigor is poor. The only other abundant shrub on the site consists of a dense stand of low growing rabbitbrush. Palatability of this shrub is poor and most individuals are not utilized. Several other species of shrubs occurred on the site, although none were very abundant.

The herbaceous understory is fairly abundant and diverse with grasses and forbs accounting for almost 11% cover in 1994, 15% in 1999, and 18% in 2004. Sum of nested frequency for grasses and forbs indicates a well dispersed cover which is effective at holding the soil in place. The dominant grass is crested wheatgrass which was seeded in the past. The next most abundant grass is letterman needlegrass. Forbs are diverse and fairly abundant. The most common species include redroot eriogonum and pingue hymenoxys.

1994 APPARENT TREND ASSESSMENT

Protective ground cover is adequate to prevent serious erosion on the site. The apparent browse trend is stable with adequate numbers of seedlings and young, and low percent decadency for the preferred browse species, black sagebrush and Mountain big sagebrush. Utilization is generally light and vigor is good. The herbaceous understory is fairly abundant and diverse providing moderately effective protective ground cover for the soil. The Desirable Components Index (see methods) rated this site as fair with a score of 57 due to moderate shrub cover, low decadence, and moderate grass and forb cover.

winter range condition (DC Index) - 57 (fair) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is stable. Litter and vegetative cover have increased slightly, but percent cover for bare ground remains similar to 1994. There is some erosion occurring, although it is minimal due to the level terrain. The browse trend is stable for the key species, black sagebrush and mountain big sagebrush. Both show stable populations, mostly light to moderate use, good recruitment and vigor, and low decadence. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses increased slightly while frequency of perennial forbs declined slightly. Grasses provide the bulk of the herbaceous cover and crested wheatgrass accounts or 66% of the grass cover and 47% of the herbaceous cover. The Desirable Components Index rated this site as good with a score of 72 due to an increase in shrub cover, several young shrubs, and an increase in grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable(3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 72 (good) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Litter, vegetation, and bare ground cover have remained similar to previous estimates. There are many open bare ground spots, but slope is flat so erosion is minimal. The browse trend is down for the key species, black sagebrush and mountain big sagebrush. Densities of both have decreased while the number of dead plants have increased. Black sagebrush is lightly used and has good vigor. Mountain big sagebrush is heavily hedged with poor vigor. Many of young plants in 1999 most likely did not become established to replace the dying population. Trend for herbaceous understory is slightly down. Sum of nested frequency for perennial grasses and forbs decreased, although cover actually increased. Grasses decreased mainly due to a loss of Letterman needlegrass, while for forbs the decrease was in mat penstemon. Grasses provide the bulk of the herbaceous cover and crested wheatgrass accounted for 87% of the grass cover and 76% of the herbaceous cover. The Desirable Components Index rated this site as fair with a score of 50 due to a decrease in shrub cover, high decadence, and excellent grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 50 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 34

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	233	254	234	4.23	6.86	13.96
G	Agropyron dasystachyum	a-	a-	b22	-	-	.40
G	Agropyron smithii	a1	a6	b20	.00	.15	.19
G	Bromus inermis	8	3	-	.01	.06	-

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Elymus salina	$_{ab}$15	$_{b}$41	$_{a}$6	.11	.21	.06
G	Oryzopsis hymenoides	-	-	1	-	-	.03
G	Poa fendleriana	64	40	63	1.03	.50	.75
G	Sitanion hystrix	2	2	9	.03	.06	.10
G	Stipa lettermani	$_{b}$133	$_{b}$120	$_{a}$51	1.95	2.49	.45
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		456	466	406	7.38	10.36	15.96
Total for Grasses		456	466	406	7.38	10.36	15.96
F	Androsace septentrionalis (a)	$_{a}$-	$_{b}$28	$_{a}$-	-	.14	-
F	Arabis spp.	3	3	2	.00	.01	.01
F	Astragalus convallarius	6	-	1	.03	-	.03
F	Astragalus miser	3	3	2	.15	.03	.00
F	Aster spp.	$_{a}$-	$_{b}$14	$_{a}$-	-	.05	-
F	Castilleja linariaefolia	3	2	-	.01	.01	-
F	Calochortus nuttallii	-	-	7	-	-	.02
F	Chaenactis douglasii	-	4	-	-	.00	-
F	Chenopodium leptophyllum(a)	$_{a}$-	$_{a}$-	$_{b}$50	-	-	.23
F	Cryptantha spp.	2	-	-	.00	-	-
F	Eriogonum alatum	3	-	-	.03	-	-
F	Erigeron eatonii	$_{c}$128	$_{b}$49	$_{a}$3	1.05	.36	.03
F	Erigeron flagellaris	-	-	3	-	-	.03
F	Erigeron pumilus	$_{b}$15	$_{a}$2	$_{a}$4	.04	.03	.01
F	Eriogonum racemosum	$_{a}$25	$_{b}$65	$_{b}$52	.16	.56	.43
F	Gayophytum ramosissimum(a)	-	-	2	-	-	.01
F	Hymenoxys acaulis	$_{b}$16	$_{a}$4	$_{a}$3	.10	.01	.00
F	Hymenoxys richardsonii	51	55	32	.78	1.23	.67
F	Ipomopsis aggregata	-	2	-	-	.03	-
F	Linum lewisii	2	1	-	.03	.03	.03
F	Lupinus argenteus	$_{b}$10	$_{ab}$3	$_{a}$-	.07	.09	-
F	Machaeranthera canescens	3	3	6	.01	.01	.02
F	Machaeranthera grindelioides	12	10	6	.08	.10	.09
F	Penstemon caespitosus	$_{b}$71	$_{b}$55	$_{a}$-	.35	1.17	-
F	Penstemon spp.	5	-	3	.01	-	.03
F	Petradoria pumila	5	2	2	.03	.03	.03
F	Phlox longifolia	-	-	2	-	-	.00
F	Polygonum douglasii (a)	-	-	7	-	-	.01
F	Potentilla gracilis	$_{ab}$3	$_{b}$9	$_{a}$-	.03	.07	.00

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Senecio multilobatus	$_{a}$4	$_{ab}$22	$_{b}$29	.00	.07	.20
F	Sphaeralcea coccinea	3	7	9	.01	.07	.21
F	Trifolium spp.	36	43	62	.16	.09	.21
Total for Annual Forbs		0	28	59	0	0.14	0.26
Total for Perennial Forbs		409	358	228	3.20	4.08	2.09
Total for Forbs		409	386	287	3.20	4.23	2.35

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

BROWSE TRENDS --
Management unit 16C, Study no: 34

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	98	100	91	9.90	11.98	6.00
B	Artemisia tridentata vaseyana	29	37	7	3.06	3.95	.38
B	Chrysothamnus depressus	0	4	3	-	.15	.03
B	Chrysothamnus viscidiflorus viscidiflorus	92	93	87	3.55	7.03	8.10
B	Eriogonum corymbosum	13	13	12	.36	.34	.33
B	Gutierrezia sarothrae	14	14	24	.03	.09	.48
B	Leptodactylon pungens	1	2	1	-	-	-
B	Opuntia spp.	1	1	1	-	-	-
B	Pediocactus simpsonii	0	0	1	-	-	-
B	Symphoricarpos oreophilus	1	1	1	-	-	-
Total for Browse		249	265	228	16.92	23.55	15.34

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 34

Species	Percent Cover '04
Artemisia nova	6.56
Artemisia tridentata vaseyana	.21
Chrysothamnus viscidiflorus viscidiflorus	10.56
Eriogonum corymbosum	.81
Gutierrezia sarothrae	.33

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 34

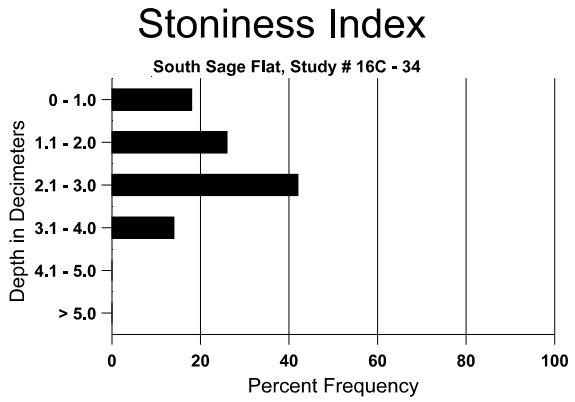
Species	Average leader growth (in) '04
Artemisia nova	1.2

BASIC COVER --
Management unit 16C, Study no: 34

Cover Type	Average Cover % '94	'99	'04
Vegetation	29.04	33.97	34.65
Rock	4.80	1.56	1.79
Pavement	1.41	8.42	8.31
Litter	20.91	27.77	28.44
Cryptogams	0	.04	.03
Bare Ground	40.17	38.25	38.18

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 34, Study Name: South Sage Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.2	54.0 (11.2)	6.9	62.0	15.4	22.6	1.9	10.5	115.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 34

Type	Quadrat Frequency '94	'99	'04
Rabbit	10	15	3
Elk	48	59	42
Deer	12	8	3
Cattle	4	8	4

Days use per acre (ha) '99	'04
-	-
85 (210)	58 (144)
1 (2)	9 (22)
31 (77)	14 (34)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 34

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**0**	-	-	-	-	-	0	0	-	-	0	11/11
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
94	**13900**	200	1380	10320	2200	440	17	5	16	2	2	6/16
99	**14120**	700	2700	8560	2860	520	16	4	20	5	5	6/15
04	**6440**	1200	400	4560	1480	3160	0	0	23	16	16	6/11
Artemisia tridentata vaseyana												
94	**1600**	-	180	1340	80	20	30	0	5	3	3	14/30
99	**1680**	140	360	1180	140	20	13	20	8	1	1	14/27
04	**240**	-	-	120	120	360	50	42	50	50	50	13/23
Chrysothamnus depressus												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**100**	-	40	60	-	-	0	0	-	-	0	2/5
04	**60**	-	-	60	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
94	**9560**	20	440	9020	100	-	.20	0	1	-	0	4/8
99	**12480**	220	1320	10980	180	-	1	0	1	-	0	3/8
04	**7460**	2220	200	7260	-	40	0	0	0	-	0	5/10
Eriogonum corymbosum												
94	**320**	-	-	280	40	-	6	0	13	6	6	9/19
99	**340**	-	40	300	-	-	24	6	0	-	0	12/21
04	**280**	40	-	240	40	20	7	7	14	7	7	9/20
Eriogonum microthecum												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	9/17
Gutierrezia sarothrae												
94	**640**	-	40	560	40	60	0	0	6	6	6	5/7
99	**540**	-	100	440	-	-	0	0	0	-	0	5/6
04	**1220**	60	-	1220	-	-	0	0	0	-	0	7/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
94	**20**	-	-	20	-	-	0	0	0	-	0	-/-
99	**60**	-	-	40	20	-	0	0	33	33	33	2/6
04	**20**	-	-	20	-	-	0	0	0	-	0	5/6
Opuntia spp.												
94	**40**	-	-	40	-	-	0	0	0	-	0	2/5
99	**40**	-	-	20	20	-	0	0	50	-	0	-/-
04	**20**	-	-	20	-	-	0	0	0	-	0	3/9
Pediocactus simpsonii												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
94	**20**	-	-	20	-	-	0	0	-	-	0	14/38
99	**20**	-	-	20	-	-	0	0	-	-	0	13/27
04	**40**	-	-	40	-	-	0	0	-	-	0	9/22
Tetradymia canescens												
94	**0**	-	-	-	-	-	0	0	-	-	0	4/8
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	4/9

Trend Study 16C-35-04

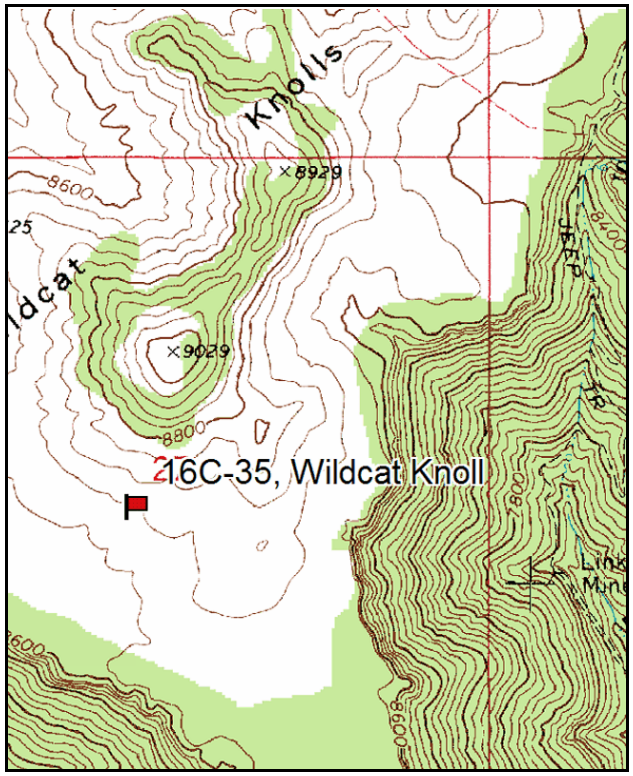
Study site name: Wildcat Knoll . Vegetation type: Mountain Big Sagebrush .

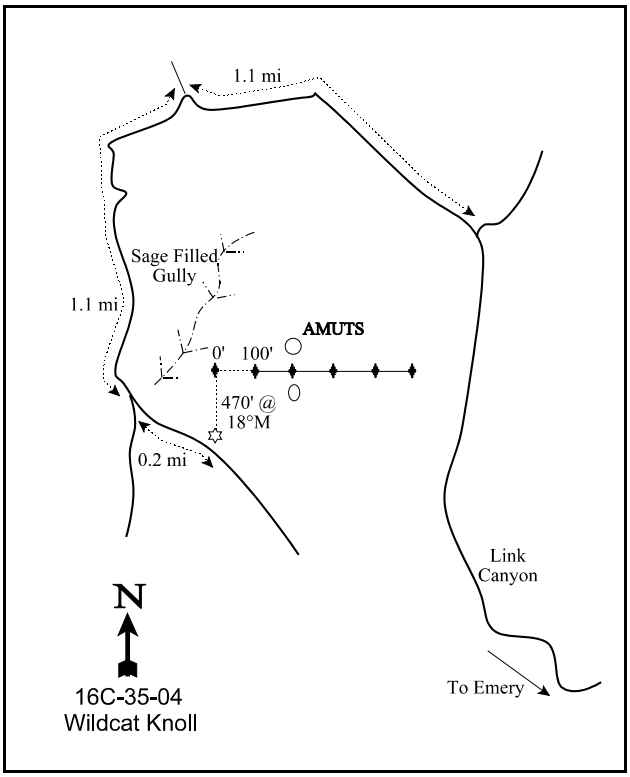
Compass bearing: frequency baseline 95 degrees magnetic.

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

LOCATION DESCRIPTION

From Center St. in Emery, travel west 1.2 miles. Turn right onto a dirt road and proceed for 0.6 miles. Turn left and travel 8.7 miles (1.7 miles from turnoff to site 16C-31). Bear left at the fork and travel 1.1 miles to another fork. Stay left on F.S. #344 for 1.1 miles to another fork (at 0.1 miles on F.S. #344, go left at the fork). At the fork, bear left and travel 0.2 miles to a witness post. From the witness post to the 0 ft baseline stake, walk 470 ft at a bearing of 18°M. The 0 ft stake has browse tag #485 attached.





Map Name: Emery West

Diagrammatic Sketch

Township 21S , Range 5E , Section 27

GPS: NAD 27, UTM 12S 4312157 N, 470096 E

DISCUSSION

Wildcat Knolls - Trend Study No. 16C-35

This Wildcat Knolls study site was established in 1994. It samples a Mountain big and black sagebrush/grass community which is considered important for elk. The site has a general south aspect with a gentle slope of 3-5% at an elevation of 8,700 feet. There is little escape or thermal cover on the site. About half mile away there is good cover provided by Ponderosa pine trees. This area is part of the Emery allotment which is grazed from June 16 to September 30 by 1,387 cows on a 5 pasture rest rotation system. Water is limited here with guzzlers fairly close, about three-qaurters of a mile from the site. Pellet group data from 1999 estimate 9 deer, 109 elk and 29 cow days use/acre (22 ddu/ha, 269 edu/ha, 72 cdu/ha). Pellet group data from 2004 estimate 6 deer, 97 elk, and 30 cow days use/acre (15 ddu/ha, 240 edu/ha, and 73 cdu/ha). Nearly all of the elk and deer pellet groups for both sampled years were from the previous winter, although a few were more recent. Most of the cattle pats appear to be from last season.

Soil depth varies on the site with deeper soils along the shallow ravine corridors where mountain big sagebrush, snowberry, woods rose, and large serviceberry shrubs grow. In between these wetter areas, the soil is more shallow and drier. Black sagebrush and rabbitbrush dominate here. Effective rooting depth averages just over 11 inches along the study site baseline. It has a sandy clay loam texture with a slightly acid pH (6.4). Parent material is limestone. There is little rock and pavement on the surface or in the profile, yet there is a hard compacted layer at about 8 to 12 inches in depth. There is some slight to moderate pedestaling of soil around the base of plants and there is a small gully on the site. However, protective ground cover appears adequate to control most erosion.

There are several varieties of palatable browse on the site including serviceberry, black sagebrush, mountain big sagebrush, antelope bitterbrush, and snowberry. Serviceberry occurs on areas with wetter and deeper soils. Individual serviceberry plants are large, highlined, and mostly unavailable. Mountain big sagebrush dominates the drainage corridors while black sagebrush, dwarf rabbitbrush, and low rabbitbrush dominate the drier areas. It appears that there was a problem identifying dwarf rabbitbrush (*Chrysothamnus depressus*) and low rabbitbrush (*Chrysothamnus viscidiflorus*). Data from 1999 classified most of the rabbitbrush as low rabbitbrush.

Mountain big sagebrush displays light to moderate hedging, good vigor, and low decadency rates. Density of mountain big sagebrush has decreased from 4,500 plants/acre in 1994 and 1999, and down to 2,140 in 2004. The difference between 1999 and 2004 was the number of young plants and the number of decadent plants that died. The density of mature plants has continually decreased since 1994 from 4,060 plants/acre to 2,500 in 1999, and 1,540 in 2004. Drought conditions most likely prevented young plants from becoming established and further increased the rate of death for decadent plants.

Black sagebrush displays light hedging, good vigor, and low decadency rates. Black sagebrush increased from 4,740 plants/acre in 1994 to 8,020 in 1999, and to 3,460 in 2004. The high spike in 1999 was a result of substantial numbers of young plants in the population. The number of young plants decreased from 2,420 plants/acre in 1999 to only 40 in 2004. Density of decadent black sagebrush was 1,360 plants/acre in 1999 and decreased to 280 by 2004. Many of those decadent plants in 1999 died. The number of dead plants increased from 260 plants/acre in 1999 to 1,840 in 2004.

Herbaceous vegetation is diverse and abundant making up 50% of the vegetation cover on the site. Grasses provided 11% cover in 1994, 16% in 1999, and 13% in 2004. The dominant species are mutton bluegrass, letterman needlegrass, and Salina wildrye which provided 34% of the grass cover in 2004. Forbs are diverse yet only a few species are common. The most abundant was an annual goosefoot (*Chenopodium spp.*) that has not been present the past two readings. It provided 65% of the forb cover in 2004.

1994 APPARENT TREND ASSESSMENT

Protective ground cover combined with the gentle terrain prevents serious erosion on the site. Browse species are diverse and abundant. The preferred species appear to have stable populations with low decadency rates and light to moderate utilization. The browse trend appears to be stable with the only negative aspect the abundance of less desirable dwarf rabbitbrush. The herbaceous understory is abundant and diverse. However, the grasses are dominated by the less preferred letterman needlegrass and Salina wildrye. Several more desirable species exist in small numbers including bluebunch wheatgrass, slender wheatgrass, *Carex spp*, Indian ricegrass, and bottlebrush squirreltail. Several desirable forbs are found on the site. The Desirable Components Index (see methods) rated this site as poor to fair with a score of 50 due to good shrub cover, no young shrubs, and moderate grass and forb cover.

winter range condition (DC Index) - 50 (poor to fair) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is considered up slightly. The combination of the ratio of cover to bare soil and decrease in bare soil is enough to warrant a slightly upward change in soil trend. Litter cover has remained similar. The increase in vegetation cover comes primarily from an increase in shrub cover. Trend for browse is up for black sagebrush and stable for mountain big sagebrush. Black sagebrush density has nearly doubled due to a dramatic increase in young plants from 40 to 2,420 plants/acre. Use is heavier, although vigor is good and percent decadence has remained low. Mountain big sagebrush has a stable density with light to moderate use. Vigor remains good and decadency relatively low. The only other common shrub is low rabbitbrush (*Chrysothamnus viscidiflorus*) which was called dwarf rabbitbrush in 1994 (*Chrysothamnus depressus*). Combined density of these shrubs has increased slightly from 12,420 to 13,520 plants/acre. The population is mostly mature and not utilized. Overall, the browse trend is considered up slightly. Trend for the herbaceous understory is down slightly. Cover for grasses and forbs has increased but sum on nested frequency has declined enough to show a slightly downward trend. Nested frequency of Salina wildrye, Carex, mutton bluegrass and letterman needlegrass have declined significantly. The Desirable Components Index (see methods) rated this site as excellent with a score of 84 due to an increase in shrub cover, many young shrubs, and excellent grass and forb cover.

TREND ASSESSMENT
soil - up slightlyen (4)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 84 (excellent) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is down slightly. Percent bare ground increased since 1999, while litter cover decreased. Vegetation remained fairly stable and provides adequate cover of soil, sum of nested for herbaceous cover has declined. Trend for key browse species, black and mountain big sagebrush, is down. The percentage of dead plants for black sagebrush population has increase from 3% in 1999 to 35% in 2004. Mountain big sagebrush has also increased the percentage of dead plants from 8% in 1999 to 29% in 2004. Utilization has decreased for both species and appears to only have light to moderate use. The decrease in the sagebrush populations is the extended drought. The other common specie, low rabbitbrush (*Chrysothamnus viscidiflorus*), has declined in density from 13,400 plants/acre in 1999 to 7,000 in 2004, but still maintains a high density. Trend for herbaceous understory is down slightly. Sum of nested frequency has declined for both perennial grasses and perennial forbs. The sum of frequency for annual forbs greatly increased, but this is an uncommon event and does not have long-term effects on trend. It was mostly because of one species, goosefoot (*Chenopodium*

spp.). It contributed 25% of the herbaceous understory. The Desirable Components Index (see methods) rated this site as fair with a score of 61 due to a decrease in shrub cover, few young shrubs, and good grass and forb cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 61 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 35

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{a}$42	$_{a}$36	$_{b}$74	.13	.34	1.91
G	Agropyron spicatum	$_{a}$3	$_{a}$4	$_{b}$26	.03	.03	.32
G	Carex spp.	99	105	91	.21	.67	.94
G	Elymus salina	$_{b}$253	$_{a}$144	$_{a}$116	4.10	5.76	4.52
G	Oryzopsis hymenoides	$_{ab}$20	$_{a}$11	$_{b}$23	.25	.04	.19
G	Poa fendleriana	$_{b}$177	$_{c}$231	$_{a}$111	1.85	5.41	2.23
G	Sitanion hystrix	11	3	12	.02	.04	.16
G	Stipa comata	$_{a}$-	$_{b}$23	$_{a}$8	-	.56	.36
G	Stipa lettermani	$_{b}$225	$_{a}$145	$_{a}$111	4.43	3.38	2.62
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		830	702	572	11.04	16.26	13.28
Total for Grasses		830	702	572	11.04	16.26	13.28
F	Agoseris glauca	-	8	2	-	.09	.00
F	Antennaria rosea	4	11	-	.06	.36	-
F	Astragalus convallarius	$_{b}$17	$_{a}$8	$_{a}$-	.12	.01	.25
F	Astragalus miser	$_{b}$35	$_{b}$38	$_{a}$9	.57	.93	.19
F	Astragalus spp.	5	9	9	.16	.66	.51
F	Castilleja linariaefolia	$_{b}$38	$_{b}$24	$_{a}$1	.10	.14	.00
F	Calochortus nuttallii	$_{a}$2	$_{a}$6	$_{b}$29	.00	.01	.09
F	Chaenactis douglasii	3	-	4	.00	-	.00
F	Chenopodium spp. (a)	$_{a}$-	$_{a}$-	$_{b}$267	-	-	5.41
F	Cirsium spp.	1	-	-	.00	-	-
F	Crepis acuminata	$_{c}$40	$_{a}$-	$_{b}$17	.14	-	.21
F	Eriogonum alatum	-	3	-	-	.03	-
F	Erigeron eatonii	$_{b}$44	$_{a}$16	$_{a}$8	.12	.09	.04
F	Eriogonum racemosum	44	38	32	.14	.41	.47
F	Eriogonum umbellatum	38	23	28	.40	.51	.26

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Gayophytum ramosissimum(a)	-	-	5	-	-	.01
F	Lappula occidentalis (a)	$_{a}$-	$_{a}$-	$_{b}$16	-	-	.20
F	Linum lewisii	-	6	4	-	.04	.01
F	Lomatium spp.	-	1	-	-	.00	-
F	Lupinus argenteus	1	10	-	.01	.25	-
F	Lygodesmia spp.	-	1	6	-	.03	.06
F	Machaeranthera canescens	6	9	3	.03	.04	.01
F	Machaeranthera grindelioides	-	1	-	-	.03	-
F	Mertensia spp.	8	-	-	.09	-	-
F	Penstemon carnosus	1	1	-	.03	.01	-
F	Penstemon spp.	-	8	5	-	.19	.31
F	Polygonum douglasii (a)	$_{a}$-	$_{a}$-	$_{b}$59	-	-	.12
F	Senecio multilobatus	-	2	2	-	.03	.00
F	Taraxacum officinale	-	3	3	-	.01	.00
F	Townsendia spp.	-	-	3	-	-	.00
F	Zigadenus paniculatus	$_{a}$4	$_{a}$-	$_{b}$17	.00	.00	.06
Total for Annual Forbs		0	0	347	0	0	5.74
Total for Perennial Forbs		291	226	182	2.00	3.91	2.53
Total for Forbs		291	226	529	2.00	3.91	8.27

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

BROWSE TRENDS --
Management unit 16C, Study no: 35

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	1	2	2	1.76	2.29	2.96
B	Artemisia frigida	1	1	1	-	-	-
B	Artemisia nova	58	67	56	3.20	6.18	2.37
B	Artemisia tridentata vaseyana	56	55	42	4.34	6.98	2.93
B	Chrysothamnus depressus	80	5	1	2.73	-	-
B	Chrysothamnus nauseosus hololeucus	2	0	4	-	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	13	88	82	.41	3.90	7.35
B	Eriogonum corymbosum	4	5	5	.03	-	.06
B	Opuntia spp.	3	0	1	.18	.00	.01
B	Purshia tridentata	1	0	2	.63	.38	.15
B	Rosa woodsii	0	2	1	.00	.06	.03
B	Symphoricarpos oreophilus	6	1	1	.60	.15	.03
B	Tetradymia canescens	4	4	3	.03	-	.03
Total for Browse		229	230	201	13.94	19.96	15.98

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 35

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	3.20	2.79
Artemisia nova	-	4.00
Artemisia tridentata vaseyana	-	4.28
Chrysothamnus viscidiflorus viscidiflorus	-	9.05
Eriogonum corymbosum	-	.18
Tetradymia canescens	-	.13

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 35

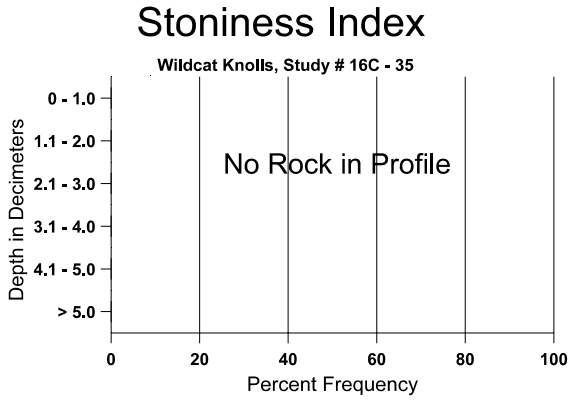
Species	Average leader growth (in) '04
Amelanchier utahensis	3.0
Artemisia tridentata vaseyana	2.2
Purshia tridentata	4.3

BASIC COVER --
Management unit 16C, Study no: 35

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	33.81	43.76	37.09
Rock	.26	.04	.03
Pavement	.12	.13	.80
Litter	47.01	45.68	34.76
Cryptogams	.00	0	0
Bare Ground	30.31	24.97	44.07

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 35, Study Name: Wildcat Knolls

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.4	52.7 (14.8)	6.4	60.0	15.4	24.6	2.7	10.9	182.4	0.5



PELLET GROUP DATA --
Management unit 16C, Study no: 35

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	10	4	5
Elk	65	51	51
Deer	24	5	2
Cattle	7	3	6

Days use per acre (ha)	
'99	'04
-	-
109 (269)	97 (240)
9 (22)	6 (15)
29 (72)	30 (73)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 35

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**20**	-	-	20	-	-	100	0	-	-	0	74/88
99	**40**	60	-	40	-	-	0	50	-	-	0	93/115
04	**40**	-	-	40	-	-	50	0	-	-	0	62/67
Artemisia frigida												
94	**80**	-	-	80	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	-/-
04	**40**	-	-	40	-	-	0	0	-	-	0	-/-
Artemisia nova												
94	**4740**	680	40	4060	640	340	58	0	14	6	6	10/16
99	**8020**	100	2420	4240	1360	260	53	23	17	1	1	8/15
04	**3460**	280	120	3060	280	1840	5	.57	8	5	5	7/11
Artemisia tridentata vaseyana												
94	**4520**	-	60	4060	400	580	77	0	9	1	1	34/36
99	**4560**	400	1500	2500	560	380	46	2	12	4	4	19/29
04	**2140**	220	400	1540	200	880	7	7	9	5	5	21/26
Chrysothamnus depressus												
94	**11160**	60	-	10980	180	20	0	0	2	-	0	3/7
99	**120**	-	20	100	-	-	0	0	0	-	0	4/7
04	**20**	-	-	20	-	-	0	0	0	-	0	-/-
Chrysothamnus nauseosus hololeucus												
94	**60**	-	-	60	-	-	0	0	0	-	0	18/18
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**120**	-	-	100	20	-	33	0	17	17	17	18/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
94	**1260**	-	-	1240	20	-	0	0	2	-	0	7/8
99	**13400**	180	1820	11340	240	40	15	0	2	-	0	5/9
04	**7000**	240	840	6060	100	400	0	0	1	.28	.28	7/11
Eriogonum corymbosum												
94	**100**	-	-	100	-	20	0	0	0	-	0	11/16
99	**160**	-	60	80	20	-	13	0	13	-	0	14/18
04	**140**	-	-	140	-	-	86	0	0	-	0	10/14
Opuntia spp.												
94	**100**	-	20	80	-	-	0	0	-	-	0	3/10
99	**0**	20	-	-	-	-	0	0	-	-	0	-/-
04	**60**	-	-	60	-	-	0	0	-	-	0	2/4
Purshia tridentata												
94	**20**	-	-	-	20	-	100	0	100	-	0	23/26
99	**0**	-	-	-	-	-	0	0	0	-	0	26/69
04	**40**	-	-	40	-	-	0	0	0	-	0	25/55
Rosa woodsii												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	40	120	-	-	-	0	0	-	-	0	-/-
04	**60**	-	60	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
94	**300**	-	-	300	-	-	27	0	-	-	0	13/23
99	**20**	-	-	20	-	-	0	0	-	-	0	20/39
04	**20**	-	-	20	-	-	0	0	-	-	0	16/29
Tetradymia canescens												
94	**140**	-	20	120	-	-	0	0	-	-	0	7/9
99	**120**	-	80	40	-	-	0	33	-	-	0	6/7
04	**100**	-	-	100	-	-	0	0	-	-	0	7/11

Trend Study 16C-36-04

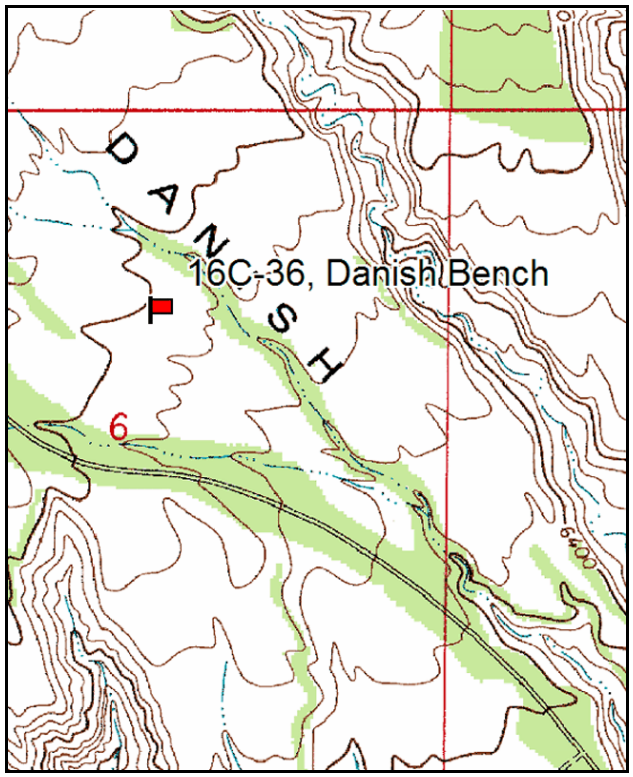
Study site name: Danish Bench . Vegetation type: Chained, Seeded P-J .

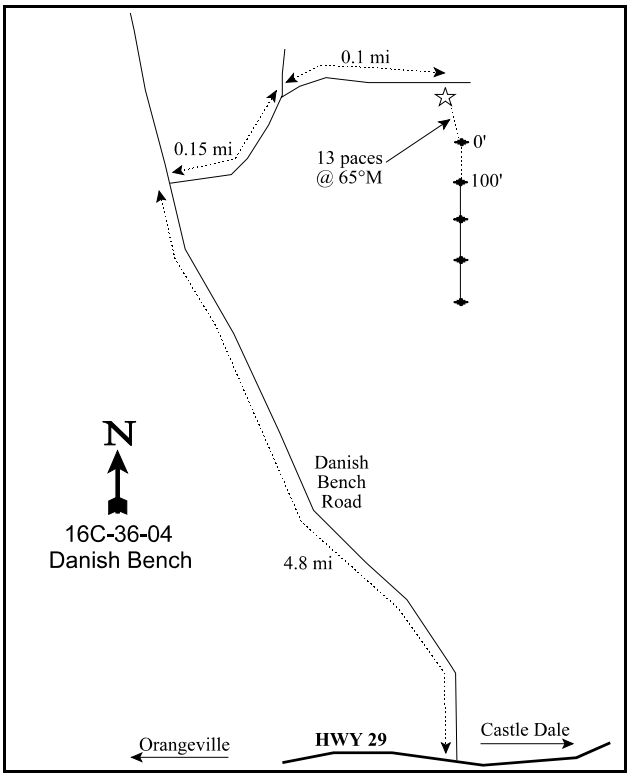
Compass bearing: frequency baseline 95 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 29 between Orangeville and Castle Dale, travel up Danish Bench Road (550 West) 4.8 miles. Turn right and proceed 0.15 miles to a fork in the road. Take the right fork and travel 0.1 mile to a witness post on the right hand side of the road. From the witness post to the 0-foot baseline stake, walk 13 paces at 65°M.





Map Name: Red Point

Diagrammatic Sketch

Township 18S , Range 8E , Section 6

GPS: NAD 27, UTM 12S 4348601 N, 494383 E

DISCUSSION

Danish Bench - Trend Study No. 16C-36

Danish Bench was established in 1994, replacing study16C-16, Church Mine Road, which has shown little wildlife use over the past several years. The new site is about one-half mile north and is more representative of important big game winter range in the area. This study also samples a seeded pinyon-juniper chaining similar to the Church Mine road study. The aspect is south with a gentle slope of 5%. Elevation is approximately 6,530 feet. Pellet group data from 1999 estimated 17 deer, 76 elk and 12 cow days use/acre (42 ddu/ha, 188 edu/ha, 30 cdu/ha). Moderate elk use was also estimated in 2004 with 43 elk days use/acre (106 edu/ha) estimated. The area is on land administered by the BLM and lies within the Wilberg grazing allotment which allows 89 cows to graze from November 1 to December 15 and again from April 16 to June 15 on two pastures.

The soil is moderately shallow and rocky with some large rocks on the surface and within the soil profile. Effective rooting depth is estimated at almost 13 inches. Soil texture is a sandy clay loam with a slightly alkaline pH (7.5). Percent organic matter is limited at only 1.8%. Phosphorus is also marginal at 7.8 ppm. Values less than 10 ppm can limit plant growth and development. Rock and pavement cover are high averaging 25% in 1994 and 44% in 2004. Litter cover is relatively low, estimated at only 24% in 1994 and 18% in 2004. There is a considerable amount of unprotected bare soil on the site. Total vegetation cover is low at only 17% to 18%. There is some localized soil movement noticeable, yet erosion is minimal due to the gentle terrain and adequate protective ground cover. The erosion condition class determined soil movement as slight in 2004.

The dominant browse on the site consists of a moderately low population of black sagebrush. Density has increased slightly from 1,540 plants/acre estimated in 1994 to 1,860 in 2004. Vigor has been good during all readings and the number of decadent plants have been low. Utilization was light in 1994 but moderate to heavy in 1999 and 2004. Small numbers of other desirable shrubs occur on the site. These include true mountain mahogany, green ephedra, cliffrose, and antelope bitterbrush. Mahogany and bitterbrush are heavily browsed, while use of cliffrose and ephedra have been moderate to heavy. Juniper and pinyon trees are increasing on the site. They provided 33% of the browse cover in 2004. Point-center quarter data from 2004 estimated an average of 110 juniper and 54 pinyon trees/acre. Average diameter of the juniper was estimated at 2.2 inches while pinyon averaged 2.6 inches. Data shows a stable population of pinyon and juniper. About half of the juniper and pinyon trees are in the around 4 feet in height.

The herbaceous understory is poor and has produced only 8% to 9% total cover on the site during any reading. Crested wheatgrass accounted for 66% of the grass cover in 1994 and 92% in 1999. Drought conditions have caused a major decline in cover and abundance for crested wheatgrass by 2004. It accounted for only 18% of the total grass cover in 2004 with a cover value of less than 1%. Indian rice grass is also fairly abundant. Total grass cover has ranged from a high of only 8% in 1994 to just under 4% in 2004. Forbs are insignificant. They made up just over 1% total cover in 1994 and 1999, increasing to nearly 4% in 2004. Common perennial species include golden cryptantha, greenthread, hoary townsendia, and fendler euphorbia.

1994 APPARENT TREND ASSESSMENT

Protective ground cover seems well distributed and erosion is currently minimal. Further increases in tree density will come at the cost of herbaceous plants. This will eventually increase the erosion problems on this site. The browse component contains several preferred species of shrubs yet none are very abundant. Black sagebrush is the only abundant shrub and the trend for this species appears stable due to a good young recruitment, low decadency, and light utilization. The herbaceous understory is diverse but not very abundant. The Desirable Components Index (see methods) rated this site as very poor with a score of 32 due to low shrub cover, few young shrubs, high decadence, and moderate grass cover.

winter range condition (DC Index) - 32 (very poor) Black sagebrush - chaining type

1999 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1994. There is some localized erosion occurring but it is not serious due to the gentle terrain combined with the well distributed protective ground cover. Trend for browse is also stable. Black sagebrush has increased slightly in density, while showing heavier use. Green ephedra provides some additional browse forage on the site. It has increased from 60 to 340 plants/acre since 1994. Use is moderate to heavy with vigor poor on 35% of the plants sampled There are several other shrub species on the site yet they occur in very small numbers. Trend for the herbaceous understory is stable but poor. Total cover of grasses and forbs is only 9%. Sum of nested frequency for perennial grasses has declined slightly while frequency of forbs has increased. Crested wheatgrass is still dominant and currently provides 92% of the grass cover and 78% of the herbaceous cover. Indian ricegrass was moderately abundant in 1994, although it has since declined in nested frequency. Forbs are insignificant and currently provide only about 1% cover. Several new species were encountered in 1999. The Desirable Components Index rated this site as very poor with a score of 33 due to low shrub cover, few young shrubs, high decadence, and moderate grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 33 (very poor) Black sagebrush - chaining type

2004 TREND ASSESSMENT

Trend for soil remains stable with similar ground cover characteristics compared to 1999. One negative aspect is the decline in perennial grass cover and a very slight decline in the ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground. There is some localized erosion occurring and the erosion condition class determined erosion as slight. Trend for browse is stable. The key browse species, black sagebrush has increased slightly in density, vigor is good, and decadence low. Utilization remains moderate to heavy. Green ephedra is of secondary importance. It provides 19% of the total browse cover and has increased in density to 580 plants/acre. Age class analysis indicates an expanding population. Other desirable shrubs, true mountain mahogany, cliffrose, and bitterbrush, occur in very low numbers. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses declined substantially due to a significant decline in the nested frequency of crested wheatgrass. Average cover of crested wheatgrass declined ten-fold from a cover value of nearly 7% to less than 1%. Nested frequency of Indian rice grass increased significantly. Perennial forbs increased in sum of nested frequency and cover rose from 1.3% to nearly 4%. The composition is diverse but common species, golden cryptantha, greenthread, hoary townsendia, and fendler euphorbia provide little forage. Total herbaceous cover remained stable at about 8%, but the overall trend is considered down due to the loss of the primary grasses, crested wheatgrass. Declines in crested wheatgrass have been noted on several trend study sites in the state due to the severe drought conditions of the past several years. The Desirable Components Index (see methods) rated this site as poor with a score of 43 due to low shrub cover, several young shrubs, moderate decadence, and a decrease in grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down (1)
winter range condition (DC Index) - 43 (poor) Black sagebrush - chaining type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 36

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{b}$279	$_{b}$299	$_{a}$33	5.41	6.72	.68
G	Agropyron intermedium	3	-	-	.00	-	-
G	Elymus junceus	5	3	6	.00	.15	.06
G	Elymus salina	2	-	4	.06	-	1.00
G	Oryzopsis hymenoides	$_{ab}$54	$_{a}$29	$_{b}$67	2.64	.41	2.08
G	Sitanion hystrix	5	-	-	.01	-	.00
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		348	331	110	8.14	7.28	3.84
Total for Grasses		348	331	110	8.14	7.28	3.84
F	Caulanthus crassicaulis	12	2	1	.04	.01	.03
F	Chenopodium fremontii (a)	$_{a}$-	$_{a}$-	$_{b}$25	-	-	.05
F	Cryptantha confertiflora	$_{b}$53	$_{a}$15	$_{b}$38	1.23	.28	.52
F	Descurainia pinnata (a)	-	-	20	-	-	.09
F	Eriogonum alatum	9	11	18	.03	.12	.11
F	Euphorbia fendleri	21	15	27	.04	.04	.35
F	Gilia spp. (a)	$_{a}$-	$_{a}$1	$_{b}$42	-	.00	.40
F	Hymenoxys acaulis	$_{a}$23	$_{b}$35	$_{a}$20	.08	.32	.08
F	Leucelene ericoides	-	4	-	-	.06	-
F	Machaeranthera grindelioides	-	3	-	-	.03	-
F	Medicago sativa	-	-	2	-	-	.03
F	Penstemon spp.	$_{a}$-	$_{b}$20	$_{a}$-	-	.07	-
F	Penstemon pachyphyllus	8	2	10	.03	.00	.03
F	Schoencrambe linifolia	-	2	-	-	.00	.00
F	Thlaspi montanum	-	3	-	-	.00	-
F	Thelesperma subnudum	$_{a}$7	$_{ab}$16	$_{b}$27	.01	.08	.18
F	Townsendia incana	$_{a}$-	$_{b}$68	$_{c}$122	-	.26	2.24
F	Unknown forb-perennial	4	-	4	.01	-	.18
Total for Annual Forbs		0	1	87	0	0.00	0.55
Total for Perennial Forbs		137	196	269	1.48	1.30	3.76
Total for Forbs		137	197	356	1.48	1.30	4.32

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

BROWSE TRENDS --
Management unit 16C, Study no: 36

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	18	21	22	1.16	1.79	3.58
B	Cercocarpus montanus	1	1	1	1.08	.78	.63
B	Chrysothamnus viscidiflorus	0	0	1	-	-	-
B	Cowania mexicana stansburiana	0	0	1	-	-	.15
B	Ephedra viridis	2	9	9	2.01	1.77	2.29
B	Eriogonum microthecum	29	26	40	.09	.07	.60
B	Gutierrezia sarothrae	0	5	31	-	.04	.71
B	Juniperus osteosperma	0	5	4	2.76	2.77	3.57
B	Opuntia spp.	0	0	1	-	-	-
B	Pinus edulis	0	2	2	.15	.38	.38
B	Purshia tridentata	3	1	0	.00	.15	-
B	Yucca harrimaniae	2	2	2	.63	-	.03
Total for Browse		55	72	114	7.92	7.77	11.97

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 36

Species	Percent Cover	
	'99	'04
Artemisia nova	-	2.46
Cercocarpus montanus	-	1.13
Cowania mexicana stansburiana	-	.15
Ephedra viridis	-	1.89
Eriogonum microthecum	-	.18
Gutierrezia sarothrae	-	1.83
Juniperus osteosperma	.80	3.18
Pinus edulis	-	.55

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 36

Species	Average leader growth (in)
	'04
Artemisia nova	1.5
Cercocarpus montanus	4.4

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 36

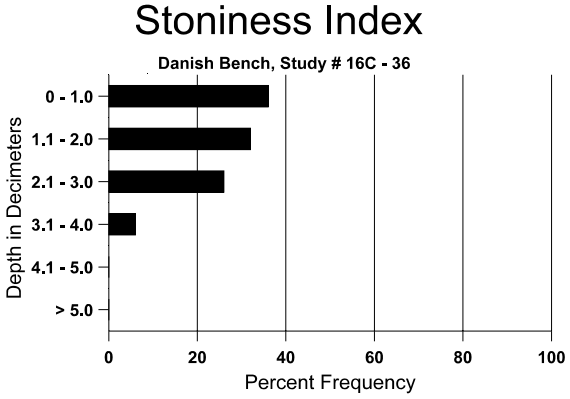
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	110	110	2.6	2.4
Pinus edulis	56	54	2.0	2.6

BASIC COVER --
Management unit 16C, Study no: 36

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	16.53	17.78	18.81
Rock	16.90	13.17	13.60
Pavement	7.61	16.29	30.38
Litter	23.86	20.95	17.67
Cryptogams	.06	1.53	.01
Bare Ground	29.31	30.11	29.64

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 36, Study Name: Danish Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.8	63.7 (14.0)	7.5	56.0	21.4	22.6	1.8	7.8	140.8	0.9



PELLET GROUP DATA --
Management unit 16C, Study no: 36

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'99	'04	'99	'04
Rabbit	36	29	24	-	-
Elk	22	57	41	76 (188)	43 (106)
Deer	19	10	16	17 (42)	5 (12)
Cattle	-	3	-	12 (30)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 36

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
94	**1540**	20	220	1320	-	20	3	0	0	-	0	11/19
99	**1700**	-	380	1100	220	20	42	12	13	1	1	6/16
04	**1860**	560	100	1580	180	20	68	10	10	8	8	7/18
Cercocarpus montanus												
94	**20**	-	-	20	-	-	0	100	0	-	0	46/55
99	**20**	20	-	20	-	-	100	0	0	-	0	50/55
04	**20**	-	-	-	20	-	0	100	100	100	100	46/50
Chrysothamnus viscidiflorus												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	6/9
Cowania mexicana stansburiana												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	11/23
04	**20**	-	-	20	-	-	100	0	-	-	0	19/25
Echinocereus spp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	6/17
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Ephedra viridis												
94	**60**	-	-	60	-	-	0	0	0	-	0	31/46
99	**340**	-	40	260	40	20	29	29	12	6	35	32/42
04	**580**	-	200	300	80	-	38	21	14	10	14	33/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum microthecum												
94	**1880**	60	100	1740	40	-	0	0	2	-	0	2/4
99	**1160**	40	140	980	40	20	7	7	3	2	2	1/3
04	**2320**	280	140	2140	40	20	29	9	2	-	0	2/3
Gutierrezia sarothrae												
94	**0**	-	-	-	-	-	0	0	-	-	0	7/9
99	**460**	140	340	120	-	-	0	0	-	4	0	4/4
04	**5080**	-	440	4640	-	20	1	0	-	-	0	6/9
Juniperus osteosperma												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	80	40	-	40	0	0	-	17	0	-/-
04	**80**	-	40	40	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	6/10
Opuntia spp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	4/12
99	**0**	-	-	-	-	-	0	0	-	-	0	4/16
04	**20**	-	-	20	-	-	0	0	-	-	0	4/17
Pinus edulis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	20	40	-	-	-	0	0	-	-	50	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
94	**60**	-	-	60	-	-	0	0	-	-	0	19/22
99	**20**	-	-	20	-	-	0	100	-	-	0	19/22
04	**0**	-	-	-	-	-	0	0	-	-	0	4/16
Yucca harrimaniae												
94	**80**	-	-	80	-	-	0	0	-	-	0	14/25
99	**40**	-	-	40	-	100	0	0	-	-	0	9/12
04	**100**	-	100	-	-	-	0	0	-	-	0	-/-

Trend Study 16C-37-04

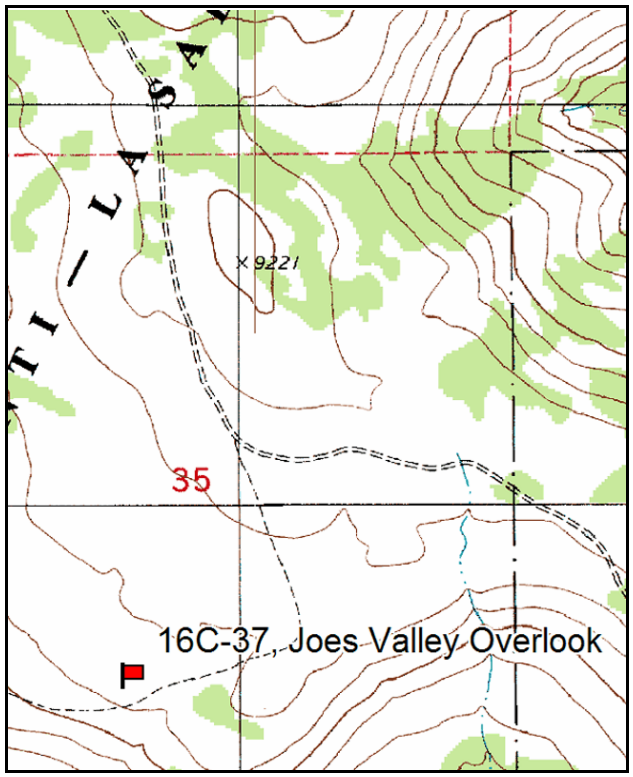
Study site name: Joes Valley Overlook . Vegetation type: Mixed Mountain Brush .

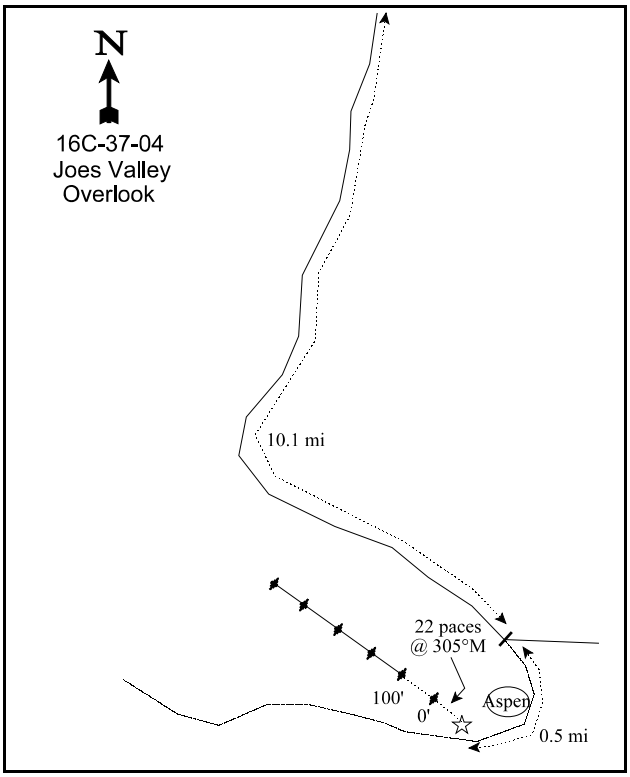
Compass bearing: frequency baseline 285 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of Cottonwood Canyon (#040) road and Trail Mountain road, travel south 10.1 miles to a cattleguard. From the cattleguard continue 0.5 miles to a witness post. From the witness post to the 0-foot baseline stake, walk 22 paces at a bearing of 305°M. The stake has browse tag #28 attached. The witness post is a tall post on a dirt mound near the end of a contour trench.





Map Name: Mahogany Point

Diagrammatic Sketch

Township 17S , Range 6E , Section 35

GPS: NAD 27, UTM 12S 4349533 N, 481707 E

DISCUSSION

Joe's Valley Overlook - Trend Study No. 16C-37

The Joe's Valley Overlook study site was established in 1994 which monitors a mixed mountain brush community on a ridge east of Joe's valley reservoir and above Cottonwood Creek. The area is administered by the Forest Service. The site has a slope of about 13% with a west-southwest aspect. Elevation is approximately 8,900 feet. The area has been contour trenched in the past and seeded. The area has been closed to cattle grazing since the contour treatment, but some trespass is occurring. Deer and elk use this site during the spring and summer. Pellet group data from 1999 estimate 9 deer, 83 elk and 20 cow days use/acre (22 ddu/ha, 205 edu/ha, 49 cdu/ha). Most of the cattle pats are from last season, but cows were grazing the area when visited in 1999. Most of the elk and deer pellet groups appear to be several months old. Pellet group data from 2004 estimate 5 deer, 72 elk, and 22 cow days use/acre (12 ddu/ha, 177 edu/ha, and 54 cdu/ha). Most of the cattle pats are from last season.

Soil on the site is moderate deep with an effective rooting depth estimated at just over 16 inches. Texture is a clay with a slightly alkaline pH (7.4). Phosphorus is limited at only 5.5 ppm. Values less than 10 ppm can limit normal plant growth and development. Rock and pavement are fairly abundant on the surface and in the profile. Percent bare ground is relatively high and there is some erosion occurring but it is limited to the areas between contoured terraces. The erosion condition class determined soil movement as stable in 2004.

A variety of browse species occur on the site including serviceberry, mountain big sagebrush, low rabbitbrush, and snowberry. This site was chosen in part, to monitor a sparse and perceived declining population of mountain mahogany. This is a marginal site for true mountain mahogany because it is above its normal elevation range which is normally 5,000 to 7,000 feet. A few scattered individuals in the 4 to 6 foot range grow in the area, but none were sampled by the nested frequency belts or in the shrub density strips. The key browse species on the site consist of a moderately dense stand of mountain big sagebrush. This mostly mature population has adequate numbers of seedlings and young, a low decadency rate, and moderate to heavy utilization. Density has slightly increased from 2,460 plants/acre in 1994 to 3,080 in 2004. Snowberry is also abundant. The mostly mature population was moderately utilized in 1994 but has only been lightly used since. A small population of three foot tall heavily hedged serviceberry also grow on the site.

Due to the elevation and heavy elk and cattle use, the herbaceous understory is considered the key element of this site. Grasses and forbs combined accounted for 53% of the vegetative cover in 1994, 52% in 1999, and 39% in 2004. This site was apparently seeded in the past. Seeded grasses include: crested wheatgrass, intermediate wheatgrass and smooth brome which occur on the site, but the most abundant grass is Salina wildrye which provided 67% of the grass cover in 1994, 44% in 1999, and 44% in 2004. Smooth brome is the most common seeded species. It grows in thick patches along the contoured trenches. Use of the grasses is heavy in places, especially within the contoured trenches. Forbs are diverse and contain several desirable species, yet many of the common forbs are low growing species like mat penstemon. Alfalfa, a seeded forb, was found in small numbers during all readings.

1994 APPARENT TREND ASSESSMENT

Ground cover characteristics are adequate to protect the soil. Vegetation cover appears low for a mountain brush site, but herbaceous vegetation which is more effective at holding the soil in place, accounts for over half of that cover. The browse trend appears stable for all species due to adequate reproductive potentials, low decadency rates, and light to moderate utilization. The herbaceous composition is dominated by the less desirable Salina wildrye which makes up 67% of the grass cover. Continuous heavy grazing in early summer on the more preferred species will only increase the dominance of this grass.

1999 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of bare ground and litter have remained similar to 1994 estimates. There is some localized erosion occurring but the trenches on contour have minimized its effects. Trend for browse is stable. Use of the key mountain big sagebrush is heavier but vigor remains normal, recruitment has improved, and percent decadence is relatively low at 25%. Snowberry displays lighter use. Density has declined yet cover has increased and strip frequency has remained similar to 1994 estimates. The change in density may be due to the difficulty in identifying individual plants of this rhizomatous shrub. Trend for the herbaceous understory is considered stable. Sum of nested frequency for perennial grasses and forbs have increased slightly, but not enough to show a change in trend. Composition has improved since 1994. Nested frequency of the less desirable Salina wildrye declined significantly, while frequency of crested wheatgrass, smooth brome, and pinewoods needlegrass increased significantly. Forbs are diverse with a few desirable species represented, but many of the common forbs are low in value and low growing.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

2004 TREND ASSESSMENT

Trend for soil is considered stable. Percent bare ground relative cover has increased from 28% in 1994 and 1999, to 34% in 2004. Litter and vegetation both decreased slightly in cover, but nested frequency remained similar to 1999 values. Rock and pavement cover has slightly increased suggest some localized erosion is still continuing. Trend for key browse specie, mountain sig sagebrush is stable. The population has remained at about 3,000 plants/acre. Percent decadence has increased slightly, but young recruitment remains high enough to compensate for dying shrubs. Utilization is heavier than previous years, but vigor remains good. Snowberry populations appear to be stable and hedging continues to remain light. Trend for herbaceous understory is down slightly. Sum of nested frequency and percent cover for grasses have decreased from 44% of total vegetation cover in 1994, 36% in 1999, and 27% in 2004. Nested frequency of bluebunch wheatgrass and intermediate wheatgrass, both natives, increased significantly, mutton bluegrass and Salina wildrye decreased. Forbs remain diverse, but provide little cover and many are low growing species.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 16C, Study no: 37

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron cristatum	$_{a}$31	$_{b}$59	$_{a}$32	.46	.81	.45
G	Agropyron intermedium	$_{a}$5	$_{a}$11	$_{b}$27	.02	.04	.24
G	Agropyron spicatum	$_{a}$16	$_{a}$22	$_{b}$97	.40	.31	2.29
G	Bromus inermis	49	83	74	.93	2.54	1.80
G	Carex spp.	9	7	3	.21	.33	.15

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Elymus cinereus	6	5	-	.15	.15	-
G	Elymus salina	$_{b}$239	$_{a}$185	$_{a}$158	8.26	5.36	4.14
G	Poa fendleriana	$_{b}$114	$_{b}$96	$_{a}$16	1.50	1.75	.19
G	Poa secunda	5	-	-	.04	-	-
G	Stipa pinetorum	$_{a}$24	$_{b}$58	$_{a}$16	.34	.86	.21
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		498	526	423	12.35	12.18	9.51
Total for Grasses		498	526	423	12.35	12.18	9.51
F	Androsace septentrionalis (a)	$_{a}$-	$_{b}$38	$_{a}$7	-	.11	.06
F	Arenaria fendleri	$_{b}$24	$_{b}$31	$_{a}$8	.15	.44	.13
F	Astragalus convallarius	3	-	7	.00	-	.39
F	Astragalus miser	10	11	7	.31	.33	.21
F	Astragalus tenellus	8	6	2	.04	.15	.03
F	Astragalus spp.	-	3	-	-	.15	-
F	Astragalus utahensis	-	-	3	-	-	.03
F	Chaenactis douglasii	-	7	2	-	.04	.03
F	Erigeron eatonii	2	3	-	.00	.01	-
F	Eriogonum umbellatum	12	17	8	.12	.25	.13
F	Hymenoxys richardsonii	33	41	55	.58	.78	.82
F	Lesquerella spp.	-	4	5	-	.03	.03
F	Lomatium spp.	-	4	-	-	.01	-
F	Lupinus argenteus	8	5	3	.15	.15	.38
F	Machaeranthera canescens	-	-	4	-	-	.06
F	Medicago sativa	13	7	6	.02	.18	.18
F	Penstemon caespitosus	$_{a}$41	$_{b}$79	$_{ab}$55	.52	2.25	1.22
F	Penstemon spp.	3	-	-	.03	-	-
F	Phlox austromontana	48	41	54	.51	.27	.60
F	Potentilla spp.	$_{a}$3	$_{b}$11	$_{a}$4	.00	.11	.01
F	Schoencrambe linifolia	-	2	3	-	.00	.00
F	Senecio multilobatus	-	2	3	-	.00	.03
F	Unknown forb-annual (a)	1	-	-	.03	-	-
F	Unknown forb-perennial	7	-	-	.04	-	-
Total for Annual Forbs		1	38	7	0.03	0.11	0.06
Total for Perennial Forbs		215	274	229	2.51	5.20	4.32
Total for Forbs		216	312	236	2.54	5.32	4.38

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

BROWSE TRENDS --
Management unit 16C, Study no: 37

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	11	8	9	.56	.67	.63
B	Artemisia nova	0	2	2	-	.38	.30
B	Artemisia tridentata vaseyana	65	69	72	8.76	8.75	12.26
B	Chrysothamnus depressus	20	14	23	.07	.39	.72
B	Chrysothamnus viscidiflorus viscidiflorus	26	33	39	.43	.29	.58
B	Gutierrezia sarothrae	0	1	11	-	.01	.06
B	Pinus flexilis	-	-	-	-	.38	-
B	Symphoricarpos oreophilus	51	50	55	3.55	5.61	7.31
B	Tetradymia canescens	2	3	4	.03	.15	.01
Total for Browse		175	180	215	13.42	16.64	21.88

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 37

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	-	1.64
Artemisia tridentata vaseyana	-	13.36
Chrysothamnus depressus	-	.50
Chrysothamnus viscidiflorus viscidiflorus	-	2.18
Gutierrezia sarothrae	-	.15
Pinus flexilis	3.00	2.59
Symphoricarpos oreophilus	-	7.84

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 37

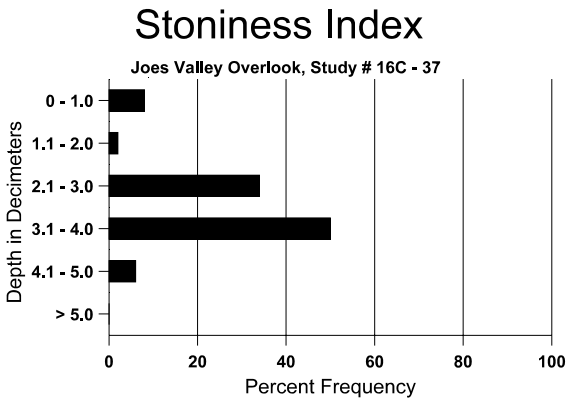
Species	Average leader growth (in)
	'04
Amelanchier utahensis	4.1
Artemisia tridentata vaseyana	2.5

BASIC COVER --
Management unit 16C, Study no: 37

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	28.10	35.87	35.57
Rock	4.41	1.75	2.28
Pavement	.48	7.40	8.17
Litter	31.17	35.45	34.20
Cryptogams	0	.00	0
Bare Ground	25.37	32.34	40.47

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 37, Study Name: Joes Valley Overlook

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.2	46.3 (16.5)	7.4	26.0	29.4	44.6	2.8	5.5	108.8	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 37

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	25	14	17
Elk	40	40	54
Deer	19	7	11
Cattle	1	3	4

Days use per acre (ha)	
'99	'04
-	-
83 (205)	72 (177)
9 (22)	5 (12)
20 (49)	22 (54)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 37

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**280**	-	40	240	-	-	36	21	-	-	0	31/39
99	**180**	-	-	180	-	-	78	22	-	-	0	30/35
04	**180**	-	40	140	-	-	11	78	-	-	0	28/39
Artemisia nova												
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**40**	-	-	40	-	20	50	0	0	-	0	7/15
04	**40**	-	-	20	20	20	0	0	50	-	0	9/24
Artemisia tridentata vaseyana												
94	**2460**	20	80	1880	500	780	30	0	20	3	3	17/32
99	**2960**	260	460	1760	740	620	39	24	25	5	5	17/29
04	**3080**	20	400	1740	940	420	50	29	31	10	10	14/27
Chrysothamnus depressus												
94	**800**	-	40	720	40	-	3	0	5	-	0	4/8
99	**560**	-	20	460	80	-	32	29	14	7	7	2/7
04	**880**	-	-	880	-	20	34	34	0	-	0	4/11
Chrysothamnus viscidiflorus viscidiflorus												
94	**1240**	-	20	1180	40	-	8	6	3	-	2	6/10
99	**1300**	-	80	1120	100	-	18	5	8	3	3	7/10
04	**1640**	-	-	1640	-	-	16	2	0	-	0	7/13
Gutierrezia sarothrae												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	-/-
04	**300**	-	-	300	-	-	0	0	-	-	0	7/10
Symphoricarpos oreophilus												
94	**3120**	-	40	3060	20	-	41	3	1	-	0	13/25
99	**2300**	100	220	2080	-	-	4	0	0	-	3	13/28
04	**2840**	-	180	2660	-	-	15	2	0	-	0	10/23
Tetradymia canescens												
94	**40**	-	20	20	-	-	0	0	-	-	0	9/7
99	**60**	-	20	40	-	-	33	0	-	-	0	4/7
04	**120**	-	40	80	-	-	0	17	-	-	0	8/10

Trend Study 16C-40-04

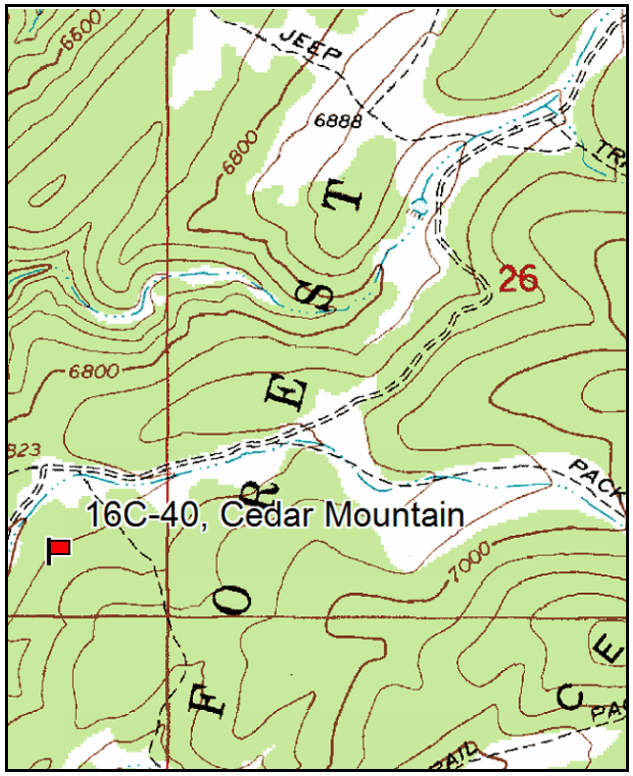
Study site name: Cedar Mountain . Vegetation type: Chained, Seeded, PJ .

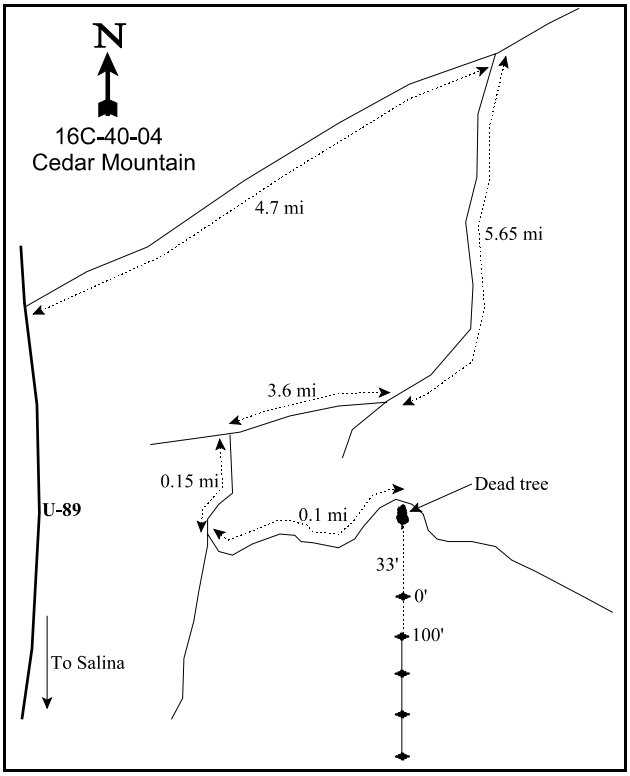
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From mile marker 198 on U-89 north of Salina, take the Willow Creek Road east for 4.7 miles to a fork near a reservoir. Turn right and go south along the dike. Continue on this road for 5.65 miles up switchbacks to the top of the hill and southwest along the top until the road forks. Take the right fork through some oak and juniper and across a chained area, staying on the main road for 3.6 miles until coming to a fork. Turn left and proceed down the bottom of the draw 0.15 miles southwest to another fork. Turn left and go uphill 0.1 miles to the second bend to the right. The frequency baseline starts 33 feet south of the road beyond a large dead tree. The transect is marked by rebar approximately 2 feet tall. The 0-foot baseline stake has a red browse tag number 7039 attached.





Map Name: Salina, Utah

Diagrammatic Sketch

Township 21S , Range 1E , Section 27

GPS: NAD 27, UTM 12S 4310983 N, 432580 E

DISCUSSION

Cedar Mountain - Trend Study No. 16C-40

The Cedar Mountain study is located on a high plateau east of Salina. Elevation is 6,800 feet with a west aspect and a 15% slope. The area was chained in 1979-80 and seeded with a mixture of grasses, forbs, and browse species by the Forest Service. These juniper-pinyon slopes were heavily grazed by domestic sheep in the past. Since the chaining, there has been no grazing and the grasses have responded with good forage production. Pellet group data from 1999 estimate only 10 deer and 34 elk days use/acre (25 ddu/ha, 84 edu/ha). Rabbit pellets are common. Most of the elk pellet groups were from early spring. Pellet group data from 2004 estimate 4 deer, and 37 elk days use/acre (10 ddu/ha and 93 edu/ha). Elk use was from previous winter. Good hiding and thermal cover exists in the unchained draw bottoms and islands of pinyon-juniper trees.

The soil is productive and relatively deep. Effective rooting depth is estimated at just over 14 inches. Soil texture is a clay loam with a slightly alkaline pH (7.6). Percent organic matter is relatively high at 5.4%, but phosphorus is limited at only 5.1 ppm. Values for phosphorus less than 10 ppm can limit normal plant growth and development. Erosion is minimal due to a vigorous stand of sod-forming perennial grasses and an abundance of litter from chaining is also common and well distributed.

There are few browse species present. Mature juniper and pinyon, averaging 8 to 12 feet in height, dominate the site by providing basically all of the browse cover. They are vigorous, producing seeds, and are not utilized. Point quarter data from 1999 estimate 44 pinyon and 90 juniper trees/acre and 2004 estimated 46 pinyon and 84 juniper trees/acre. Average diameter of pinyon in 1999 was 3.7 inches and juniper was 4.8 inches. In 2004 average diameter was 3.4 inches for pinyon and 4.5 for juniper. About 15% of the juniper trees in 1999 were tipped-over trees and still living, while only 5% in 2004. There are a few black sagebrush, rabbitbrush, and Gambel oak on the site which all display light use except black sagebrush had moderate use in 2004. Nearby, some mature mountain big sagebrush and mountain mahogany also have survived the chaining. These plants are also vigorous and only lightly browsed. Big sagebrush, bitterbrush, and fourwing saltbush were supposedly seeded, but no established plants were observed.

Grasses dominant the site by providing 71% of the total vegetative cover in 1999 and 68% in 2004. Intermediate wheatgrass is the most abundant and it produces 61% of the grass cover in 1999 and 64% in 2004. Other abundant grasses are smooth brome and crested wheatgrass. There are a few other grass species present, although they occur in very small numbers. Forbs are scarce. Alfalfa and small burnet were not found on the transect in 1985 or 1991, but a few were observed nearby indicating spotty establishment of forbs. Some alfalfa was encountered in 1999.

1985 APPARENT TREND ASSESSMENT

The soil has stabilized and trend appears upward for herbaceous species since the chaining. The seeding was successful in establishing a vigorous stand of grasses. Big game use could be enhanced by interseeding more browse and forb species.

1991 TREND ASSESSMENT

The data indicates a continued upward trend for the herbaceous species. Intermediate wheatgrass, crested wheatgrass, and smooth brome have the following quadrat frequency values; 91%, 51%, and 52%. Shrubs are still in very low numbers, but will increase in time. The soil trend is stable.

TREND ASSESSMENT
soil - stable (3)
browse - up (5)
herbaceous understory - up (5)

1999 TREND ASSESSMENT

Trend for soil is considered stable. Percent cover of bare ground has declined from 18% to 10%, however litter cover has also declined. Overall, erosion is minimal. Trend for browse is stable but useful shrubs are nearly absent on the site. The only common browse are released pinyon and juniper trees which are currently about 8 to 10 foot tall. There are only a few black sagebrush and Gambel oak sampled on the site. Shrubs will never be abundant on the site unless they are seeded or planted. Pinyon and juniper trees will continue to increase in size and density until they regain dominance. The abundant herbaceous understory will slow this transition, but the only thing that will reverse it is a burn or some other treatment to control the trees. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses is down slightly. The most abundant species, crested and intermediate wheatgrass, and smooth brome, have remained at similar levels compared to 1991. Forbs are lacking and have declined in sum of nested frequency. Some seeded alfalfa was encountered. The more abundant species are annuals or low value, low growing species. The Desirable Components Index (see methods) rated this site as fair with a score of 27 due to minimal shrub cover, few young shrubs, but good grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 27 (fair) Black sagebrush - chaining type

2004 TREND ASSESSMENT

Trend for soil is down. Percent relative cover of bare ground increased from 10% in 1999 to 28% in 2004. The amount of protective cover has decreased and rock and pavement cover has increased suggesting continued erosion. Trend for browse species is stable. No key browse species really exist on this site. A few black sagebrush have moderate use and percent decadence has increase from 0% in 1999 to 67% in 2004, but otherwise pinyon and juniper dominate this site. Pinyon and juniper trees will continue to increase in size and density until they regain dominance. The abundant herbaceous understory will slow this transition, but the only thing that will reverse it is a burn or some other treatment to control the trees. Trend for herbaceous understory is down slightly. Sum of nested frequency of grasses has decreased while cover has remained relatively the same. Both crested wheatgrass and smooth brome decreased significantly in nested frequency. Forbs are fairly diverse, but so minimal that they contribute very little to vegetation cover. The Desirable Components Index rated this site as fair with a score of 30 due to minimal shrub cover, no young shrubs, but good grass cover.

TREND ASSESSMENT
soil - down (1)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 30 (fair) Black sagebrush - chaining type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 40

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{b}$111	$_{b}$116	$_{b}$144	$_{a}$63	3.20	2.65
G	Agropyron intermedium	248	274	235	255	7.69	9.14
G	Agropyron spicatum	$_{a}$-	$_{b}$34	$_{a}$8	$_{a}$2	.21	.38
G	Bromus inermis	$_{ab}$113	$_{bc}$137	$_{c}$161	$_{a}$90	1.31	1.72
G	Elymus junceus	-	1	2	-	.03	.00
G	Elymus salina	3	-	-	-	-	-
G	Festuca ovina	4	-	-	-	-	-
G	Hordeum jubatum jubatum	6	-	-	-	-	-
G	Koeleria cristata	$_{b}$7	$_{a}$-	$_{a}$-	$_{a}$-	.00	-
G	Oryzopsis hymenoides	6	6	-	-	-	-
G	Poa fendleriana	-	2	7	5	.02	.18
G	Poa secunda	-	1	6	7	.02	.16
G	Sitanion hystrix	$_{a}$-	$_{b}$22	$_{a}$1	$_{a}$-	.00	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		498	593	564	422	12.51	14.26
Total for Grasses		498	593	564	422	12.51	14.26
F	Alyssum alyssoides (a)	-	-	$_{b}$49	$_{a}$-	.09	-
F	Arabis spp.	5	2	-	3	-	.00
F	Astragalus marianus	3	5	-	1	-	.00
F	Castilleja chromosa	-	9	-	-	-	-
F	Carduus nutans (a)	1	2	-	-	-	-
F	Calochortus nuttallii	-	9	-	-	-	-
F	Chaenactis douglasii	$_{a}$-	$_{b}$13	$_{a}$1	$_{a}$1	.00	.00
F	Cirsium spp.	-	-	-	5	-	.04
F	Crepis acuminata	-	1	-	-	-	-
F	Cryptantha spp.	$_{a}$7	$_{b}$30	$_{a}$9	$_{ab}$24	.04	.21
F	Cynoglossum officinale	-	3	3	-	.03	-
F	Erigeron pumilus	-	3	-	-	-	-
F	Eriogonum umbellatum	11	-	6	-	.01	-
F	Gilia spp. (a)	$_{a}$1	$_{b}$30	$_{a}$3	$_{a}$-	.01	-
F	Lepidium spp. (a)	-	-	$_{a}$-	$_{b}$96	-	.33
F	Lomatium spp.	-	2	-	-	-	-
F	Medicago sativa	-	-	7	-	.53	-
F	Penstemon humilis	-	-	-	2	-	.00
F	Penstemon pachyphyllus	$_{ab}$3	$_{b}$9	$_{a}$-	$_{a}$-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Physaria acutifolia	$_{a}$-	$_{b}$36	$_{b}$12	$_{b}$14	.06	.04
F	Phlox austromontana	19	23	11	15	.05	.16
F	Ranunculus testiculatus (a)	-	-	-	4	-	.01
F	Senecio multilobatus	$_{a}$-	$_{b}$12	$_{a}$-	$_{a}$-	-	-
F	Taraxacum officinale	-	4	-	-	-	-
F	Tragopogon dubius	4	-	3	1	.01	.00
F	Unknown forb-perennial	-	3	-	-	-	-
Total for Annual Forbs		2	32	52	100	0.10	0.33
Total for Perennial Forbs		52	164	52	66	0.75	0.50
Total for Forbs		54	196	104	166	0.86	0.84

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

BROWSE TRENDS --
Management unit 16C, Study no: 40

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	1	4	-	.01
B	Juniperus osteosperma	11	6	2.36	1.94
B	Pinus edulis	2	3	1.87	3.82
B	Quercus gambelii	1	0	-	-
Total for Browse		15	13	4.24	5.77

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 40

Species	Percent Cover	
	'99	'04
Juniperus osteosperma	1.39	7.58
Pinus edulis	-	2.75

POINT-QUARTER TREE DATA --
Management unit 16C, Study no: 40

Species	Trees per Acre	
	'99	'04
Juniperus osteosperma	90	84
Pinus edulis	44	46

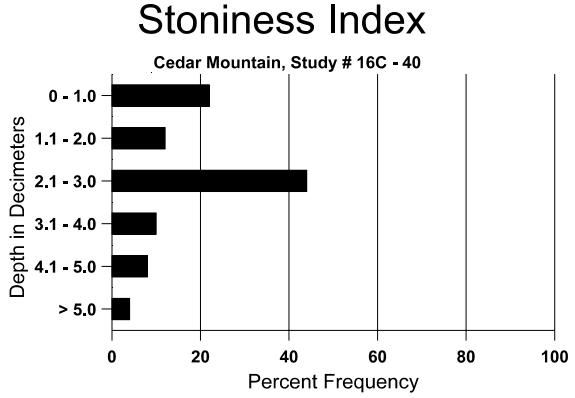
Average diameter (in)	
'99	'04
4.8	4.5
3.7	3.4

BASIC COVER --
Management unit 16C, Study no: 40

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	7.25	7.25	22.26	20.77
Rock	5.50	6.75	6.38	9.62
Pavement	9.25	6.75	6.41	13.06
Litter	63.25	61.00	49.76	37.80
Cryptogams	.25	0	.19	.03
Bare Ground	14.50	18.25	9.80	32.28

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 40, Study Name: Cedar Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.2	57.3 (12.5)	n/a	31.3	32.2	36.6	5.4	5.1	217.6	0.7



PELLET GROUP DATA --
Management unit 16C, Study no: 40

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	27	62	-	-
Elk	15	40	34 (84)	37 (93)
Deer	18	4	10 (25)	4 (10)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**60**	20	20	40	-	-	0	0	0	-	0	6/14
04	**120**	-	-	40	80	-	67	0	67	-	0	13/31
Artemisia tridentata vaseyana												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	20	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	11/10
Chrysothamnus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	-	66	-	-	0	0	-	-	0	9/11
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
85	**132**	-	-	66	66	-	0	0	50	-	0	47/43
91	**132**	-	66	66	-	-	0	0	0	-	0	69/67
99	**300**	-	100	200	-	80	0	0	0	-	0	-/-
04	**120**	-	20	100	-	-	0	0	0	-	0	-/-
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	20	0	0	-	-	0	-/-
04	**60**	-	20	40	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Quercus gambelii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	42/13

Trend Study 16C-41-04

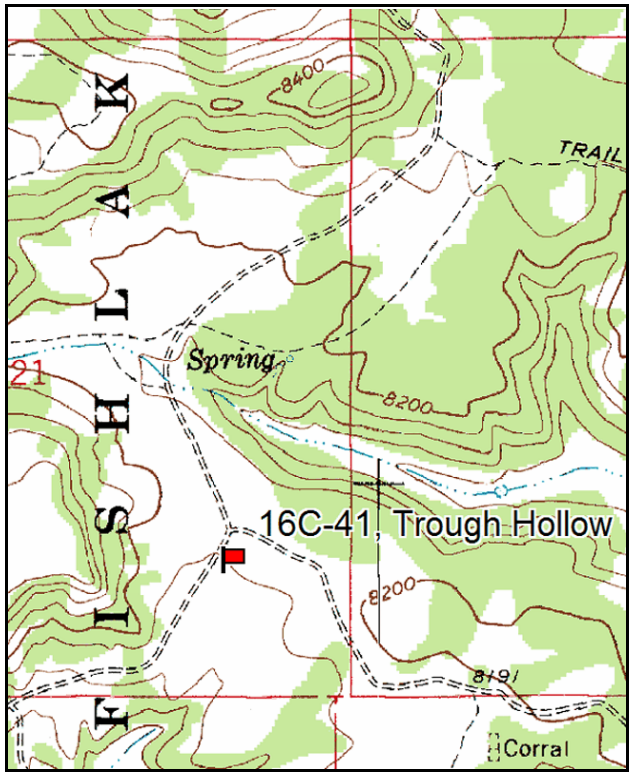
Study site name: Trough Hollow . Vegetation type: Mixed Mountain Brush .

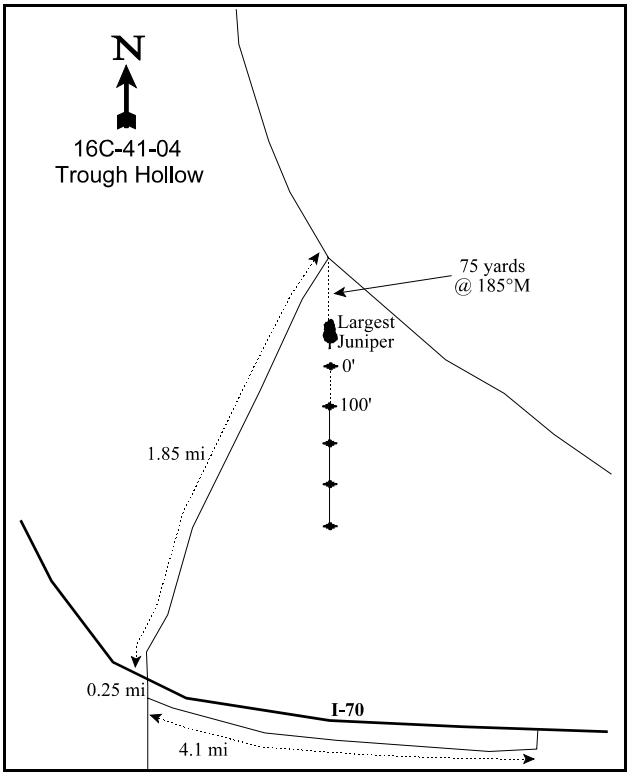
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Salina drive about 37.5 miles east on I-70 to a rest area exit. From the exit turn right and come back west on the frontage road paralleling the freeway for 4.1 miles to an intersection. Turn right on F.S. Road #011 and drive 0.25 miles to cross under the freeway. From the tunnel proceed 1.85 miles up and around a hill, then on to a major intersection. Stop here and look back at a bearing of 185 degrees magnetic to the largest juniper close to the road. It is about 75 yards from the intersection. Go back to this juniper to find the 0-foot baseline stake, 10 feet south of the tree out in the sagebrush flat. The stake is marked with browse tag #7192.





Map Name: Old Woman Plateau, Utah

Township 23S , Range 4E , Section 21

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4293331 N, 459813 E

DISCUSSION

Trough Hollow - Trend Study No. 16C-41

This trend study, Trough Hollow, is found on the south end of the Old Woman Plateau at an elevation of 8,200 feet. The site is on a slight slope with a southern exposure. It samples an open area dominated by mountain big sagebrush. The range type is described as mixed mountain brush because of the great variety of desirable browse species. The area provides good year long habitat for deer, especially in spring and fall. Deer were seen near the study site in July of 1985, and fresh tracks crossed the transect. Pellet group data from 1999 estimate 31 deer, 53 elk and 38 cow days use/acre. Most of the deer and elk pellet groups appeared to be several months old, but about 20% of the elk pellet groups were from this spring. Pellet group data from 2004 estimate 19 deer, 9 elk, and 27 cow days use/acre (48ddu/ha, 23 edu/ha, and 66 cdu/ha). The area is quite popular for deer hunting and access is good on this part of the plateau. Grazing pressure is moderate and a deferred grazing system is used on the Beavers Dam allotment.

The soil is moderately deep and appears well developed. Effective rooting depth is estimated at almost 17 inches. Soil texture is a sandy clay loam with a neutral pH (6.9). There is very little rock in the soil profile or on the surface. Stoniness measurements are more a reflection of soil compaction since no rock was hit. A compacted clay horizon was encountered at a depth of about 10 to 12 inches. This does not appear to be a rooting barrier however. The ground is covered with a high percent of litter and vegetation with little bare soil exposed.

Mountain big sagebrush and bitterbrush are the key browse species on the site. Mountain big sagebrush provided 53% of the browse cover in 2004, while bitterbrush accounted for 33%. Density of mountain big sagebrush has remained fairly stable at 4,333 plants/acre in 1985 to 4,540 in 2004. The sagebrush population has good recruitment, light use, and good vigor. Percent decadence was high in 1985 at 45%, but it has remained steady at approximately 21% since 1991. Bitterbrush has shown consistent moderate to heavy use since 1985. Most of the population was classified as decadent in 1991, now these plants have since regained their health. Density was estimated at 1,932 plants/acre in 1985, 1,732 in 1991, 2,680 in 1999, and 2,060 in 2004. The bitterbrush population has good recruitment , excellent vigor despite use, and only 5% of the population was considered decadent in 2004. These plants display a spreading prostrate growth form, forming a secondary cover under the sagebrush.

Additional browse forage is provided by small numbers of serviceberry, rabbitbrush, woods rose, snowberry, and gray horsebrush. Density of serviceberry was estimated at 599 plants/acre in 1985, 599 in 1991, 600 in 1999, and 480 in 2004. Young recruitment was down this year and is the main difference in density estimates. They show moderate to heavy use and normal vigor. There are scattered clones of oak in the area, but they do not appear to be spreading.

There are many species of perennial grasses growing under and between the sagebrush, creating a fairly dense ground cover. The grasses were vigorous with light to moderate use when the study was established in 1985, but use of the grasses growing in the open was moderate to heavy in 1999 and 2004. The most common grasses are western wheatgrass, mutton and Kentucky bluegrass. Letterman needlegrass and slender wheatgrass decreased significantly in 2004. Forbs are diverse, but have a low abundance. Some provide highly palatable and preferred forage for deer, such as redroot eriogonum, penstemon, fleabanes, legumes, and dandelion. Utilization of forbs is generally light.

1985 APPARENT TREND ASSESSMENT

The soil is stable and improving as litter and dense vegetation give protection, add to the organic matter, and help build up the soil. The vegetative community appears stable at present. The great species diversity, and general health and vigor of the desirable species, contributes to the stability of the community. However, the

current rate of sagebrush reproduction may be inadequate to maintain the population in the future. Continued light to moderate use by both big game and livestock also tends to promote stability.

1991 TREND ASSESSMENT

Soil appears basically unchanged and stable, which could probably be considered an improvement with the drought conditions since 1989. There has been a decrease in litter, but with a corresponding increase in vegetative cover. Trend for the key browse species: serviceberry, mountain big sagebrush, and rabbitbrush are essentially stable with the exception of a slight decrease for bitterbrush. The principal species, mountain big sagebrush, has a slight decreased in it's population (3%), but percent decadency has gone from 45% down to 22%. This slight decrease in density would be expected from the extended drought. About half of the grasses sampled have increased nested and quadrat frequencies, especially western wheatgrass. Nested frequency of perennial forbs have increased slightly.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil continues to be stable. Ground cover characteristics have remained similar to 1991 levels. Trend for the key species, mountain big sagebrush and bitterbrush, is up slightly. Density of sagebrush is up slightly, use is lighter, and percent decadency has declined from 22% to 19%. Recruitment remains good with 21% of the population consisting of young plants. Bitterbrush has also increased slightly in density. Use is heavier but vigor improved and percent decadence has declined from 62% to only 1%. Some of the differences in density of sagebrush and bitterbrush may be due to the much larger sample used in 1999. Trend for the herbaceous understory is down slightly for grasses and down for forbs. Sum of nested frequency for perennial grasses and forbs has declined. Sum of nested frequency of western wheatgrass and mutton bluegrass have declined significantly while frequency of Kentucky bluegrass has increased significantly. Nested frequency of forbs has declined dramatically. The Desirable Components Index (see methods) rated this site as excellent with a score of 93 due to excellent shrub cover, many young shrubs, moderate decadence, and excellent grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 93 (excellent) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Protective cover remains high, while percent bare ground cover has decreased. Cryptograms have been present since 1985, but appear to absence in 2004. Soil erosion in minimal due to the extensive vegetation cover. Trend for key browse species is stable. Density has down slightly, but the majority of losses would be from the young age class. Percent decadence has increased from 19% in 1999 to 24% in 2004, but young recruitment remains fairly good. Bitterbrush populations has remained stable. Use is still heavy, but plants have maintained good vigor and recruitment is adequate. Trend for herbaceous understory is down slightly. Sum of nested frequency have decreased slightly for perennial grasses and forbs. Use by livestock remains moderate to heavy. Letterman needlegrass decreased significantly. Forbs remain diverse, but provide only a small percentage of vegetation cover mainly due to low growth form. The

Desirable Components Index (see methods) rated this site as excellent with a score of 82 due to excellent shrub cover, many young shrubs, moderate decadence, and excellent grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 82 (excellent) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 41

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	a99	b215	a91	a70	1.06	.94
G	Agropyron spicatum	-	-	-	1	-	.00
G	Agropyron trachycaulum	a-	b34	ab25	a5	.92	.06
G	Bouteloua gracilis	b12	b14	a-	a-	-	-
G	Bromus ciliatus	b16	a-	c66	b12	.71	.10
G	Bromus inermis	5	-	8	-	.04	-
G	Carex spp.	5	12	14	3	.24	.00
G	Festuca ovina	b13	a-	a-	a1	-	.03
G	Poa fendleriana	ab227	b214	a175	ab202	7.59	6.55
G	Poa pratensis	a13	b116	c166	d234	6.27	6.21
G	Poa secunda	-	4	-	3	-	.15
G	Sitanion hystrix	c162	b38	a13	a2	.20	.02
G	Stipa columbiana	2	3	6	-	.18	-
G	Stipa lettermani	b119	b105	b95	a38	2.16	.30
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		673	755	659	571	19.41	14.39
Total for Grasses		673	755	659	571	19.41	14.39
F	Agoseris glauca	a-	b76	a-	a1	-	.00
F	Antennaria rosea	a14	b29	ab12	ab26	.62	1.35
F	Androsace septentrionalis (a)	-	-	b64	a29	.41	.18
F	Arabis spp.	a-	ab4	b13	a-	.05	-
F	Astragalus convallarius	b113	a35	a18	a10	.16	.05
F	Aster spp.	4	-	-	-	-	-
F	Astragalus spp.	4	8	12	1	.22	.00
F	Castilleja chromosa	5	10	3	-	.06	-
F	Calochortus nuttallii	b90	ab148	a-	a2	-	.01
F	Chaenactis douglasii	-	-	2	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Cirsium wheeleri	3	4	2	3	.03	.03
F	Collinsia parviflora (a)	-	-	$_{a}$3	$_{b}$144	.01	.61
F	Crepis acuminata	$_{b}$12	$_{ab}$6	$_{a}$-	$_{a}$-	-	-
F	Erigeron caespitosus	10	-	-	-	-	-
F	Erigeron eatonii	$_{b}$105	$_{b}$96	$_{a}$23	$_{a}$25	.31	.15
F	Erigeron flagellaris	16	7	16	7	.13	.01
F	Erigeron pumilus	$_{a}$5	$_{ab}$14	$_{ab}$18	$_{b}$20	.50	.08
F	Eriogonum racemosum	112	122	88	99	1.36	1.33
F	Eriogonum umbellatum	9	6	19	13	.24	.80
F	Ipomopsis aggregata	5	-	1	-	.00	-
F	Lithospermum ruderale	-	3	-	-	-	-
F	Lupinus argenteus	8	2	8	1	.54	.03
F	Lychnis drummondii	-	-	3	-	.00	-
F	Machaeranthera canescens	-	-	2	-	.03	-
F	Microsteris gracilis (a)	-	-	-	7	-	.02
F	Oxybaphus linearis	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Penstemon palmeri	2	-	-	-	-	-
F	Penstemon pachyphyllus	5	11	1	-	.15	.00
F	Petradoria pumila	-	-	2	-	.00	-
F	Penstemon watsonii	$_{a}$5	$_{b}$29	$_{b}$21	$_{a}$4	.31	.04
F	Polygonum douglasii (a)	-	-	$_{a}$18	$_{b}$44	.04	.11
F	Senecio multilobatus	-	-	1	-	.00	-
F	Taraxacum officinale	23	15	26	11	.08	.03
F	Tragopogon dubius	-	3	-	-	-	-
F	Trifolium spp.	6	5	-	-	-	-
F	Unknown forb-perennial	$_{b}$34	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Vicia americana	$_{b}$18	$_{ab}$11	$_{a}$-	$_{a}$2	-	.00
F	Zigadenus paniculatus	$_{ab}$6	$_{b}$12	$_{a}$-	$_{a}$-	-	-
Total for Annual Forbs		0	0	85	224	0.46	0.92
Total for Perennial Forbs		626	656	291	225	4.86	3.97
Total for Forbs		626	656	376	449	5.32	4.89

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

BROWSE TRENDS --
Management unit 16C, Study no: 41

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Amelanchier utahensis	25	19	.66	.66
B	Artemisia tridentata vaseyana	96	92	19.40	18.44
B	Chrysothamnus nauseosus hololeucus	0	4	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	37	50	1.11	1.74
B	Gutierrezia sarothrae	0	2	-	.18
B	Juniperus osteosperma	2	2	.38	.38
B	Mahonia repens	13	14	21.55	13.67
B	Purshia tridentata	71	72	10.40	11.54
B	Rosa woodsii	7	6	.49	.52
B	Symphoricarpos oreophilus	11	15	.45	.52
B	Tetradymia canescens	5	12	.06	.36
Total for Browse		267	288	33.16	34.69

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 41

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	-	.36
Artemisia tridentata vaseyana	-	24.01
Chrysothamnus nauseosus hololeucus	-	.23
Chrysothamnus viscidiflorus viscidiflorus	-	2.88
Juniperus osteosperma	1.00	1.83
Mahonia repens	-	.40
Purshia tridentata	-	19.28
Rosa woodsii	-	.30
Symphoricarpos oreophilus	-	1.06
Tetradymia canescens	-	.35

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 41

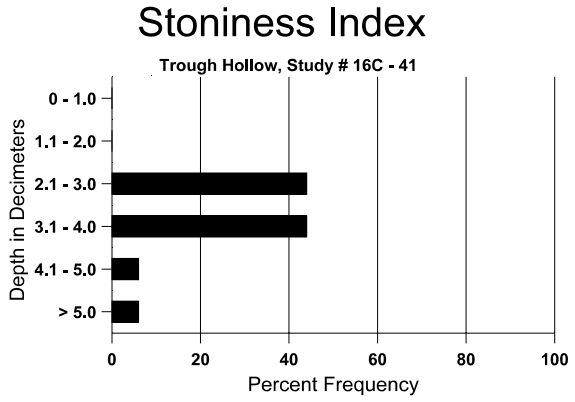
Species	Average leader growth (in) '04
Amelanchier utahensis	3.9
Artemisia tridentata vaseyana	2.4
Purshia tridentata	5.0

BASIC COVER --
Management unit 16C, Study no: 41

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	13.25	21.25	56.79	51.33
Rock	0	.50	0	.01
Pavement	0	.25	.21	.14
Litter	73.00	63.25	59.30	61.34
Cryptogams	.75	.25	.21	0
Bare Ground	13.00	14.50	13.29	11.04

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 41, Study Name: Trough Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.9	46.3 (12.7)	n/a	48.0	25.4	26.6	2.3	8.5	163.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 41

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	5	24	-	-
Elk	11	10	53 (131)	9 (23)
Deer	13	32	31 (77)	19 (48)
Cattle	7	10	38 (94)	27 (66)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 41

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	**599**	66	533	66	-	-	33	0	0	-	0	10/15
91	**599**	-	400	66	133	-	33	11	22	-	0	21/13
99	**600**	-	280	320	-	-	27	33	0	-	3	20/18
04	**480**	-	40	280	160	-	17	50	33	8	8	16/17
Artemisia tridentata vaseyana												
85	**4333**	666	400	2000	1933	-	40	0	45	-	14	26/25
91	**4199**	133	800	2466	933	-	14	0	22	-	5	26/32
99	**5260**	520	1100	3180	980	540	4	1	19	3	3	35/42
04	**4540**	240	380	3080	1080	1120	16	.44	24	8	8	29/32
Cercocarpus ledifolius												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	33/27
Chrysothamnus nauseosus hololeucus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**220**	20	40	180	-	-	0	0	-	-	0	14/25
Chrysothamnus viscidiflorus viscidiflorus												
85	**1800**	-	600	1200	-	-	0	0	0	-	0	5/8
91	**2266**	-	1800	466	-	-	21	0	0	-	3	4/9
99	**2120**	-	120	2000	-	-	0	0	0	-	0	8/11
04	**2280**	20	20	2240	20	-	0	0	1	-	0	9/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**60**	-	-	60	-	-	0	0	-	-	0	7/9
Juniperus osteosperma												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	**1666**	-	266	1400	-	-	0	0	-	-	0	3/3
91	**333**	533	333	-	-	-	0	0	-	-	0	-/-
99	**2080**	-	520	1560	-	-	0	0	-	-	0	2/4
04	**1420**	20	200	1220	-	-	0	0	-	-	0	2/4
Purshia tridentata												
85	**1932**	200	400	1466	66	-	45	21	3	-	0	19/28
91	**1732**	-	400	266	1066	-	23	23	62	7	23	9/19
99	**2680**	80	660	1980	40	-	14	68	1	-	0	21/38
04	**2560**	120	380	2060	120	-	13	66	5	.78	.78	19/40
Rosa woodsii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**620**	-	280	340	-	-	0	0	-	-	0	11/8
04	**580**	-	300	280	-	-	0	0	-	3	0	8/8
Symphoricarpos oreophilus												
85	**733**	200	533	200	-	-	0	0	0	-	0	9/10
91	**932**	-	400	466	66	-	36	0	7	-	0	9/14
99	**580**	20	280	300	-	-	3	0	0	-	0	18/22
04	**520**	-	80	360	80	-	0	0	15	4	4	14/18
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**120**	-	-	100	20	-	0	0	17	-	0	8/7
04	**280**	-	80	180	20	-	0	7	7	7	7	8/12

Trend Study 16C-42-04

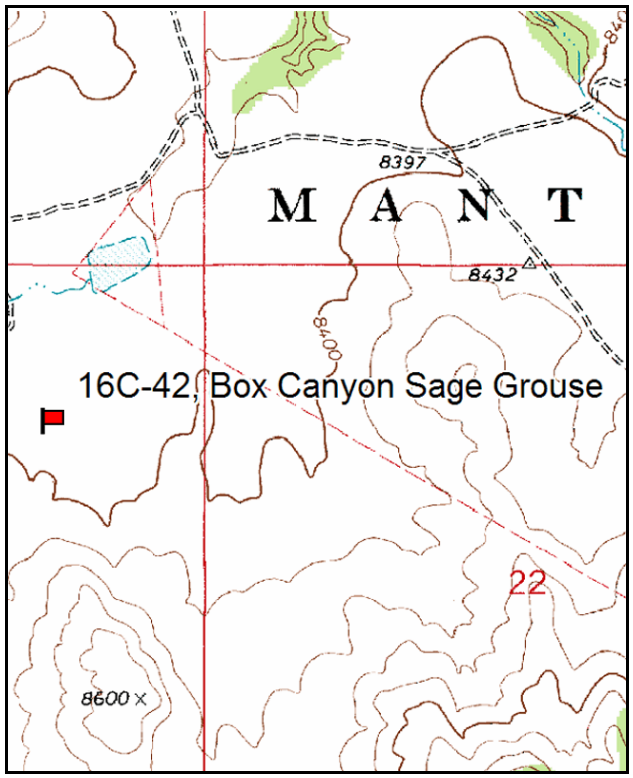
Study site name: Box Canyon Sage Grouse . Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 185 degrees magnetic.

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

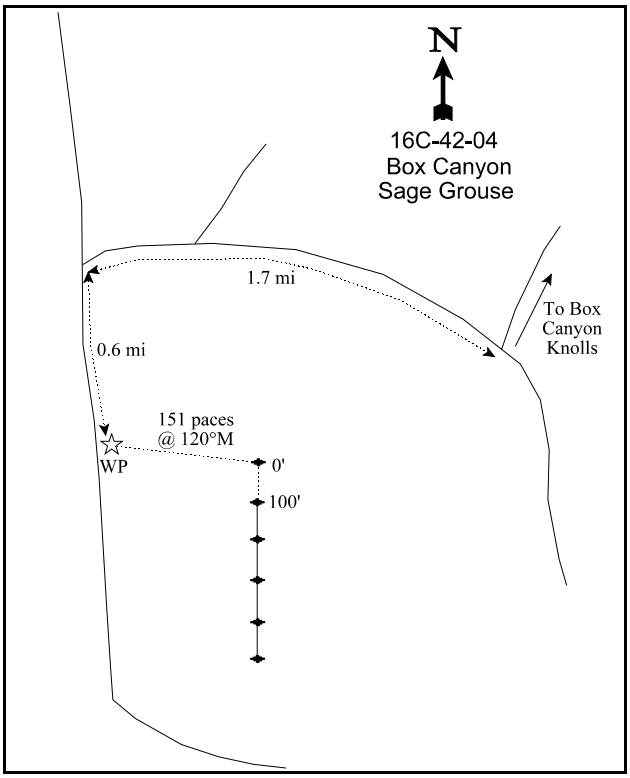
LOCATION DESCRIPTION

From Center Street in the town of Emery, continue south on Highway 10 for 1.2 miles. Turn right onto a dirt road and go 0.6 miles. Turn left and travel up Link Canyon 7 miles (4WD road) to the top. Stay left at the fork. Continue west for 1.7 miles to another fork. Turn left and head south for 0.6 miles to a witness post on the left hand side of the road. The 0-foot post is 151 paces from the witness post at 120°M and is marked with a blue browse tag, #49.



Map Name: Emery West

Township 21S , Range 5E , Section 21



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4314265 N, 469012 E

DISCUSSION

Box Canyon Sage Grouse - Trend Study No. 16C-42

The Box Canyon Sage Grouse site was established in 2004 to monitor sage grouse nesting and brooding habitat. There is an active lek just south of this site. The nearby Wildcat Knolls study site samples elk, but no sage grouse. The site has a slope of about 5% with a north aspect. Elevation is approximately 8,400 feet. It samples a mountain big sagebrush community that sits in a large basin. This areas is part of the Emery grazing allotment. Pellet group data for 2004 estimate 29 elk, 5 deer, 28 cow days use /acre, and 131 sage grouse pellet groups/acre (73 edu/ha, 12 ddu/ha, 70 cdu/ha, and 322 sgp/ha). Deer and elk use is mostly from winter use, a few from spring. Cow pats were from last season, but cows could be seen a quarter mile away. Sage grouse pellets were from winter and early spring.

The soil is moderately deep and appears well developed. Effective rooting depth is moderate at 15 inches. A slight compacted clay layer was encountered about 6 inches down in the profile. It does not appear to be continuos or a rooting barrier. Soil texture is a sandy clay loam with a neutral pH (6.8). There is very little rock in the soil profile or on the surface. Stoniness measurements are more a reflection of soil compaction since no rock was hit. The ground is covered with a high percent of litter and vegetation with little bare soil exposed. The erosion condition class determined soil movement as stable in 2004.

Mountain big sagebrush is the key browse species on this site. Density of mountain big sagebrush was estimated at 3,580 plants/acre. Mostly a mature population, a few seedlings and young plants were found, but overall reproduction was low. Utilization was light to moderate and vigor was good. Percent decadence was estimated at 23% and only 13% of the total population appear to be dying. Density of low rabbitbrush is scattered and in low numbers.

The herbaceous understory is dominated by perennial grasses creating a fairly dense ground cover between the sagebrush. Perennial grasses account for 49% of total cover on this site. Smooth brome is the dominate grass and contributes 56% of the grass cover. Mutton bluegrass and sedge species are also common in the understory. Forbs are very diverse, but contribute little (4%) to ground cover. However, several species that are important to sage grouse are located on this site, such as common dandelion, hawksbeard, penstemon, lupine, and two milkvetch species (Beck and Mitchell 1997).

2004 APPARENT TREND ASSESSMENT

Soil shows little sign of erosion due to extensive ground cover and appears to be stable. There is good protective cover in the understory and bare ground is relatively low. Key browse species, mountain big sagebrush, appears stable. Use is light to moderate and vigor is good. Recruitment is low, while percent decadency is 23%. This may be a potential problem in the future with continued drought. Understory vegetation has good ground cover, which is dominated by smooth brome. Forbs are limited in the understory, but are very diverse. The abundance of smooth brome (which is shade tolerant and a sod-former) can outcompete the forbs and further reduce their abundance. The Desirable Components Index (see methods) rated this site as good with a score of 76 due to excellent shrub cover, several young shrubs, high decadence, and excellent grass and forb cover.

winter range condition (DC Index) - 76 (good) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 42

Type	Species	Nested Frequency '04	Average Cover % '04
G	Agropyron cristatum	47	1.00
G	Agropyron spicatum	7	.07
G	Bromus anomalus	3	.03
G	Bromus inermis	333	12.10
G	Carex spp.	160	2.19
G	Festuca ovina	50	.77
G	Poa fendleriana	147	4.22
G	Sitanion hystrix	8	.05
G	Stipa lettermani	37	.87
Total for Annual Grasses		0	0
Total for Perennial Grasses		792	21.32
Total for Grasses		792	21.32
F	Antennaria rosea	58	.74
F	Androsace septentrionalis (a)	4	.04
F	Arabis spp.	6	.02
F	Astragalus convallarius	25	.20
F	Astragalus spp.	7	.07
F	Castilleja linariaefolia	4	.04
F	Chaenactis douglasii	6	.06
F	Chenopodium spp. (a)	7	.01
F	Comandra pallida	6	.04
F	Crepis acuminata	4	.03
F	Erigeron eatonii	17	.07
F	Erigeron pumilus	10	.04
F	Eriogonum racemosum	61	.52
F	Eriogonum umbellatum	14	.16
F	Hedysarum boreale	3	.06
F	Lupinus argenteus	12	.37
F	Lychnis drummondii	21	.14
F	Machaeranthera canescens	2	.03
F	Oenothera pallida	11	.02
F	Orthocarpus luteus (a)	16	.12
F	Penstemon comarrhenus	12	.11
F	Penstemon watsonii	12	.25
F	Polygonum douglasii (a)	33	.06

Type	Species	Nested Frequency '04	Average Cover % '04
F	Potentilla spp.	48	.81
F	Senecio multilobatus	5	.04
F	Taraxacum officinale	17	.10
Total for Annual Forbs		60	0.24
Total for Perennial Forbs		361	3.97
Total for Forbs		421	4.21

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

BROWSE TRENDS --
Management unit 16C, Study no: 42

Type	Species	Strip Frequency '04	Average Cover % '04
B	Artemisia nova	5	1.06
B	Artemisia tridentata vaseyana	80	15.85
B	Chrysothamnus nauseosus	7	.21
B	Chrysothamnus viscidiflorus viscidiflorus	24	.81
B	Symphoricarpos oreophilus	2	.03
B	Tetradymia canescens	1	.03
Total for Browse		119	18.00

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 42

Species	Percent Cover '04
Artemisia nova	.65
Artemisia tridentata vaseyana	15.98
Chrysothamnus nauseosus	.35
Chrysothamnus viscidiflorus viscidiflorus	.18

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 42

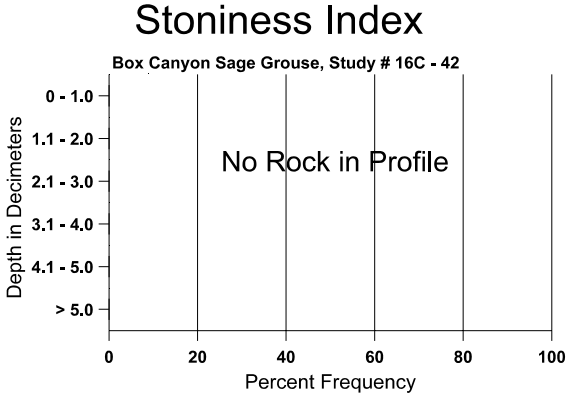
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	1.9

BASIC COVER --
Management unit 16C, Study no: 42

Cover Type	Average Cover % '04
Vegetation	45.07
Pavement	.01
Litter	55.27
Cryptogams	.23
Bare Ground	22.39

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 42, Study Name: Box Canyon Sage Grouse

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.5	48.3 (16.7)	6.8	55.4	18.8	25.8	3.1	21.0	304.0	1.0



PELLET GROUP DATA --
Management unit 16C, Study no: 42

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	6	-
Grouse	4	-
Elk	11	29 (73)
Deer	8	5 (12)
Cattle	8	28 (70)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 42

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
04	**420**	80	100	200	120	100	0	0	29	14	14	15/20
Artemisia tridentata vaseyana												
04	**3580**	280	340	2420	820	840	9	.55	23	13	15	30/40
Chrysothamnus nauseosus												
04	**220**	-	20	200	-	-	0	0	-	-	0	16/18
Chrysothamnus viscidiflorus viscidiflorus												
04	**1180**	180	60	1120	-	20	5	0	-	41	0	9/14
Symphoricarpos oreophilus												
04	**40**	-	40	-	-	-	0	0	-	-	0	5/6
Tetradymia canescens												
04	**20**	-	20	-	-	-	0	0	-	-	0	7/7

Trend Study 16C-43-04

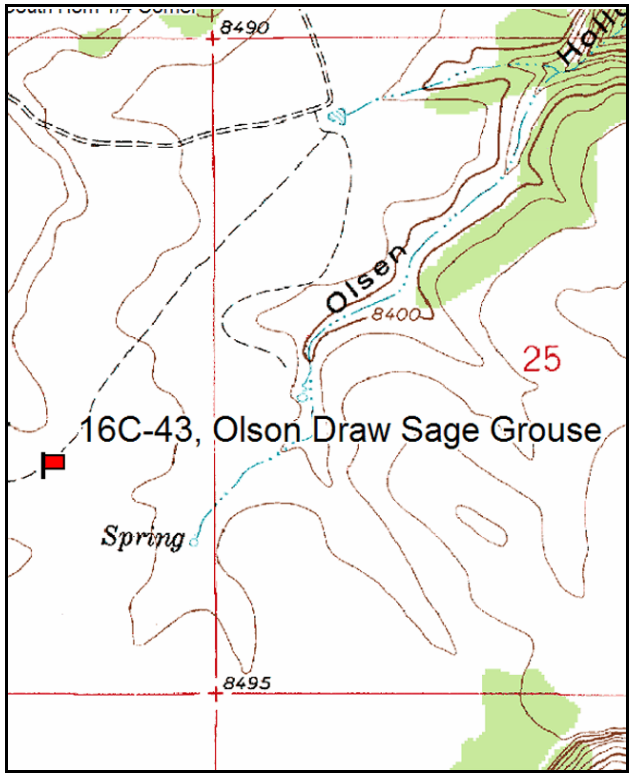
Study site name: Olson Draw Sage Grouse . Vegetation type: Sagebrush/grass .

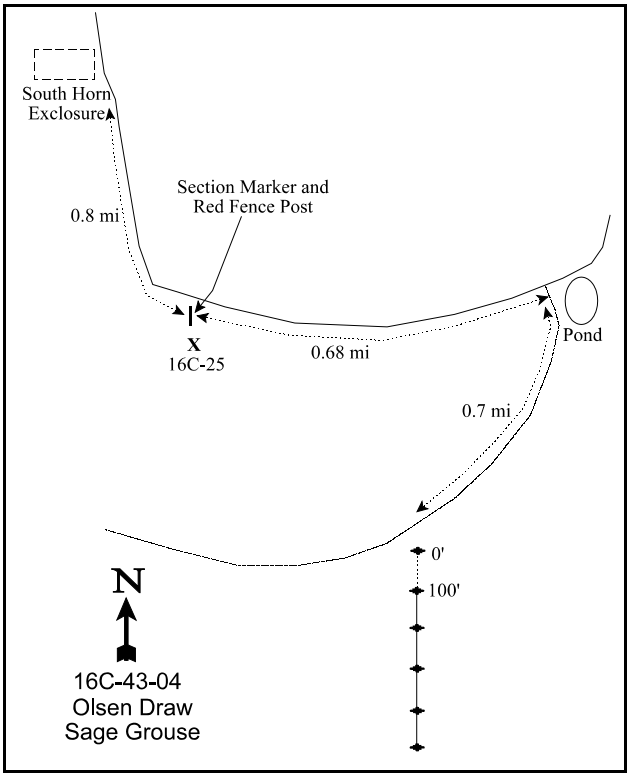
Compass bearing: frequency baseline 200 degrees magnetic.

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

LOCATION DESCRIPTION

From the South Horn exclosure (by study #16C-24), continue south on the main USGS road for 0.8 miles to a USGS landline marker by a tall red fencepost on the right side of the road. Continue 0.68 miles and turn right before the pond on a two track. There may be a faint road going off to the left, but stay right for 0.7 miles. The site is on the left hand side of the road. Use a GPS unit to get to the beginning of the baseline.





Map Name: The Cap

Diagrammatic Sketch

Township 19S , Range 6E , Section 26

GPS: NAD 27, UTM 12S 4331790 N, 481768 E

DISCUSSION

Olson Draw Sage Grouse - Trend Study No. 16C-43

The Olson Draw Sage Grouse site was established in 2004 to monitor sage grouse nesting and brooding habitat. It also provides a good area for wintering elk. There is an active lek just southeast of this site. The site has a slope of about 3-10% with a north-northeast aspect. Elevation is approximately 8,450 feet. It samples a mountain big sagebrush community. Pellet group data from 2004 estimate 137 elk, 4 deer, 4 cow days use/acre, and 96 sage grouse pellet groups/acre (337 edu/ha, 10ddu/ha, 11 cdu/ha, and 236 sgp/ha). Cow use was from this year and cattle were on the site during data collection. This area is part of the Horn Mountain grazing allotment managed by the Forest Service. Elk and deer use was from winter use. Moderate number of sage grouse pellet groups on the site, although pellet transect didn't pick them up because they were very clumped in an area.

The soil is moderately shallow with an effective rooting depth estimated at 15 inches. A slight compacted layer was encountered about 8 inches down. It does not appear to be continuos or a rooting barrier. Soil texture is a sandy clay loam with a neutral pH (7.1). There is very little rock in the soil profile or on the surface. Stoniness measurements are more a reflection of soil compaction since no rock was contacted. The ground is covered with a moderate percent of litter and vegetation with some bare soil. Erosion is minimal, although soil movement has created some pedestaling. The erosion condition class determined soil movement as stable to slightly eroding in 2004.

Mountain big sagebrush is the key browse on this site. Density of mountain big sagebrush was estimated at 3,480 plants/acre. Mostly a mature population, although seedlings were abundant this year while few young plants were found. Utilization was moderate to heavy and vigor overall is good. Percent decadence was moderately high at 48% with 24% of the total population classified as dying. The high decadency without better recruitment may cause a decrease in density of the sagebrush. Density of low rabbitbrush is scattered and in low numbers. A few serviceberry are on the site, although none were sampled within the density strip.

The herbaceous understory has several perennial grasses creating a fairly dense ground cover between the sagebrush. Perennial grasses account for 32% of the total cover on this site. Salina wildrye is the dominate grass and is 42% of the grass cover. Mutton bluegrass, western wheatgrass, and Indian rice grass are also common in the understory. Forbs are very diverse and account for 15% of the ground cover. Several species that are important to sage grouse are located on this site, such as Watson's penstemon, hawksbeard, trifolium spp., and two milkvetch species (Beck and Mitchell 1997).

2004 APPARENT TREND ASSESSMENT

Soil shows a little sign of erosion mostly in the appearance of pedestaling. There is good protective cover in the understory and a moderate amount of bare ground in the interspace. Key browse species, mountain big sagebrush, appears moderately healthy. Use is moderate to heavy and vigor is good. Seedling recruitment was high, but recruitment of young was low. Percent decadency was moderately high at 48% and about one-half of those were classified as dying. This could be a potential problem in the future if several of the mature plants die. Understory vegetation has good ground cover. There is a good diversity of perennial grasses and forbs. Forbs are not as dominated as the grasses, but provide fair cover and several are excellent food for sage grouse. The Desirable Components Index (see methods) rated this site as fair with a score of 59 due to good shrub cover, few young shrubs, high decadence, and excellent grass and forb cover.

winter range condition (DC Index) - 59 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 43

Type	Species	Nested Frequency '04	Average Cover % '04
G	Agropyron smithii	92	1.27
G	Agropyron spicatum	7	.04
G	Elymus salina	132	5.01
G	Koeleria cristata	1	.03
G	Oryzopsis hymenoides	19	.79
G	Poa fendleriana	106	3.51
G	Sitanion hystrix	28	.67
G	Stipa comata	5	.04
G	Stipa spp.	12	.45
Total for Annual Grasses		0	0
Total for Perennial Grasses		402	11.84
Total for Grasses		402	11.84
F	Arabis spp.	9	.02
F	Astragalus convallarius	12	.13
F	Astragalus tenellus	16	.52
F	Astragalus spp.	5	.15
F	Chenopodium album (a)	69	.20
F	Comandra pallida	4	.03
F	Collinsia parviflora (a)	1	.00
F	Crepis acuminata	43	.80
F	Cryptantha spp.	6	.01
F	Erigeron eatonii	17	.27
F	Erigeron pumilus	1	.00
F	Eriogonum racemosum	10	.29
F	Eriogonum umbellatum	15	.16
F	Gayophytum ramosissimum(a)	2	.01
F	Lappula occidentalis (a)	3	.01
F	Machaeranthera canescens	1	.03
F	Penstemon caespitosus	11	.21
F	Penstemon watsonii	24	1.24
F	Phlox austromontana	22	.21
F	Polygonum douglasii (a)	27	.10
F	Potentilla spp.	12	.16
F	Schoencrambe linifolia	36	.18
F	Senecio multilobatus	2	.01

Type	Species	Nested Frequency '04	Average Cover % '04
F	Trifolium spp.	62	.64
Total for Annual Forbs		102	0.33
Total for Perennial Forbs		308	5.11
Total for Forbs		410	5.45

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

BROWSE TRENDS --
Management unit 16C, Study no: 43

Type	Species	Strip Frequency '04	Average Cover % '04
B	Artemisia tridentata vaseyana	88	16.10
B	Chrysothamnus depressus	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	64	3.93
B	Gutierrezia sarothrae	14	.09
B	Pediocactus simpsonii	1	-
B	Symphoricarpos oreophilus	1	-
B	Tetradymia canescens	1	-
Total for Browse		170	20.12

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 43

Species	Percent Cover '04
Artemisia tridentata vaseyana	16.56
Chrysothamnus viscidiflorus viscidiflorus	5.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 43

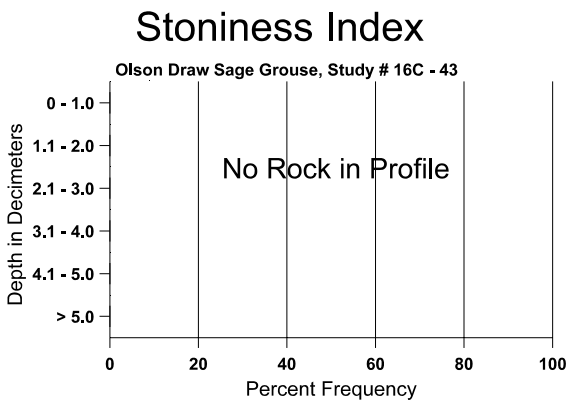
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	1.9

BASIC COVER --
Management unit 16C, Study no: 43

Cover Type	Average Cover % '04
Vegetation	33.25
Rock	.14
Pavement	1.16
Litter	44.95
Cryptogams	.22
Bare Ground	35.24

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 43, Study Name: Olsen Draw Sage Grouse

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
10.4	51.2 (11.0)	7.1	61.3	15.2	23.6	2.0	14.3	249.6	0.8



PELLET GROUP DATA --
Management unit 16C, Study no: 43

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	5	-
Elk	42	137 (337)
Deer	4	4 (10)
Cattle	1	4 (11)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
04	**0**	-	-	-	-	-	0	0	-	-	0	4/11
Artemisia tridentata vaseyana												
04	**3480**	2240	80	1740	1660	1140	35	37	48	24	24	24/34
Chrysothamnus depressus												
04	**20**	-	-	20	-	-	0	0	-	-	0	5/9
Chrysothamnus viscidiflorus viscidiflorus												
04	**3800**	80	20	3780	-	-	0	0	-	-	0	9/13
Gutierrezia sarothrae												
04	**720**	60	-	720	-	-	0	0	-	-	0	6/10
Pediocactus simpsonii												
04	**20**	-	-	20	-	-	0	0	-	-	0	2/3
Symphoricarpos oreophilus												
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Tetradymia canescens												
04	**20**	-	-	20	-	-	0	0	-	-	0	5/8

Trend Study 16R-5-04

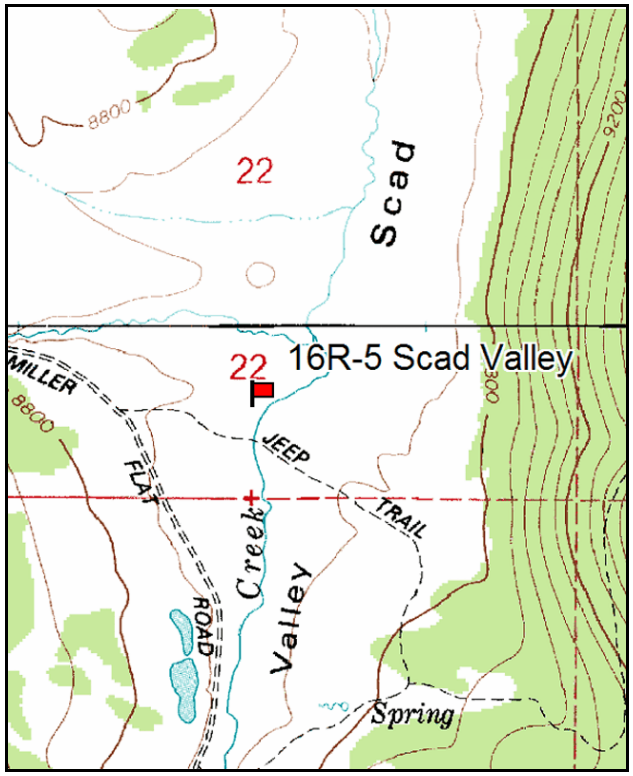
Study site name: Scad Valley . Vegetation type: Meadow .

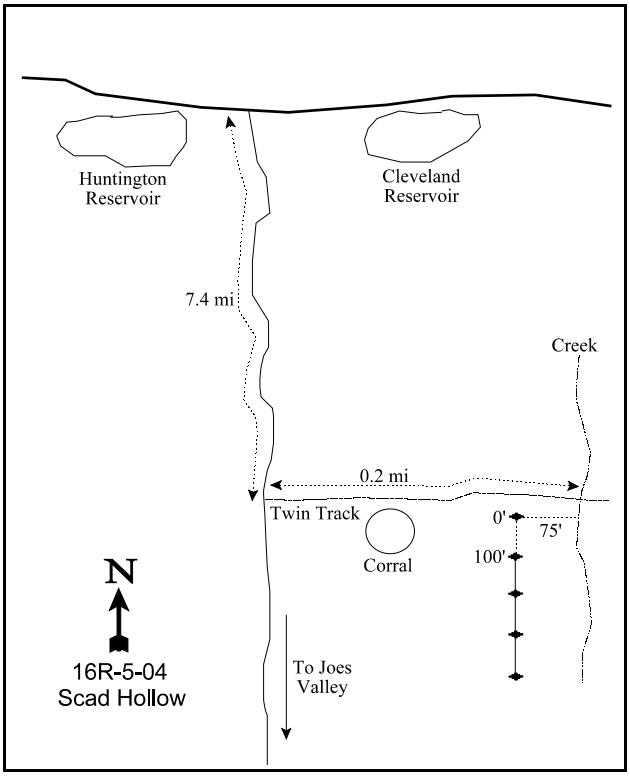
Compass bearing: frequency baseline 185 degrees magnetic.

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

LOCATION DESCRIPTION

On State Route 31 turn south between Huntington Reservoir and Cleveland Reservoir. Travel 7.4 miles toward Joe's Valley. There will be a twin track on the left hand side. Turn onto this and drive 0.2 miles to the creek. Walk 75 feet west of the creek to the beginning of the frequency baseline. The 0-foot stake is marked with browse tag #455.





Map Name: Rilda Canyon

Diagrammatic Sketch

Township 15S , Range 6E , Section 22

GPS: NAD 27, UTM 12S 4371880 N, 479570 E

DISCUSSION

Scad Valley - Trend Study No. 16R-5

The Scad Valley site was established in 1998 to monitor sheep use where old sheep corrals were removed by the Forest Service and new corrals were built away from the riparian area. This areas is part of the Horse Creek grazing allotment managed by the Forest Service. The site has a slope of about 3% with a east aspect. Elevation is approximately 8,500 feet. It samples a meadow community approximately 75 feet from Scad Valley Creek. Pellet group data from 1998 estimate 11 sheep days use/acre (28 sdu/ha). Sheep pellets were old and most likely from previous season. Pellet group data from 2004 estimate 33 sheep days use/acre (81 sdu/ha). Sheep use was from this season and sheep were located on the site during data collection.

The soil is very deep with an effective rooting depth estimated at 33 inches. Soil texture is a loam with a slightly acidic pH (6.3). There is very little rock in the soil profile or on the surface. Stoniness measurements are more a reflection of soil compaction since no rock was hit. Phosphorus is limited at only 5.9 ppm and potassium is limited as well at 3.2 ppm. Phosphorus less than 10 ppm and potassium less than 70 ppm can limit normal plant growth and development. Organic matter is fairly high at 5.1%. The ground is covered with a moderate percent of litter and vegetation with little bare soil exposed. Bare ground that is exposed is mostly due to gopher activity. No signs of erosion due to thick vegetation cover. The erosion condition class determined soil movement as stable in 2004.

Silver sagebrush is the key browse on this site. Density of silver sagebrush was estimated at 2,980 plants/acre in 1998 and 3,200 in 2004. Browse cover only accounted for 6% of total vegetation cover in 1998 and 4% in 2004. The silver sagebrush is mostly a mature population, although seedlings and young plants were abundant in 1998 and much lower in 2004. Utilization was light, vigor was good, and percent decadence was low at 4%. A few mountain big sagebrush and low rabbitbrush are on the site, although in very low numbers.

The herbaceous understory account for the majority of the vegetation cover. Perennial grasses accounted for 36% of total cover in 1998 and 39% in 2004. Kentucky bluegrass (an increaser species with moderate grazing) is the dominate grass and was 67% of the grass cover in 1998 and 65% in 2004. Other common perennial grasses and grass-like plants include carex spp, tufted hair-grass, and Baltic rush. Forbs are abundant and accounted for 58% of total cover in 1998 and 2004. Dominate forbs include cinquefoil spp, common dandelion, aster spp, a thistle spp, orange sneezeweed, yarrow, and false dandelion.

1998 APPARENT TREND ASSESSMENT

Protective ground cover is adequate to prevent serious erosion on the site. The apparent browse trend is stable with adequate numbers of seedlings and young, and low percent decadency for the preferred browse species, silver sagebrush. Utilization is generally light and vigor is good. The herbaceous understory is very abundant and diverse providing protective ground cover for the soil.

2004 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground has more than doubled since last reading, but this is mostly likely due to gopher activity. Sum of nested frequency has remained fairly constant for vegetation cover, although vegetation cover has declined, but still is adequate to prevent soil erosion. Trend for key browse is slightly up. Density for mature silver sagebrush has increased from 1,680 plants/acre in 1998 to 2,660 in 2004. Utilization is light, vigor is good, and percent decadence is low. Recruitment is down from 1998, but there is still a fair amount of young plants in the population. Trend for herbaceous understory is stable. Sum of nested frequency and cover have remained fairly stable for grasses and forbs.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 16R, Study no: 5

Type	Species	Nested Frequency '98	Nested Frequency '04	Average Cover % '98	Average Cover % '04
G	Agropyron trachycaulum	11	13	.08	.18
G	Carex spp.	b140	a77	3.26	3.29
G	Deschampsia caespitosa	b114	a80	.93	2.69
G	Festuca ovina	b19	a3	1.97	.03
G	Hordeum brachyantherum	-	5	-	.15
G	Juncus balticus	109	105	1.20	2.87
G	Muhlenbergia spp.	8	-	.30	-
G	Phleum alpinum	-	6	-	.06
G	Phleum pratense	b16	a3	.06	.03
G	Poa pratensis	389	425	16.33	17.96
G	Stipa columbiana	10	7	.10	.24
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		816	724	24.27	27.53
Total for Grasses		816	724	24.27	27.53
F	Achillea millefolium	254	225	3.13	3.57
F	Agoseris spp.	a-	b94	-	2.62
F	Antennaria rosea	11	11	.56	.33
F	Arabis spp.	-	3	-	.00
F	Aster spp.	181	196	3.42	5.24
F	Cirsium spp.	b159	a110	6.72	5.94
F	Erigeron pumilus	-	1	-	.00
F	Fragaria virginiana	-	5	-	.06
F	Helenium hoopesii	90	73	5.19	2.82
F	Polygonum douglasii (a)	-	4	-	.00
F	Potentilla gracilis	a-	b52	-	1.66
F	Potentilla spp.	210	200	11.37	11.27
F	Taraxacum officinale	b307	a236	7.90	6.70
F	Trifolium spp.	97	91	1.12	.75

Type	Species	Nested Frequency		Average Cover %	
		'98	'04	'98	'04
Total for Annual Forbs		0	4	0	0.00
Total for Perennial Forbs		1309	1297	39.44	40.99
Total for Forbs		1309	1301	39.44	41.00

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

BROWSE TRENDS --
Management unit 16R, Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'98	'04	'98	'04
B	Artemisia cana	29	36	3.74	2.54
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	-	-
Total for Browse		29	37	3.74	2.54

CANOPY COVER, LINE INTERCEPT --
Management unit 16R, Study no: 5

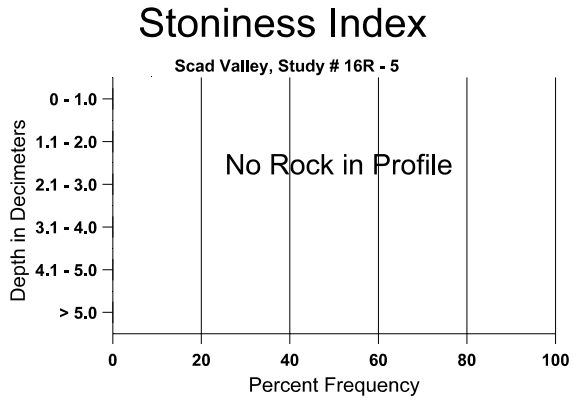
Species	Percent Cover
	'04
Artemisia cana	6.05

BASIC COVER --
Management unit 16R, Study no: 5

Cover Type	Average Cover %	
	'98	'04
Vegetation	81.47	72.86
Rock	0	.01
Pavement	.03	.00
Litter	2.58	7.30
Cryptogams	6.65	4.98
Bare Ground	7.73	21.65

SOIL ANALYSIS DATA --
Management unit 16R, Study no: 5, Study Name: Scad Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
33.5	46.0 (18.1)	6.3	44.7	28.7	26.6	5.1	5.9	3.2	0.5



PELLET GROUP DATA --
Management unit 16R, Study no: 5

Type	Quadrat Frequency	
	'98	'04
Sheep	6	10
Cattle	-	1

Days use per acre (ha)	
'98	'04
11 (28)	33 (81)
-	-

BROWSE CHARACTERISTICS --
Management unit 16R, Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia cana												
98	**2980**	820	1300	1680	-	-	0	0	0	-	0	14/16
04	**3200**	-	420	2660	120	-	4	0	4	-	0	13/20
Artemisia tridentata vaseyana												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	16/34
Chrysothamnus viscidiflorus viscidiflorus												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Potentilla fruticosa												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	12/41

SUMMARY

WILDLIFE MANAGEMENT UNIT - 16C - MANTI - NEBO, MANTI SOUTH

The 27 trend studies on unit 16C are difficult to group and categorize due to the extensive diversity. Eight sites sample pinyon-juniper chainings, nine sites sampled mountain big sagebrush, five sites sample mixed mountain brush, two sites sampled black sagebrush, two sites sampled curlleaf mountain mahogany, and one site sampled Wyoming big sagebrush. All sites sample deer or elk winter range except Joe's Valley overlook (#37),Trough Hollow (#41) and two sage grouse sites, Box Canyon Sage Grouse (#42) and Olson Draw Sage Grouse (#43).

Pinyon-juniper chainings make up a large portion of the studies that sample winter range for big game on this unit. These transects include Red Point (#14), Howard Forest Service Chaining (#15), Middle Mountain (#17), Dry Mountain (#26), Birch Creek Chaining (#27), South of Dry Wash (#28), Danish Bench (#36) and Cedar Mountain (#40). Soil trend in 1999 on these chaining study sites were all stable or slightly improved. In 2004, only three of the sites were stable, while the remaining five were down or slightly down. In 1999, browse trends were stable at Red Point, Howard Forest Service Chaining, Birch Creek Chaining, Danish Bench, and Cedar Mountain, and slightly up for the other three sites. In 2004, only Middle Mountain and South of Dry Wash showed improving browse trends. Red Point, Birch Creek chaining, Danish Bench, and Cedar Mountain showed stable browse trends. The remaining two, Howard FS chaining and Dry Mountain, indicated slightly downward trends. Herbaceous trends in 1999 were stable or slightly up for all sites but in poor condition at Red Point, Howard Forest Service Chaining, South of Dry Wash, and Danish Bench. Herbaceous trends for 2004 indicated all sites were either slightly-down or down because of the drought.

Another important component of the winter ranges sampled on this unit are the mountain big sagebrush flats. These studies include East Mountain (#18), Miles Point (#20), North Horn-Rock Canyon (#22), Black Dragon (#23), South Horn 1/4 Corner (#25), Wildcat Knolls (#35), Box Canyon Sage Grouse (#42), and Olson Canyon Sage Grouse (#43). Soil trends for 1999 on all of these sites were stable except for Wildcat Knolls which had a slightly improving trend. Soil trends for 2004 were very similar with all being considered stable except for Miles Point and Wildcat Knolls which were slightly down. Browse trends for 1999 were stable on all sites except for South Horn 1/4 Corner and Wildcat Knolls which had slightly improving trends. Browse tends for 2004 have changed markedly with the drought. East Mountain, Black Dragon, Box Canyon Sage Grouse(#42), and Olson Canyon Sage Grouse (#43) all had stable browse trends. North Horn-Rock Canyon received a slightly downward trend for browse and the remainder of the sites all had downward browse trends. Six studies sample mixed mountain brush which are all at elevations above 8,300 feet. These studies include Trail Mountain Exclosure (#19), North Horn Cap (#21), South Horn Exclosure (#24), Upper Hole Trail (#30), Joe's Valley Overlook (#37), and Trough Hollow (#41). Soil trends for 1999 were stable at Trail Mountain Exclosure, Joe's Valley Overlook, and Trough Hollow and slightly up on the remaining three sites. Soil trends for 2004 are all stable except for Trail Mountain Exclosure which was slightly down and North Horn Cap which was suspended. Browse trends for 1999 were stable at Trail Mountain Exclosure, Upper Hole Trail, and Joe's Valley Overlook. Browse trends are slightly upward at South Horn Exclosure and Trough Hollow. North Horn Cap has displayed a slightly downward browse trend since 1994 and it is now suspended. Herbaceous trends for 1999 were slightly improved for North Horn Cap which is now suspended. The rest are stable except for Trough Hollow which was the only one that exhibited a slightly downward browse trend. The herbaceous trend for 2004 was slightly downward for all sites because of the extended drought.

Black sagebrush is sampled by the Box Canyon Knolls (#31) and South Sage Flat (#34) studies. South Sage Flat was established in 1994 to monitor elk use. This site showed a stable soil, browse, and herbaceous trends. In 2004, South Sage Flat showed similar trends for soil and herbaceous species, and downward for browse. The browse was thought to be especially effected by the extended drought. Box Canyon Knolls for 1999 exhibited stable trends for soil, browse, and herbaceous understory. For 2004 this all changed with a slightly

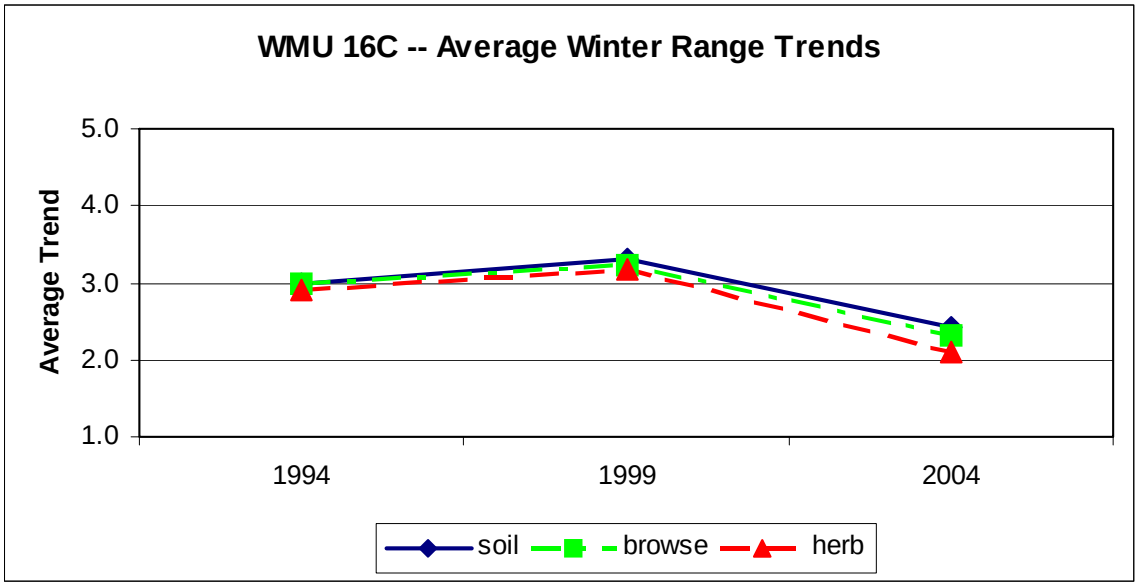
downward trend for soil and downward trend for both browse and herbaceous understory.

Curlleaf mountain mahogany is sampled on two sites, West Huntington Canyon (#13) and Scab Hollow (#29). Trends for both sites in 1999 was stable for soil, browse, and herbaceous trends. Trends for 2004 was again all stable trends for Scab Hollow, while West Huntington Canyon trends were slightly downward for soil and herbaceous understory, and stable for browse.

Little Nelson Mountain samples an opening of Wyoming big sagebrush along Ferron Creek. This was a new study established in 1994. In 1999, it displayed an upward soil and herbaceous trend and a slightly upward browse trend. The trends for 2004 indicated that soil and herbaceous understory were stable, and browse trend was downward. The other Wyoming big sagebrush site is the Muddy Creek site which is one of the sites with the lowest elevations in the unit. It occurs at the lower elevational limit as indicated with its association with shadscale which is associated with precipitation at or less than 8 inches per year. Trends for 1999 showed stable trends for soil and herbaceous understory, but both would be rated as very poor. Browse trend was determined as slightly downward. Trends for 2004 indicated similar trends for both soil and herbaceous understory. However, the browse trend went to a downward trend because most all the Wyoming big sagebrush has been lost to drought on this very dry site. Density is down to only 400 plants/acre and 70% of these plants were classified as dying. In 1999, the Wyoming big sagebrush population was at 3,200 plants/acre with 50% of them classified as decadent. The population has come a long ways down from that relatively high density in 1999.

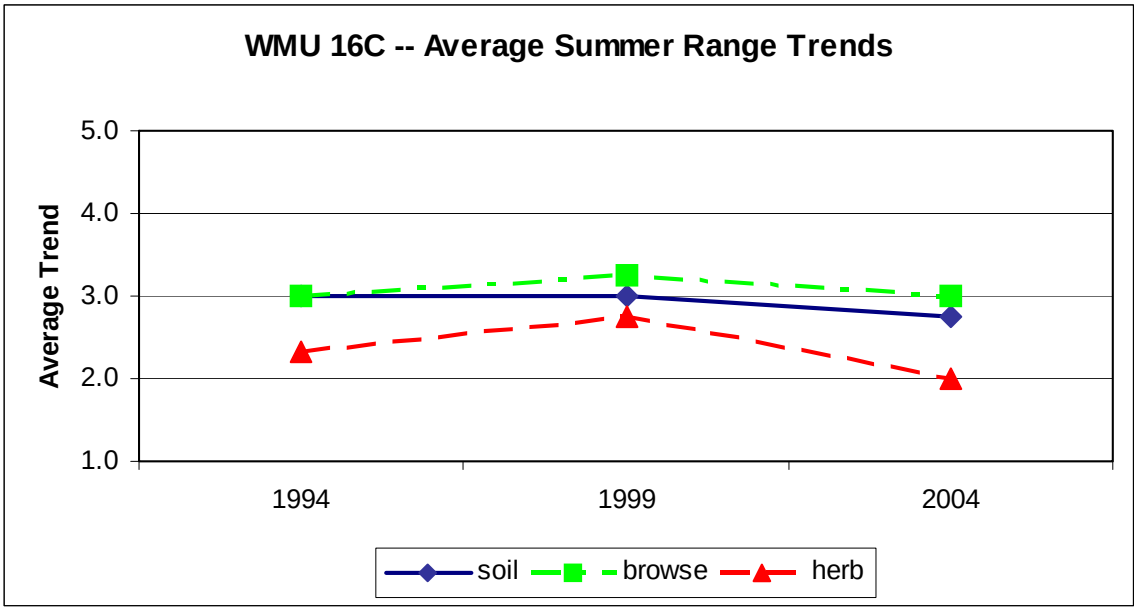
Winter Average Trends -- WMU 16C Manti-Nebo, Manti South

	1994	1999	2004
soil	3.0	3.3	2.4
browse	3.0	3.2	2.3
herb	2.9	3.2	2.1
	19 sites	22 sites	22 sites

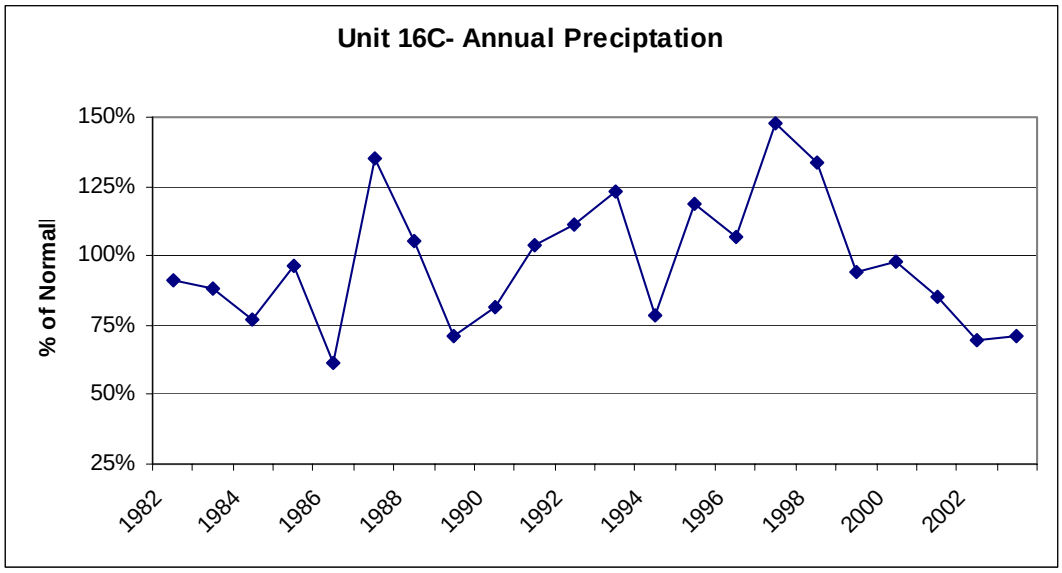


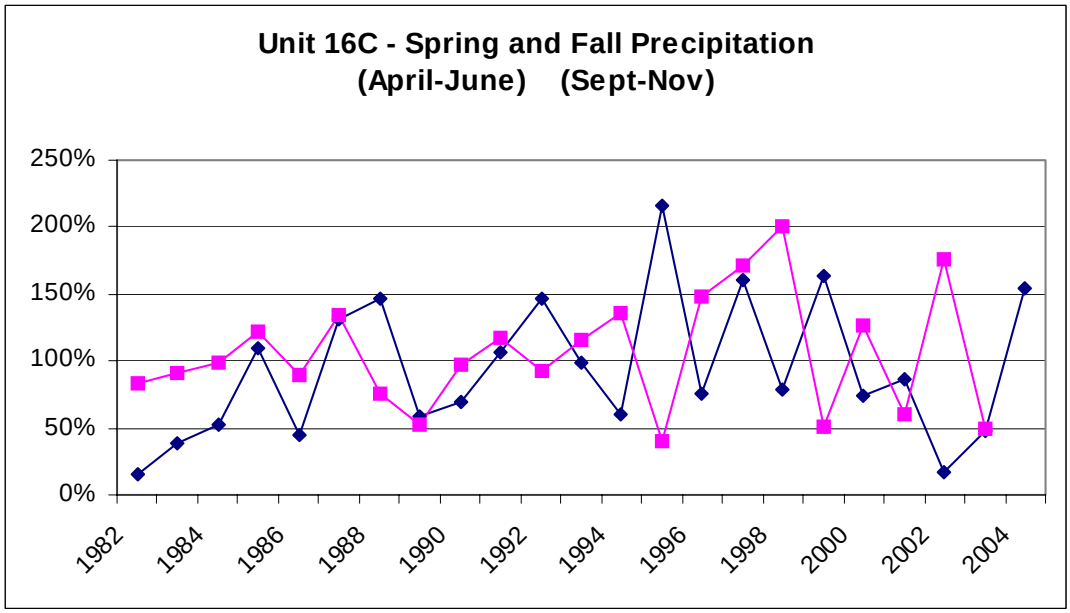
Summer Average Trends -- WMU 16C Manti-Nebo, Manti South

	1994	1999	2004
soil	3.0	3.0	2.8
browse	3.0	3.3	3.0
herb	2.3	2.8	2.0
	3 sites	4 sites	4 sites



Precipitation graphs for the Manit-Nebo, Manti South unit. Data is percent of normal precipitation averaged for 3 weather stations in Salina, Ferron, and Castle Dale (Utah Climate Summaries 2004).





Trend Summary

Site	Category	1988	1994	1999	2004
16C-13 West Huntington Canyon	soil	est	3	3	2
	browse	est	3	3	3
	herbaceous understory	est	2	3	2
16C-14 Red Point	soil	est	4	3	2
	browse	est	3	3	3
	herbaceous understory	est	2	3	1
16C- 15 Howard Forest Service Chaining	soil	est	3	3	2
	browse	est	2	3	2
	herbaceous understory	est	2	4	1
16C-17 Middle Mountain	soil	est	1	4	3
	browse	est	3	4	4
	herbaceous understory	est	3	3	2
16C-18 East Mountain	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	2	3	2
16C-19 Trail Mountain Exclosure	soil	est	3	3	2
	browse	est	3	3	3
	herbaceous understory	est	2	3	2
Site	Category	1998	1994	1999	2004
16C-20 Miles Point	soil	est	3	3	2
	browse	est	3	3	1
	herbaceous understory	est	4	3	2
16C-21 North Horn Cap	soil	est	2	4	
	browse	est	3	2	susp
	herbaceous understory	est	3	4	
16C-22 North Horn Rock Canyon	soil	est	3	3	3
	browse	est	2	3	2
	herbaceous understory	est	2	4	3

1) = down, (2) = slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Site	Category	1998	1994	1999	2004
16C-23 Black Dragon	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	3	3	2
16C-24 South Horn Exclosure	soil	est	3	4	3
	browse	est	3	4	2
	herbaceous understory	est	2	3	2
16C-25 South Horn 1/4 Corner	soil	est	3	3	3
	browse	est	2	4	1
	herbaceous understory	est	2	3	2
16C-26 Dry Mountain	soil	est	3	3	3
	browse	est	3	4	2
	herbaceous understory	est	3	3	2
16C-27 Birch Creek Chaining	soil	est	3	3	2
	browse	est	3	3	3
	herbaceous understory	est	2	4	2
16C-28 South of Dry Wash	soil	est	3	4	2
	browse	est	3	4	4
	herbaceous understory	est	3	3	2
16C-29 Scab Hollow	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	3	3	3
16C-30 Upper Hole Trail	soil	est	3	4	3
	browse	est	3	3	3
	herbaceous understory	est	4	3	2
16C-31 Box Canyon Knolls	soil	est	4	3	2
	browse	est	4	3	1
	herbaceous understory	est	3	3	1

(1) = down, (2) = slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

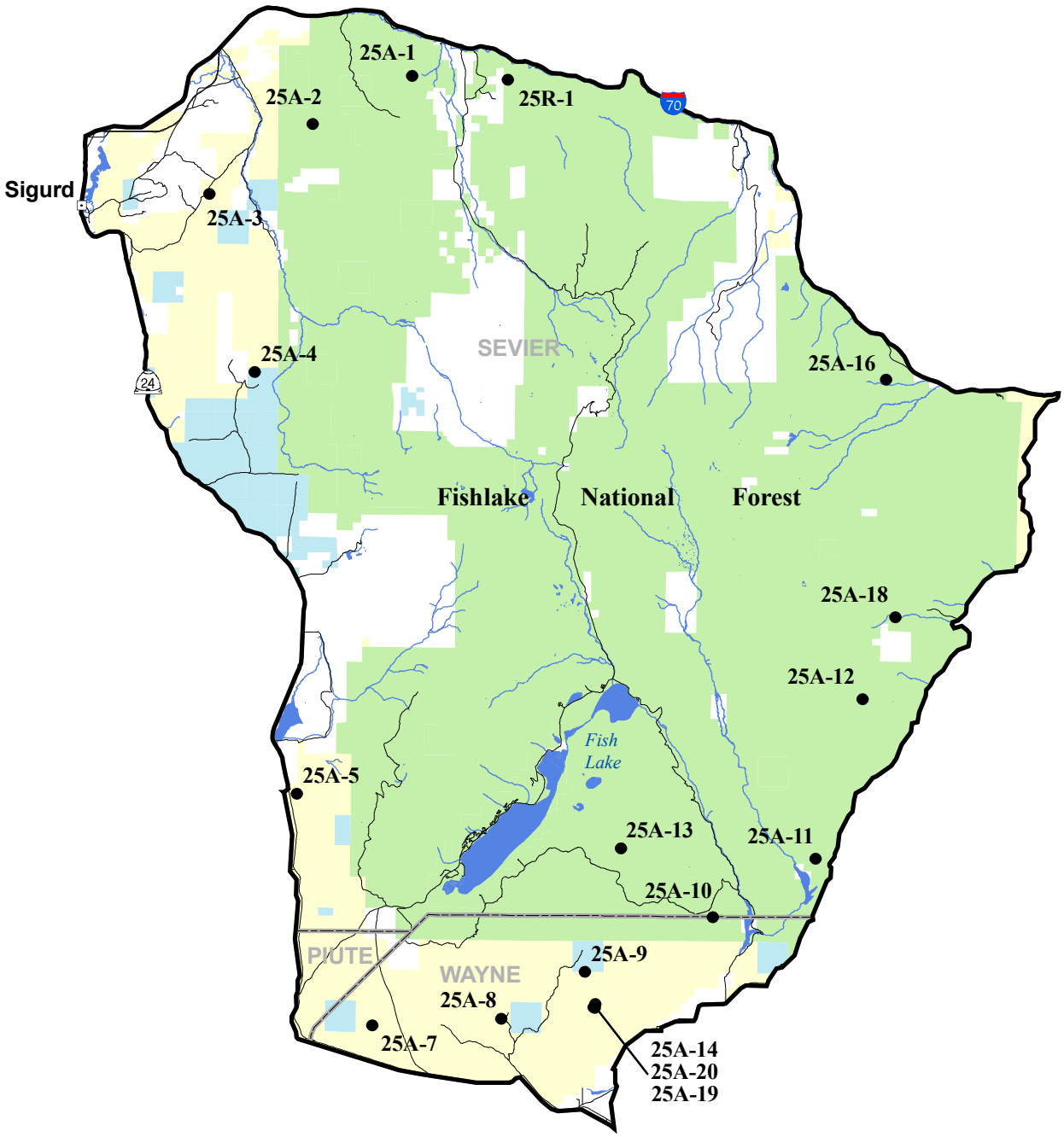
Site	Category	1998	1994	1999	2004
16C-32 Muddy Creek	soil	est	4	3	3
	browse	est	3	2	1
	herbaceous understory	est	4	3	3
16C-33 Little Nelson Mountain	soil		est	4	3
	browse		est	4	1
	herbaceous understory		est	4	3
16C-34 South Sage Flat	soil		est	3	3
	browse		est	3	1
	herbaceous understory		est	3	2
16C-35 Wildcat Knolls	soil		est	4	2
	browse		est	4	1
	herbaceous understory		est	2	2
16C-36 Danish Bench	soil		est	3	3
	browse		est	3	3
	herbaceous understory		est	3	1
16C-37 Joe's Valley Overlook	soil		est	3	3
	browse		est	3	3
	herbaceous understory		est	3	2
Site	Category	1985	1991	1999	2004
16C-40 Cedar Mountain	soil	est	3	3	1
	browse	est	5	3	3
	herbaceous understory	est	5	3	2
16C-41 Trough Hollow	soil	est	3	3	3
	browse	est	3	4	3
	herbaceous understory	est	3	2	2
16C-42 Box Canyon Sage Grouse	soil				est
	browse				est
	herbaceous understory				est

(1) = down, (2) = slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Site	Category	1998	1994	1999	2004
16C-43 Olson Draw Sage Grouse	soil				est
	browse				est
	herbaceous understory				est
Site	Category			1998	2004
16R-5 Scad Hollow	soil			est	3
	browse			est	4
	herbaceous understory			est	3

(1) = down, (2) = slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Management Unit 25A

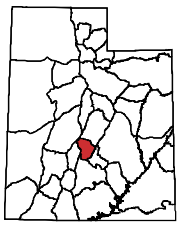


Map scale 1:335,000 (1 inch = 5.3 miles)

N

Transect Location
National Forest
BLM
State of Utah
Private Land
Water body
River or stream
Intermittent stream
Road

Unit Location



WILDLIFE MANAGEMENT UNIT 25A - PLATEAU, FISH LAKE

Boundary Description

Sevier, Wayne and Piute Counties - Boundary begins at Highway SR-24 and Highway SR-72; west and north on SR-24 to Highway US-89; north on US-89 to Interstate 70; east on I-70 to SR-72; south on SR-72 to SR-24 and beginning point.

Unit Description

Prior to 1998, the Fish Lake unit was called deer herd unit 44. In the spring of 1998 this unit was enlarged, now it is a subunit within the larger Wildlife Management Unit 25 - Plateau. This wildlife management unit now incorporates the Boulder Mountains (25C), Thousand Lake Mountains (25B), and the Fish Lake Mountains (25A).

The Fish Lake unit includes Fish Lake Mountain and drainages; Otter Creek to the west and the Fremont River with its major tributaries, 7-mile Creek and UM Creek to the east. Some steep, relatively rough areas exist in the drainage heads along the northwestern side, but most of the unit is an inclined, rolling plateau. Elevation ranges from 11,599 feet on Mt. Marvine to 7,040 feet at Loa. The northern two-thirds of the unit includes the higher elevations of the Fish Lake Mountains and constitutes summer range for deer and elk. Winter range is primarily confined to the lower elevations of the southern third of the unit and the sagebrush benches on the west side above Highway 24. Antelope are present and are normally found in the more open areas of the deer and elk winter range. Sage grouse are found near water in the same areas as those used by antelope. Fish Lake, Johnson Reservoir, Mill Meadow Reservoir, and Forsyth Reservoir are all popular summer fishing and camping areas. The higher portions of the unit are also popular elk and deer hunting areas. Another major public land use of the area is livestock grazing.

Huff and Blotter (1964) identified four dominant vegetation types on the winter range. Sagebrush was the most prevalent type. Black sagebrush (*Artemisia nova*) was the dominant species with islands of big sagebrush (*A. tridentata*) scattered throughout. Pinyon-juniper was the second most common vegetation type. Pinyon-juniper woodland occupies primarily southern slopes at higher elevations and is dispersed in patches throughout the lower elevations. Mountain brush can be found along the upper limits of the winter range. The mixed types occur in localized areas throughout the winter range.

The normal winter range can be found between 7,200 and 9,000 feet (Huff and Blotter 1964). Excessive accumulations of snow during severe winters confine deer below the 8,600-foot contour. Pinyon-juniper on both normal and severe wintering areas provide extremely important protective cover for elk and deer, while the closely associated sagebrush type produces the bulk of the required forage. In an update on winter range needs in the state, Mann (1985) considered the public land on the unit adequate to meet the wintering needs of deer without acquiring additional land from the private sector. The percent of the winter range that is administered by the BLM and USFS is respectively 30% and 47%. The Forest Service is responsible for managing almost all of the summer range (83%).

A history of heavy overgrazing by sheep and cattle is largely responsible for the present composition of most of the vegetative communities. Grazing began in the 1860's when the first settlers arrived in the Fremont Valley. Cattle, horses, and sheep grazed unregulated and range conditions deteriorated as herds increased. The result was overuse of the valuable cool-season grasses and forbs and degradation of the range in general. Even after the inception of the Forest Reserve (the predecessor to the Forest Service) in 1906, the situation worsened until livestock numbers peaked in 1924. Although overgrazing still occurs in many areas, grazing restrictions and management plans have been implemented on both Forest Service and BLM lands. Range conditions appear to be improving in most areas.

Browse species increased as the competition from grasses and forbs was reduced by the heavy grazing. The result was large areas of deer winter range with abundant browse forage. However, good spring-fall deer range or transition range is lacking. During these seasons, deer seek succulent green grasses and forbs. Because the herbaceous component is inadequate, depredation occurs on private croplands, especially alfalfa fields. The DWR is working with the other agencies to improve spring-fall ranges with chaining, spraying, harrowing, and/or seeding projects.

Mining activities are nonexistent on the area, but gas and oil exploration and road building are current land management concerns. There is presently a moderately high density of roads on the area. Although off-road use of vehicles is prohibited, ORV's and four-wheel drive vehicles can go almost anywhere and new roads are being created each year. Winter traffic and the increase of unregulated winter recreation will have a negative impact on big game.

Wildlife Management Unit Objectives

The current wildlife management objectives are to achieve a target winter herd size of 6,200 deer (stabilize the west side of the unit and increase the east side). A post season herd composition 15 bucks to 100 does with 30% of the bucks being 3 point or better will be maintained. The target winter herd size for elk is 4,800 for subunits 25A Fish Lake and 25B Thousand Lake. A herd composition of a minimum 8 bulls to 100 cows with 4 of those bulls being 2 ½ years of age or older will be maintained.

The Fish Lake deer unit is part of the Parker Mountain antelope unit. One hundred and twenty-nine pronghorns were transplanted to the Parker unit from Montana in 1964 and 1965. Because this antelope unit has done so well, antelope from this expanding herd have been transplanted to other areas of the state. Additionally, the yearly harvest has increased from 36 in 1974 to 133 in 1984 with an average hunter success rate of 93%. The Fish Lake part of the Parker Mountain antelope unit supports a modest portion of the total herd, but will likely become more important if the herd continues to expand.

Trend Study Site Description

Twelve trend study sites were placed within the Fish Lake unit in 1985. Eleven of the 12 study sites occur on deer and elk winter range and one on summer range. In 1991, all sites were reread and three additional summer or transitional range sites were established at East Tidwell #25A-12, Ox Spring #25A-13, and Row of Pines Exclosure #25A-14. These 15 trend studies were read again in 1999. Two additional study sites were established in 1999, within the Row of Pines exclosure. One samples the livestock exclosure (#25A-19) and the other samples the total exclosure (#25A-20). Data from these sites can be compared with the Row of Pines exclosure trend study site #25A-14, which samples the area outside of the exclosure.

Trend Study 25A-1-04

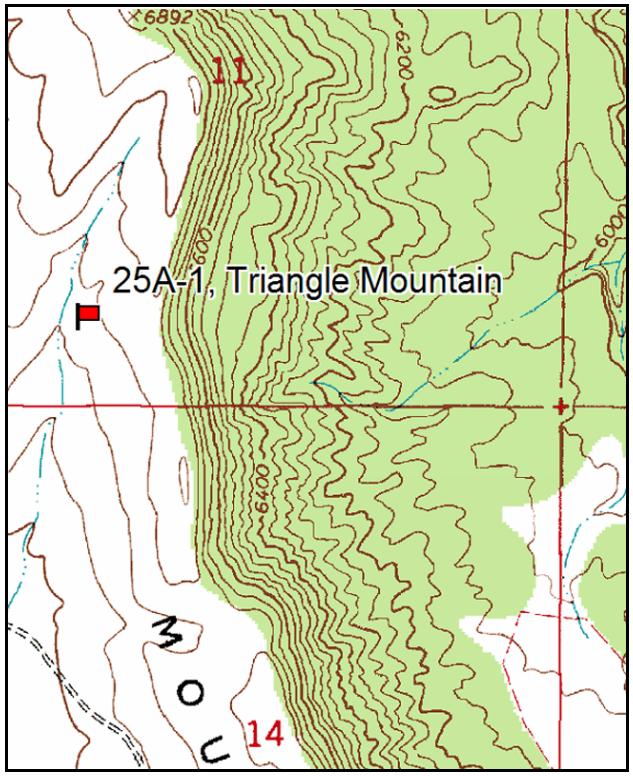
Study site name: Triangle Mountain . Vegetation type: Chained, Seeded P-J .

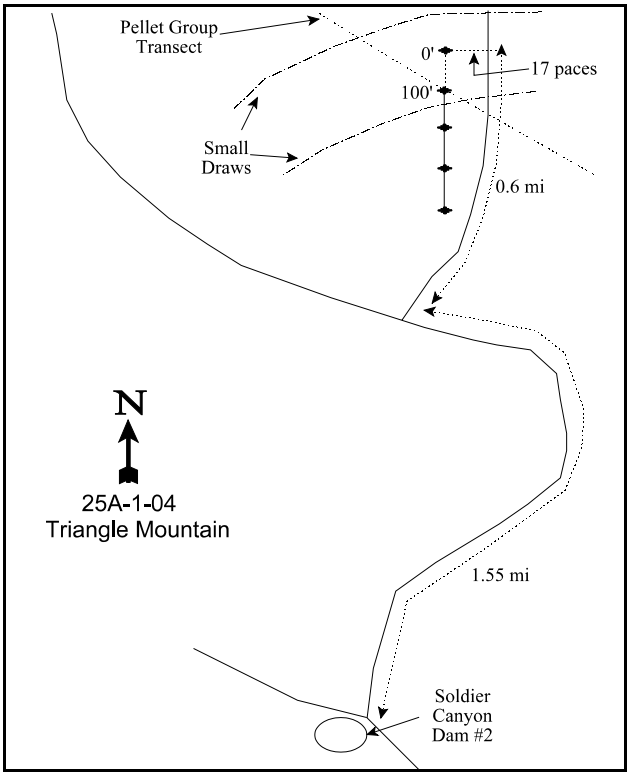
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the Gooseberry Creek Road outside Salina, take the Soldier Canyon Road west approximately 2.5 miles to Soldier Canyon Dam #2. At the dam, turn right up the road to Triangle Mountain. Go 1.55 miles to a fork. Take the right fork 0.6 miles to the top of a low rise between 2 small draws. Walk 17 paces due west of the road to the 0-foot baseline stake, which is a 4-foot rebar. A pellet group transect crosses the frequency baseline at the 100-foot mark.





Map Name: Salina, Utah

Diagrammatic Sketch

Township 22S , Range 1E , Section 11

GPS: NAD 27, UTM 12S 4306250 N, 433224 E

DISCUSSION

Triangle Mountain - Trend Study No. 25A-1

The Triangle Mountain study is located on a gentle sloping (5%-10%) southwest side of Triangle Mountain in the Fish Lake National Forest at an elevation of 6,700 feet. The area was formerly dominated by pinyon-juniper. It was chained and seeded in 1970. It is presently occupied by evenly scattered young pinyon and juniper trees that escaped the chain, and seeded perennial grasses. Cattle use the area in early summer and the grazing is heavy. The area is within the Brown's Hole allotment which allows grazing for approximately a two week period from June 1 to June 15 depending on conditions. In 1985, deer use at a nearby pellet group transect was relatively low at 31 deer days use/hectare when compared to the figures shown by other pellet group transects on the herd unit (average 69 deer days use/hectare) (Jense et al. 1985). Pellet group data from 1991 estimated 7 elk days use/acre (18 edu/ha). Pellet group data from 1999 estimate 21 deer (53 ddu/ha), 66 elk (162 edu/ha), and 49 cow days use/acre (120 cdu/ha). Pellet group data from 2004 estimated 10 deer (25 ddu/ha), 12 elk (30 edu/ha), and 5 cow days use/acre (13 cdu/ha). Rabbit use is fairly abundant on this site.

The soil is a light-colored, loam soil that is relatively shallow due to the prevalence of rock on the surface and throughout the profile. The estimated effective rooting depth is just under 12 inches. It is derived from a limestone parent material, and has a slightly alkaline pH (7.6). The amount of phosphorus is low and could be a limiting factor at 6.5 ppm because values below 10 ppm may limit normal plant growth and development. Soil organic matter is relatively high at 5.8%. There is good surface litter cover. Erosion is not severe due to the gentle slope and adequate cover from herbaceous vegetation and litter. The erosion condition class determined soil movement as stable in 2004. The area itself is quite dry with an average of about 10 inches of precipitation per year measured in Salina (5 miles away to the northwest and 1,600 feet lower).

Browse is infrequent on the site, resulting in light use by deer. Black sagebrush is the key browse species, but has a very low density. In 1985 , black sagebrush density was 66 plants/acre, 199 in 1991, 480 in 1999, and 420 in 2004. Use is mostly light, but recruitment was high in 1999 (38%), with some seedlings (8%). No young recruitment or seedlings were observed in 2004 and decadence was 19%. White-stemmed rubber rabbitbrush is scattered throughout the site in low numbers. Young pinyons and junipers were 4-8 feet in height in 2004. Density was estimated at 43 pinyon trees/acre and 35 juniper trees/acre in 1999. In 2004, pinyon was estimated at 33 trees/acre with an average diameter of 5.6 inches and juniper was estimated at 34 trees/acre with an average diameter of 7.8 inches. Some junipers were lightly hedged. Nearby, more dense stands of pinyon-juniper provide good cover.

Herbaceous vegetation makes up the majority of the vegetation cover at the site. In 1999, grasses and forbs combined made up 97% of the total vegetation and in 2004 they made up 94%. Seeded perennial grass species dominate the understory. The major species present are: crested wheatgrass, intermediate wheatgrass, and Russian wildrye. Crested wheatgrass is the dominate species overall, it provided 45% of the total vegetation cover in 1999 and 52% in 2004. Russian wildrye is scattered throughout the site in clumps that display a halo effect. Cheatgrass was sampled in 1999 and 2004, however it was infrequent, occurring in only 7 out of 100 quadrats. Seeded alfalfa decreased significantly in nested frequency and percent cover dropped from 48% of the forb cover to 12%. The annual, pale alyssum, is abundant and provided 28% of the forb cover and bur buttercup provided 58% in 2004, a significant increase from 1999. Other forbs are infrequent and unimportant.

1985 APPARENT TREND ASSESSMENT

Juniper and pinyon are regaining their former dominance in the chained areas with good vigor and virtually no competition. Other browse species are sporadic but may be slowly increasing. The grasses are well-established. The soil condition is poor, but relatively stable considering the relatively high amount of

bare soil.

1991 TREND ASSESSMENT

It appears that the juniper and pinyon trees, on the site, are those that escaped the chaining treatment and have been released from competing with the older adult trees. Density for the key browse species, black sagebrush, has increased by 67%, but is still low at about 200 plants/acre. This increase in density for black sagebrush would be expected to continue. All major seeded grasses have increased sum of nested frequency and quadrat frequency values. Another plus is that alfalfa has also increased since 1985, at which time it was questioned if it would survive. It has a 49% quadrat frequency, which is excellent for a 20 year old chaining. Bare ground has also decreased substantially.

TREND ASSESSMENT
soil - slightly up (4)
browse - up (5), but preferred browse still provides less than .1% cover
herbaceous understory - slightly up (4)

1999 TREND ASSESSMENT

Trend for soil is stable. Erosion is minimal due to adequate protective cover from herbaceous vegetation and litter. Percent cover from bare ground has stayed nearly the same as the previous reading. Trend for browse is stable, but insignificant on this site. Black sagebrush is the most abundant species, but it occurs at a very low density. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses decreased slightly, but the most abundant species, crested wheatgrass and Russian wildrye, have remained fairly stable, while nested frequency of intermediate wheatgrass has increased slightly. Sum of nested frequency for perennial forbs remained stable. Herbaceous plants are low in stature and moderately to heavily utilized. The Desirable Components Index rated this site as fair with a score of 31 due to very low shrub cover, good perennial grass cover, and no young shrubs.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3), preferred browse still only provides less than .1% cover
herbaceous understory - stable (3)
winter range condition (DC Index) - 31 (fair) Black sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Overall protective cover increased while percent bare ground decreased. Pavement increased suggesting perhaps some soil movement, but no current soil erosion was present on the site. Trend for key browse, black sagebrush, is stable, but is very low in density. Percent decadence increased from 0% to 19% in 2004 and no recruitment from the young or seedlings age classes were observed in 2004. Trend for the herbaceous understory is slightly down. Seeded perennial grasses (crested wheatgrass and Russian wildrye) decreased significantly in nested frequency. Cheatgrass is present on the site, but continues to remain at relatively low values. Alfalfa (major perennial forb) decreased significantly in nested frequency. Annual forbs increased (bur buttercup) in percent cover and frequency. The Desirable Components Index rated this site as fair with a score of 31 due to very low shrub cover, excellent perennial grass cover, and no young shrubs.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3), preferred browse still only provides less than 0.2% cover
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 31 (fair) Black sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{b}$267	$_{b}$293	$_{b}$242	$_{a}$208	7.19	13.39
G	Agropyron intermedium	$_{a}$109	$_{a}$158	$_{b}$180	$_{b}$163	2.45	4.88
G	Agropyron smithii	$_{a}$1	$_{b}$18	$_{a}$-	$_{a}$-	-	-
G	Agropyron spicatum	7	7	2	-	.00	-
G	Bromus tectorum (a)	-	-	$_{a}$6	$_{b}$19	.02	.11
G	Elymus junceus	$_{b}$79	$_{b}$99	$_{b}$95	$_{a}$24	1.76	.59
G	Elymus salina	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$18	-	.99
G	Festuca ovina	$_{b}$9	$_{c}$25	$_{a}$-	$_{a}$-	-	-
G	Oryzopsis hymenoides	-	-	1	2	.00	.06
G	Poa secunda	$_{a}$-	$_{a}$-	$_{c}$29	$_{b}$19	.20	.13
G	Sitanion hystrix	3	-	-	-	-	-
Total for Annual Grasses		0	0	6	19	0.01	0.10
Total for Perennial Grasses		475	600	549	434	11.62	20.05
Total for Grasses		475	600	555	453	11.64	20.16
F	Alyssum alyssoides (a)	-	-	$_{b}$260	$_{a}$205	1.41	1.14
F	Antennaria rosea	$_{b}$18	$_{a}$-	$_{ab}$7	$_{a}$2	.04	.01
F	Aster spp.	5	-	1	-	.00	-
F	Astragalus spp.	1	11	6	2	.21	.00
F	Chaenactis douglasii	-	2	-	-	-	-
F	Cryptantha spp.	$_{a}$-	$_{b}$19	$_{c}$52	$_{ab}$1	.92	.00
F	Descurainia pinnata (a)	-	-	-	4	-	.02
F	Gilia spp. (a)	-	-	-	-	-	.00
F	Hymenoxys acaulis	-	8	-	-	-	-
F	Lithospermum ruderale	1	1	3	-	.03	-
F	Medicago sativa	$_{b}$74	$_{b}$110	$_{b}$99	$_{a}$24	2.43	.47
F	Phlox austromontana	$_{ab}$4	$_{b}$13	$_{a}$1	$_{ab}$2	.00	.01
F	Ranunculus testiculatus (a)	-	-	$_{a}$3	$_{b}$192	.00	2.35
F	Streptanthus cordatus	-	-	-	3	-	.03
F	Townsendia spp.	-	6	-	-	-	-
Total for Annual Forbs		0	0	263	401	1.41	3.53

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
Total for Perennial Forbs		103	170	169	34	3.65	0.53
Total for Forbs		103	170	432	435	5.07	4.06

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

BROWSE TRENDS --
Management unit 25A, Study no: 1

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	15	14	.01	.18
B	Chrysothamnus nauseosus	2	0	-	-
B	Chrysothamnus viscidiflorus	2	2	-	.15
B	Gutierrezia sarothrae	1	4	-	-
B	Juniperus osteosperma	0	1	-	1.18
B	Leptodactylon pungens	2	2	-	-
B	Pinus edulis	3	0	.48	-
Total for Browse		25	23	0.49	1.51

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 1

Species	Percent Cover	
	'99	'04
Artemisia nova	-	.88
Chrysothamnus viscidiflorus	-	.03
Gutierrezia sarothrae	-	.48
Juniperus osteosperma	-	1.39
Pinus edulis	3.00	-

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 1

Species	Average leader growth (in)
	'04
Artemisia nova	2.0

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 1

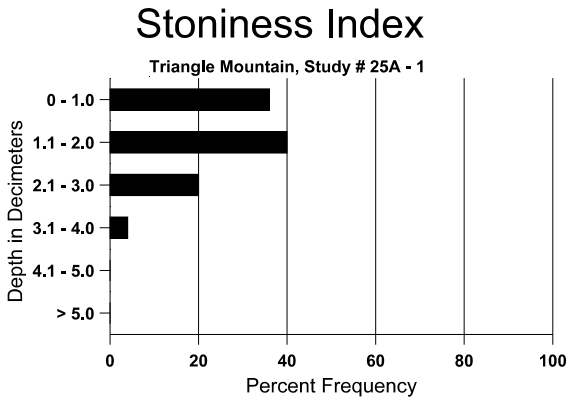
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	35	34	5.3	4.8
Pinus edulis	43	33	4.0	5.6

BASIC COVER --
Management unit 25A, Study no: 1

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	10.50	12.50	19.34	26.27
Rock	4.50	4.75	4.50	6.74
Pavement	19.50	13.50	10.88	23.19
Litter	30.75	48.00	26.33	31.02
Cryptogams	0	.50	1.20	2.27
Bare Ground	34.75	20.75	18.20	18.53

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 1, Study Name: Triangle Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.7	53.0 (9.6)	7.6	40.0	34.7	25.3	5.8	6.5	243.2	0.7



PELLET GROUP DATA --
Management unit 25A, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	27	44	-	-
Elk	18	12	66 (162)	12 (30)
Deer	18	16	21 (53)	10 (25)
Cattle	10	12	49 (120)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**66**	-	-	66	-	-	0	0	0	-	0	12/20
91	**199**	-	133	66	-	-	33	0	0	-	0	19/36
99	**480**	40	180	300	-	60	29	0	0	-	0	15/23
04	**420**	-	-	340	80	-	19	0	19	5	5	11/18
Chrysothamnus nauseosus												
85	**66**	-	-	66	-	-	0	0	0	-	0	14/9
91	**399**	-	333	-	66	-	17	0	17	-	17	-/-
99	**40**	-	20	20	-	-	0	0	0	-	0	18/16
04	**0**	-	-	-	-	-	0	0	0	-	0	17/19
Chrysothamnus nauseosus hololeucus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	26/40
Chrysothamnus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	8/8
04	**60**	-	-	60	-	-	0	0	-	-	0	6/7
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	9/7
04	**120**	-	-	120	-	-	0	0	-	-	0	10/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	-	60	-	-	0	0	-	-	0	4/13
04	**40**	-	-	40	-	-	0	0	-	-	0	5/10
Pinus edulis												
85	**66**	-	-	66	-	-	0	0	-	-	0	51/31
91	**66**	-	-	66	-	-	0	0	-	-	0	72/75
99	**60**	-	-	60	-	20	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25A-2-04

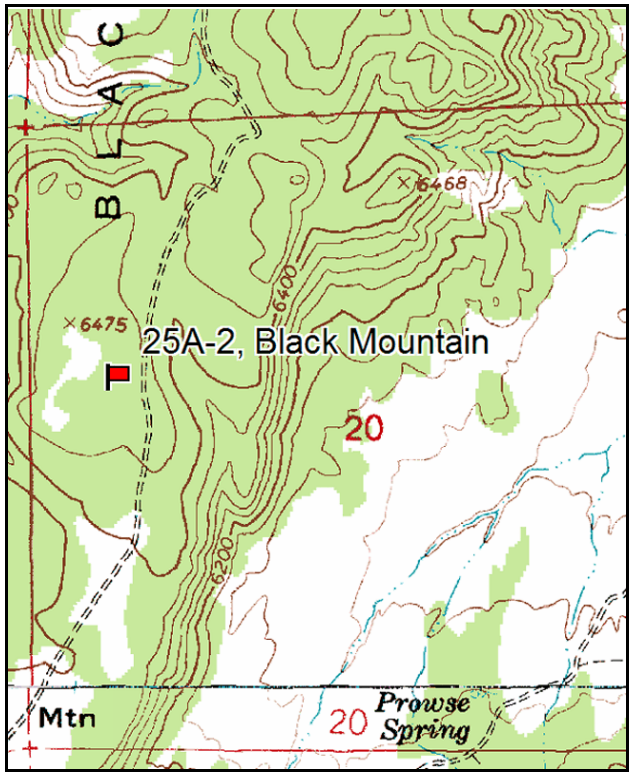
Study site name: Black Mountain . Vegetation type: Chained, Seeded P-J .

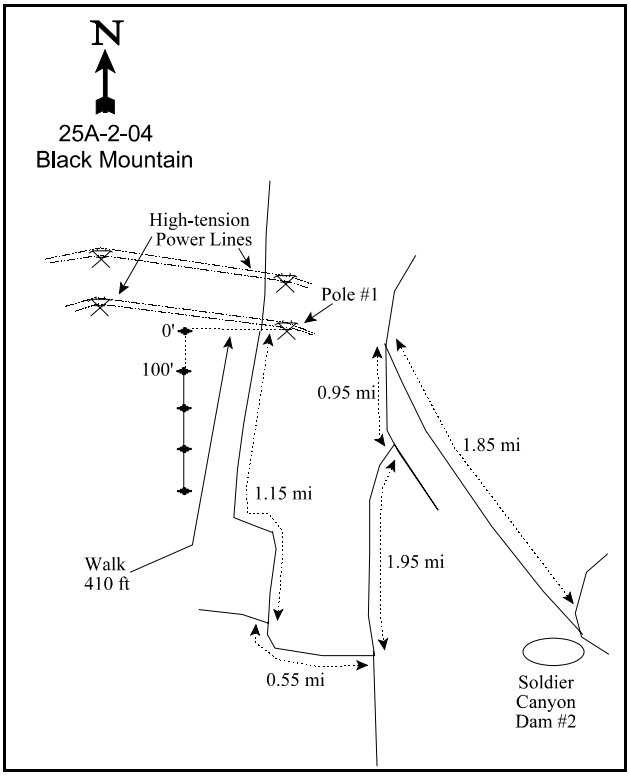
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Soldier Canyon Dam #2, proceed 1.85 miles west on the Soldier Canyon Road to the Black Mountain Road. Make a sharp left turn onto this road and travel south-southeast 0.95 miles to a junction. Take the right fork 0.85 miles to the double high-tension powerlines. The transect starts under these lines on the mesa to the right. Continue 1.1 miles beyond the powerlines to a 90-degree fork to the right. Turn right and go 0.55 miles to another fork. Stay to the right and proceed 1.15 miles up the hill and across a chaining until you are between the powerlines. Starting from the pole (#1) east of the road, pace off 410 feet west directly under the lines to the start of the frequency baseline which is 10 feet to the right. The 0 foot post is marked with browse tag #7028.





Map Name: Salina, Utah

Diagrammatic Sketch

Township 22S , Range 1E , Section 20

GPS: NAD 27, UTM 12S 4303753 N, 428085 E

DISCUSSION

Black Mountain - Trend Study No. 25A-2

The Black Mountain trend study was Ely chained and seeded in 1984. Slope is less than 5% with a slight southern aspect and an elevation of 6,400 feet. The distance to free water (at least 1.5 to 2 miles) has limited livestock use of the area. Cattle have grazed the area for the past 30 or more years, but historically it has had only light to moderate use. Before then, there was heavy pressure from sheep and deer. Cattle now use the area in late spring for about two weeks on their way to summer range as part of the Browns Hole allotment. Deer use averaged 27 deer days use/acre (68 dd/ha) from 1985 to 1991 on a nearby pellet group transect. In the past, elk use has been light most years with three elk days use/hectare being reported in the winter of 1983-84 (Jense et al. 1985). Pellet group data from 1999 estimated 38 elk (93 edu/ha), 78 deer (192 ddu/ha), 24 cow days use/acre (59 cdu/ha). Pellet group data from 2004 estimated 20 elk (50 edu/ha), 52 deer (127 ddu/ha), and 12 cow days use/acre (30 cdu/ha) from the last spring.

The soil has a sandy clay loam texture with a slightly alkaline pH (7.6). It is moderately shallow with an estimated effective rooting depth under 12 inches. A gravelly layer is present approximately 12 inches below the surface. Soil organic matter is higher than expected at this site at 3.5%. Phosphorus is low at 5.7 ppm as values below 10 ppm may limit normal plant growth and development. Relative percent bare ground cover was 35% in 1999 and 23% in 2004, which is not excessive for a characteristically dry area that was chained. The erosion condition class determined soil movement as stable in 2004.

Black sagebrush is the dominate key preferred browse, although stickyleaf low rabbitbrush is the most abundant browse species. Black sagebrush density has decreased from 999 plants/acre in 1985, to 600 in 1991, 860 in 1999, and 540 in 2004. The increase in 1999 was due to a high proportion of young plants in the population, although it would seem that many did not survive to maturity. Percent decadence has fluctuated from 33% in 1991, to 5% in 1999, to a high of 63% in 2004. Almost half of the black sagebrush population was consider to be dying in 2004. Use was light to moderate and vigor was poor in 2004. This population of black sagebrush is in an unstable state and has the potential of disappearing from this site with continuing drought. A few mountain big sagebrush plants were sampled in 1999 and 2004. This species was included in the seed mix, however this is a marginally dry site for this species. Plants are low in stature and moderately hedged.

Stickyleaf low rabbitbrush is the most numerous shrub on the site; estimated at 2,200 plants/acre in 1999 and 1,400 in 2004. There was moderate use on rabbitbrush in 1999 and only light use in 2004. It appears that dwarf rabbitbrush *(Chrysothamnus depressus)* was misidentified in 1985 and 1991. All of the rabbitbrush encountered in 1999 were stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*). The chaining effectively removed the dominant overstory of mature juniper-pinyon and reduced it to widely scattered young trees. Density for juniper in 1999 was estimated at 72 trees/acre and pinyon was estimated at 23 trees/acre.

Grass composition is dominated by a variety of seeded and native perennial species. Indian ricegrass and bottlebrush squirreltail were the most abundant native perennial grasses in 1999 and 2004. Seeded species such as crested and intermediate wheatgrass, smooth brome, Russian wildrye, and sheep fescue are present, although less abundant except for crested and intermediate wheatgrass. Most of the perennial species displayed moderate to heavy use in 1999 and only light use in 2004. Cheatgrass was the most common herbaceous species in 1999, but decreased significantly, while crested wheatgrass increased significantly. Forb density and diversity is low. Annual increasers such as Russian thistle and prickly lettuce were most common immediately after the chaining. Since then forbs have nearly disappeared from the understory. Only four species were sampled in 1999 and three in 2004, with pale alyssum and bur buttercup, both annuals, being the most abundant in cover and frequency. The seeded forbs, alfalfa, small burnet, and yellow sweet clover,

were not sampled in 1999 or 2004.

1985 APPARENT TREND ASSESSMENT

Trend will depend upon the success of the seeding. Any assessment this soon would be tentative at best. However, it would appear that trend of both soils and vegetative composition can only be up.

1991 TREND ASSESSMENT

This site is dryer than the Triangle Mountain site (25A-1) and is evident by the slow recovery for most species on this chained site. Most of the seeded grasses are increasing in sum of nested and quadrat frequency values, but it has been slow because of the prolonged drought. The major three native grasses are also increasing in numbers and distribution (bluebunch wheatgrass, Indian ricegrass, and bottlebrush squirreltail). The alfalfa that was seeded has almost disappeared now. The black sagebrush is also showing the effects of the drought. It's population has decreased by 40% and percent decadency has increased to 33%. These are not good signs, but with a change in the weather patterns, we would expect the grasses and black sagebrush to recover. Because of these decreases in vegetation, percent bare ground has increased dramatically from 20% to 38%. However, litter cover has remained similar and nested frequency of grasses and forbs have increased.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - slightly up (4)

1999 TREND ASSESSMENT

Trend for soil is stable, but still in poor condition. Herbaceous vegetation and litter are low for a chained and seeded site due to the shallow soils and drought. Relative percent bare ground cover is moderately high at 35% cover, but the gentle slope holds erosion to minimal levels. Trend for browse is stable overall. Black sagebrush, the most numerous preferred species, shows a 30% increase in density. It also has high recruitment from young plants at 21%. Percent decadency is low at 5% with light to moderate use. On a negative note, stickyleaf low rabbitbrush is the most numerous species on the site, increasing by 73% since 1991. It appears that this species will continue to increase with the young age class making up 25% of its population. The herbaceous understory shows a stable trend for grasses, while forbs continue to decline. Perennial forbs are nearly nonexistent and annual grasses and forbs are increasing. Perennial forbs, primarily the seeded species, have disappeared from the understory altogether. Perennial grasses have remained fairly stable in their sum of nested frequency overall, but show moderate to heavy use. The Desirable Components Index rated this site as good with a score of 47 due to low shrub cover, good perennial grass cover, and many young shrubs.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 47 (good) Black sagebrush type

2004 TREND ASSESSMENT

Trend for soil is considered slightly down. There was a slightly improvement for relative percent bare ground cover which went down from 35% to 23%. However, percent relative cover of pavement increased from 13% in 1999 to 28% in 2004. Increase in pavement cover would suggest soil loss has increased exposing more pavement. Increase in pavement has the potential to increase overland flows, reducing infiltration into the soil.

Bare ground decreased in percent cover also suggesting soil loss. Trend for key browse black sagebrush is down. Density has decreased from 860 plants/acre in 1999 to 540 in 2004. About half of the current population was classified as dying. No recruitment of young was recorded in 2004. Trend for herbaceous understory is stable with only a slight decrease in perennial grass sum of nested frequency. Nested frequency for crested wheatgrass increased significantly, however two other perennial species decreased while cheatgrass decreased significantly. Forbs lack diversity and most are all small annuals species that contribute little to total cover. The Desirable Components Index rated this site as poor with a score of 23 due to high decadency, low shrub cover, but good perennial grass cover.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 23 (poor) Black sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 2

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	a14	b57	ab41	c98	.75	3.25
G	Agropyron intermedium	a9	c88	ab42	b55	.89	1.26
G	Agropyron smithii	4	-	-	-	-	-
G	Agropyron spicatum	a5	b45	a6	a10	.09	.48
G	Bromus inermis	a4	a6	b73	a11	1.20	.12
G	Bromus tectorum (a)	-	-	b133	a14	1.31	.18
G	Elymus junceus	a-	b9	b12	b6	.11	.22
G	Festuca ovina	a-	ab10	b27	a2	.37	.00
G	Oryzopsis hymenoides	68	77	95	105	2.92	4.10
G	Poa fendleriana	2	-	6	2	.06	.03
G	Poa secunda	-	-	5	5	.06	.04
G	Sitanion hystrix	49	89	80	79	1.58	2.74
Total for Annual Grasses		0	0	133	14	1.31	0.18
Total for Perennial Grasses		155	381	387	373	8.06	12.25
Total for Grasses		155	381	520	387	9.38	12.44
F	Alyssum alyssoides (a)	-	-	b189	a137	.62	1.31
F	Antennaria rosea	6	-	-	-	-	-
F	Astragalus spp.	a4	b30	a14	a-	.11	-
F	Castilleja spp.	-	2	-	-	-	-
F	Chaenactis douglasii	a-	b12	a-	a-	-	-
F	Cryptantha spp.	-	-	1	-	.00	-
F	Erigeron engelmannii	-	2	-	-	-	-
F	Eriogonum ovalifolium	a-	b14	a-	a-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Gilia spp. (a)	-	-	-	10	-	.02
F	Lactuca serriola	$_{a}$-	$_{b}$7	$_{a}$-	$_{a}$-	-	-
F	Machaeranthera canescens	-	4	-	-	-	-
F	Medicago sativa	$_{b}$14	$_{a}$1	$_{a}$-	$_{a}$-	-	-
F	Phlox longifolia	$_{a}$-	$_{b}$12	$_{a}$-	$_{a}$-	-	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{b}$174	-	1.11
F	Salsola iberica (a)	$_{a}$1	$_{b}$19	$_{a}$-	$_{a}$-	-	-
F	Sanguisorba minor	$_{b}$29	$_{a}$1	$_{a}$-	$_{a}$-	-	-
F	Senecio multilobatus	3	-	-	-	-	-
F	Streptanthus cordatus	2	2	-	-	-	-
F	Taraxacum officinale	-	1	-	-	-	-
F	Tragopogon dubius	-	3	10	-	.02	-
F	Unknown forb-perennial	-	2	-	-	-	-
Total for Annual Forbs		1	19	189	321	0.62	2.45
Total for Perennial Forbs		58	93	25	0	0.13	0
Total for Forbs		59	112	214	321	0.75	2.45

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

BROWSE TRENDS --
Management unit 25A, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	26	16	1.70	1.03
B	Artemisia tridentata vaseyana	1	2	-	.12
B	Chrysothamnus viscidiflorus viscidiflorus	42	36	2.12	1.97
B	Juniperus osteosperma	8	4	1.83	2.27
B	Pinus edulis	1	0	.03	.15
Total for Browse		78	58	5.70	5.55

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 2

Species	Percent Cover '04
Artemisia nova	1.50
Chrysothamnus viscidiflorus viscidiflorus	4.55
Juniperus osteosperma	1.81

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 2

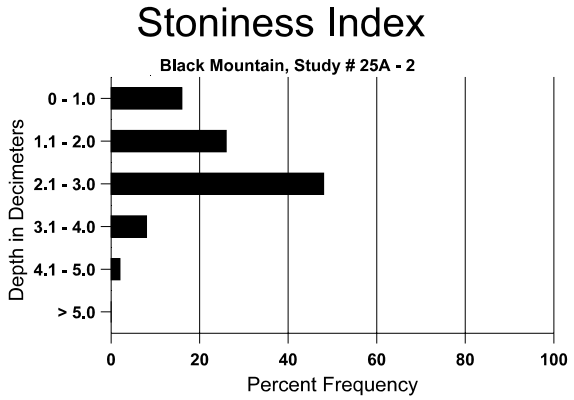
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	72	-	2.3	-
Pinus edulis	23	-	1.7	-

BASIC COVER --
Management unit 25A, Study no: 2

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	1.50	3.00	18.36	19.96
Rock	1.75	3.25	4.71	4.80
Pavement	30.25	14.00	11.60	31.67
Litter	46.50	42.00	21.79	29.77
Cryptogams	0	0	.05	1.04
Bare Ground	20.00	37.75	29.98	26.72

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 2, Study Name: Black Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.7	61.3 (10.9)	7.6	50.0	25.1	24.9	3.5	5.7	316.8	0.5



PELLET GROUP DATA --
Management unit 25A, Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	18	56	-	-
Elk	15	16	38 (93)	20 (50)
Deer	24	39	78 (192)	52 (127)
Cattle	16	6	24 (59)	12 (30)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**999**	-	-	866	133	-	7	0	13	-	0	6/7
91	**600**	-	-	400	200	-	0	0	33	-	0	8/11
99	**860**	20	180	640	40	20	40	0	5	-	0	11/18
04	**540**	-	-	200	340	160	22	15	63	48	48	11/18
Artemisia tridentata vaseyana												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**40**	-	40	-	-	60	100	0	0	-	0	13/16
04	**40**	-	-	20	20	-	50	50	50	50	50	11/15
Chrysothamnus depressus												
85	**533**	-	-	400	133	-	0	0	25	-	0	7/7
91	**266**	-	66	200	-	-	0	0	0	-	0	13/14
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**599**	66	266	333	-	-	0	0	0	-	0	15/19
99	**2200**	40	540	1600	60	40	20	16	3	-	16	14/22
04	**1400**	-	-	1340	60	120	0	6	4	3	3	13/23
Juniperus osteosperma												
85	**132**	-	66	-	66	-	0	0	50	-	0	-/-
91	**66**	-	66	-	-	-	0	0	0	-	0	-/-
99	**160**	20	120	40	-	160	0	0	0	-	0	-/-
04	**80**	-	20	60	-	-	25	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	40	0	0	-	-	100	-/-
04	**0**	-	-	-	-	20	0	0	-	-	0	-/-

Trend Study 25A-3-04

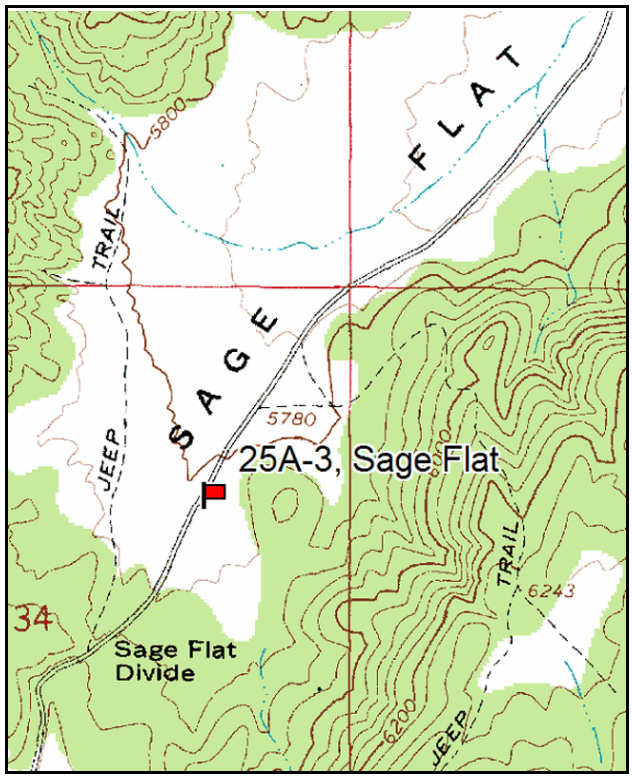
Study site name: Sage Flat . Vegetation type: Wyoming Big Sagebrush .

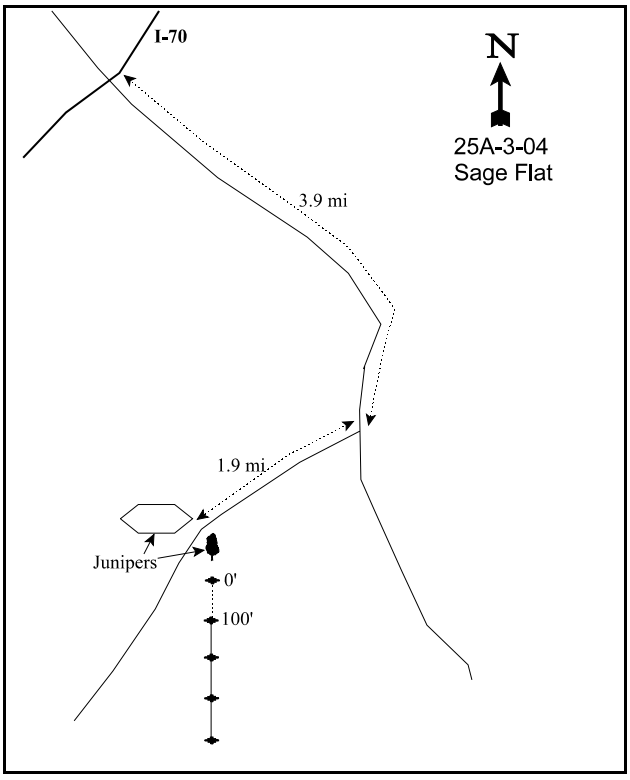
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the point where the Lost Creek Road passes under I-70 east of Aurora, proceed southeast up the Lost Creek Road 1.2 miles to a truck crossing. Continue past the truck crossing 1.65 miles to a bridge, then 1.05 miles beyond the bridge to a road turning off to the right. Turn right here onto the Sage Flat Road. Drive along this road for 1.9 miles to a slight bend with 5 junipers on the right side. Stop the vehicle 20-30 yards beyond these trees. On the left side of the road is a lone juniper. The baseline begins 15 feet south of this tree.





Map Name: Sigurd, Utah

Diagrammatic Sketch

Township 22S , Range 1W , Section 34

GPS: NAD 27, UTM 12S 4300135 N, 422720 E

DISCUSSION

Sage Flat - Trend Study No. 25A-3

The Sage Flat trend study is located in a sagebrush flat surrounded by sagebrush and juniper covered hills. The flat is dominated by Wyoming big sagebrush with a thick understory of cheatgrass at an elevation of 5,800 feet. The area is used by wintering deer, especially in severe winters when there is heavy snow at higher elevations. The BLM allows sheep grazing in the winter, with both cattle and sheep using it in the spring. However, the Gypsum allotment is not currently used by sheep and there is little use by cows on the site. The road through the flat is well-used, and possible adverse impacts could come from off-road vehicle use. Pellet group transect data from the site in 1999 indicate heavy use by deer with an estimated 125 deer days use/acre (308 ddu/ha). Use by elk and livestock was light in 2004 as pellet group data from estimated 246 deer (608 ddu/ha), 1 elk (2 edu/ha), and 4 cow days use/acre (9 cdu/ha). Livestock use was from the previous summer.

Soils are a fine-textured, loam to sandy loam with a slightly alkaline pH (7.7). Soil depth is moderately deep with an estimated effective rooting depth of just over 15 inches. The soil is not overly rocky on the surface or within the profile, although a gravelly layer is present at about 16 inches. Organic matter is relatively low at 1.3%, with phosphorus at 5.8 ppm. Values below 10 ppm for phosphorus may limit normal plant growth and development. Soil movement is noticeable in a few active gullies on the site, especially along the bottom of the flat. Slight pedestaling is occurring around base of the sagebrush. However, the gentle slope of the area limits erosion to minimal levels. The erosion condition class determined soil movement as stable in 2004. Percent bare ground has slightly decreased since 1991 with a large decrease from 1999 to 2004, due to the increase in cheatgrass cover.

The vegetation of the site is comprised primarily of two species: Wyoming big sagebrush in the overstory, and cheatgrass in the understory. Each species provided roughly 46% of the total vegetative cover in 1999 and in 2004 sagebrush only provided 27% and cheatgrass provided 65%. Together they provided 92% of the total vegetative cover. Wyoming big sagebrush is the only browse species sampled directly on the site besides a cactus species. Sagebrush density was estimated at 2,399 plants/acre in1985, 5,199 in 1991, 3,500 in 1999, and 3,200 in 2004. Differences between 1991 and 1999 are somewhat accounted for because the baseline was in 1999 to increase the sample size for better density estimates for browse species. The higher density in 1991 can also be attributed in part to the very large number of young plants estimated in the population that year (2,866 plant/acre). The population appears to be declining with 26% of the population classified as dying and decadence increasing to 38%. Young recruitment only accounted for 3% of the population, no seedlings were observed, and vigor is only fair. Use has been light to moderate in past years, but in 2004 the majority of the population had heavy use. Leader growth on several plants was measured at 8 inches in 1999 and just over 2 inches in 2004. This population of sagebrush may be at risk with an increase in use, increase in percent decadency, poor vigor, and a significant increase in cheatgrass nested frequency. A greater diversity of browse species is found in the flat, with saltbush (*Atriplex spp.*), greasewood (*Sarcobatus vermiculatus*), and winterfat (*Ceratoides lanata*) occurring along the washes. Junipers are abundant and vigorous on the area surrounding the transect, but do not appear to be spreading into the flat.

The herbaceous vegetation is completely dominated by annuals. Cheatgrass presents a major fire hazard to the big sagebrush population which is not tolerant of fire. If this site were to burn in the future, the area's importance as deer winter range would be lost or greatly reduced. Cheatgrass provided 100% of the grass cover, 89% of the herbaceous cover, and 65% of the total vegetation cover at the site in 2004. It occurs in 100% of the sampling quadrats and will normally prohibit emergence and establishment of sagebrush seedlings. In 1999, perennial grasses were represented by only two species, bottlebrush squirreltail and sand dropseed. In 2004 only bottlebrush squirreltail was found and was observed in only a single quadrat. Forbs are insignificant, and are made up of only annual species.

1985 APPARENT TREND ASSESSMENT

Soil and vegetative trends appear to be downward. Continuous heavy spring grazing pressure from livestock is most responsible for the poor vegetative composition (lack of cool season herbaceous species). Although it provides important early green forage, the shallow rooted cheatgrass provides little erosion control and is a fire hazard. In order to replace this plant with more desirable perennial grasses and forbs and reverse present trends, this site needs a rest from spring livestock grazing and may require some kind of treatment and seeding.

1991 TREND ASSESSMENT

The key browse species, Wyoming sagebrush, has increased in density by 54% without including the estimated 8,000 seedlings per acre. However, 72% of the population is currently made up of young plants, which can be lost quickly with continued drought and competition with cheatgrass. It appears that the cheatgrass has increased from last time, but there is no quantifiable data for the project disregarded the inventory of annual species before 1992. Very few perennial forbs or grasses were encountered on the site. Site understory composition was considered poor for it was mostly annuals.

TREND ASSESSMENT
soil - stable (3)
browse - up (5)
herbaceous understory - down (1)

1999 TREND ASSESSMENT

Soil trend is stable, but is in very poor condition because it depends almost entirely on cheatgrass for protective herbaceous cover. Perennial vegetation has almost entirely disappeared from the site. Herbaceous and litter cover are provided by cheatgrass, which is not as good as perennial cover at holding soils in place. Soil movement is noticeable with pedestaling around the base of sagebrush and some gullies occurring on site. Browse trend is stable. Although deer use is moderately high, Wyoming big sagebrush shows a relatively stable density of mature (actually increased 50%) and decadent plants, good vigor, and mostly light to moderate use. Percent seedling age class is low, but recruitment from young plants is fairly good at 11%. Percent decadency has remained at similar levels between readings, currently it is at 31%. Average height and crown measurements increased between 1991 and 1999. The herbaceous understory trend is down and in seriously poor condition. Perennial species are almost non-existent, with cheatgrass dominating the herbaceous composition. This composition creates a major fire hazard for this winter range site, where the sagebrush population could be lost if it were to burn in the future. The Desirable Components Index rated this site as poor with a score of 23 due to high decadency, high cheatgrass cover, and poor perennial grass or forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down (1)
winter range condition (DC Index) - 23 (poor) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Bare ground decreased mainly due to an increase in cheatgrass nested frequency and cover, although annual vegetation is not as good at holding soil in place as perennial cover. Some rills and pedestaling are noticeable on the site. Trend for key browse Wyoming big sagebrush is down. Density has decreased and 26% of the population was classified as dying, it will most likely continue to decrease.

Decadency is relatively high at 38%, vigor is fair, heavy use is apparent on most plants, and very little young or seedling recruitment was observed. Trend for the herbaceous understory is down. Cheatgrass increased significantly in nested frequency and percent cover increased from 15% in 1999 to 32% in 2004. Only one perennial species was sampled on the entire transect, which is down from two species in 1999. This composition creates a major fire hazard for this winter range site, where the sagebrush population could be lost if it were to burn in the future. The Desirable Components Index rated this site as very poor with a score of 3 due to high decadency, high cheatgrass cover, and poor perennial grass or forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 3 (very poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 3

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Bromus tectorum (a)	-	-	$_{a}$349	$_{b}$379	15.05	32.11
G	Poa secunda	3	-	-	-	-	-
G	Sitanion hystrix	$_{b}$38	$_{b}$19	$_{a}$3	$_{a}$3	.03	.03
G	Sporobolus cryptandrus	-	-	1	-	.18	-
Total for Annual Grasses		0	0	349	379	15.05	32.11
Total for Perennial Grasses		41	19	4	3	0.21	0.02
Total for Grasses		41	19	353	382	15.26	32.14
F	Alyssum alyssoides (a)	-	-	23	25	.17	.14
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{b}$36	-	.63
F	Ranunculus testiculatus (a)	-	-	$_{a}$143	$_{b}$267	.88	3.12
F	Salsola iberica (a)	-	-	-	4	-	.00
F	Sisymbrium altissimum (a)	-	-	18	8	1.20	.07
F	Tragopogon dubius	-	1	-	-	-	-
F	Unknown forb-perennial	-	1	-	-	-	-
Total for Annual Forbs		0	0	184	340	2.25	3.99
Total for Perennial Forbs		0	2	0	0	0	0
Total for Forbs		0	2	184	340	2.25	3.99

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

BROWSE TRENDS --
Management unit 25A, Study no: 3

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia tridentata wyomingensis	84	86	14.90	13.39
B	Opuntia spp.	1	1	-	.03
Total for Browse		85	87	14.90	13.42

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 3

Species	Percent Cover '04
Artemisia tridentata wyomingensis	19.66
Opuntia spp.	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 3

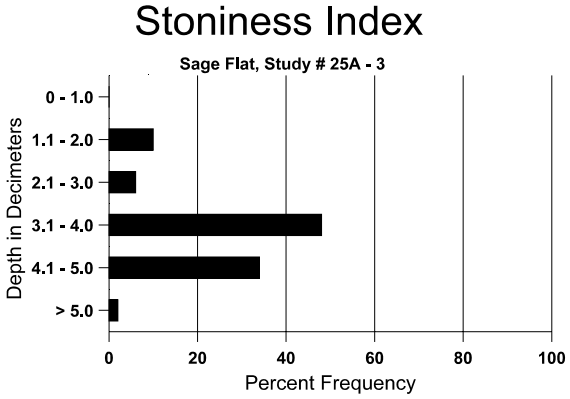
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.3

BASIC COVER --
Management unit 25A, Study no: 3

Cover Type	Average Cover % '85	'91	'99	'04
Vegetation	8.50	1.25	30.59	49.87
Rock	1.50	1.75	1.32	1.52
Pavement	7.75	19.25	10.25	11.38
Litter	54.25	55.25	37.05	43.91
Cryptogams	0	0	.09	.87
Bare Ground	28.00	22.50	20.09	12.67

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 3, Study Name: Sage Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.2	64.7 (12.5)	7.7	52.0	28.7	19.3	1.3	5.8	147.2	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 3

Type	Quadrat Frequency '99	Quadrat Frequency '04	Days use per acre (ha) '99	Days use per acre (ha) '04
Rabbit	35	36	-	-
Elk	-	1	4 (9)	1 (2)
Deer	53	82	125 (308)	246 (608)
Cattle	2	2	6 (14)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
85	**2399**	-	133	1466	800	-	3	0	33	.83	6	24/26
91	**5199**	8000	2866	1000	1333	-	24	0	26	2	5	21/19
99	**3500**	20	400	2020	1080	540	26	3	31	1	1	26/34
04	**3200**	-	80	1900	1220	460	18	74	38	26	26	22/31
Opuntia spp.												
85	**66**	-	-	66	-	-	0	0	-	-	0	6/6
91	**66**	-	-	66	-	-	0	0	-	-	0	6/13
99	**20**	-	-	20	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	4/9

Trend Study 25A-4-04

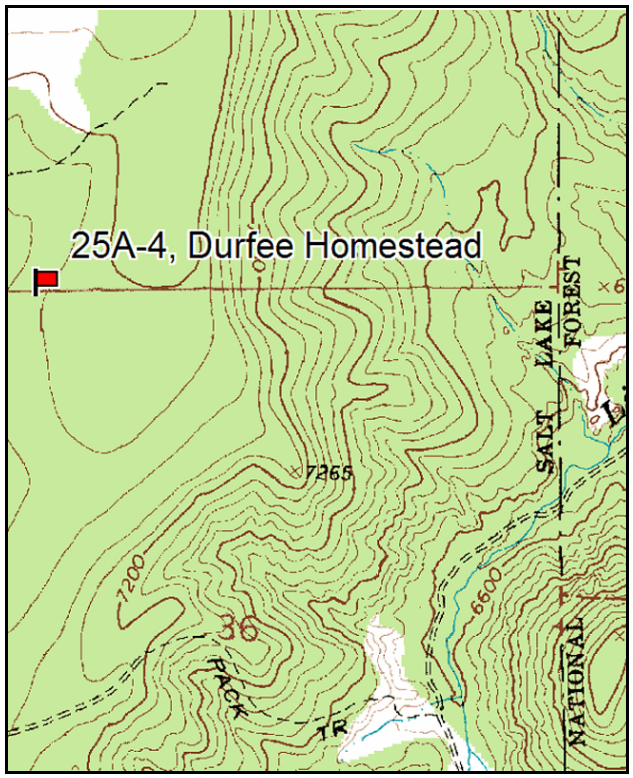
Study site name: Durfee Homestead . Vegetation type: Chained, Seeded P-J .

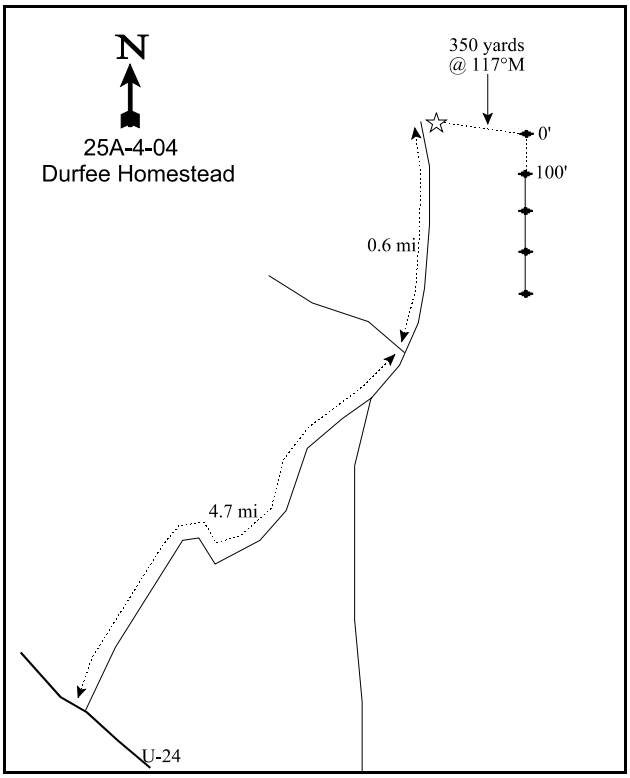
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Sigurd, drive east on U-24 to mile marker 21. Turn left (north) on the Sand Ledge Road and drive northeast for 1.6 miles. Turn left at the intersection and proceed north 3.1 miles to an intersection with a trough and pond. Continue 0.1 miles to a road that goes up the draw bottom. Drive up this road for 0.5 miles. Stop at the witness post (1/2" red rebar 2' tall on east side of road) and walk out 350 yards at a bearing of 117 degrees magnetic. The baseline starts out in the chaining about 100 feet from the edge of the PJ. The 0-foot baseline stake has a red browse tag #7194 attached.





Map Name: Rex Reservoir, Utah

Diagrammatic Sketch

Township 23S , Range 1W , Section 36

GPS: NAD 27, UTM 12S 4290868 N, 425073 E

DISCUSSION

Durfee Homestead - Trend Study No. 25A-4

The Durfee Homestead trend study lies on BLM administered land, in an area that was chained and seeded in 1983. The transect is on a west aspect with a 10% slope at an elevation of 7,400 feet. Scattered patches of pinyon-juniper were left as protective cover. The transect is located within 100 feet of a dense pinyon-juniper border of unchained, mature trees. The area is used in the late spring by cattle as part of the Sand Ledge allotment which is administered by the BLM. Pellet group transect data indicates use by wildlife and livestock is moderate. In 1999, pellet group data estimated 15 deer (38 ddu/ha), 33 elk (82 edu/ha), and 16 cow days use/acre (40 cdu/ha). Pellet group data from 2004 estimated 15 deer (36 ddu/ha), 7 elk (17 edu/ha), and 4 cow days use/acre (9 cdu/ha).

The soil is a loam to clay loam in texture and has a slightly alkaline pH (7.5). Soil organic matter is moderately high at 4.3%. Rock is prevalent on the surface and throughout the profile, resulting in an estimated effective rooting depth of just under 12 inches. Rock and pavement together provided nearly 40% of the surface cover in 1999 and increased to nearly 60% in 2004. Bare ground was relatively low at about 20% in 1999 and decreased to 9% in 2004, mostly likely due to increase in rock and pavement. Litter and slash from the chaining made up 72% of the ground cover in 1985, dropping to only 21% by 1991. It appears that litter was greatly overestimated in 1985. Litter was estimated at 15% in 2004. Erosion is minimal due to the heavily armored surface from pavement and rock. The erosion condition class determined soil movement as stable in 2004.

The chaining was very effective in removing the overstory of juniper and pinyon. However, preferred browse species are almost non-existent following the chaining and seeding. The key browse species are Wyoming big sagebrush, antelope bitterbrush, and a very sparse Utah serviceberry. Together, these preferred species provide only about 6% of the browse cover. Wyoming big sagebrush density was 20 plants/acre in 1999 and increased to 100 in 2004, but was greatly reduced following a fire previous to the 1991 reading. Bitterbrush (also not tolerant of fire) density was estimated at 20 plants/acre in 2004, 40 in 1999, which was down from an estimated 532 plants/acre when the site was first read in 1985. Slenderbush eriogonum was moderately utilized in 1999, but this species is small and does not produce much forage. It was estimated at 1,732 plants/acre in 1985 and due to fire is only estimated at 120 plants/acre in 2004.

The increaser, stickyleaf low rabbitbrush, currently dominates the browse component. This species has increased during each sampling period, especially since the fire, and was estimated at 3,640 plant/acre in 2004. The population was all young plants in 1991. In 2004, it was mostly mature and appeared to have a stable population with low recruitment (6%). The average height and crown measurements for low rabbitbrush have more than doubled since 1985. Broom snakeweed was the second most abundant browse in 2004 with an estimated density of 3,200 plants/acre, which was up from 1,700 in 1999. Small clumps of Gambel oak clones occur on the site.

Herbaceous vegetation is diverse, moderately dense, and composed mainly of native species. Several seeded grasses are present, but occur infrequently. These species include: smooth brome, crested wheatgrass, and intermediate wheatgrass. Native grasses are the most abundant with bluebunch wheatgrass, Sandberg bluegrass, mutton bluegrass, and bottlebrush squirreltail all present. Cheatgrass is present at the site and has increased from 10% of the grass cover in 1999 to 21% in 2004. Forbs are sparse, but fairly diverse and include a few valuable species such as sulfur and redroot eriogonum, tapertip hawksbeard, and hoary aster.

The area was to have been rested from livestock grazing since the chaining, however the pellet group transect has noted cattle trespass since 1999.

1985 APPARENT TREND ASSESSMENT

Current soil condition is fairly good and appears stable. Vegetative trend appears up as the browse recovers from the chaining.

1991 TREND ASSESSMENT

A fire occurred on the area since the 1985 survey. The data showed a loss of almost all the bitterbrush, slenderbush eriogonum, and dwarf rabbitbrush, while low rabbitbrush increased by 63%, and Wyoming big sagebrush decreased by almost 95%. These spectacular changes can all be attributed to the effect of a fire on two species that are especially not tolerant of fire. Almost all grasses have decreased values for both sum of nested and quadrat frequency. Most forbs did have increased sum of nested and quadrat frequency values, but the ones with the highest quadrat frequencies are increasers (fire related), e.g. pale agoseris, thistle, prickly lettuce, and hoary aster. Percent rock cover increased by 68% and percent pavement increased by 56%. Litter cover decreased by 71%. Percent bare ground increased from 9% to 26%. All these findings indicate a downward trend. This trend was surely aggravated by the drought, slope, and west aspect.

TREND ASSESSMENT
soil - down (1)
browse - down (1)
herbaceous understory - down (1)

1999 TREND ASSESSMENT

Trend for soil is considered stable to improving. Rock and pavement provide nearly 40% of the surface cover at the present time which armors the surface from heavy erosion. Bare ground and litter cover both decreased in 1999, with vegetative cover increasing. Trend for browse is down. The preferred species, Wyoming big sagebrush and bitterbrush, provide less than 5% of the browse cover, and have not recovered from the fire prior to the 1991 reading. These species have very low densities and young and seedling recruitment are currently nonexistent. Stickyleaf low rabbitbrush is the dominant species in the chaining. It continues to increase in density and stature. Average height crown measurements have more than doubled since 1985. Broom snakeweed, another increaser, is the second most abundant browse species. Trend for the herbaceous understory is slightly up. Perennial grasses are the dominate group in the understory providing the great majority of the herbaceous cover. Sum of nested frequency for perennial grasses and forbs combined increased in 1999. The Desirable Components Index rated this site as fair with a score of 27 due to low shrub cover, few young shrubs, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 27 (fair) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soils is stable. Bare ground has decreased in percent cover, but rock and pavement combined increased from 40% relative cover to 60%, which may suggest some soil loss. Overall the high rock and pavement provide good armoring against erosion. Trend for key browse Wyoming big sagebrush and antelope bitterbrush is stable. Sagebrush increased from 20 plant/acre in 1999 to 100 in 2004 and shows good seed production this year. Bitterbrush decreased from 40 plants/acre in 1999 to 20 in 2004 and shows repeated heavy use, although vigor appears normal. Broom snakeweed doubled its density and stickleaf low

rabbitbrush remains at fairly high densities. Trend for herbaceous understory is slightly down. Seeded perennial grasses remained similar to previous readings, but native species (sandberg bluegrass and bottlebrush squirreltail) decreased. Overall, the sum of nested frequency for perennial grasses decreased and it also decreased for the perennial forbs. This may have been due to an increase in cheatgrass nested frequency and cover since 1999. The Desirable Components Index rated this site as fair with a score of 27 due to low shrub cover, few young shrubs, increase cheatgrass cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 27 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{b}$22	$_{b}$20	$_{a}$3	$_{a}$7	.03	.06
G	Agropyron intermedium	$_{b}$46	$_{a}$10	$_{a}$20	$_{a}$15	.43	.60
G	Agropyron spicatum	$_{a}$68	$_{a}$48	$_{b}$124	$_{b}$123	3.56	5.56
G	Bromus inermis	$_{a}$18	$_{a}$12	$_{b}$80	$_{b}$83	2.65	2.41
G	Bromus tectorum (a)	-	-	110	92	.90	2.57
G	Carex spp.	$_{b}$12	$_{a}$-	$_{ab}$2	$_{a}$-	.03	-
G	Oryzopsis hymenoides	-	-	-	-	.00	-
G	Poa fendleriana	$_{b}$58	$_{b}$46	$_{ab}$33	$_{a}$16	.28	.46
G	Poa secunda	$_{a}$9	$_{ab}$20	$_{c}$79	$_{b}$38	1.32	.40
G	Sitanion hystrix	$_{c}$76	$_{b}$42	$_{ab}$25	$_{a}$9	.20	.09
Total for Annual Grasses		0	0	110	92	0.90	2.57
Total for Perennial Grasses		309	198	366	291	8.53	9.61
Total for Grasses		309	198	476	383	9.44	12.18
F	Agoseris glauca	$_{a}$7	$_{b}$29	$_{ab}$18	$_{a}$4	.17	.01
F	Allium spp.	4	5	-	-	-	-
F	Arabis spp.	-	5	3	4	.01	.01
F	Astragalus beckwithii	6	10	3	3	.00	.03
F	Chaenactis douglasii	$_{ab}$4	$_{ab}$1	$_{b}$11	$_{a}$-	.03	-
F	Cirsium spp.	$_{a}$-	$_{b}$21	$_{b}$40	$_{b}$37	1.23	1.27
F	Collomia linearis (a)	-	-	$_{a}$1	$_{b}$58	.00	.17
F	Comandra pallida	$_{ab}$3	$_{c}$13	$_{b}$1	$_{b}$-	.00	-
F	Collinsia parviflora (a)	-	-	$_{a}$9	$_{b}$190	.01	.52
F	Crepis acuminata	2	4	-	2	-	.00
F	Cymopterus longipes	3	2	-	-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Draba spp. (a)	-	-	6	3	.04	.00
F	Epilobium brachycarpum (a)	-	-	$_{b}$39	$_{a}$4	.13	.01
F	Erodium cicutarium (a)	-	3	-	-	-	-
F	Erigeron eatonii	-	2	6	2	.04	.01
F	Erigeron pumilus	$_{a}$8	$_{ab}$9	$_{b}$21	$_{a}$5	.42	.04
F	Eriogonum racemosum	9	15	6	6	.04	.23
F	Eriogonum umbellatum	$_{b}$19	$_{a}$1	$_{a}$4	$_{a}$2	.01	.03
F	Gayophytum ramosissimum(a)	-	-	21	25	.17	.10
F	Lactuca serriola	$_{a}$-	$_{b}$64	$_{a}$-	$_{a}$-	-	-
F	Lepidium spp. (a)	-	-	-	7	-	.02
F	Machaeranthera canescens	$_{b}$50	$_{b}$46	$_{a}$16	$_{a}$3	.12	.03
F	Microsteris gracilis (a)	-	-	$_{a}$24	$_{b}$66	.06	.16
F	Petradoria pumila	$_{a}$-	$_{a}$-	$_{ab}$6	$_{b}$17	.60	.84
F	Phlox longifolia	$_{a}$-	$_{b}$35	$_{a}$3	$_{b}$27	.00	.12
F	Polygonum douglasii (a)	-	-	$_{a}$7	$_{b}$31	.02	.09
F	Ranunculus testiculatus (a)	-	-	$_{a}$8	$_{b}$63	.01	.16
F	Sphaeralcea coccinea	-	-	3	-	.03	-
F	Tragopogon dubius	$_{ab}$4	$_{b}$18	$_{c}$61	$_{a}$-	.67	.00
F	Trifolium spp.	$_{a}$4	$_{b}$21	$_{a}$-	$_{a}$-	-	-
F	Unknown forb-perennial	-	3	-	-	-	-
Total for Annual Forbs		0	3	115	447	0.46	1.25
Total for Perennial Forbs		123	304	202	112	3.40	2.66
Total for Forbs		123	307	317	559	3.87	3.92

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

BROWSE TRENDS --
Management unit 25A, Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Amelanchier utahensis	0	1	.00	.03
B	Artemisia tridentata wyomingensis	1	5	.15	.38
B	Chrysothamnus depressus	3	4	.03	.30
B	Chrysothamnus nauseosus hololeucus	3	1	.18	.03
B	Chrysothamnus viscidiflorus viscidiflorus	55	53	6.44	5.06
B	Eriogonum microthecum	2	2	-	-
B	Gutierrezia sarothrae	33	57	1.37	2.36
B	Purshia tridentata	2	1	.30	.38
B	Quercus gambelii	1	3	2.03	2.24
B	Sambucus cerulea	1	1	.38	.63
B	Tetradymia canescens	4	2	.03	-
Total for Browse		105	130	10.92	11.43

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 4

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	-	.08
Artemisia tridentata wyomingensis	-	.91
Chrysothamnus depressus	-	.28
Chrysothamnus nauseosus hololeucus	-	.11
Chrysothamnus viscidiflorus viscidiflorus	-	6.90
Gutierrezia sarothrae	-	5.84
Juniperus osteosperma	-	1.00
Purshia tridentata	-	.60
Quercus gambelii	1.39	2.48
Sambucus cerulea	-	.36

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 4

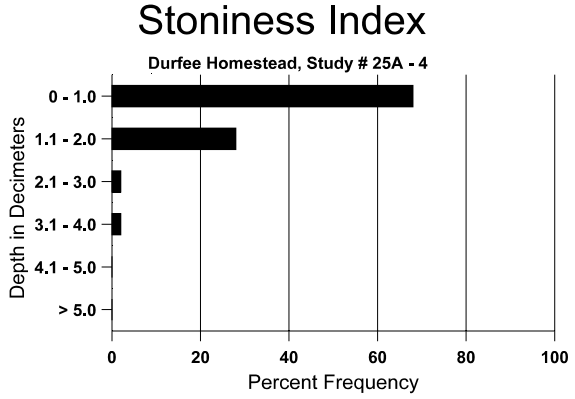
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.3
Purshia tridentata	5.2

BASIC COVER --
Management unit 25A, Study no: 4

Cover Type	Average Cover % '85	'91	'99	'04
Vegetation	2.75	6.00	23.77	27.43
Rock	12.25	38.00	22.90	29.98
Pavement	3.75	9.00	15.65	29.29
Litter	72.00	21.00	18.27	14.93
Cryptogams	.25	0	.01	.00
Bare Ground	9.00	26.00	19.98	8.79

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 4, Study Name: Durfee Homestead

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.9	60.3 (8.1)	7.5	34.0	38.7	27.3	4.3	38.1	214.4	0.7



PELLET GROUP DATA --
Management unit 25A, Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	8	56	-	-
Elk	9	7	33 (82)	7 (17)
Deer	7	11	15 (38)	15 (36)
Cattle	9	1	16 (40)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	20/28
04	**20**	-	-	20	-	-	0	100	-	-	0	14/17
Artemisia tridentata wyomingensis												
85	**1198**	133	66	266	866	-	44	6	72	-	28	13/14
91	**66**	-	-	66	-	-	0	0	0	-	0	11/7
99	**20**	-	-	20	-	20	0	0	0	-	0	35/53
04	**100**	-	20	80	-	-	40	0	0	-	0	16/22
Atriplex canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	19/27
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus depressus												
85	**932**	66	133	666	133	-	0	0	14	-	0	5/8
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**140**	-	-	140	-	-	29	0	0	-	0	5/7
04	**260**	-	-	200	60	-	31	69	23	8	8	5/8
Chrysothamnus nauseosus hololeucus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	-	60	-	-	0	0	-	-	0	22/32
04	**40**	20	-	40	-	-	0	100	-	-	0	21/28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
85	**866**	66	266	600	-	-	0	0	0	-	0	6/7
91	**2333**	200	2333	-	-	-	6	9	0	-	0	-/-
99	**3660**	-	200	2840	620	40	1	0	17	7	8	15/22
04	**3640**	-	220	2440	980	-	4	5	27	7	31	13/24
Echinocereus triglochidatus												
85	**66**	-	66	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Eriogonum microthecum												
85	**1732**	-	600	1066	66	-	8	4	4	-	0	7/7
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**60**	-	-	60	-	-	100	0	0	-	0	3/13
04	**120**	-	-	120	-	-	0	0	0	-	0	7/14
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**1700**	20	100	1600	-	20	0	1	0	-	0	8/11
04	**3200**	20	300	2860	40	-	0	0	1	1	1	9/12
Pinus edulis												
85	**132**	-	66	-	66	-	0	0	50	-	100	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Purshia tridentata												
85	**532**	-	133	333	66	-	50	13	12	-	0	15/25
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**40**	-	-	40	-	-	0	100	0	-	0	20/48
04	**20**	-	-	20	-	-	0	100	0	-	0	21/57
Quercus gambelii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**260**	-	-	260	-	-	0	0	-	-	0	69/69
04	**280**	-	60	220	-	-	0	0	-	-	0	51/37

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sambucus cerulea												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	43/52
04	**20**	-	-	20	-	-	0	100	-	-	0	55/57
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**100**	-	-	100	-	-	20	0	-	-	0	6/14
04	**40**	-	-	40	-	-	50	0	-	-	0	10/20

Trend Study 25A-5-04

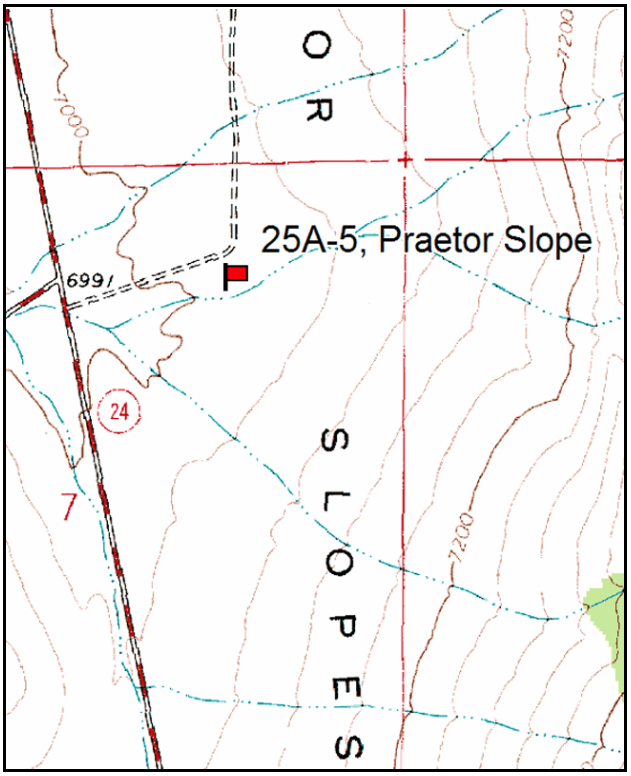
Study site name: Praetor Slope . Vegetation type: Harrowed Sagebrush/Grass.

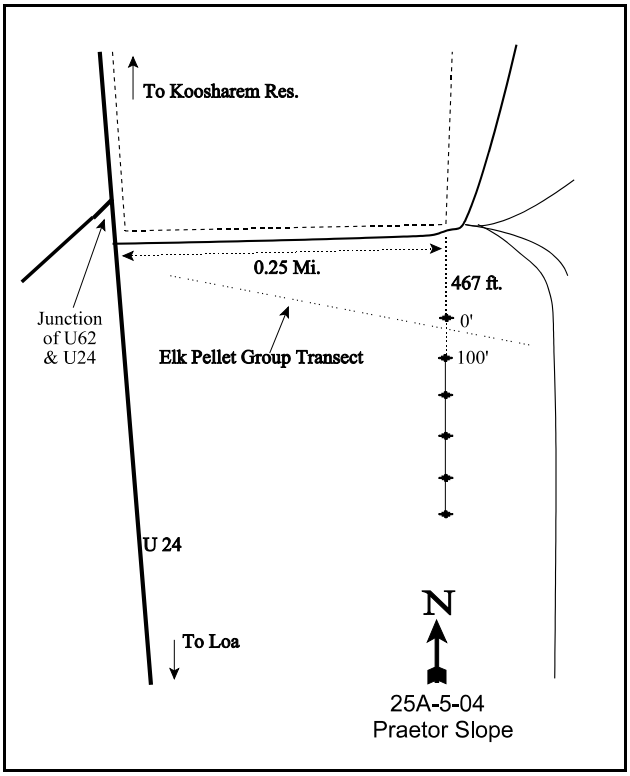
Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of U-62 and U-24 south of Koosharem Reservoir, proceed south for 25 yards and turn left onto a dirt road. Go through the gate and up the road 0.25 miles to where the road turns at the fence corner. Walk 467 feet due south from the fence corner to the top of a small rise. The baseline starts here, and is marked by a 5' steel fence post with a blue browse tag #55.





Map Name: Burrville, Utah

Diagrammatic Sketch

Township 26S , Range 1E , Section 7

GPS: NAD 27, UTM 12S 4268970 N, 427257 E

DISCUSSION

Praetor Slope - Trend Study No. 25A-5

The Praetor Slope trend study surveys deer and elk winter range on BLM land south of Koosharem Reservoir. This is an area of 1,440 acres that was chained and seeded in 1964 and 3,000 acres were harrowed and seeded in the fall of 2002. The harrow removed the study site, but was reestablished in 2004 at the same location. The study is located at an elevation of about 7,000 feet on the east side of Plateau Valley. The aspect is west with a gentle slope of 2-5%. Average yearly precipitation is low, with just over 9 inches measured at Koosharem (elevation 6,900 feet, 3 miles southwest). The transect is 300 yards from state highway U-24. The area is on the Fishlake allotment with sheep use scheduled from either June 1 to June 30 (600 sheep) or October 25 through November 15 (1,400 sheep) on a rotating basis. Pellet group data from 1999 estimated 12 deer (30 ddu/ha) and 22 sheep days use/acre (56 sdu/ha). Elk do not appear to be using the area with only 1 pellet group sampled in 1999. Pellet group data from 2004 estimated 4 elk days use/acre (10 edu/ha). Rabbits appear to be abundant on the site.

Although rocky throughout the profile, the soil is fairly deep with an estimated effective rooting depth of nearly 18 inches. The soil is a loam in texture and has a slightly alkaline pH (7.6). Organic matter is relatively low at 1.7%, with most of the litter present under the sagebrush crowns. Bare ground was low at 11% in 1999, but increased to 20% by 2004. Pavement and rock cover combined are high at 36%. Erosion is not severe with the gentle slope and relatively high cover from crested wheatgrass. The erosion condition class determined soil movement as stable in 2004.

Wyoming big sagebrush dominated the site until the harrow treatment in 2002. In 1999, it provided all of the browse cover and contributed to 42% of the total vegetation cover. By 2004, sagebrush cover was reduced to 1% of the total vegetation cover. Density was reduced from 4,420 plants/acre in 1999 to 380 in 2004 and 37% of the remaining population was classified as dying. The majority of the plants were moderate to heavily hedged in all three sampled years until 2004 where only light hedging was observed. The only other browse species present in the area are a few pricklypear cactus, and a population of rubber rabbitbrush in the bottom of a wash. Antelope bitterbrush and forage kochia were included in the harrow seed mix, but neither were observed in 2004. There is no protective cover for wildlife near the transect.

Crested wheatgrass is the dominate species on this site and made up 86% of the total vegetation cover in 2004. Other grasses observed in 2004 were intermediate wheatgrass (seeded), western wheatgrass, and sandberg bluegrass. Another 13% of the total vegetation cover comes from forbs. Lewis flax made up 35% of the forb cover and was in full bloom in the spring. Before the harrow treatment, bur buttercup was the only forb found on the site. It was still the most abundant forb in 2004, but 10 other species were observed, mostly annuals. A total of three grasses and four forbs were seeded and the only dominate grass was crested wheatgrass. The only dominate forb was Lewis flax, the other three were either not found or only a small trace was found.

1985 APPARENT TREND ASSESSMENT

Overall range trend appears stable. Erosion of the top soil and along trails has occurred, but appears to have stabilized with a high percentage of pavement on the surface. Continuous spring grazing pressure has most likely depleted the desirable native perennial grasses and forbs. At present, the vegetative composition is simple, but both sagebrush and crested wheatgrass are vigorous and producing well. As long as care is taken to protect against overgrazing by livestock in the spring, current management is probably adequate to maintain the range in fair condition.

1991 TREND ASSESSMENT

The trend for soil is stable to slightly down with an increase in percent bare soil and a decrease in percent litter cover. Sagebrush density has gone down (32%) and percent decadency has increased from 8 to 52%. The high sagebrush densities, competition with itself, and the drought have been the main reason for this increase in percent decadency. Another problem with the area is the low average annual precipitation (effect of a rain shadow) even with a relatively high elevation of 6,900 feet. The herbaceous understory is made up of basically one species, crested wheatgrass which appears to be stable at this time.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is stable. Bare ground and litter cover both decreased, with rock and pavement cover increasing. Erosion is minimal at the site due to the gentle slope and high cover from crested wheatgrass. Trend for browse is stable. The population of Wyoming big sagebrush has declined slightly since 1991, however much of the change is because the sample size for browse has more than tripled and now gives significantly better estimates for browse which usually has discontinuous and/or clumped distributions. More importantly, now the population shows a significantly lower percent decadency, lower proportion of decadent plants classified as dying, and improved vigor. Use remains moderate to heavy on the majority of the population. Trend for the herbaceous understory is stable, but lacking in diversity. Crested wheatgrass is overly dominant with other grasses and forbs being scarce. The Desirable Components Index rated this site as good with a score of 55 due to moderate shrub cover, few young shrubs, but good perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 55 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Bare ground relative cover increased from 11% to 18% from 1999 to 2004 due to the two-way Dixie harrow treatment. Perennial grasses are the dominate species and provides good protective cover for the soil. Trend for the key browse Wyoming big sagebrush is down. The two-way harrow treatment removed all but 1% of the sagebrush cover. A few seedlings and young plants were observed, but overall density is very low and 37% were classified as dying. Trend for the herbaceous understory is slightly up. Crested wheatgrass sum of nested frequency actually decreased significantly after the two-way Dixie harrow treatment, however there are now three other grasses being sampled. Seeded forbs have helped diversify the forb population from only one small annual species previously observed. The Desirable Components Index rated this site as fair with a score of 40 due to low shrub cover, few young shrubs, but good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 40 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 5

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{b}$329	$_{b}$316	$_{b}$311	$_{a}$269	16.31	27.72
G	Agropyron intermedium	-	-	-	8	-	.09
G	Agropyron smithii	-	-	-	3	-	.00
G	Poa secunda	-	-	-	2	-	.00
G	Sitanion hystrix	1	2	-	-	-	-
G	Stipa lettermani	-	3	1	-	.00	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		330	321	312	282	16.31	27.82
Total for Grasses		330	321	312	282	16.31	27.82
F	Antennaria rosea	5	-	-	-	-	-
F	Arabis spp.	-	1	-	-	-	-
F	Astragalus beckwithii	-	4	-	-	-	-
F	Astragalus miser	6	10	-	7	-	.09
F	Chenopodium fremontii (a)	-	-	-	3	-	.00
F	Erigeron spp.	6	3	-	-	-	-
F	Eriogonum spp.	-	1	-	-	-	-
F	Gayophytum ramosissimum(a)	-	-	$_{a}$-	$_{b}$11	-	.07
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$70	-	1.44
F	Microsteris gracilis (a)	-	-	-	7	-	.01
F	Penstemon spp.	-	-	-	1	-	.03
F	Phlox longifolia	$_{a}$-	$_{c}$57	$_{a}$-	$_{b}$15	-	.06
F	Ranunculus testiculatus (a)	-	-	$_{a}$29	$_{b}$185	.15	2.07
F	Sanguisorba minor	-	-	-	2	-	.00
F	Sphaeralcea grossulariaefolia	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$16	-	.27
F	Trifolium spp.	$_{b}$18	$_{b}$33	$_{a}$-	$_{a}$-	-	-
Total for Annual Forbs		0	0	29	206	0.15	2.17
Total for Perennial Forbs		35	109	0	111	0	1.90
Total for Forbs		35	109	29	317	0.15	4.08

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

BROWSE TRENDS --
Management unit 25A, Study no: 5

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia tridentata wyomingensis	90	16	12.08	.31
B	Leptodactylon pungens	0	1	-	-
Total for Browse		90	17	12.08	0.31

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 5

Species	Percent Cover '04
Artemisia tridentata wyomingensis	.33
Leptodactylon pungens	.13

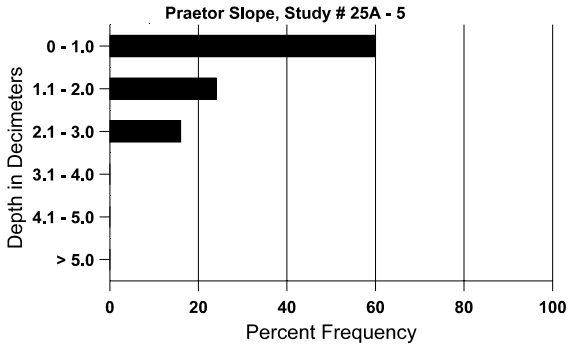
BASIC COVER --
Management unit 25A, Study no: 5

Cover Type	Average Cover % '85	'91	'99	'04
Vegetation	4.75	4.75	25.31	31.67
Rock	5.00	13.25	12.26	19.76
Pavement	24.50	17.75	29.79	16.14
Litter	44.75	37.00	21.65	25.97
Cryptogams	0	0	1.10	0
Bare Ground	21.00	27.25	11.23	20.52

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 5, Study Name: Praetor Slope

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
17.8	67.3 (9.8)	7.6	36.0	39.1	24.9	1.7	14.7	361.6	0.9

Stoniness Index



PELLET GROUP DATA --
Management unit 25A, Study no: 5

Type	Quadrat Frequency '99	Quadrat Frequency '04	Days use per acre (ha) '99	Days use per acre (ha) '04
Sheep	8	-	22 (56)	-
Rabbit	66	45	-	-
Elk	1	2	1 (2)	4 (10)
Deer	12	1	12 (30)	-
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
85	**8265**	733	3533	4066	666	-	39	48	8	-	6	17/21
91	**5599**	-	266	2400	2933	-	65	8	52	7	24	16/18
99	**4420**	-	60	3020	1340	540	62	23	30	11	11	21/28
04	**380**	20	40	200	140	-	0	16	37	37	37	13/16
Atriplex canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	9/12
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	5/7
Opuntia spp.												
85	**66**	-	-	66	-	-	0	0	-	-	0	6/9
91	**66**	-	-	66	-	-	0	0	-	-	0	2/2
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25A-7-04

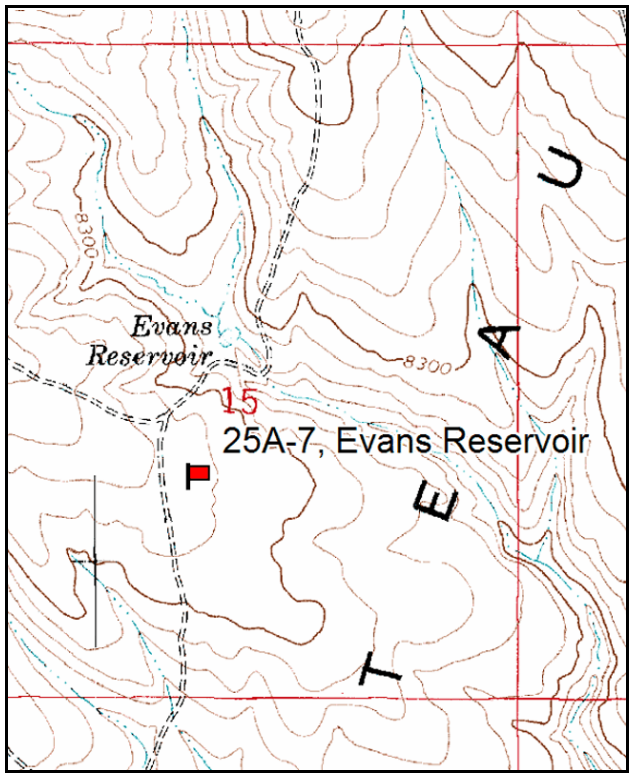
Study site name: Evans Reservoir . Vegetation type: Harrowed Big Sagebrush .

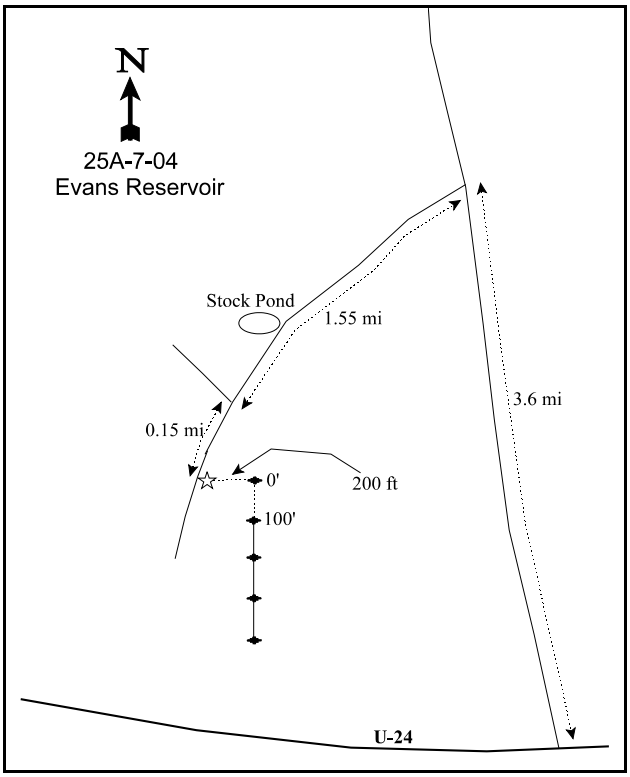
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

Heading northwest out of Loa on U-24, turn right at mile marker 45. Go 3.5 miles to a green and yellow fence post on the left (20 feet off the road). Continue about 0.1 miles past the fence post and turn left. Go 1.55 miles past a stock pond and up to a fork. Turn left at the fork and go 0.15 miles to a steel rebar witness post on the left side of the road. From the witness post, walk 200 feet east to the 0-foot baseline stake, a rebar with browse tag #7122.





Map Name: Abes Knoll, Utah

Diagrammatic Sketch

Township 27S , Range 1E , Section 15

GPS: NAD 27, UTM 12S 4256930 N, 431157 E

DISCUSSION

Evans Reservoir - Trend Study No. 25A-7

The Evans Reservoir study is located on one of the open rolling ridges of the Awapa Plateau at an elevation of 8,300 feet. The transect is on a relatively flat ridge top within a sagebrush-grass community with a slope of about 6% and a northeast aspect. The area was two-way Dixie harrowed and fourteen species were seeded in the fall of 1999. The first 100 feet of the baseline was harrowed in the fall of 1998. The immediate area around the transects stakes were avoided. Sheep graze the area in the spring and fall as part of the Fishlake allotment. Wildlife use is predominately pronghorn antelope, although mule deer will use the site during some winters. Both antelope and sage grouse were observed in the area in 1991. Pellet group data from 1999 estimated 51 elk (126 edu/ha) and 16 deer and pronghorn (combined) days use/acre (40 days use/ha) with most of this probably coming from antelope. The pellets from these two species were difficult to distinguish differences. Sage grouse droppings were also encountered in 1999. Rabbit use is high in the area as well with over 200 groupings sampled in 1999. Pellet group data from 2004 estimated 25 elk (63 edu/ha) and 19 deer/pronghorn days use/acre (48 ddu/ha). Evans Reservoir, a small stock pond located 1/4 mile to the north, is an important water source for the area.

Soils are densely compacted and relatively shallow with an estimated effective rooting depth of only 9 inches. Texture is a sandy loam with a neutral pH (7.1). Soil organic matter is low at 1.7% and phosphorus is slightly low at 8.8 ppm. Values below 10 ppm may limit normal plant growth and development. A calcium carbonate layer is present within the profile at about 10 inches below the surface, which could be restrictive to root development. The vegetation is widely dispersed, with little bare soil sampled in 1985. By 1991, bare soil was estimated at 23% which is probably an overestimation as bare ground dropped to 11% in 1999 and was at 17% in 2004. Pavement cover has been high in all years and averages 32%. Vegetation and litter cover together provide 55% of the cover at the site. There is some evidence of wind erosion and wind-scoured depressions, with slight pedestaling occurring around the base of sagebrush. The erosion condition class determined soil movement as stable in 2004.

Browse composition is dominated by a mix of mountain big sagebrush and black sagebrush. Mountain big sagebrush density was estimated at 6,266 plants/acre in 1985, 4,732 plants/acre in 1991, 4,360 plants/acre in 1999, and dropped to 1,620 plants/acre in 2004 due to the two-way harrow treatment. The harrow treatment appears to have been done in patches, leaving some mature plants. The mountain big sagebrush has shown moderate to heavy use in the past three sampling years, but in 2004 it dropped to light to moderate use. Generally vigor has been good, but percent decadency has been high at 28% in 1991, 53% in 1999, and 31% in 2004. Much of this decadency is due to plants that were damaged by the pipe harrowed.

Black sagebrush is second in abundance to mountain big sagebrush. Its density was estimated at 3,733 plants/acre in 1985, 2,666 in 1991, 4,140 in 1999, and then decreased to 1,820 in 2004. Decreases from 1999 to 2004 were due to the two-way harrow treatment. Black sagebrush consists mostly of mature (80%) and decadent plants (14%). Decadency has decreased over the years from 59% in 1985, to 47% in 1991, to 43% in 1999 and finally with the harrow treatment to 14% in 2004. Use has been light to moderate in the past and only light use in 2004. Young recruitment is low, but seedling production increased in 2004 to 360 seedlings/acre.

Perennial native grasses dominate the understory by providing 36% of the total vegetation cover in 1999 and 59% in 2004. Mutton bluegrass and bluebunch wheatgrass are the most abundant, but other native species include: pinewoods needlegrass, blue grama, bottlebrush squirreltail, and a Carex. The two-way harrow treatment appears to have seeded crested wheatgrass and intermediate wheatgrass, although they only appear at relatively low values. Grasses make up a small percentage of the diet of antelope in Utah except during the new flush of growth each spring. The forbs observed are quite diverse, but with low quadrat frequencies.

Antelope are known to utilize some of these in summer, especially *Astragalus sp., Lotus sp., Eriogonum racemosum,* and *Linum lewisii* (Smith and Beale 1980). Smith and Beale (1980) also thought that antelope on the Awapa Plateau may feed on the abundant lichens. The most abundant forbs are timber poisonvetch and desert phlox, which provided 73% of the forb cover in 1999 and 57% in 2004. Many of the seeded species were not observed or only in very low numbers.

1985 APPARENT ASSESSMENT OF TREND

Soil trend appears stable. There is little erosion because of the pavement and litter cover. The data indicate a downward vegetative trend. There are few young or seedlings in the mountain big sagebrush or black sagebrush populations with their form and vigor appearing to decline. Several increaser species, narrowleaf low rabbitbrush, broom snakeweed, pricklypear cactus, and desert phlox are present in rather low numbers, although they could increase with a decline of the sagebrush population. The grasses appear stable.

1991 TREND ASSESSMENT

Soil trend appears to be slightly down. Pavement and rock cover declined from 55% to 37%, while cover for bare ground increased from 8% to 23%. Litter cover increased slightly. The key browse species, mountain big sagebrush, did decrease in density since 1985 by 24%, while percent decadency decreased from 47% to 28%. However, 60% of the decadent plants (1,333 plants/acre) were classified as dying. The percentage of the population in the young and mature age classes improved respectively from 3% to 10% and 50% to 62%. Another important aspect of this population is that with the decrease in density which was already too high, shrub size for mature plants has increased for both width and height. The effective volume of each plant, on average, has almost doubled. Trend for browse would be considered slightly down. The herbaceous understory trend is improved. Bluebunch wheatgrass was not even recorded in 1985, but it now has a quadrat frequency of 27%. Mutton bluegrass, bottlebrush squirreltail, and pinewoods needlegrass have increased also. They had quadrat frequency changes respectively of 63% to 76%, 28% to 50%, and 39% to 68%. Most of the forbs also had increasing quadrat sum of frequency values.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - up slightly (4)

1999 TREND ASSESSMENT

Trend for soil is slightly improved. Vegetation and litter cover combined provide more than 60% of the cover. Relative percent bare ground has decreased from 23% to 11%. Pavement cover is moderately high at 25%, although it was at 33% at the last reading. Erosion is minimal with the gentle slope. Trend for the key browse is slightly down. Mountain big sagebrush looks to decrease in the future with a high rate of decadent plants (53%), and more decadent dying plants than young in the population. Use continues to be moderate to heavy. Black sagebrush also shows high decadency at 43%, with 56% of these classified as dying. Nearly one-fourth of the population displays poor vigor. Recruitment and seedling production of black sagebrush are low. Trend for the herbaceous understory is slightly down. Sum of nested frequency for perennial grasses and forbs decreased by 17% in 1999. The Desirable Components Index rated this site as fair with a score of 66 due to high shrub decadency, few young shrubs, but good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 66 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Relative percent bare ground cover increased slightly from 11% to 15%. Rock and pavement remained fairly constant. Protective cover and rock/pavement provide good soil erosion protection. Trend for key browse mountain big sagebrush and black sagebrush is down. Both species decreased substantially in density due to the two-way harrow treatment. Use decreased on both species, although vigor appears to be better than previous years. The harrow treatment removed many of the decadent shrubs decreasing percent decadence for both species. Trend for herbaceous understory is stable. Some of the native species had increases in their nested frequency values, but overall, there was almost no change in the values for perennial grasses which contribute to 85% of the perennial herbaceous cover. Seeded grasses are at relatively low values and contribute little to overall cover. Forbs are diverse and contribute to 15% of the herbaceous cover. The Desirable Components Index rated this site as fair with a score of 57 due to reduced shrub cover, moderate shrub decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 57 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 7

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	a-	a-	a-	b19	-	.28
G	Agropyron intermedium	-	-	-	-	-	.00
G	Agropyron spicatum	a2	b51	c127	c116	4.24	6.28
G	Agropyron trachycaulum	-	-	-	3	-	.03
G	Bouteloua gracilis	37	40	50	39	.65	.75
G	Carex spp.	6	4	18	19	.56	.29
G	Oryzopsis hymenoides	-	2	7	3	.33	.06
G	Poa fendleriana	a136	ab168	ab139	b178	4.73	8.13
G	Poa secunda	b44	a16	a10	a4	.09	.04
G	Sitanion hystrix	b62	c119	a25	ab45	.71	1.11
G	Stipa comata	-	-	5	7	.21	.24
G	Stipa pinetorum	a81	c142	b97	a47	1.47	1.64
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		368	542	478	480	13.02	18.89

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
Total for Grasses		368	542	478	480	13.02	18.89
F	Androsace septentrionalis (a)	-	-	$_{b}$29	$_{a}$5	.19	.01
F	Arabis demissa	$_{b}$62	$_{a}$19	$_{a}$3	$_{a}$6	.00	.01
F	Astragalus convallarius	$_{a}$6	$_{a}$14	$_{c}$71	$_{b}$39	2.23	.31
F	Aster spp.	-	1	-	-	-	-
F	Astragalus spp.	1	-	-	-	-	-
F	Castilleja chromosa	-	5	-	-	-	-
F	Chaenactis douglasii	-	3	8	-	.02	-
F	Comandra pallida	-	-	4	2	.06	.03
F	Cryptantha spp.	$_{b}$58	$_{b}$68	$_{a}$17	$_{a}$19	.25	.16
F	Eriogonum alatum	-	-	2	-	.00	-
F	Erigeron pumilus	$_{a}$3	$_{a}$1	$_{ab}$5	$_{b}$12	.01	.13
F	Eriogonum racemosum	-	-	1	3	.01	.06
F	Eriogonum umbellatum	14	11	10	4	.21	.09
F	Gayophytum ramosissimum(a)	-	-	$_{a}$-	$_{b}$19	-	.06
F	Lappula occidentalis (a)	-	-	-	8	-	.02
F	Lactuca serriola	-	3	-	-	-	-
F	Linum lewisii	$_{a}$1	$_{a}$17	$_{b}$29	$_{a}$1	.30	.00
F	Lotus utahensis	$_{c}$55	$_{a}$-	$_{b}$16	$_{b}$16	.36	.80
F	Penstemon comarrhenus	-	-	-	1	-	.03
F	Phlox austromontana	$_{a}$67	$_{b}$130	$_{ab}$101	$_{ab}$100	1.83	1.67
F	Phlox longifolia	$_{b}$9	$_{b}$19	$_{a}$-	$_{b}$9	-	.03
F	Sanguisorba minor	$_{b}$6	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Senecio multilobatus	$_{a}$3	$_{b}$61	$_{a}$6	$_{a}$-	.05	-
F	Streptanthus cordatus	-	5	-	2	-	.03
F	Trifolium spp.	$_{a}$-	$_{b}$13	$_{a}$5	$_{a}$2	.01	.01
F	Unknown forb-perennial	$_{b}$20	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Zigadenus paniculatus	2	-	-	-	-	-
Total for Annual Forbs		0	0	29	32	0.19	0.09
Total for Perennial Forbs		307	370	278	216	5.38	3.40
Total for Forbs		307	370	307	248	5.57	3.49

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

BROWSE TRENDS --
Management unit 25A, Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	65	42	6.79	2.40
B	Artemisia tridentata vaseyana	85	47	9.89	3.47
B	Chrysothamnus viscidiflorus viscidiflorus	30	42	.46	1.54
B	Coryphantha vivipara	1	0	-	-
B	Eriogonum corymbosum	1	2	.03	.03
B	Eriogonum microthecum	3	13	.06	.18
B	Gutierrezia sarothrae	1	24	-	.91
B	Kochia prostrata	0	0	-	.02
B	Leptodactylon pungens	18	25	.09	.23
B	Opuntia spp.	1	0	-	-
B	Tetradymia canescens	0	2	-	-
Total for Browse		205	197	17.33	8.82

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 7

Species	Percent Cover '04
Artemisia nova	3.54
Artemisia tridentata vaseyana	5.09
Chrysothamnus viscidiflorus viscidiflorus	2.26
Eriogonum microthecum	.16
Gutierrezia sarothrae	1.03
Leptodactylon pungens	.25

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 7

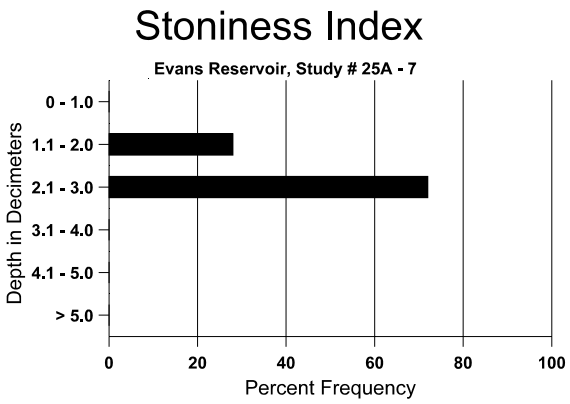
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.0

BASIC COVER --
Management unit 25A, Study no: 7

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	11.00	8.75	35.34	32.10
Rock	0	4.00	1.35	2.43
Pavement	54.75	33.00	25.01	31.26
Litter	26.25	30.25	25.26	31.07
Cryptogams	.50	1.00	.08	.03
Bare Ground	7.50	23.00	10.93	16.96

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 7, Study Name: Evans Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
9.3	56.0 (8.3)	7.1	59.3	21.4	19.3	1.7	8.8	217.6	1.2



PELLET GROUP DATA --
Management unit 25A, Study no: 7

Type	Quadrat Frequency	
	'99	'04
Rabbit	45	53
Grouse	2	2
Elk	38	14
Deer	5	18
Antelope	1	3

Days use per acre (ha)	
'99	'04
-	-
26 (65)	-
51 (126)	25 (63)
16 (40)	15 (36)
-	5 (12)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**3733**	200	133	1400	2200	-	36	54	59	3	11	10/9
91	**2666**	-	-	1400	1266	-	75	0	47	7	23	8/16
99	**4140**	80	240	2100	1800	320	44	1	43	24	24	11/19
04	**1820**	360	100	1460	260	260	0	0	14	4	4	8/16
Artemisia tridentata vaseyana												
85	**6266**	533	200	3133	2933	-	68	11	47	.63	9	15/21
91	**4732**	266	466	2933	1333	-	49	34	28	5	17	18/26
99	**4360**	-	440	1600	2320	580	62	10	53	13	15	17/29
04	**1620**	440	120	1000	500	680	12	6	31	7	11	14/23
Chrysothamnus viscidiflorus viscidiflorus												
85	**1066**	133	-	733	333	-	0	0	31	-	6	5/4
91	**332**	-	133	133	66	-	20	20	20	6	20	5/6
99	**1220**	-	100	1060	60	20	0	0	5	-	0	8/10
04	**1540**	160	20	1500	20	-	0	0	1	-	0	9/15
Coryphantha vivipara												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	2/4
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Eriogonum corymbosum												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	-	0	0	-	-	0	7/6
04	**60**	-	-	60	-	-	33	0	-	-	0	9/12
Eriogonum microthecum												
85	**400**	-	-	400	-	-	0	0	-	-	0	7/5
91	**466**	-	133	333	-	-	57	29	-	-	0	5/7
99	**80**	-	-	80	-	-	25	0	-	-	0	4/4
04	**440**	-	20	420	-	-	0	5	-	-	0	7/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	3/7
04	**920**	100	-	920	-	20	0	0	-	-	0	9/13
Kochia prostrata												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	360	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**600**	-	40	560	-	-	0	0	0	-	0	6/7
04	**820**	-	60	720	40	20	0	0	5	5	5	6/10
Opuntia spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	5/13
04	**0**	-	-	-	-	-	0	0	-	-	0	6/9
Symphoricarpos oreophilus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	11/27
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**80**	-	60	20	-	-	0	0	-	-	0	4/5

Trend Study 25A-8-04

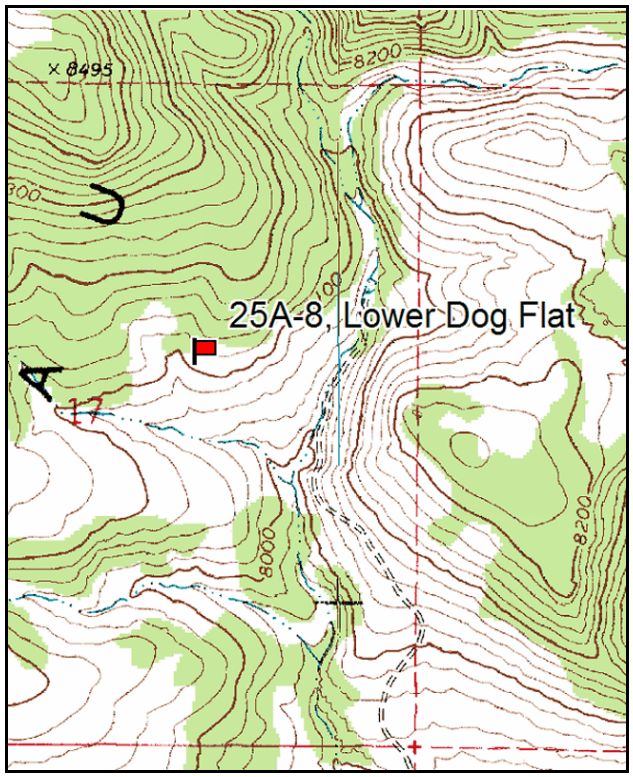
Study site name: Lower Dog Flat . Vegetation type: Chained, Seeded P-J .

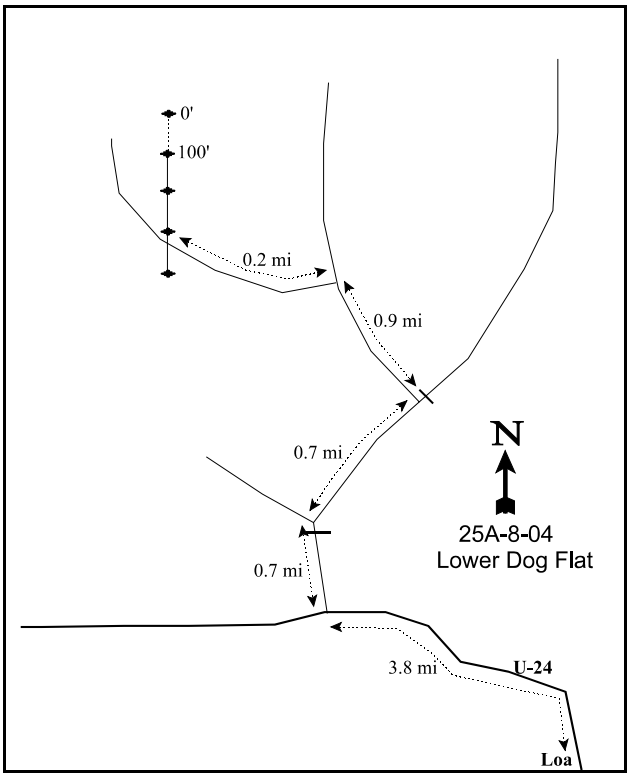
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From Loa, go 3.8 miles northwest on U-24 (0.9 miles beyond mile marker 49). Turn right (north) on a gravel road and proceed 0.7 miles. Just beyond the cattleguard turn right and go another 0.7 miles. Turn left just before another cattleguard and go 0.9 miles. At the bottom of the hill, a road forks off to the left, through a wash, up a steep hill and west into the chaining. Take this road 0.2 miles and stop at a 3' rebar post on the right side of the road marking the 300' stake of the baseline. The 0-foot baseline stake is marked by browse tag #7188.





Map Name: Loa, Utah

Diagrammatic Sketch

Township 27S , Range 2E , Section 17

GPS: NAD 27, UTM 12S 4257293 N, 437864 E

DISCUSSION

Lower Dog Flat - Trend Study No. 25A-8

The Lower Dog Flat study is located on a 13-15% south facing slope at an elevation of 8,100 feet on the eastern side of the Awapa Plateau. The area was once covered by pinyon pine, but was chained in 1980 effectively eliminating the trees. Most of the mountain big sagebrush survived. Sagebrush and broom snakeweed are now the principal species. Establishment of seeded species was erratic and native species are still the most prominent. The land is managed by the BLM as part of the Seven Mile allotment. Cattle use occurs for approximately 20 days in May under a deferred grazing system. A pellet group transect nearby on Dog Flat indicated 30 deer days use/acre (73 ddu/ha) during the winter of 1984-85. Elk use varies (Jense et al. 1985). Pellet group data from 1999 estimated 17 deer days (43 ddu/ha), 1 elk (3 edu/ha), and 8 cow days use/acre (20 cdu/ha). Pellet group data from 2004 estimated 21 deer (53 ddu/ha), 2 elk (5 edu/ha), and 5 cow days use/acre (13 cdu/ha). Antelope could also use the area. Good thermal and escape cover is provided by thick stands of unchained pinyon about 1/10 mile away.

The soil is a very compact clay loam with a loose surface layer. Soil depth is moderately shallow with an estimated effective rooting depth of almost 11 inches. The soil has a neutral pH (7.3) and is low in phosphorus at 6.7 ppm. Values below 10 ppm may limit normal plant growth and development. A dense hardpan is located at a little more than a foot in depth, which could be limiting for roots of shrubs. Pavement and rock combined provide nearly half of the ground cover. Bare ground was low at 13% in 1999, but increased to 20% in 2004. There is some movement of pavement and soil with pedestaling and puddling apparent, but erosion is not considered serious. The erosion condition class determined soil movement as stable in 2004.

The key browse species is mountain big sagebrush. All of the sagebrush have been classified as mountain big sagebrush, although some of the plants resemble black sagebrush in growth form and foliage color. Density was estimated at 5,332 plants/acre in 1985, 6,266 in 1991, 6,180 in 1999, and 6,100 in 2004. Seedling production and recruitment were very high in 1985, 1991, and 2004, but were at lower levels in 1999. Decadency has been low in the past at 15%, but rose slightly to 23% in 2004. Vigor is mostly good with various use on the sagebrush probably due to different hybrids, but is mostly light to moderate. Broom snakeweed density has varied over the years, usually following precipitation patterns, from 18,466 plants/acre in 1985, to 4,333 in 1991, 20,580 in 1999, and 5,080 in 2004. Other browse species include prickly phlox and pricklypear cactus, which are increasers with moderate to heavy cattle grazing.

Grass composition was initially dominated by smooth brome (highest sum of nested frequency), a valuable seeded species in 1985, but because of a new road that went through the baseline, it was relocated in 1991. This relocation especially affected sum of nested frequency values for crested wheatgrass and smooth brome because of the small size of the sampled area initially. Since then, the sampling design was increased to 500 feet, allowing a much better sampling design for herbaceous species. Blue grama and bottlebrush squirreltail are the dominant species. Blue grama provided 82% of the grass cover in 1999 and 92% in 2004, while bottlebrush squirreltail provided 15% in 1999 and 8% in 2004. Both are increasers that have only fair forage value. Forbs are insignificant and infrequently encountered. Seeded forbs, alfalfa, yellow sweet clover, and small burnet, were infrequent in 1985 and have not been sampled since.

1985 APPARENT TREND ASSESSMENT

The soil appears stable with the added litter and the seeded grasses. Reestablishment of the key browse species, mountain big sagebrush, is encouraging but the density of broom snakeweed raises some concerns. This chaining must be protected from heavy grazing for a number of years to insure that this undesirable invader does not further increase in density.

1991 TREND ASSESSMENT

The soil appears to still be stable. Percent rock, pavement, and litter have switched around somewhat, but percent bare ground is still about the same. Typically, broom snakeweed dies off in large numbers during a drought, especially an drought. This was no exception on this site with 97% of the population dying off since 1985. The population went from 18,466 to only 4,333 plants/acre. The key species, mountain big sagebrush, increased during this same period by 15%, but much of this could have been because of the relocation of the baseline. The percent of young plants has also improved. It has gone from 27% in 1985 to 40% in 1991. The trend for browse is considered stable. The herbaceous understory is difficult to determine because of the relocation of the baseline which would especially effect nested frequency values for the herbaceous species, but with the examination of the data for the other eight sites, it would still be considered stable.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is stable. Erosion is not serious with the gentle slope and adequate vegetation and litter cover. Trend for browse is stable overall. The key species, mountain big sagebrush, shows a stable trend with the population density, percent decadency and vigor all remaining stable. Use has increased somewhat, but is still mostly light to moderate. Recruitment is moderate at 12%. There was an explosion of broom snakeweed population in 1999. It should be recalled how the population crashed in 1991 with drought. This species was greatly reduced due to the drought in the late 1980's and early 1990's and competition with the sagebrush. However, with improved precipitation in recent years, this species is again increasing. Trend for the herbaceous understory is stable. Perennial grasses are the most abundant group and have increased slightly in sum of nested frequency in 1999. The Desirable Components Index rated this site as fair with a score of 61 due to good shrub cover, moderate perennial grasses, but poor forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 61 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground increased slightly, mostly likely due to dry conditions and the decrease of broom snakeweed. Trend for key browse mountain big sagebrush is stable. Density has remained similar to 1999. Percent decadence has increased from 15% in 1999 to 23% in 2004 most likely due to dry conditions. Use has slightly increased from previous years, but still is only moderate and different sagebrush hybrids have different levels of use. Trend for the herbaceous understory is down. Nested frequency and quadrat frequency has decreased on average more than 34%. Blue gramma decreased as well, indicating summer drought. Forbs remain an insignificant source of forage and contribute little to vegetation cover. The Desirable Components Index rated this site as fair with a score of 54 due to good shrub and perennial grass cover, moderate shrub decadency, and poor forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down (1)
winter range condition (DC Index) - 54 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 8

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{c}$43	$_{a}$-	$_{b}$14	$_{a}$-	.07	-
G	Agropyron intermedium	6	-	2	-	.00	-
G	Agropyron spp.	-	7	-	-	-	-
G	Agropyron spicatum	$_{b}$26	$_{a}$-	$_{a}$-	$_{a}$-	-	-
G	Bouteloua gracilis	$_{a}$115	$_{b}$166	$_{c}$215	$_{bc}$193	7.15	7.20
G	Bromus inermis	$_{c}$141	$_{a}$-	$_{b}$11	$_{a}$-	.13	-
G	Koeleria cristata	-	-	4	-	.03	-
G	Oryzopsis hymenoides	-	-	-	4	-	.03
G	Poa fendleriana	2	-	3	-	.00	-
G	Sitanion hystrix	$_{a}$41	$_{b}$149	$_{b}$137	$_{a}$49	1.27	.61
G	Stipa comata	-	-	3	-	.03	-
G	Stipa pinetorum	$_{b}$17	$_{ab}$13	$_{a}$3	$_{a}$-	.00	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		391	335	392	246	8.71	7.85
Total for Grasses		391	335	392	246	8.71	7.85
F	Antennaria rosea	-	-	-	3	-	.00
F	Androsace septentrionalis (a)	-	-	27	16	.14	.04
F	Arabis demissa	$_{b}$27	$_{b}$20	$_{a}$3	$_{a}$2	.00	.00
F	Astragalus spp.	3	-	-	4	-	.00
F	Chaenactis douglasii	3	-	-	-	-	-
F	Chenopodium spp. (a)	-	-	-	4	-	.01
F	Cryptantha spp.	$_{b}$16	$_{b}$10	$_{a}$-	$_{ab}$5	-	.01
F	Descurainia pinnata (a)	-	10	5	6	.01	.01
F	Eriogonum ovalifolium	6	3	3	3	.03	.00
F	Erigeron pumilus	$_{ab}$16	$_{bc}$22	$_{c}$40	$_{a}$5	.21	.01
F	Machaeranthera canescens	2	-	-	-	-	-
F	Melilotus officinalis	8	-	-	-	-	-
F	Medicago sativa	$_{b}$16	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Penstemon comarrhenus	1	-	-	-	-	-
F	Phlox longifolia	$_{a}$4	$_{b}$22	$_{a}$4	$_{a}$3	.01	.01

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Sanguisorba minor	3	-	-	-	-	-
F	Salsola pestifer (a)	2	-	-	-	-	-
F	Unknown forb-perennial	11	-	-	-	-	-
Total for Annual Forbs		2	10	32	26	0.15	0.06
Total for Perennial Forbs		116	77	50	25	0.25	0.05
Total for Forbs		118	87	82	51	0.41	0.11

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

BROWSE TRENDS --
Management unit 25A, Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	1	0		
B	Artemisia tridentata vaseyana	93	92	17.72	18.47
B	Gutierrezia sarothrae	84	75	1.20	2.07
B	Leptodactylon pungens	0	0	-	-
B	Opuntia spp.	2	2	-	-
B	Pediocactus simpsonii	0	2	-	.03
B	Pinus edulis	0	0	-	-
Total for Browse		180	171	18.93	20.59

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 8

Species	Percent Cover '04
Artemisia tridentata vaseyana	21.50
Gutierrezia sarothrae	1.70

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 8

Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	1.7

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 8

Species	Trees per Acre	
	'99	'04
Juniperus scopulorum	6	-
Pinus edulis	7	25

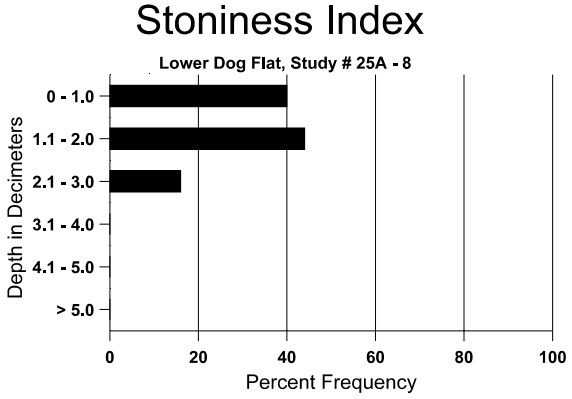
Average diameter (in)	
'99	'04
3.3	-
2.5	1.9

BASIC COVER --
Management unit 25A, Study no: 8

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	8.00	7.50	27.16	27.31
Rock	8.00	29.75	24.86	24.52
Pavement	33.00	17.25	24.32	22.38
Litter	37.00	29.75	20.95	22.14
Cryptogams	0	0	.08	.24
Bare Ground	14.00	15.75	13.14	20.08

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 8, Study Name: Lower Dog Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
10.7	56.3 (10.4)	7.3	43.3	29.4	27.3	2.3	6.7	201.6	0.7



PELLET GROUP DATA --
Management unit 25A, Study no: 8

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	26	43	-	-
Elk	3	1	1 (3)	2 (5)
Deer	10	13	17 (43)	21 (53)
Cattle	4	1	8 (20)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	100	0	-	-	0	5/9
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
85	**5332**	5333	1466	3066	800	-	1	0	15	-	0	18/17
91	**6266**	866	2533	2933	800	-	9	0	13	2	5	19/18
99	**6180**	100	760	4480	940	300	37	17	15	6	6	16/26
04	**6100**	1840	220	4500	1380	800	49	18	23	8	8	16/28
Chrysothamnus viscidiflorus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	5/6
Gutierrezia sarothrae												
85	**18466**	12933	6333	12133	-	-	0	0	0	-	0	9/9
91	**4333**	12600	1200	2533	600	-	8	0	14	1	5	2/3
99	**20580**	2800	14080	6420	80	100	0	0	0	.09	.09	6/6
04	**5080**	640	660	4420	-	60	0	0	0	-	0	6/8
Leptodactylon pungens												
85	**133**	66	-	133	-	-	0	0	0	-	0	7/7
91	**198**	-	66	66	66	-	33	0	33	-	0	3/4
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia spp.												
85	**133**	-	133	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	3/7
04	**40**	-	-	40	-	-	0	0	-	-	0	3/10
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	40	-	-	-	-	0	0	-	-	0	-/-
04	**0**	20	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25A-9-04

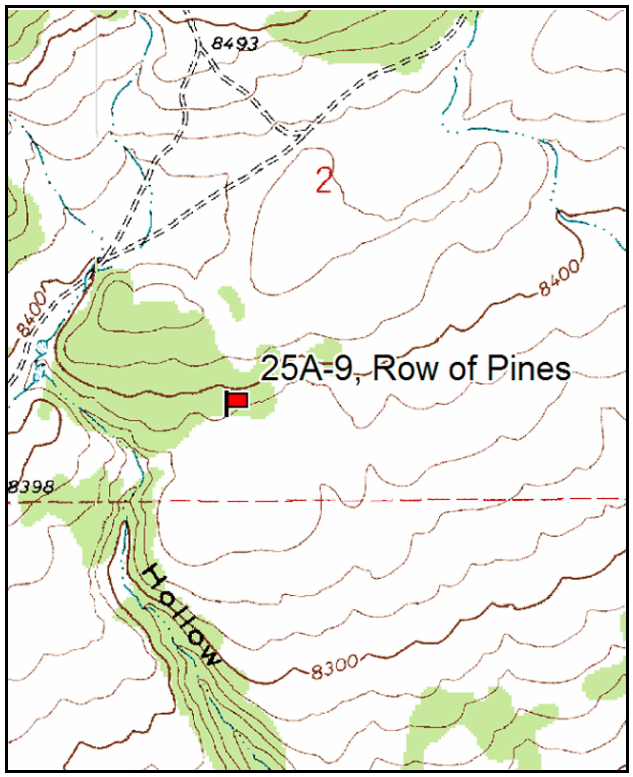
Study site name: Row of Pines . Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic.

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

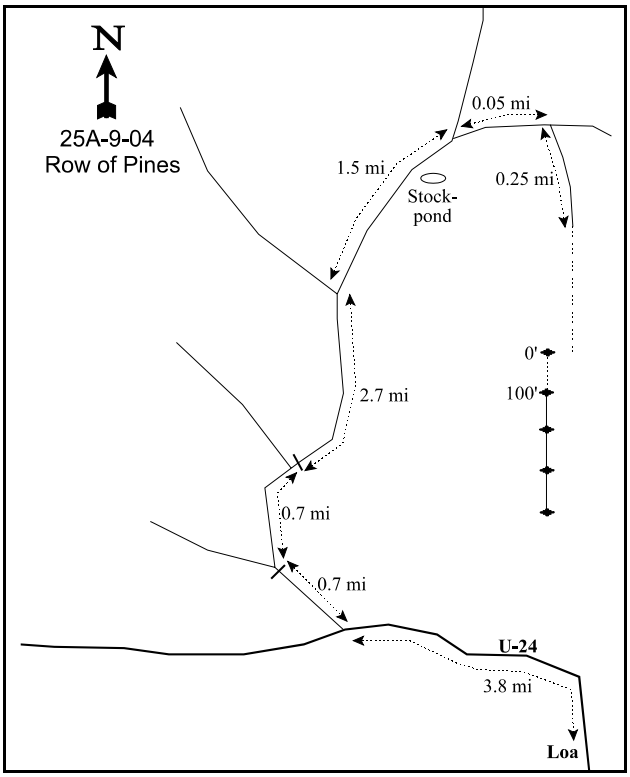
LOCATION DESCRIPTION

From Loa, proceed northwest on U-24 for 3.8 miles (0.9 miles beyond mile marker 49). Turn right and go 0.7 miles to a cattleguard. Just beyond the cattleguard turn right and go another 0.7 miles. Turn right and go across a cattleguard. Proceed 2.7 miles to an intersection, turn right and continue 1.3 miles to a stock pond on the east side of the road. Continue 0.2 miles to a fork, turn right and go 0.05 miles. Turn right and go 0.25 miles to the end of the road, where a pellet group transect begins. On the left side of the road is a gray fence post which marks the north end of the pellet transect. Count 16 stakes south through the belt of pinyon-juniper (the 16th stake is 25 feet from the trees). The beginning of the frequency baseline is 50 feet west of the 16th pellet group stake. Rebar (2-1/2 feet tall) is used to mark the transect, the 0-foot baseline stake has a red browse tag #7064 attached.



Map Name: Loa, Utah

Township 27S , Range 2E , Section 2



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4259722 N, 442185 E

DISCUSSION

Row of Pines - Trend Study No. 25A-9

The Row of Pines trend study is located on the gently sloping Row of Pines Bench, north of Loa. The bench has a general south aspect, but the site is nearly level. Elevation is 8,400 feet. The study samples a sagebrush-perennial grass type starting near a stand of pinyon and juniper trees. Besides the trees near the 0 foot stake, there are few trees and/or escape cover on the sagebrush flat. This area is within the Seven Mile allotment which allows cattle grazing on a deferred rotation system for approximately 20 days in May. Pellet group data from 1999 estimated light use with 13 deer (32 ddu/ha), 1 elk (3 edu/ha), and 3 cow days use/acre (7 cdu/ha). Rabbit sign was moderately abundant. Pellet group data from 2004 estimated 49 deer (121 ddu/ha) and 2 cow days use/acre (5 cdu/ha). Deer and rabbit pellets were more common near the 0 foot stake which is closer to the escape and thermal cover of the pinyon and juniper trees.

Soil at the site is moderately shallow with abundant gravel sized rocks on the surface and throughout the soil profile. Texture is a sandy clay loam with a neutral pH (6.9). Soil organic matter is low at only 1.1% and phosphorus is marginal at 9.1 ppm. Values below 10 ppm may limit normal plant growth and development. The majority of protective ground cover comes shrubs, litter, and pavement. Litter has steadily declined since 1985, but increased in 2004. Rock and pavement cover have steadily increased, but decreased slightly in 2004. However, percent cover of bare ground was relatively low at 18% in 1985 and 1999. The protective ground cover and gentle slope appear to preclude serious erosion problems. The erosion condition class determined soil movement as stable in 2004.

The dominant browse is Wyoming big sagebrush. Density was 8,399 plants/acre in 1985, 8,265 in 1991, 7,100 in 1999, and 5,760 in 2004. Percent cover was estimated at 17% in 2004. These shrubs displayed moderate to heavy hedging in 1985 with lighter use reported in 1991, 1999, and 2004. Decadent plants are common with decadence ranging between 41% and 52% since 1985. The percentage of the population classified as dying was estimated at 4% in 1985, 3% in 1991, 18% in 1999, and increased to 27% in 2004. Seedlings were common in 1985 and 2004, yet lacking in 1991 and 1999. Young plants have been moderately abundant on each reading, but not in high enough numbers to replace decadent/dying individuals. Black sagebrush is the next dominate browse and was estimated at 2,665 plants/acre in 1985, 2,532 in 1991, 1,600 in 1999, and 1,300 in 2004. Utilization was moderate in 1985 and 1999, but mostly light in 1991 and 2004. Vigor was good in 1985 and 1999, but was considered fair in 1991 and 2004. Recruitment is poor with a few seedlings and young plants sampled in 1999 and 2004. Broom snakeweed is the most numerous browse species, especially on the upper (south) end of the study site. It had a high density of 10,732 plants/acre in 1985, which dropped dramatically to only 1,465 plants/acre in 1991. This was a common occurrence throughout the management area. The much larger sample used in 1999 estimated 11,300 plants/acre, a similar density to 1985. In 2004, the density dropped again to 640 plants/acre and is a mostly mature population. Other increasers present in low numbers are narrowleaf low rabbitbrush and prickly pear cactus.

The herbaceous understory is dominated by blue grama, a low-growing warm season perennial that provides very little forage. It provided 13% of the total vegetation cover in 1999 and 9% in 2004. The only other grass found more than occasionally is bottlebrush squirreltail. Forbs are small and sparse. They provided only 1% of the total cover in 1999 and 2004.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable and there is no serious erosion evident. The vegetative trend is presently down, as populations of big and black sagebrush appear to be declining.

1991 TREND ASSESSMENT

Soil trend is slightly down because of lower vegetative cover and increase in bare ground and decrease in litter cover. These are all downward indicators reflective of an drought. The two key browse species are also showing a slightly downward trend with population losses of 5% and 2% respectively for black sagebrush and Wyoming big sagebrush. The occurrence of Wyoming big sagebrush on this site instead of mountain big sagebrush, further illustrates the relative dryness of the site. This is additionally compounded by the relatively high density the sagebrush populations have to contend with on this site. The herbaceous understory trend is stable but in poor condition because the dominant grass is a very low growing warm season grass (blue grama) which is of little value for spring or fall use.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is slightly up. Relative percent cover of bare ground has declined from 28% to 14%. Litter cover has declined slightly however. Relative percent cover of rock and pavement has decreased slightly. Vegetation cover numbers increased dramatically, but vegetation cover data from 1985 and 1991 measured only basal cover, while aerial cover is estimated now so the numbers are not comparable. There appears to be little erosion due to the levelness of the terrain. Trend for the key species, Wyoming big sagebrush is down slightly. Density has declined since 1991, but some of the change is due to the much larger sample used in 1999. Use is heavier, and percent decadence remains high. In addition, a large portion of the decadent plants sampled (44%) appear to be dying. Recruitment is currently inadequate to replace the proportion of dying plants. The less abundant black sagebrush appears to be more stable, but only contributes to 13% of the browse cover. Trend for the herbaceous understory is up for grasses and stable for forbs. Overall trend is considered up since grasses provide nearly all of the herbaceous cover. Composition is poor however, with the low growing warm season, blue grama, providing 84% of the grass cover. The Desirable Components Index rated this site as good with a score of 51 due to good shrub cover, fair perennial grass cover, but high shrub decadence.

TREND ASSESSMENT
soil - slightly up (4)
browse - down slightly (2)
herbaceous understory - up (5)
winter range condition (DC Index) - 51 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable even with the slight increase in relative percent soil which was not enough warrant a downward trend for soil. Pavement and rock decreased slightly as did vegetation cover, but percent litter increased. Trend for key browse Wyoming big sagebrush and Black sagebrush is down. Wyoming big sagebrush densities decreased and percent decadence increased. Seedling production was high, but very few young plants were observed. The number of plants classified as dying increased from 18% in 1999 to 27% in 2004. Black sagebrush had similar observations as the Wyoming big sagebrush. Densities were lower with an increase in percent decadent and dying plants. Young recruitment was low as well. Trend for the herbaceous understory is down because the perennial grasses contribute to 92% of the perennial herbaceous production and the nested frequency and quadrat frequency dropped by an average of 39%. The dominate species, blue gramma, has decreased greatly since 1999 indicating severe summer drought. The Desirable Components

Index rated this site as fair with a score of 37 due to good shrub cover, high shrub decadence, and decreased perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 37 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 9

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	-	-	12	3	.07	.00
G	Agropyron spicatum	-	-	6	-	.01	-
G	Bouteloua gracilis	100	102	173	105	5.55	2.06
G	Oryzopsis hymenoides	$_{b}$31	$_{a}$7	$_{a}$10	$_{a}$3	.10	.04
G	Poa secunda	-	-	2	-	.00	-
G	Sitanion hystrix	$_{a}$58	$_{ab}$82	$_{b}$110	$_{ab}$61	.84	.74
G	Stipa pinetorum	-	4	4	11	.03	.05
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		189	195	317	183	6.63	2.90
Total for Grasses		189	195	317	183	6.63	2.90
F	Androsace septentrionalis (a)	-	-	$_{b}$87	$_{a}$11	.44	.02
F	Arabis demissa	$_{b}$22	$_{ab}$12	$_{a}$6	$_{b}$24	.04	.05
F	Astragalus lentiginosus	$_{b}$21	$_{a}$3	$_{a}$3	$_{a}$7	.01	.01
F	Chenopodium leptophyllum(a)	-	-	-	4	-	.01
F	Cryptantha spp.	2	7	-	-	-	-
F	Descurainia pinnata (a)	-	-	4	1	.01	.00
F	Eriogonum ovalifolium	7	16	13	10	.19	.08
F	Erigeron pumilus	$_{ab}$20	$_{a}$-	$_{b}$34	$_{a}$6	.23	.04
F	Phlox longifolia	$_{a}$8	$_{b}$33	$_{a}$-	$_{a}$6	.00	.01
F	Senecio multilobatus	$_{a}$-	$_{a}$1	$_{b}$23	$_{ab}$6	.06	.04
Total for Annual Forbs		0	0	91	16	0.45	0.04
Total for Perennial Forbs		80	72	79	59	0.54	0.25
Total for Forbs		80	72	170	75	0.99	0.30

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

BROWSE TRENDS --
Management unit 25A, Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia frigida	6	4	.03	.00
B	Artemisia nova	20	23	4.51	2.30
B	Artemisia tridentata wyomingensis	93	93	24.40	17.31
B	Chrysothamnus viscidiflorus stenophyllus	0	2	-	.03
B	Gutierrezia sarothrae	64	22	4.71	.18
B	Opuntia fragilis	11	10	.06	.18
B	Pediocactus simpsonii	1	5	-	.00
B	Pinus edulis	0	0	-	.00
Total for Browse		195	159	33.74	20.03

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 9

Species	Percent Cover
	'04
Artemisia nova	2.33
Artemisia tridentata wyomingensis	21.43
Gutierrezia sarothrae	.51
Opuntia fragilis	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 9

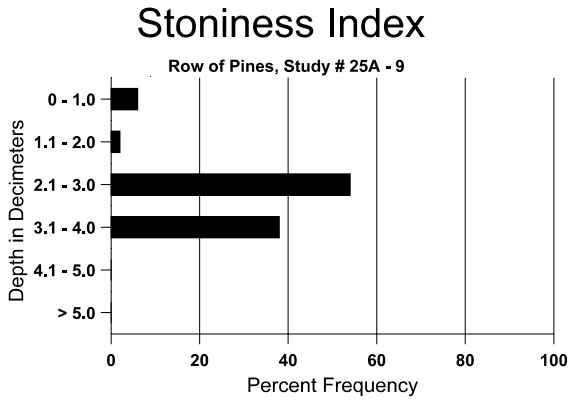
Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	2.2

BASIC COVER --
Management unit 25A, Study no: 9

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	10.00	6.00	41.90	23.89
Rock	2.75	3.75	8.67	6.71
Pavement	31.75	34.75	33.29	27.15
Litter	34.50	24.50	22.44	32.81
Cryptogams	3.50	3.50	2.30	1.96
Bare Ground	17.50	27.50	18.19	23.42

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 9, Study Name: Row of Pines

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.7	59.3 (13.8)	6.9	51.3	23.4	25.3	1.1	9.1	192.0	0.5



PELLET GROUP DATA --
Management unit 25A, Study no: 9

Type	Quadrat Frequency	
	'99	'04
Rabbit	28	49
Elk	-	-
Deer	15	30
Cattle	3	2

Days use per acre (ha)	
'99	'04
-	-
1 (2)	-
13 (32)	49 (121)
3 (7)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**240**	-	20	200	20	-	17	42	8	-	0	3/4
04	**100**	-	20	80	-	-	0	0	0	-	0	5/6
Artemisia nova												
85	**2665**	266	466	1066	1133	-	53	0	43	-	0	10/13
91	**2532**	-	266	933	1333	-	5	0	53	9	32	8/14
99	**1600**	-	80	1220	300	-	69	5	19	8	8	10/17
04	**1300**	100	-	920	380	440	6	0	29	18	18	7/17
Artemisia tridentata wyomingensis												
85	**8399**	466	466	4000	3933	-	60	28	47	4	13	16/17
91	**8265**	-	866	3133	4266	-	19	5	52	3	10	16/19
99	**7100**	120	380	3820	2900	800	43	12	41	18	18	18/28
04	**5760**	1380	100	2760	2900	2020	30	6	50	27	27	16/26
Chrysothamnus viscidiflorus stenophyllus												
85	**466**	-	-	200	266	-	0	0	57	-	0	7/9
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**60**	-	-	60	-	-	0	0	0	-	0	5/6
Eriogonum microthecum												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	3/5
Gutierrezia sarothrae												
85	**10732**	1333	3466	6933	333	-	1	0	3	-	0	8/7
91	**1465**	-	666	266	533	-	23	9	36	1	5	2/2
99	**11300**	860	880	10200	220	220	0	0	2	.88	.88	8/9
04	**640**	-	40	600	-	-	0	0	0	-	0	6/7
Opuntia fragilis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**260**	20	40	220	-	40	0	0	-	-	0	3/9
04	**220**	-	-	220	-	20	0	0	-	-	9	2/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	1/2
04	**160**	-	-	160	-	-	0	0	-	-	0	1/2
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	40	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25A-10-04

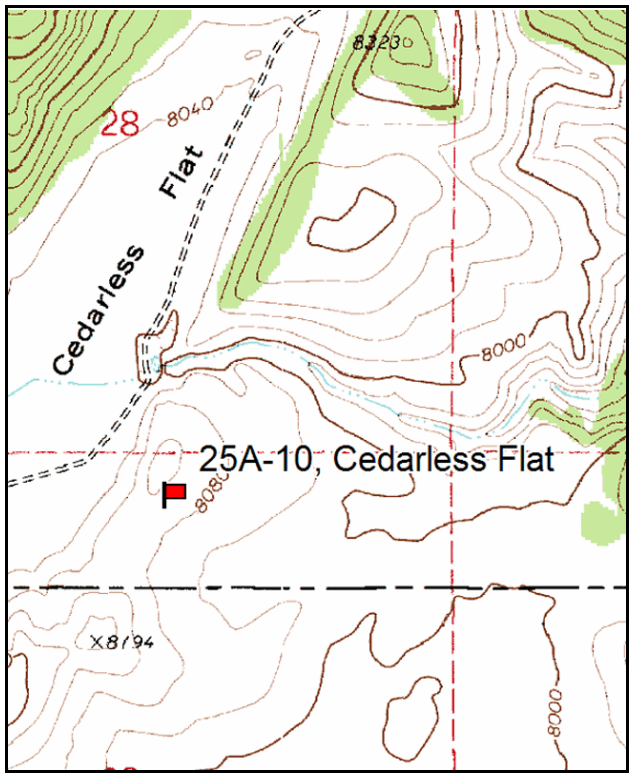
Study site name: Cedarless Flat . Vegetation type: Wyoming Big Sagebrush .

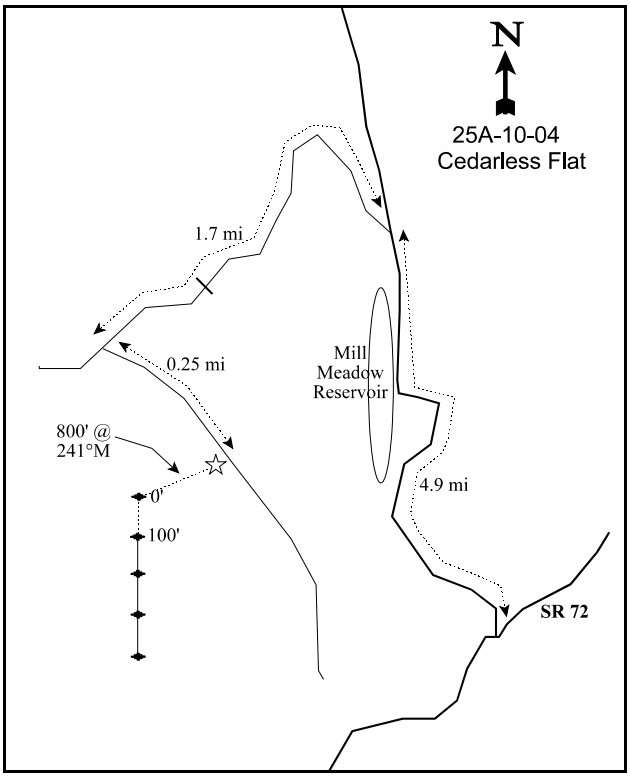
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From Fremont, travel northeast on SR72 for 2.25 miles to a major fork (the sign says Mill Meadow Reservoir). Turn left and proceed 4.5 miles past the reservoir to Fremont Creek. Cross the bridge and go 0.4 miles to a fork. Bear left on the Mytoge Road and go 1.1 miles to a cattleguard in Cedarless Flat. From the cattleguard, go 0.6 miles to a fork. Turn left and go exactly 0.25 miles to a witness post on the south side of the road. From the witness post, go 800 feet at 241°M to the 0 ft baseline stake. The baseline stake is marked with a red browse tag number 407.





Map Name: Forsyth Reservoir, Utah Diagrammatic Sketch

Township 26S , Range 3E , Section 33 GPS: NAD 27, UTM 12S 4262560 N, 448847 E

DISCUSSION

Cedarless Flat - Trend Study No. 25A-10

The Cedarless Flat transect is located on a sagebrush hill that is part of critical deer winter and spring range. The elevation is 8,080 feet with a southeast aspect. The land is managed by the Forest Service and has had a history of overgrazing. Better early spring range is needed to help alleviate depredation by big game on the agricultural lands around Fremont. The area was chained and seeded in 1987 to reduce sagebrush and increase availability of the needed succulent forbs and cool season grasses. Several areas were excluded from the treatment to retain sage grouse habitat. By 1999, treatment boundaries were nearly indistinguishable. This area is within the UM Creek allotment which is grazed in the spring for generally two weeks from June 1 to June 15 as conditions permit. Pellet group data from the site estimated 7 deer, 21 elk, and 4 cow days use/acre (17 ddu/ha, 52 edu/ha, 10 cdu/ha) in 1999. In 2004, pellet group data estimated 33 deer, 5 elk, and 3 cow days use/acre (81 ddu/ha, 12 edu/ha, 7 cdu/ha). Escape and thermal cover is limited to thick stands of juniper approximately one-fourth mile away.

The soil is moderately shallow, compacted and relatively stable. Effective rooting depth is estimated at just over 14 inches. It has a clay loam texture with a slightly alkaline pH (7.4). Phosphorus is limited at 7 ppm. Values less than 10 ppm may limit plant development and growth. Erosion is limited by pavement and rocks, which are common on the soil surface. Litter cover is low, but the armored surface prevents erosion from being a problem. Vegetation cover decreased in 2004, which resulted in high pavement cover.

Wyoming big sagebrush is the dominant browse species. Density has declined with each reading since the study was established in 1985. Density was high at 8,798 plants/acre in 1985, prior to the treatment. After treatment density declined by 25% to 6,599 plants/acre in 1991. In 1999, density was 5,440 plants/acre, but some of the change in density between 1991 and 1999 would be partly due to the much larger sample used in 1999. Five years later in 2004, density declined by 21% to 4,320 plants/acre. In 1999, the population was very healthy with very low decadence at 4% with 31% of the population classified as young. By 2004, only 5% of the population was young and decadence had increased to 38%. Utilization has been moderate each time the study was monitored. Drought conditions have been detrimental to this population. A few black sagebrush plants are also found on this site. Broom snakeweed density declined 59% between 1999 and 2004.

Herbaceous vegetation was particularly sparse and insignificant prior to the treatment. Sum of nested frequency for grasses more than doubled after treatment, but has decreased with each subsequent reading. Blue grama and seeded Russian wildrye are the most common grasses, along with crested wheatgrass and Indian ricegrass. Cover of perennial grasses decreased from 13% in 1999 to 4% by 2004. Perennial forbs have never been very abundant since the study was established in 1985. Slimleaf goosefoot (an annual species) had over 6% cover in 2004 and had not been previously sampled. It made up 96% of the total forb cover, with Fremont goosefoot making up the remainder of the forb cover.

1985 APPARENT TREND ASSESSMENT

Soil condition appears stable while vegetative trend is down. The age structure and general vigor of the sagebrush indicates a declining population. Cool season grasses and forbs and valuable forage plants are conspicuously absent.

1991 TREND ASSESSMENT

Soil condition is still considered stable even with the slight increase in percent bare ground (still relatively low for a Wyoming sagebrush-grass site), for the area was chained and seeded in 1987. The treatment did initially establish more grasses on the site. The browse trend is slightly up because the treatment thinned the sagebrush

and it shows good vigor and a much lower percent of the population is decadent. The herbaceous understory is greatly improved with many cool season grasses established since treatment.

TREND ASSESSMENT
soil - stable (3)
browse - slightly up (4)
herbaceous understory - up (5)

1999 TREND ASSESSMENT

Trend for soil is still considered stable. Percent cover of bare ground is similar to 1991 estimates, while litter cover has declined slightly. This is primarily due to the deterioration of chaining debris. Herbaceous cover is still moderately abundant and erosion is not a serious problem. Trend for browse is stable. Density of the key species, Wyoming big sagebrush, has declined 18% but some of the difference is likely due to the much larger sample used in 1999. Utilization is moderate to heavy but vigor is good and percent decadence has declined from 14% to 4%. Young plants are abundant and account for 31% of the population. This combined with the low number of decadent plants would indicate an expanding population. One negative aspect of the browse trend is the increase in broom snakeweed to 4,240 plants/acre. Only 599 plants/acre were estimated prior to the treatment in 1985 and no broom snakeweed was encountered in 1991. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses has declined slightly, yet more importantly, sum of nested frequency for the seeded crested wheatgrass has declined significantly with frequency of the less desirable, low growing, warm season blue grama, has increased significantly. Most of the seeded grasses were found growing only within the protection of sagebrush canopies, which would indicate excessive livestock spring grazing pressure. Forbs are still rare.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 69 (excellent) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The trend for soil is stable. Relative percent bare ground is stable. Pavement has increased slightly and this is likely due to lower vegetation cover, which exposes more pavement. The armored soil surface protects it from erosion. The browse trend is slightly down. The key species, Wyoming big sagebrush, has decreased in density and cover since 1999. Decadence has increased from 4% to 38%, while the percent of the population classified as young is down to only 5%. Drought conditions have been harmful to this sagebrush population. Positively, broom snakeweed density also has declined. The herbaceous understory trend is also down. The sum of nested frequency for perennial grasses has declined since 1991, and declined 40% since 1999. Blue grama declined significantly in nested frequency. Perennial forbs are still rare and annual goosefoot species are very common.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - down (1)
winter range condition (DC Index) - 26 (poor to fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 10

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{a}$-	$_{c}$155	$_{b}$41	$_{b}$27	1.14	.69
G	Bouteloua gracilis	$_{a}$70	$_{b}$104	$_{c}$193	$_{b}$105	8.30	1.89
G	Bromus inermis	$_{a}$-	$_{c}$55	$_{b}$12	$_{a}$-	.22	-
G	Bromus tectorum (a)	-	3	-	-	-	-
G	Carex spp.	$_{a}$-	$_{a}$-	$_{b}$15	$_{ab}$14	.07	.07
G	Elymus junceus	$_{a}$-	$_{c}$84	$_{bc}$61	$_{b}$51	2.59	1.41
G	Oryzopsis hymenoides	$_{ab}$15	$_{a}$15	$_{b}$36	$_{ab}$18	.72	.08
G	Sitanion hystrix	$_{b}$97	$_{b}$75	$_{a}$29	$_{a}$18	.20	.12
G	Stipa lettermani	1	5	4	-	.01	-
Total for Annual Grasses		0	3	0	0	0	0
Total for Perennial Grasses		183	493	391	233	13.29	4.28
Total for Grasses		183	496	391	233	13.29	4.28
F	Androsace septentrionalis (a)	-	-	$_{b}$11	$_{a}$-	.02	-
F	Arabis demissa	$_{b}$9	$_{ab}$2	$_{ab}$3	$_{a}$-	.00	-
F	Astragalus lentiginosus	4	-	5	1	.03	.00
F	Chenopodium fremontii (a)	-	-	$_{a}$-	$_{b}$25	-	.27
F	Chenopodium leptophyllum(a)	-	-	$_{a}$-	$_{b}$236	-	6.38
F	Cryptantha spp.	5	3	1	-	.03	-
F	Descurainia pinnata (a)	-	-	-	3	-	.00
F	Eriogonum cernuum (a)	-	-	-	3	-	.00
F	Eriogonum ovalifolium	5	1	-	-	-	-
F	Erigeron pumilus	4	1	-	-	-	-
F	Phlox longifolia	1	5	1	2	.00	.00
F	Senecio multilobatus	5	-	-	-	-	-
Total for Annual Forbs		0	0	11	267	0.02	6.66
Total for Perennial Forbs		33	12	10	3	0.07	0.01
Total for Forbs		33	12	21	270	0.10	6.67

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

BROWSE TRENDS --
Management unit 25A, Study no: 10

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	2	4	-	.01
B	Artemisia tridentata wyomingensis	83	83	9.25	7.77
B	Chrysothamnus viscidiflorus viscidiflorus	9	10	.15	.15
B	Gutierrezia sarothrae	56	42	.38	.26
B	Opuntia spp.	2	5	.03	.03
B	Pediocactus simpsonii	3	2	.03	.03
Total for Browse		155	146	9.84	8.27

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 10

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	11.51
Gutierrezia sarothrae	.30
Opuntia spp.	.03

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 10

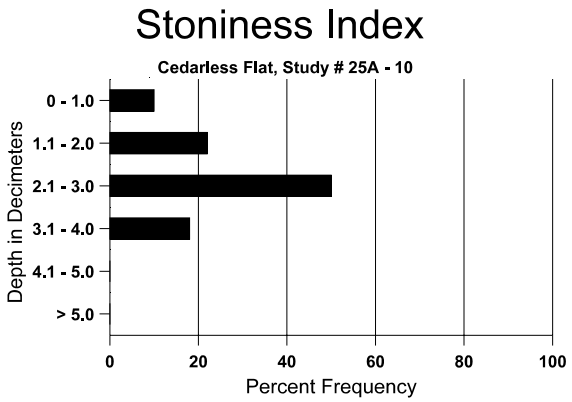
Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	1.8

BASIC COVER --
Management unit 25A, Study no: 10

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	1.50	4.50	23.21	18.60
Rock	6.00	8.00	9.06	7.65
Pavement	51.00	46.50	27.46	44.11
Litter	32.50	22.75	13.73	19.38
Cryptogams	0	0	.00	0
Bare Ground	9.00	18.25	20.26	23.65

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 10, Study Name: Cedarless Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.1	62.3 (10.1)	7.4	43.3	25.4	31.3	2.6	7.0	112.0	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 10

Type	Quadrat Frequency	
	'99	'04
Rabbit	9	40
Elk	6	2
Deer	8	17
Cattle	3	1
Antelope	-	2

Days use per acre (ha)	
'99	'04
-	-
21 (52)	5 (12)
7 (17)	33 (81)
4 (10)	3 (7)
-	-

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	-	-	80	-	-	0	0	-	-	0	6/15
04	**200**	-	-	200	-	-	10	0	-	-	0	10/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
85	**8798**	533	1066	5266	2466	-	37	8	28	.68	2	18/20
91	**6599**	933	1333	4333	933	-	22	4	14	-	0	12/15
99	**5440**	40	1680	3540	220	320	52	15	4	3	3	13/22
04	**4320**	320	220	2480	1620	680	36	10	38	26	27	13/23
Chrysothamnus viscidiflorus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	0	0	-	0	-/-
99	**240**	-	-	220	20	-	17	8	8	8	8	7/12
04	**240**	80	-	240	-	20	0	0	0	-	0	7/13
Gutierrezia sarothrae												
85	**599**	-	133	466	-	-	0	0	-	-	0	8/4
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**4240**	100	2200	2040	-	-	0	0	-	-	0	4/4
04	**1720**	-	80	1640	-	20	0	0	-	-	0	5/7
Opuntia spp.												
85	**66**	66	-	-	66	-	0	0	100	-	0	-/-
91	**399**	-	133	266	-	-	0	0	0	-	0	2/4
99	**80**	-	20	60	-	-	0	0	0	-	0	3/10
04	**100**	-	20	80	-	-	0	0	0	-	0	2/9
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	20	40	-	-	0	0	-	-	0	2/4
04	**40**	-	-	40	-	-	0	0	-	-	0	1/3

Trend Study 25A-11-04

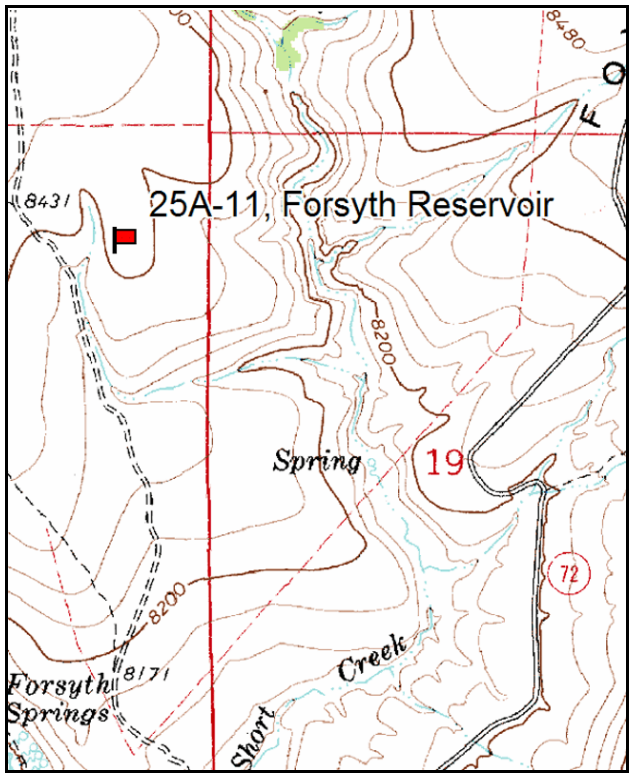
Study site name: Forsyth Reservoir . Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic.

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

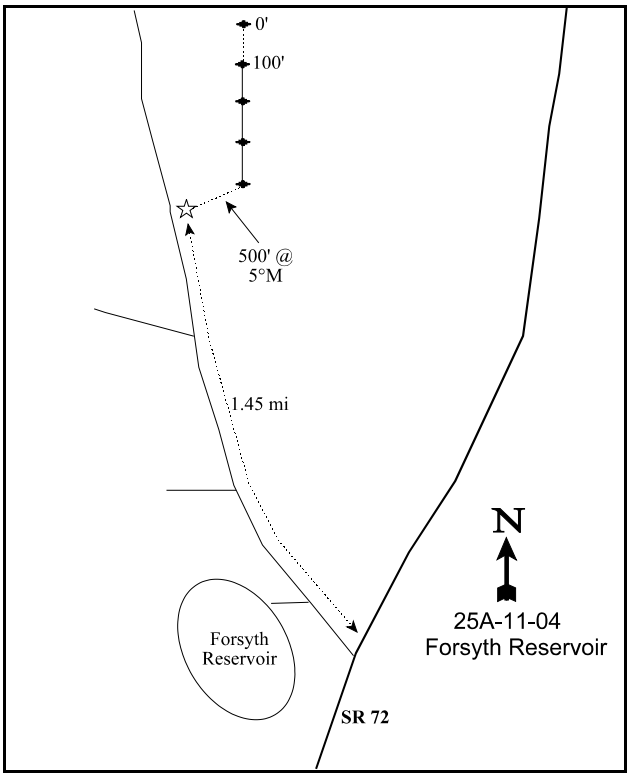
LOCATION DESCRIPTION

Between Lyman and Loa, turn north towards Fremont to connect with SR 72. Travel up SR 72 until you cross a Forest Service boundary cattleguard (about 5 miles from Fremont). Continue another 2.7 miles to Forsyth Reservoir. Turn at the Forsyth Reservoir sign and drive down 0.3 miles to a fork. Turn right and continue 0.1 miles to where the road crosses Short Creek (which empties into the east cove of Forsyth). From Short Creek, go up 0.1 miles to a fork. Turn right and go 0.25 miles to a cattleguard. Continue 0.15 miles beyond the cattleguard to a fork. Take the right fork and go 0.55 miles to a draw below a ridge to the northeast. There is a steel rebar witness post on the right side of the road. The last baseline stake is located 500 feet away at a bearing of 5°M on top of the ridge. The 0-foot baseline stake is 400 feet due north, and has a red browse tag #7062 attached.



Map Name: Forsyth Reservoir, Utah

Township 26S , Range 3E , Section 24



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4265582 N, 454184 E

DISCUSSION

Forsyth Reservoir - Trend Study No. 25A-11

The Forsyth Reservoir study site transect is located on the top of a hill north of Forsyth Reservoir. The slope is 5% with a south-southeast aspect and an elevation of 8,400 feet. The area is managed by the Fish Lake National Forest as part of the Tidwell cattle allotment. Historically, the area has received heavy grazing by cattle and sheep, but with an especially high impact within the vicinity of the reservoir. A large area was sprayed with 2,4-D in the spring of 1976 to reduce shrub competition and release the grasses and forbs. A drought after the spraying impaired growth, but five years after the spraying it was noted by Forest Service personnel that there was fair grass production with good vigor. The study site is dominated by black sagebrush. The area is still used by cattle every other year in early June. It is used by deer and elk in the winter. Pellet group data from 1999 estimate 2 deer, 60 elk, and 7 cow days use/acre (5 ddu/ha, 148 edu/ha, 17 cdu/ha). Cattle pats and the majority of the elk pellet groups were from the spring of 1999. Pellet group data from 2004 estimated 2 deer (5 ddu/ha), 14 elk (35 edu/ha), and 4 cow days use/acre (11 cdu/ha). Cattle use was from the previous spring.

Soil on the site is moderately deep with an effective rooting depth estimated at just over 14 inches. Texture is a clay loam with a neutral pH (7.0). Phosphorus is low at only 2.6 ppm. Values below 10 ppm may limit normal plant growth and development. Rock and pavement cover are relatively high on the surface and the profile contains abundant gravel. Litter cover dropped in 1999, but rose back to previous levels in 2004. Percent bare soil is low ranging from 1 to 4% since 1985. The soil appears to absorb and hold water well and the layer of pavement effectively stops erosion. Overall protective cover is abundant.

The dominant browse on the site is black sagebrush which provided 66% of the total vegetation cover in 1999 and 49% in 2004. It has had extremely high densities ranging from 15,466 plants/acre in 1985, 21,133 in 1991, 28,180 in 1999, and decreased to 13,080 by 2004. Use of black sagebrush has been light to moderate in past readings, but only light use was observed in 2004. Vigor has remained good, but percent decadence has steadily increased from 9% in 1985 to 29% in 1999, and finally to 40% in 2004. Many of the decadent plants encountered had partial crown death likely due to drought and winter injury, combined with intraspecific competition. The percentage of plants classified as dying increased from 2% in 1999 to 19% by 2004. There are some scattered mountain big sagebrush plants on the site, which are more heavily hedged because of their higher preference.

Other common shrubs found on the site include fringed sage and stickyleaf low rabbitbrush. Density of fringed sage and stickyleaf low rabbitbrush declined considerable between 1991 and 1999, but most of the change is due to the much larger sample used in 1999. These low growing shrubs show light use and good vigor.

The herbaceous understory is diverse yet not particularly abundant considering the treatment. Grasses produced 23% of the total vegetation cover in 1999 and 40% in 2004, while forbs provided only 4% for last two readings. The dominant grass is the warm season blue grama, other perennial grasses such as Mutton bluegrass, bottlebrush squirreltail, and letterman needlegrass are also fairly abundant. Forbs are limited to a few low growing, poor value species like lobeleaf groundsel, rockcress, low fleabane, and longleaf phlox.

1985 APPARENT TREND ASSESSMENT

The soil appeared stable. Spraying has made this a dynamic vegetative community with many changes occurring. Grasses, as well as the key species black sagebrush, are doing well and increasing. The Forest Service has recommendations to re-spray the sagebrush by 1990. However, additional seeding and further restrictions on cattle grazing may be necessary in order to improve the site for cool season herbaceous species

and early spring use by wildlife and late spring use by cattle.

1991 TREND ASSESSMENT

The soil is still stable, with only 1% bare ground at this time. Fringed sagebrush and stickyleaf low rabbitbrush have increased in density. The key species, black sagebrush, also increased in density by 27%. The herbaceous understory has remained about the same, with few changes.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is still considered stable even with the slight increase in bare soil, as it is still very low at only about 4%. The soil surface is still covered with pavement which provides adequate protection and erosion is not currently a problem. Trend for browse is stable for the key species, black sagebrush. Some of the changes in density of shrubs between 1991 and 1999 is the result of the larger sample used in 1999. Black sagebrush displays light to moderate use, good vigor, and excellent recruitment. The population currently appears to be at the maximum for the site. The dramatic decline in density of fringed sagebrush and stickyleaf low rabbitbrush also appears to be the result of the larger sample used this year which gives a more representative sample of shrub populations with discontinuous and/or clumped distributions. Trend for the herbaceous understory is stable even with the slight decrease in perennial grass nested frequency. This decrease is not enough to warrant a downward herbaceous trend as the perennial grasses contribute to 86% of the herbaceous component. Sum of nested frequency for blue grama declined slightly with frequency of bottlebrush squirreltail declining significantly. Forbs are limited to a few low growing, poor value species like rockcress, low fleabane, and longleaf phlox. The Desirable Components Index rated this site as good with a score of 65 due to good shrub cover, high shrub decadence, and fair perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 65 (good) Black sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Litter cover increased from low levels in 1999 and is close to previous years now. Soil erosion is not a problem on this site due to an abundance of protective cover. Trend for the key browse black sagebrush is down. Density has dropped from 28,180 plants/acre in 1999 to 13,080 in 2004. Part of this large drop is due to a large abundance of young sagebrush plants that may have been eliminated by drought. The number of dead plants increased from 720 plants/acre in 1999 to 6,080 in 2004. Almost half (40%) of the population was classified as decadent and 19% of the total population was identified as dying. Trend for the herbaceous understory is stable. Sum of nested frequency remained relativity the same as 1999. Forbs are small growing and contribute very little to overall cover. The Desirable Components Index rated this site as fair with a score of 55 due to fair shrub cover, increase shrub decadence, and excellent perennial grass cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 55 (fair) Black sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 11

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron spicatum	-	-	-	1	-	.03
G	Agropyron trachycaulum	$_{b}$14	$_{ab}$4	$_{ab}$9	$_{a}$-	.04	-
G	Bouteloua gracilis	$_{a}$140	$_{b}$184	$_{ab}$166	$_{b}$178	2.44	5.97
G	Carex spp.	$_{a}$6	$_{a}$6	$_{b}$33	$_{b}$42	.14	.46
G	Poa fendleriana	102	113	120	129	2.00	3.46
G	Sitanion hystrix	$_{b}$156	$_{b}$161	$_{a}$85	$_{a}$78	.66	1.36
G	Stipa comata	$_{a}$1	$_{a}$-	$_{b}$35	$_{a}$11	.37	.15
G	Stipa lettermani	102	102	85	74	1.14	1.37
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		521	570	533	513	6.82	12.82
Total for Grasses		521	570	533	513	6.82	12.82
F	Androsace septentrionalis (a)	-	-	3	2	.03	.00
F	Arabis demissa	$_{c}$143	$_{b}$74	$_{a}$25	$_{a}$9	.05	.02
F	Astragalus lentiginosus	3	-	-	-	-	-
F	Astragalus spp.	-	-	-	3	-	.00
F	Chaenactis douglasii	$_{a}$2	$_{b}$14	$_{a}$3	$_{ab}$5	.00	.06
F	Erigeron pumilus	$_{d}$137	$_{c}$110	$_{b}$66	$_{a}$20	.19	.07
F	Gayophytum ramosissimum(a)	-	-	-	2	-	.01
F	Hymenoxys richardsonii	$_{a}$1	$_{a}$-	$_{b}$17	$_{a}$-	.70	-
F	Pedicularis centranthera	-	-	1	4	.00	.03
F	Penstemon spp.	-	1	9	-	.02	-
F	Phlox austromontana	-	-	2	-	.01	-
F	Phlox longifolia	$_{c}$60	$_{b}$33	$_{ab}$19	$_{a}$2	.05	.01
F	Polygonum douglasii (a)	-	-	-	2	-	.00
F	Senecio multilobatus	$_{a}$-	$_{a}$3	$_{a}$10	$_{b}$42	.02	.86
Total for Annual Forbs		0	0	3	6	0.03	0.01
Total for Perennial Forbs		346	235	152	85	1.07	1.06
Total for Forbs		346	235	155	91	1.11	1.08

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

BROWSE TRENDS --
Management unit 25A, Study no: 11

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia frigida	31	25	.16	.29
B	Artemisia nova	96	96	19.44	15.63
B	Artemisia tridentata vaseyana	2	2	-	-
B	Chrysothamnus nauseosus	1	0	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	29	28	1.60	1.58
B	Coryphantha vivipara arizonica	2	1	.06	-
B	Eriogonum microthecum	9	7	.03	.09
B	Gutierrezia sarothrae	4	12	.01	.18
B	Leptodactylon pungens	2	2	-	-
B	Pediocactus simpsonii	2	3	.03	.01
B	Pinus edulis	1	1	-	-
B	Tetradymia canescens	1	1	-	-
Total for Browse		180	178	21.35	17.80

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 11

Species	Percent Cover '04
Artemisia frigida	.58
Artemisia nova	14.89
Artemisia tridentata vaseyana	.65
Chrysothamnus viscidiflorus viscidiflorus	2.01
Gutierrezia sarothrae	.30
Pinus edulis	.03

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 11

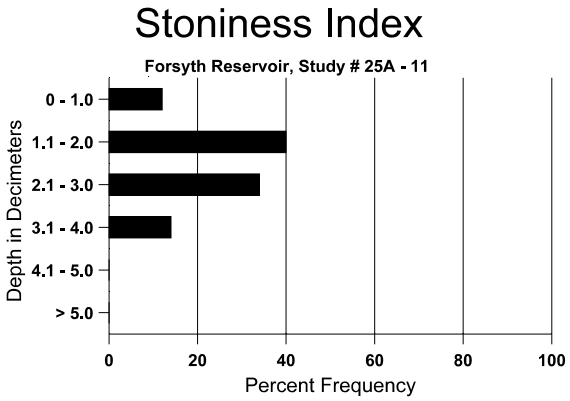
Species	Average leader growth (in) '04
Artemisia nova	1.4

BASIC COVER --
Management unit 25A, Study no: 11

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	5.75	10.75	32.02	31.75
Rock	6.25	2.75	14.71	9.88
Pavement	49.50	57.00	38.54	47.79
Litter	32.00	27.75	7.75	20.64
Cryptogams	4.75	.75	1.71	1.78
Bare Ground	1.75	1.00	3.56	4.67

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 11, Study Name: Forsyth Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.4	50.7 (9.6)	7.0	41.3	35.4	23.3	2.2	2.6	89.6	0.5



PELLET GROUP DATA --
Management unit 25A, Study no: 11

Type	Quadrat Frequency	
	'99	'04
Rabbit	6	10
Elk	19	16
Deer	5	3
Cattle	2	1

Days use per acre (ha)	
'99	'04
-	-
60 (148)	14 (35)
2 (5)	2 (5)
7 (17)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**23199**	4866	13866	9333	-	-	0	0	0	-	0	2/4
91	**20399**	200	3266	15600	1533	-	30	14	8	.19	.65	2/3
99	**2240**	40	280	1960	-	-	8	0	0	-	0	4/6
04	**1780**	-	100	1660	20	20	2	0	1	-	0	7/9
Artemisia nova												
85	**15466**	9466	5733	8333	1400	-	19	2	9	.12	.43	7/10
91	**21133**	-	10533	7800	2800	-	15	7	13	1	5	6/11
99	**28180**	120	7640	12240	8300	720	37	.63	29	2	2	7/16
04	**13080**	240	40	7820	5220	6080	0	0	40	19	19	8/15
Artemisia tridentata vaseyana												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	50	50	-	-	0	11/25
04	**40**	-	-	40	-	-	0	0	-	-	0	18/34
Chrysothamnus nauseosus												
85	**66**	-	-	66	-	-	0	0	-	-	0	2/2
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	100	-	-	0	7/9
04	**0**	-	-	-	-	-	0	0	-	-	0	31/35
Chrysothamnus viscidiflorus viscidiflorus												
85	**11732**	800	2866	8666	200	-	0	0	2	-	.56	7/8
91	**11932**	133	2066	7666	2200	-	19	9	18	.33	4	3/4
99	**1900**	-	100	1720	80	-	2	1	4	2	2	6/11
04	**1560**	-	120	1320	120	20	0	0	8	1	1	6/11
Cowania mexicana stansburiana												
85	**0**	66	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Coryphantha vivipara arizonica												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	-	120	-	-	0	0	-	-	0	1/2
04	**20**	-	-	20	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum microthecum												
85	**66**	-	-	66	-	-	0	0	0	-	0	5/5
91	**199**	-	133	-	66	-	33	0	33	-	0	-/-
99	**220**	-	40	140	40	-	36	0	18	18	18	5/9
04	**200**	-	-	200	-	-	0	40	0	-	0	6/9
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	-	-	80	-	-	0	0	-	-	0	6/7
04	**340**	-	20	320	-	-	0	0	-	-	0	7/8
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	-	120	-	-	0	0	-	-	0	7/9
04	**120**	-	-	120	-	-	0	0	-	-	0	5/6
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	-	0	0	-	-	0	1/3
04	**60**	-	-	60	-	-	0	0	-	-	0	1/2
Pinus edulis												
85	**0**	66	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	100	0	-	-	0	-/-
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	7/10
04	**20**	-	-	20	-	-	0	0	-	-	0	10/21

Trend Study 25A-12-04

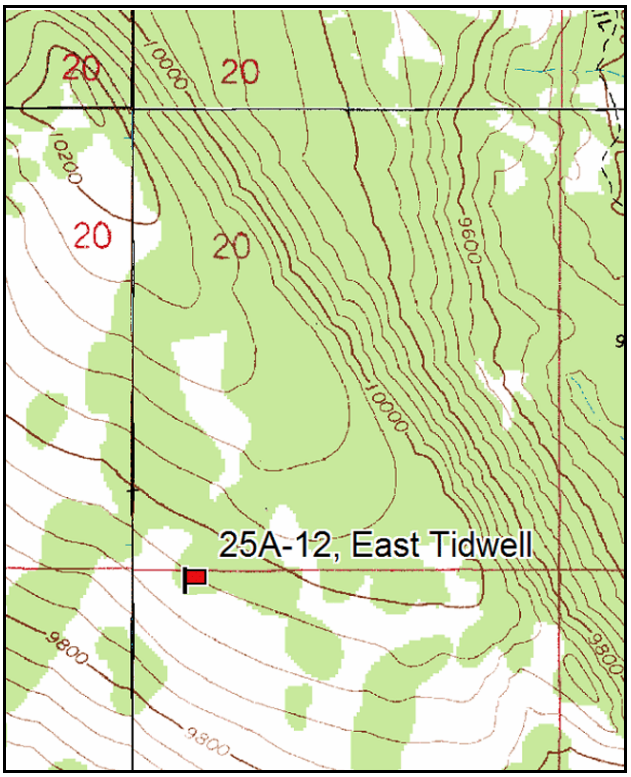
Study site name: East Tidwell . Vegetation type: Alpine-Mixed .

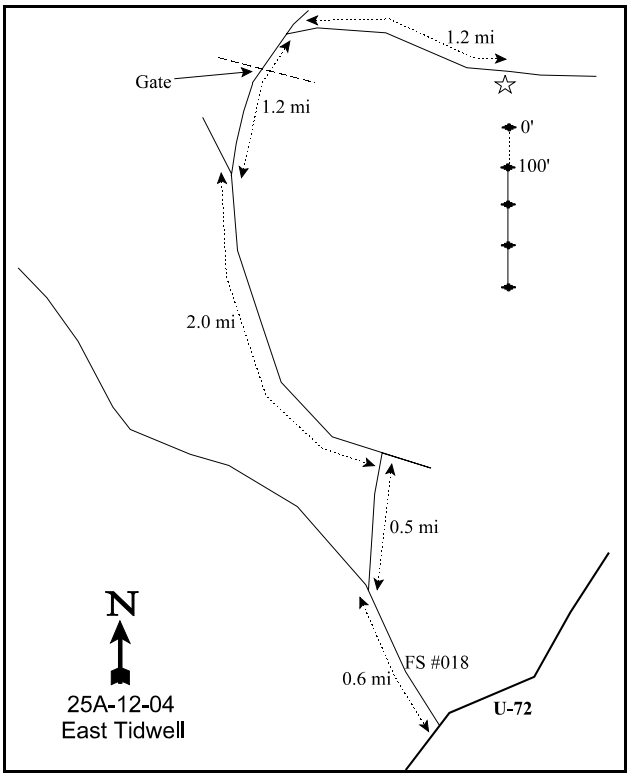
Compass bearing: frequency baseline 173 degrees magnetic.

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

LOCATION DESCRIPTION

Traveling north on U-72 from Fremont, turn west on Forest Service road #018 (between the cattleguard and mile marker #16). Go 0.6 miles (crossing a cattleguard) to a fork in the road, go right. One-half mile later you'll come to a "T" in the road, stay to the left. Go 2.0 miles and turn right at a fork that goes up a steep hill. After 0.1 miles there is a faint intersection. Stay on the main road heading north for 0.9 miles to a gate. Go through the gate and go 0.2 miles to a fork in the road. Stay to the right and go through a grove of trees, up a steep and rocky road. Here the road becomes very faint, but travel 1.2 miles to a witness post. The 0 foot baseline stake is easy to see, and has browse tag #9078 attached.





Map Name: Geyser Peak

Diagrammatic Sketch

Township 25S , Range 4E , Section 20

GPS: NAD 27, UTM 12S 4273874 N, 456600 E

DISCUSSION

East Tidwell - Trend Study No. 25A-12

The East Tidwell study was established in 1991. It is located on summer range with a 12% southwest facing slope at an elevation of 9,950 feet. The plant community consists entirely of low growing shrubs, forbs, and grasses. The area is grazed by cattle and used heavily by elk. It is within the Solomon allotment which is grazed by cattle on a deferred rotation. On odd numbered years, grazing occurs from August 20 to September 20, and on even numbered years, it is grazed from September 20 to October 31. Pellet group data from 1999 estimated 15 deer and 68 elk days use/acre (37 ddu/ha and 168 edu/ha). Nearly all of the deer and about 75% of the elk pellet groups appeared to be from the spring or early summer. Pellet group data in 2004 estimated 16 deer, 35 elk, and 5 cow days use/acre (40 ddu/ha, 86 edu/ha, 13 cdu/ha). All cattle pats appeared to be from the previous season. There is a water trough about 600 feet south of the site which is fed by a pipe that goes to a fenced spring about half mile to the north. There was no water in the trough during the 1999 reading and it appeared that the pipeline was not functioning.

Soil at the site is well drained and moderately deep with an effective rooting depth of 16 inches. Rock and especially pavement are abundant on the surface. The profile contains mostly gravel sized rock with larger rock concentrated at 10 to 12 inches in depth. Texture of the soil is a loam with a slightly alkaline pH (7.5). Parent material is basalt. Bare ground is low due to the well armored nature of the soil surface. Erosion is stable and there are no active gullies in the area.

The most dominant browse species is Parry rabbitbrush, which had about 6% cover in 1999 and increased to nearly 11% in 2004. Parry rabbitbrush had an estimated density of 38,865 plants/acre in 1991, which declined to 13,140 in 1999. This change in density may be due to the increased sample size in 1999, which gives a more representative estimate for shrub densities that have distributions that are clumped and/or discontinuous. It also appears that the stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus viscidiflorus*) was called Parry rabbitbrush (*Chrysothamnus parryi*) in 1991. In 2004, Parry rabbitbrush density declined 44% to 7,420 plants/acre. Utilization has been light. Several other shrubs occur in relatively small numbers including: black sagebrush, mountain big sagebrush, fringed sagebrush, stickyleaf low rabbitbrush, and gray horsebrush.

Due to the high elevation of this site, the herbaceous understory is the key forage source for big game and livestock. Grasses and forbs are diverse and moderately abundant. Eleven species of grasses were sampled in 1999 and 2004. Prairie Junegrass, slender wheatgrass, mutton bluegrass, bottlebrush squirreltail, and letterman needlegrass, are the most common grasses. No utilization was noted on the grasses in 1999 and 2004. Slender wheatgrass and Letterman needlegrass had significant increases in nested frequency, while mutton bluegrass declined significantly in 2004. Forbs are also diverse with 28 species encountered in 1999 and 25 in 2004. Forb cover was about 14% in 1999 and 2004, compared to about 9% for grasses. There are several useful species on the site, although many of the common forbs are low growing less desirable types such as pussytoes, low fleabane, Eaton fleabane, trailing fleabane, pingue hymenoxys, and elegant cinquefoil. Some of the paintbrush and bastard toadflax had been utilized in 1999. Penstemon had been grazed in 2004.

1991 APPARENT TREND ASSESSMENT

With the high amount of rock cover, it is unlikely that there will be erosion problems in the future. The overstory consists mostly of rabbitbrush. There is a diversity of grasses and forbs but only a few shrubs. Because of the high diversity, the site will most likely be able to recover from stressful ecological events, but could be compromised because of the high density of rabbitbrush.

1999 TREND ASSESSMENT

Trend for soil is stable. Percent cover of bare ground declined but litter cover also declined from 22% to only 6%. The soil surface is well protected by vegetation and pavement and erosion does not appear to be a problem. Shrubs are not a particularly important component on this high elevation site. Trend for browse appears stable for the key species, Parry rabbitbrush. The decline in density since 1991 is due to a combination of the much larger sample used in 1999 and misidentification of low rabbitbrush in 1991. The population is mostly mature, lightly browsed, and in good vigor. The key vegetational component at this elevation is the herbaceous understory, especially the forbs. Trend for the herbaceous understory is stable for grasses and down slightly for forbs. Overall, the herbaceous trend is considered down slightly.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)

2004 TREND ASSESSMENT

The trend for soil is stable. Relative bare ground increased slightly from 4% to 7%, but is still very low. Rock and pavement are abundant to protect the soil surface. The browse trend is stable. Parry rabbitbrush density is lower, but cover is higher. It appears to be stable as a dominant species at this site. Black sagebrush and mountain big sagebrush densities are slightly higher, but still low. Broom snakeweed and gray horsebrush densities are higher. The herbaceous understory is the more important vegetation component on summer range. The trend for the herbaceous understory is slightly down. The sum of nested frequency for both grasses and forbs is slightly down. Cover has remained fairly stable. Diversity and abundance of herbaceous species is very good.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 25A, Study no: 12

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
G	Agropyron trachycaulum	a-	b24	c79	.32	1.04
G	Bouteloua gracilis	b24	ab14	a2	.03	.00
G	Carex spp.	b49	a9	a15	.10	.16
G	Festuca ovina	b59	b77	a19	.70	.10
G	Koeleria cristata	132	159	165	2.15	3.16
G	Poa fendleriana	a89	b170	a103	2.92	1.53
G	Sitanion hystrix	b128	a84	a66	1.22	.98
G	Stipa comata	a-	b10	a1	.06	.04
G	Stipa lettermani	c184	a68	b126	1.35	2.29

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		665	615	576	8.88	9.32
Total for Grasses		665	615	576	8.88	9.32
F	Agoseris glauca	$_{b}$46	$_{a}$20	$_{a}$4	.15	.09
F	Antennaria rosea	70	62	67	1.21	2.53
F	Androsace septentrionalis (a)	-	$_{b}$31	$_{a}$1	.11	.00
F	Aster spp.	$_{b}$38	$_{a}$7	$_{a}$1	.01	.00
F	Astragalus spp.	76	55	61	1.55	.76
F	Chaenactis douglasii	5	7	10	.01	.17
F	Comandra pallida	$_{a}$-	$_{b}$9	$_{ab}$7	.10	.04
F	Delphinium spp.	2	-	-	-	-
F	Eriogonum alatum	-	5	10	.06	.09
F	Erigeron eatonii	7	14	12	.32	.08
F	Erigeron flagellaris	-	5	7	.01	.18
F	Erigeron pumilus	$_{a}$5	$_{b}$56	$_{c}$79	1.10	1.79
F	Eriogonum umbellatum	19	29	32	.52	.46
F	Gentiana calycosa	$_{b}$34	$_{b}$18	$_{a}$-	.25	-
F	Geranium caespitosum	$_{b}$174	$_{a}$103	$_{a}$114	1.65	1.73
F	Hymenoxys richardsonii	$_{b}$82	$_{b}$68	$_{a}$46	1.59	1.08
F	Ivesia gordonii	$_{b}$29	$_{a}$6	$_{a}$-	.04	-
F	Lesquerella wardii	$_{b}$58	$_{a}$13	$_{a}$4	.05	.01
F	Linum lewisii	$_{a}$22	$_{b}$56	$_{a}$29	.86	.57
F	Lupinus argenteus	4	7	6	.39	.40
F	Lychnis drummondii	$_{a}$-	$_{b}$13	$_{a}$-	.06	-
F	Lygodesmia spp.	-	-	-	-	.00
F	Machaeranthera canescens	$_{b}$90	$_{a}$7	$_{a}$14	.07	.24
F	Oxytropis lambertii	$_{ab}$14	$_{b}$45	$_{a}$4	.49	.30
F	Penstemon spp.	$_{b}$95	$_{b}$80	$_{a}$39	.43	.33
F	Phlox longifolia	$_{b}$121	$_{a}$49	$_{a}$66	.17	.29
F	Potentilla concinna	$_{b}$134	$_{a}$39	$_{a}$26	.75	.83
F	Polygonum douglasii (a)	-	2	-	.00	-
F	Potentilla gracilis	$_{a}$-	$_{b}$26	$_{c}$61	.06	.72
F	Senecio multilobatus	$_{a}$41	$_{c}$158	$_{b}$78	1.60	.64
F	Taraxacum officinale	$_{b}$26	$_{ab}$14	$_{a}$8	.10	.02
F	Unknown forb-perennial	2	-	-	-	-
Total for Annual Forbs		0	33	1	0.11	0.00

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
Total for Perennial Forbs		1194	971	785	13.69	13.43
Total for Forbs		1194	1004	786	13.80	13.44

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

BROWSE TRENDS --
Management unit 25A, Study no: 12

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia frigida	40	33	.37	.79
B	Artemisia nova	5	11	.53	.78
B	Artemisia tridentata vaseyana	2	9	.15	.19
B	Chrysothamnus parryi	81	97	5.82	10.76
B	Chrysothamnus viscidiflorus viscidiflorus	47	44	.71	1.06
B	Gutierrezia sarothrae	27	71	.06	1.82
B	Symphoricarpos oreophilus	1	0	-	-
B	Tetradymia canescens	43	54	.95	1.93
Total for Browse		246	319	8.61	17.35

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 12

Species	Percent Cover '04
Artemisia frigida	.83
Artemisia nova	.33
Artemisia tridentata vaseyana	.56
Chrysothamnus parryi	16.39
Chrysothamnus viscidiflorus viscidiflorus	3.25
Gutierrezia sarothrae	2.50
Tetradymia canescens	2.29

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 12

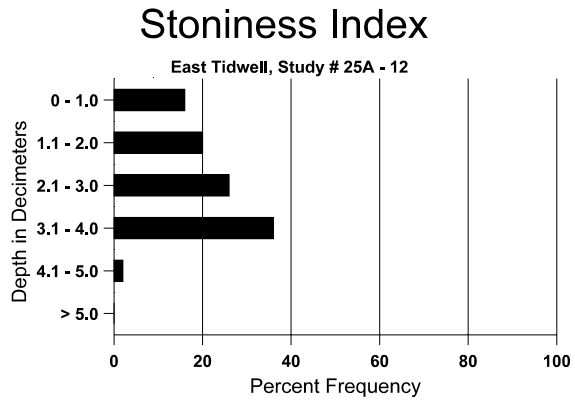
Species	Average leader growth (in) '04
Artemisia nova	1.3
Artemisia tridentata vaseyana	2.7

BASIC COVER --
Management unit 25A, Study no: 12

Cover Type	Average Cover % '91	'99	'04
Vegetation	10.50	30.06	34.51
Rock	13.25	10.85	9.94
Pavement	44.25	43.96	54.81
Litter	22.25	6.19	8.01
Cryptogams	.25	.18	.24
Bare Ground	9.50	4.02	8.05

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 12, Study Name: East Tidwell

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.0	48.0 (14.8)	7.5	47.3	29.4	23.3	3.1	21.0	166.4	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 12

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	12	34	-	-
Elk	37	25	68 (168)	35 (86)
Deer	17	15	15 (37)	16 (40)
Cattle	2	1	1 (2)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
91	**1133**	66	933	200	-	-	18	6	-	-	0	2/5
99	**4520**	80	640	3880	-	-	1	0	-	-	0	5/7
04	**1240**	-	60	1180	-	-	8	2	-	-	0	8/11
Artemisia nova												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**140**	-	40	100	-	-	0	0	-	-	0	10/28
04	**380**	80	120	260	-	20	0	0	-	-	0	10/20
Artemisia tridentata vaseyana												
91	**399**	-	-	333	66	-	17	67	17	-	0	4/5
99	**40**	-	-	40	-	-	50	0	0	-	0	8/20
04	**240**	120	20	220	-	-	42	8	0	-	0	13/28
Chrysothamnus parryi												
91	**38865**	4333	10733	17066	11066	-	36	22	28	1	5	4/6
99	**13140**	120	1220	11400	520	60	.76	0	4	1	1	5/8
04	**7420**	120	400	6920	100	60	2	.53	1	.26	.26	5/9
Chrysothamnus viscidiflorus viscidiflorus												
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**2220**	-	220	1900	100	-	0	.90	5	4	4	5/9
04	**2480**	-	100	2260	120	-	0	0	5	4	4	7/12
Gutierrezia sarothrae												
91	**599**	-	266	333	-	-	11	0	-	-	0	3/3
99	**960**	20	100	860	-	-	0	0	-	-	0	4/6
04	**3860**	-	-	3860	-	-	0	0	-	-	0	5/8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	100	0	-	-	0	8/30
04	**0**	-	-	-	-	-	0	0	-	-	0	10/31
Tetradymia canescens												
91	**1332**	66	200	666	466	-	40	25	35	2	5	4/5
99	**2280**	80	620	1560	100	-	9	0	4	.87	.87	6/9
04	**3120**	-	280	2800	40	-	7	2	1	.64	3	6/11

Trend Study 25A-13-04

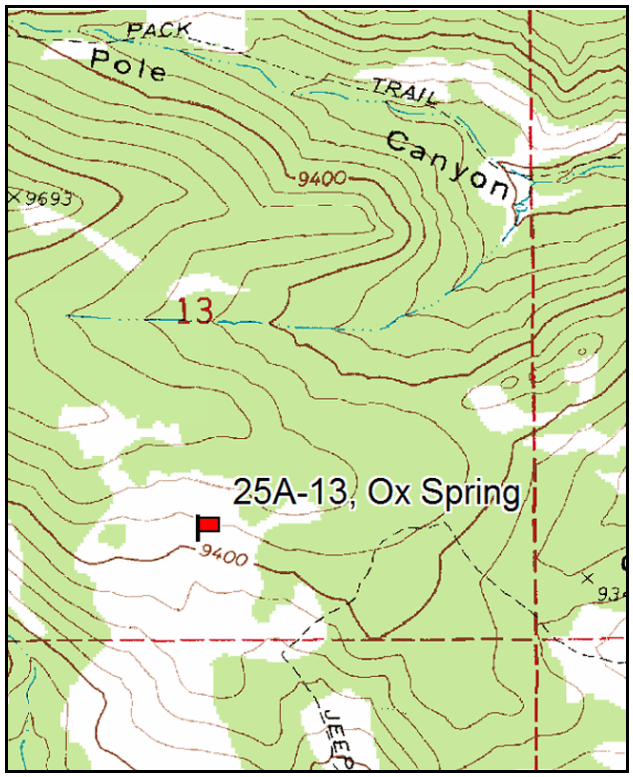
Study site name: Ox Spring . Vegetation type: Burn - Rabbitbrush .

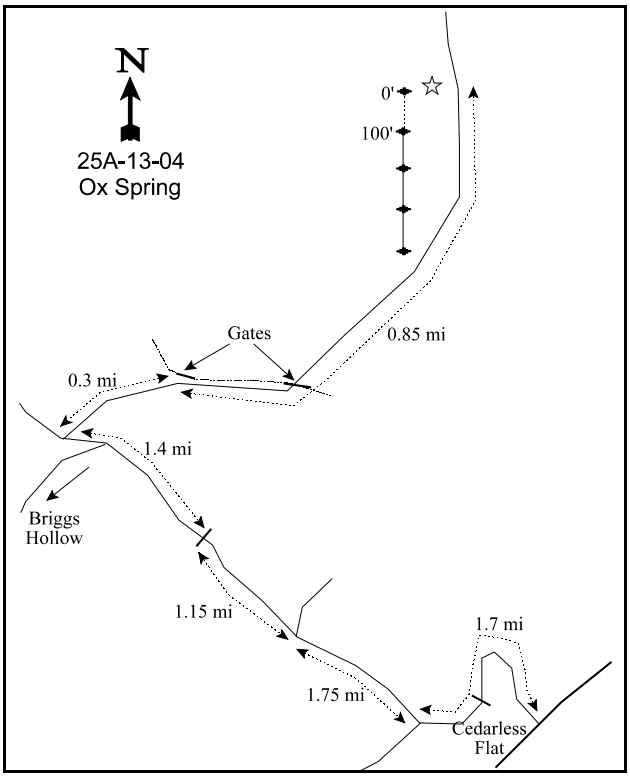
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

Turn west off of SR 72 onto the Mill Meadow Road north of Fremont. Go past the lake and up the Johnson Reservoir Road for 3.8 miles. Turn west off the paved road and go 1.1 miles to a cattleguard at the head of Cedarless Flat. Continue 0.6 miles to a fork in the road. Go right for 1.75 miles to the Ox Spring trail turnoff. Stay left (on the main road) for 1.15 miles to another cattleguard. Go another 1.05 miles to the Briggs Hollow turnoff. Stay right for 0.35 miles, turn right off the Mytoge Road, and go 0.3 miles. Before the gate turn right and follow the fence line 0.2 miles to another gate. Drive another 0.85 miles (passing through two more gates) to a half high witness post among some rocks,11 paces off the left (west) side of the road. From the witness post, the white-topped 0 foot baseline stake is 7 paces away at an azimuth of 284°M.





Map Name: Fish Lake, Utah

Diagrammatic Sketch

Township 26S , Range 2E , Section 24

GPS: NAD 27, UTM 12S 4266131 N, 444067 E

DISCUSSION

Ox Spring - Trend Study No. 25A-13

This study was established in 1991 and is located about one mile west of Ox Spring. It samples a prescribed burn on a high elevation mountain big sagebrush type with a 10-12% south-facing slope and an elevation of 9,400 feet. The burn occurred in either 1989 or 1990. The land is administered by the U.S. Forest Service. The area is grazed by cattle during the summer as part of the Seven Mile allotment which is used in the spring. Pellet group data from a nearby Division pellet group transect estimated 19 deer and 46 elk days use/acre in 1991 (46 ddu/ha, 114 edu/ha). Elk use appeared heavy in the spring of 1991. An exclosure nearby is used to monitor spring elk utilization. Pellet group data taken along the study site baseline in 1999 estimated 9 deer, 97 elk and 25 cow days use/acre (22 ddu/ha, 240 edu/ha, and 62 cdu/ha). All of the cattle pats appeared to be from the previous season. Most elk pellet groups seemed to be from the spring. In 2004, pellet group data estimated 5 deer and 112 elk days use/acre (13 ddu/ha and 276 edu/ha).

The soil is moderately deep with an effective rooting depth of over 16 inches. It has a loam texture with a neutral pH (7.3). The soil is dark in color and fertile with a relatively high organic matter content of 5.2%. The surface horizon contains a high percentage of gravel sized rock fragments. Litter and pavement cover most of the bare areas leaving little exposed bare ground. Erosion does not appear to be a problem on this site due to uniform distribution of vegetation and litter cover and rock and pavement which armor the soil surface.

Rabbitbrush is the most abundant species. Right after the fire in 1991, density was estimated at 12,466 plants/acre. In 1999 the sample size was greatly increased and density was 7,240 plants/acre. This increased to 9,140 plants/acre in 2004 and cover increased from 14% to 20%. Most plants were young in 1991 and since then the population has been mostly mature. A high number of seedlings were sampled in 2004. Utilization was moderate in 1991, but there was little sign of use in 1999 and 2004. Density of mountain big sagebrush was 160 plants/acre in 1999 and increased to 260 plants/acre in 2004. Rubber rabbitbrush nearly doubled in density from 960 plants/acre in 1999 to 1,740 plants/acre in 2004. Other browse species are mostly sprouting shrubs such as woods rose, Oregon grape, and snowberry.

The site is dominated by native grasses and forbs which provided 72% of the total vegetation cover in 1999, but only 47% in 2004. The most abundant grass is mutton bluegrass. Other common species include bottlebrush squirreltail, prairie junegrass, obtuse sedge, pinewoods needlegrass, and bluebunch wheatgrass. Nested frequency decreased significantly in 2004 for mutton bluegrass, nodding brome, obtuse sedge, prairie junegrass, and bottlebrush squirreltail. There were 25 species of forbs sampled in 1991, 20 in 1999 and 23 in 2004. Common forbs include Watson penstemon, Lupine, aster, and rose pussytoes. Perennial forb cover dropped from 17% in 1999 to only 5% in 2004 and the sum of nested frequency was less reduced by half.

1991 APPARENT TREND ASSESSMENT

Overall, the soil trend appears stable. No recent erosion was evident and no active gullies occur on the site. Vegetation and litter cover appear sufficient to hold the soil in place. The only desirable browse, stickyleaf low rabbitbrush, has a large population with a good percentage of young plants. Native grasses and forbs are diverse and abundant.

1999 TREND ASSESSMENT

Trend for soil is stable. Percent cover of bare ground has declined but litter cover has also declined. There does not appear to be any problem with erosion on this site. Trend for browse is up slightly. Density of the increaser, stickyleaf low rabbitbrush has declined, while density of the more preferred mountain big sagebrush and white-stemmed rubber rabbitbrush have increased. However, shrubs are not the most important

component on this site. Trend for the herbaceous understory is down slightly overall. Sum of nested frequency for grasses increased slightly, although frequency of forbs declined substantially. It appears that forb abundance is declining after a flush of growth following the fire and associated drought.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - up slightly for grasses, down for forbs, down slightly overall (2)

2004 TREND ASSESSMENT

The soil trend is stable. The ratio of protective cover (vegetation, litter, and cryptogams) to bare ground improved from 1:3.1 to 1:4.2. Bare ground remained stable at about 9%. Vegetation cover is lower, but rock and pavement cover are higher. The browse trend is down. Rabbitbrush density and cover increased. There are no preferred browse species that are abundant on this site, but the herbaceous component is much more important on this transitional/summer range. The herbaceous understory trend is down. Drought conditions 4 of the 5 past years have been detrimental to the understory. Sum of nested frequency for perennial grasses declined 34%. Five perennial grasses species are significantly less abundant than they were in 1999. Perennial forb abundance is half as high it was in 1999.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 25A, Study no: 13

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
G	Agropyron smithii	$_{b}$110	$_{a}$48	$_{a}$72	.72	1.27
G	Agropyron spicatum	$_{a}$-	$_{b}$85	$_{b}$83	2.27	4.11
G	Bromus anomalus	$_{a}$-	$_{b}$38	$_{a}$1	.60	.00
G	Carex obtusata	$_{b}$75	$_{c}$94	$_{a}$16	2.68	.25
G	Koeleria cristata	$_{b}$129	$_{b}$125	$_{a}$41	2.82	.84
G	Poa fendleriana	$_{b}$258	$_{b}$275	$_{a}$212	10.56	6.57
G	Sitanion hystrix	$_{c}$138	$_{c}$102	$_{b}$57	1.87	1.12
G	Sporobolus cryptandrus	-	1	-	.03	-
G	Stipa comata	-	4	6	.03	.06
G	Stipa pinetorum	$_{b}$78	$_{a}$65	$_{a}$62	1.81	2.01
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		788	837	550	23.44	16.27
Total for Grasses		788	837	550	23.44	16.27
F	Agoseris glauca	$_{b}$74	$_{a}$-	$_{a}$4	-	.03
F	Antennaria rosea	$_{b}$105	$_{b}$124	$_{a}$71	5.07	.99

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
F	Androsace septentrionalis (a)	-	$_{b}$84	$_{a}$-	.44	-
F	Artemisia dracunculus	$_{b}$37	$_{a}$-	$_{a}$-	-	-
F	Arabis drummondi	$_{b}$10	$_{a}$-	$_{a}$-	-	-
F	Astragalus argophyllus	$_{b}$12	$_{a}$-	$_{b}$13	-	.13
F	Aster chilensis	$_{b}$98	$_{b}$52	$_{a}$28	1.57	.22
F	Astragalus serpens	$_{b}$17	$_{a}$-	$_{a}$-	-	-
F	Astragalus spp.	$_{a}$6	$_{b}$38	$_{a}$3	.22	.03
F	Castilleja linariaefolia	10	7	2	.07	.00
F	Chenopodium album (a)	-	-	12	-	.09
F	Chenopodium leptophyllum(a)	-	$_{a}$-	$_{b}$35	-	.23
F	Comandra pallida	-	-	6	-	.01
F	Crepis acuminata	$_{b}$41	$_{a}$5	$_{a}$-	.02	-
F	Erigeron eatonii	$_{b}$18	$_{a}$-	$_{b}$16	-	.08
F	Erigeron pumilus	-	8	4	.09	.01
F	Eriogonum racemosum	57	74	63	1.66	1.62
F	Eriogonum umbellatum	8	6	2	.08	.04
F	Fritillaria atropurpurea	$_{b}$21	$_{a}$-	$_{a}$-	-	-
F	Gayophytum ramosissimum(a)	-	$_{a}$-	$_{b}$19	-	.06
F	Lappula occidentalis (a)	-	-	4	-	.01
F	Lotus utahensis	$_{ab}$13	$_{b}$26	$_{a}$5	.50	.07
F	Lupinus argenteus	$_{b}$116	$_{b}$109	$_{a}$5	3.48	.04
F	Lychnis drummondii	$_{a}$-	$_{b}$9	$_{a}$5	.07	.01
F	Machaeranthera canescens	1	2	-	.03	-
F	Penstemon watsonii	$_{b}$131	$_{a}$63	$_{a}$58	1.88	1.73
F	Phlox austromontana	4	-	3	-	.03
F	Phlox longifolia	$_{b}$97	$_{a}$-	$_{a}$8	-	.07
F	Potentilla concinna	3	9	5	.33	.07
F	Taraxacum officinale	$_{b}$69	$_{b}$79	$_{a}$3	1.31	.03
F	Tragopogon dubius	-	1	-	.03	-
F	Unknown forb-perennial	2	-	-	-	-
F	Viguiera multiflora	-	1	-	.00	-
Total for Annual Forbs		0	84	70	0.43	0.40
Total for Perennial Forbs		950	613	304	16.46	5.25
Total for Forbs		950	697	374	16.90	5.66

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

BROWSE TRENDS --
Management unit 25A, Study no: 13

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia tridentata vaseyana	5	9	-	.60
B	Chrysothamnus nauseosus	24	38	.87	1.68
B	Chrysothamnus viscidiflorus viscidiflorus	88	92	13.89	20.17
B	Mahonia repens	2	2	.06	.15
B	Rosa woodsii	6	4	.09	.03
B	Symphoricarpos oreophilus	13	13	1.01	1.27
Total for Browse		138	158	15.93	23.93

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 13

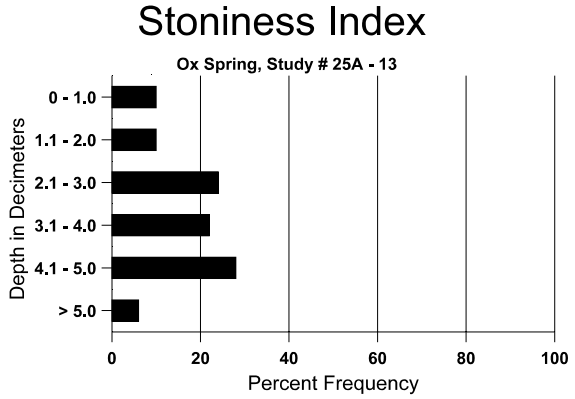
Species	Percent Cover '04
Artemisia tridentata vaseyana	.55
Chrysothamnus nauseosus	1.36
Chrysothamnus viscidiflorus viscidiflorus	24.70
Mahonia repens	.05
Symphoricarpos oreophilus	1.71

BASIC COVER --
Management unit 25A, Study no: 13

Cover Type	Average Cover % '91	Average Cover % '99	Average Cover % '04
Vegetation	17.00	56.81	44.18
Rock	7.00	5.75	7.89
Pavement	14.50	12.86	24.80
Litter	45.25	35.65	25.22
Cryptogams	0	0	.03
Bare Ground	16.25	9.22	9.74

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 13, Study Name: Ox Spring

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.5	49.5 (17.5)	7.3	33.3	43.4	23.3	5.2	20.5	428.8	0.7



PELLET GROUP DATA --
Management unit 25A, Study no: 13

Type	Quadrat Frequency '99	Quadrat Frequency '04	Days use per acre (ha) '99	Days use per acre (ha) '04
Rabbit	4	6	-	-
Horse	1	-	-	-
Elk	57	61	97 (240)	112 (276)
Deer	7	3	9 (22)	5 (13)
Cattle	8	1	25 (62)	-

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	14/15
Artemisia tridentata vaseyana												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**160**	-	80	80	-	3260	0	0	-	-	0	22/38
04	**260**	820	120	140	-	20	38	0	-	-	0	14/20
Chrysothamnus nauseosus												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**960**	-	-	960	-	-	4	0	-	-	0	9/14
04	**1740**	-	20	1720	-	-	2	0	-	-	0	8/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
91	**12466**	-	6933	5400	133	-	43	8	1	-	0	5/10
99	**7240**	-	920	6200	120	-	0	0	2	1	1	13/21
04	**9140**	1300	740	8260	140	-	.21	0	2	.65	.65	11/19
Cowania mexicana stansburiana												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	9/17
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**260**	-	100	160	-	-	0	0	-	-	0	3/6
04	**280**	-	220	60	-	-	0	0	-	-	0	4/3
Rosa woodsii												
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**260**	-	80	180	-	-	0	0	0	-	0	9/9
04	**220**	-	80	100	40	-	0	0	18	18	18	6/4
Symphoricarpos oreophilus												
91	**666**	-	466	200	-	-	70	20	0	-	0	6/10
99	**440**	-	120	300	20	-	0	0	5	-	0	19/32
04	**360**	-	20	300	40	-	6	6	11	11	11	15/26
Tetradymia canescens												
91	**66**	-	66	-	-	-	100	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	10/15

Trend Study 25A-14-04

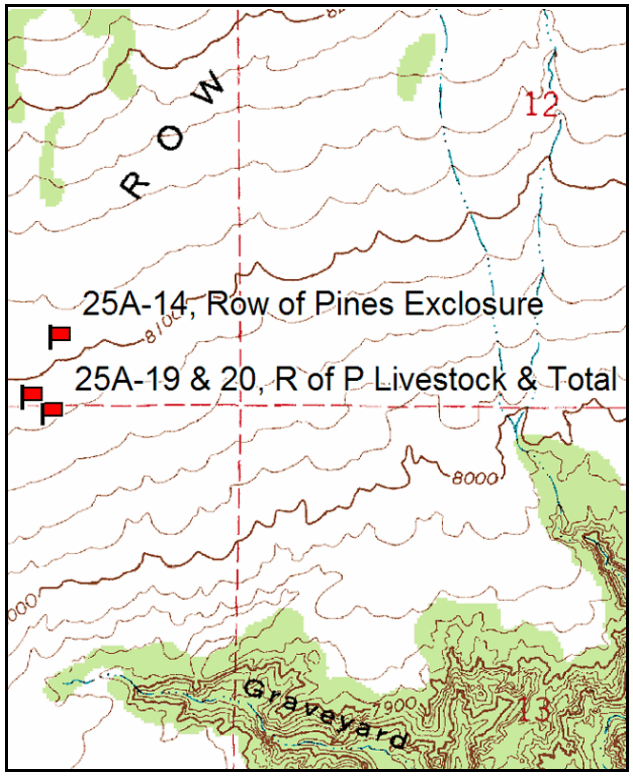
Study site name: Row of Pines Exclosure . Vegetation type: Wyoming Big Sagebrush .

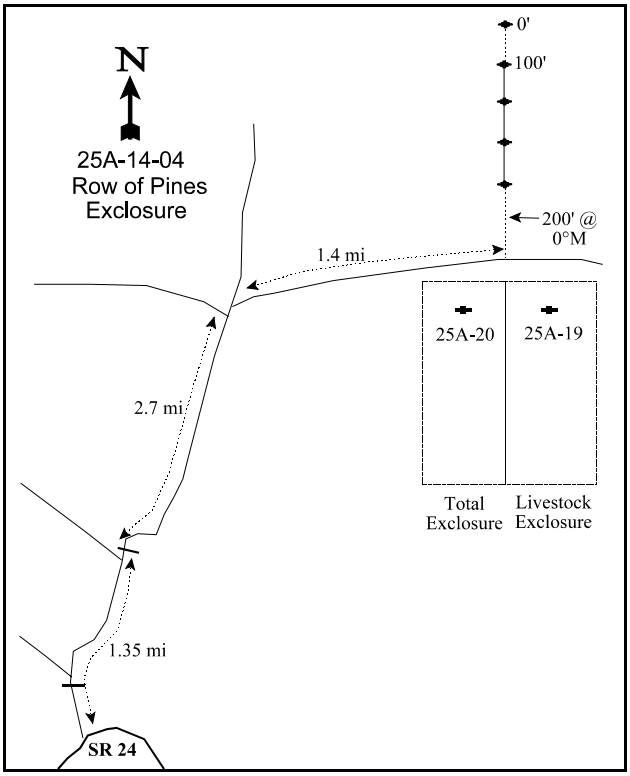
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the Chappell Cheese Factory northwest of Loa on SR 24, go west 2.6 miles to a side road on the north where the highway makes a sharp turn (0.95 miles west of mile marker #49). Take this road 0.65 miles and turn right after crossing a cattleguard. After 0.7 more miles, turn right at the fork and cross another cattleguard. Go 2.7 miles to another fork where you will again turn right. After ~60', turn right (east) and go 1.4 miles to an exclosure. Stop at the middle of the exclosure and walk 200 feet at an azimuth of 0°M to the 400' stake. The 0' stake is 400 feet to the north in front of a large rock.





Map Name: Loa, Utah

Diagrammatic Sketch

Township 27S , Range 2E , Section 14

GPS: NAD 27, UTM 12S 4258045 N, 442732 E

DISCUSSION

Row of Pines Exclosure - Trend Study No. 25A-14

The Row of Pines Exclosure study was established in 1991 just outside of the exclosure. The exclosure was built in the late 1980's by the BLM and DWR after the area was chained and seeded. It samples a sagebrush-grass type that was chained and seeded. The site has a slight slope of 3% to 5% with a south aspect. The area is within the BLM Sevenmile allotment which allows cattle grazing for approximately 20 days in May. Cattle sign and tracks were found in the area in 1991. Deer sign and remains were also found in 1991 and pellet group data estimated 21 deer days use/acre (52 ddu/ha). Large amounts of sage grouse droppings were also encountered on the area during study site establishment in 1991. Pellet group data from the site in 1999 estimated 29 deer, 15 elk and 15 cow days use/acre (72 ddu/ha, 37 edu/ha, 37 cdu/ha). Cattle pats were from the previous year. In 2004, 76 deer, 3 elk, and 4 cow days use/acre (190 ddu/ha, 7 edu/ha, 11 cdu/ha) were estimated. Deer and elk use was from the winter. Sage grouse pellet groups were sampled with about 35 pellet groups/acre. Escape cover is about a half mile from the transect.

Soil depth is moderately shallow with an estimated effective rooting depth of just over 11 inches. Texture is a sandy clay loam to a loam with a neutral pH (7.0). Soil parent material is basalt. Phosphorus is marginal at 8.5 ppm. Values less than 10 ppm may limit normal plant growth and development. The soil surface is a combination of pavement and bare ground with some evidence of soil erosion. However, due to the lack of slope, water erosion is not currently a significant problem in this area. Wind erosion could be more of a concern.

The dominant browse species is Wyoming big sagebrush which had a density of 6,399 plants/acre in 1991. This declined by 13% in 1999 to 5,580 plants/acre and declined again in 2004 by 14% to 4,780 plants/acre. Most of the population has been mature or decadent with each reading. Decadency increased in 2004 to 42% from 27 and 29% in the previous readings. Seedlings and young have only been found in low numbers. The percent of the population classified as dying has been higher than the percent young in each of the last readings. There have not been enough young plants within the population to replace the dying plants. Sagebrush cover has declined from 13% in 1999 to 11% in 2004. Utilization has been moderate to heavy since 1991.

The only other common shrubs are undesirable increasers, narrowleaf low rabbitbrush and broom snakeweed. Narrowleaf low rabbitbrush density was lower in 1999, which was probably due to the much larger sample used in 1999 which gives more accurate density estimates for browse populations with discontinuous distributions. Since 1999, density appears to be stable at about 1,100 plants/acre. Broom snakeweed increased from 6,066 plants/acre in 1991 to 10,000 by 1999, then decreased to only 1,420 plants/acre in 2004.

Seeded grasses, crested wheatgrass, smooth brome, and Russian wildrye, have become established since the chaining, but in low numbers. The dominant grasses have been blue grama and bottlebrush squirreltail. Blue grama abundance has been stable, but cover declined sightly in 2004 because of summer drought. Bottlebrush squirreltail and crested wheatgrass nested frequency declined significantly in 2004. Forb composition and abundance is poor with all forbs combined providing less than 1% cover. The only common species encountered in 1999 was low fleabane and was not sampled at all in 2004.

1991 APPARENT TREND ASSESSMENT

With the high amount of pavement and rock, the soil is basically stable. The disturbance due to chaining caused only slight erosion, with much of the erosion likely caused by wind and not water. Forbs on the site are not abundant or diverse. The major forage species is Wyoming big sagebrush which is in good condition.

1999 TREND ASSESSMENT

Trend for soil is stable to improving. Percent cover of bare ground has declined while litter cover has also gone down. Rock and pavement cover have increased. Erosion does not currently appear to be a problem on this site. Trend for browse is down slightly. The key species, Wyoming big sagebrush, has a fairly stable population. However, 14% (760 plants/acre) of the population were classified as dying. The proportion of young plants in the population has declined from 15% in 1991 to only 6% currently. There are not enough young plants to replace decadent/dying individuals. Seedlings are rare. Utilization has remained moderate to heavy. Another negative aspect of the browse trend is the increase in density and size of broom snakeweed. It currently has a mostly mature population of 10,000 plants/acre. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses and forbs has increased slightly since 1991. However, composition is poor with the low growing blue grama providing 73% of the grass cover and 68% of the herbaceous cover. This would point to excessive late spring grazing of the cool season species by livestock. Seeded grasses did not establish well and remain at low numbers. Forbs are lacking.

TREND ASSESSMENT
soil - up slightly (4)
browse - down slightly (2)
herbaceous understory - up slightly (4)
winter range condition (DC Index) - 48 (fair to good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The trend for soil is down slightly. Percent relative bare ground increased from 20% to 31% in 2004. Vegetation cover decreased, while rock and pavement have remained fairly stable. The slight slope keeps erosion from being a problem. The browse trend is slightly down. Wyoming big sagebrush density declined 14% after a 13% decline in 1999. Percent decadence is higher than it has previously been at 42%, with 19% of the population classified as dying. There are still too few young plants to replace the dying plants. Positively, broom snakeweed density and cover decreased. Density declined from 10,000 plants/acre in 1999 to 1,420 plants/acre. The trend for the herbaceous understory is down. Sum of nested frequency for perennial grasses declined 39%, while cover decreased from 9 to 6%. The warm season species, blue grama is the most dominant, which is an indication of overgrazing during the spring. Forbs are rare and have also declined 67% in sum of nested frequency since 1999.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - down (1)
winter range condition (DC Index) - 32 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 14

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
G	Agropyron cristatum	[b]32	[b]36	[a]7	.22	.06
G	Bouteloua gracilis	122	149	150	6.48	4.82
G	Bromus inermis	4	9	3	.07	.03

Type	Species	Nested Frequency			Average Cover %	
		'91	'99	'04	'99	'04
G	Elymus junceus	$_{a}$1	$_{b}$19	$_{ab}$10	.18	.21
G	Oryzopsis hymenoides	33	18	18	.11	.10
G	Sitanion hystrix	$_{b}$135	$_{b}$152	$_{a}$47	1.73	.46
G	Stipa comata	2	1	-	.00	-
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		329	384	235	8.83	5.70
Total for Grasses		329	384	235	8.83	5.70
F	Androsace septentrionalis (a)	-	$_{b}$12	$_{a}$-	.02	-
F	Arabis demissa	2	-	3	-	.15
F	Astragalus lentiginosus	4	6	16	.01	.03
F	Chenopodium fremontii (a)	-	-	2	-	.15
F	Chenopodium leptophyllum(a)	-	-	3	-	.03
F	Descurainia pinnata (a)	-	4	5	.01	.04
F	Eriogonum ovalifolium	7	3	-	.18	-
F	Erigeron pumilus	$_{b}$7	$_{c}$63	$_{a}$-	.38	-
F	Phlox longifolia	12	5	4	.01	.01
F	Sphaeralcea coccinea	$_{b}$13	$_{ab}$5	$_{a}$4	.02	.01
Total for Annual Forbs		0	16	10	0.03	0.21
Total for Perennial Forbs		45	82	27	0.61	0.21
Total for Forbs		45	98	37	0.64	0.43

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

BROWSE TRENDS --
Management unit 25A, Study no: 14

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia frigida	5	3	-	-
B	Artemisia tridentata wyomingensis	93	89	13.11	11.14
B	Chrysothamnus viscidiflorus stenophyllus	31	31	.45	.47
B	Eriogonum microthecum	0	0	-	-
B	Gutierrezia sarothrae	96	45	3.20	.27
B	Opuntia fragilis	14	20	.19	.06
B	Pediocactus simpsonii	1	2	-	-
Total for Browse		240	190	16.96	11.96

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 14

Species	Percent Cover '04
Artemisia tridentata wyomingensis	9.55
Chrysothamnus viscidiflorus stenophyllus	.41
Gutierrezia sarothrae	.71
Opuntia fragilis	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 14

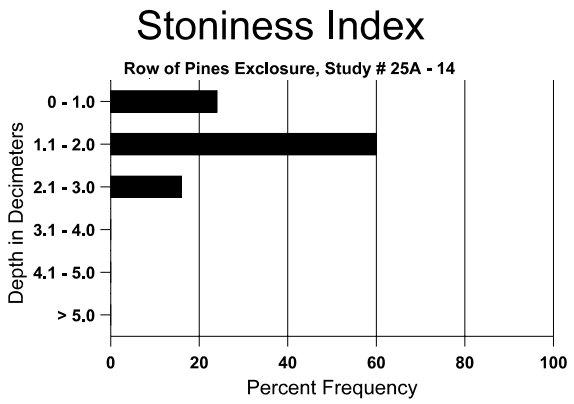
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.4

BASIC COVER --
Management unit 25A, Study no: 14

Cover Type	Average Cover %		
	'91	'99	'04
Vegetation	4.00	25.65	18.32
Rock	11.50	13.64	13.11
Pavement	23.00	29.28	26.68
Litter	27.00	18.03	21.06
Cryptogams	0	.24	.13
Bare Ground	34.50	21.60	34.99

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 14, Study Name: Row of Pines Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.2	57.7 (11.0)	7.0	47.3	27.4	25.3	1.6	8.5	163.2	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 14

Type	Quadrat Frequency	
	'99	'04
Rabbit	34	45
Grouse	-	2
Elk	5	3
Deer	16	29
Cattle	3	4

Days use per acre (ha)	
'99	'04
-	-
-	-
15 (37)	3 (7)
29 (72)	77 (190)
15 (37)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**200**	-	20	180	-	-	20	40	-	-	0	4/6
04	**60**	-	-	60	-	-	0	67	-	-	0	3/3
Artemisia tridentata wyomingensis												
91	**6399**	800	933	3733	1733	-	40	36	27	.31	2	7/9
99	**5580**	60	340	3620	1620	620	45	17	29	14	14	13/24
04	**4780**	360	80	2700	2000	1500	44	22	42	19	19	13/25
Chrysothamnus viscidiflorus stenophyllus												
91	**3266**	66	533	2000	733	-	45	31	22	-	2	4/6
99	**1100**	-	20	820	260	-	7	0	24	9	9	4/9
04	**1060**	60	60	900	100	-	8	0	9	6	6	5/11
Eriogonum microthecum												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	4/6
Gutierrezia sarothrae												
91	**6066**	266	1600	4133	333	-	14	11	5	.32	1	2/2
99	**10000**	520	1000	8780	220	500	0	0	2	1	1	7/8
04	**1420**	-	20	1400	-	-	0	0	0	-	0	5/8
Opuntia fragilis												
91	**0**	66	-	-	-	-	0	0	0	-	0	-/-
99	**540**	-	40	480	20	-	0	0	4	4	4	2/8
04	**720**	-	40	680	-	-	0	0	0	-	0	2/7
Pediocactus simpsonii												
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**40**	-	-	40	-	-	0	0	-	-	0	1/2

Trend Study 25A-16-04

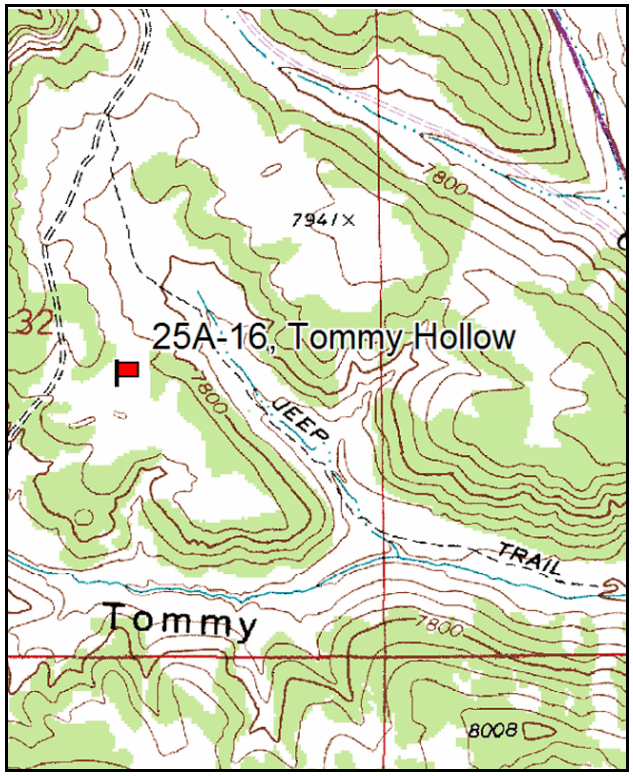
Study site name: Tommy Hollow . Vegetation type: Wyoming Big Sagebrush .

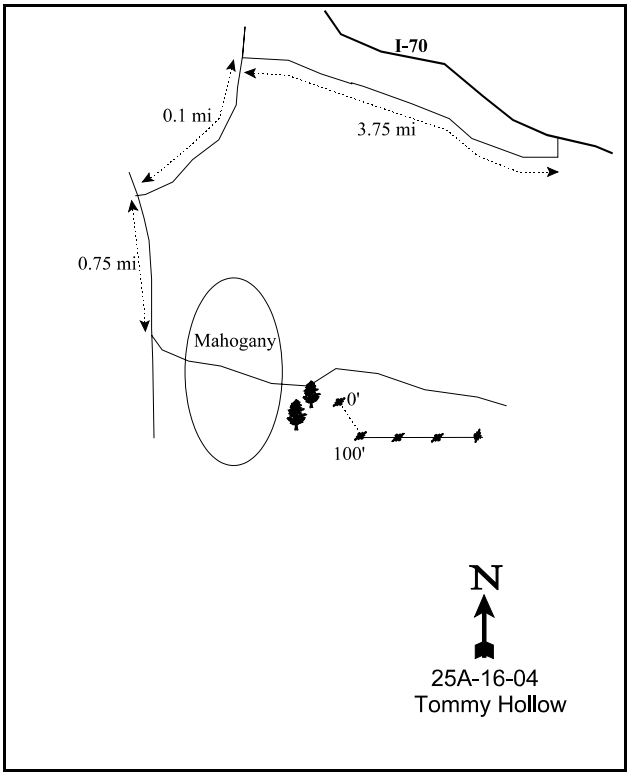
Compass bearing: frequency baseline 167 degrees magnetic.

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

LOCATION DESCRIPTION

Take I-70 east for about 37.5 miles from Salina to a rest area exit. From the exit, turn right once, then right again to go west on the frontage road paralleling the freeway. Drive on the frontage road for 3.75 miles to a road (FS #013) turning left. Take this left turn and proceed 0.1 miles to a "T" in the road, turn left again and go south for 0.75 miles to the crest of the second hill. On the crest there is an old jeep trail turning left and going down the top of the hill. This road goes through a small clearing at the intersection, then through a thick patch of mahogany and junipers. The transect begins in the next sage clearing beyond the trees, about 50 feet past two pinyons standing beside each other near the edge of the clearing. The transect is marked with 2-1/2 foot tall rebar. The 0-foot baseline stake has a red browse tag #7193 attached.





Map Name: Old Woman Plateau, Utah

Diagrammatic Sketch

Township 23S , Range 4E , Section 32

GPS: NAD 27, UTM 12S 4290475 N, 457846 E

DISCUSSION

Tommy Hollow - Trend Study No. 25A-16

Tommy Hollow is located on the low rolling mountains about one mile south of Emigrant Pass on I-70 at about 7,800 feet. It samples a flat that is dominated by sagebrush and grass and surrounded by pinyon and juniper trees and curlleaf mountain mahogany. This study is located in the Forest Service Beaver Dams allotment which is a grazed in early June and July. Cattle were seen on site in July of 1985. In 1985, there were also signs to indicate that elk and deer use the site in winter. Pellet group data in 1991 estimated 42 deer and 15 elk days use/acre (103 ddu/ha, 38 edu/ha). Pellet group data from 1999 estimated 96 deer, 93 elk and 9 cow days use/acre (237 ddu/ha, 229 edu/ha, 22 cdu/ha). Most of the deer and elk pellet groups were from winter use. Rabbit sign was also very common. In 2004, wildlife use was lower with an estimated 12 deer, 13 elk, and 9 cow days use/acre (30 ddu/ha, 33 edu/ha, 21 cdu/ha). Rabbit sign was very abundant in 2004.

The soil is relatively deep with an effective rooting depth estimated at nearly 19 inches. It is a sandy clay loam with a slightly acid pH (6.5). Phosphorus is limiting at only 4.1 ppm. Values less than 10 ppm may limit normal plant growth and development. There is a hard clay layer in some areas at about 4 to 6 inches in depth. The soil pentrometer was able to penetrate the layer but it must be limiting to root development since black sagebrush is found in these areas. The soil surface has little rock or pavement cover and there is a high amount of bare soil exposed in the shrub interspaces. Erosion is moderate with a high amount of pedestaling.

The key species in the flat are mountain big sagebrush and black sagebrush. Some of the changes in density of sagebrush between 1991 and 1999 are due to the much larger sample used in 1999. Mountain big sagebrush cover declined from about 13% in 1999 to almost 11% in 2004. Density declined 37% from 6,880 plants/acre in 1999 to 4,340 plants/acre in 2004. Decadence increased from 21% to 37%. Plants classified as dying increased from 3% to 24%. Prior to 2004, young plants made up at least 29% of the population, but this dropped to only 7% in 2004. Utilization has been moderate with each reading. It appears drought has caused a decline in this population. Black sagebrush density has declined with each reading. Density declined 19% in 2004 to 6,280 plants/acre. The number of mature plants remained stable. Decadency only increased from 9% to 17%, but the number of young plants declined dramatically. Prior to 2004 young plants made up at least 24% of the population, but was only 1% in 2004. Utilization has been light, with some moderate to heavy use in 1991.

Several other desirable browse species available on or near the site include winterfat, bitterbrush, curlleaf mountain mahogany, and Utah serviceberry. Besides providing variety in forage, the nearby curlleaf mountain mahogany and pinyon-juniper stands provide good protective cover. Bitterbrush occurs in low numbers and receives moderate to heavy use. The entire population was classified as decadent in 1991, but improved to 33% in 1999 and to only 14% in 2004. It appears there was some confusion with identification of rabbitbrush and broom snakeweed in 1985 and 1991. Stickyleaf low rabbitbrush density declined 43% from 12,580 plants/acre in 1999 to 7,120 plants/acre in 2004. Broom snakeweed density also declined between 1999 and 2004 from 5,780 plants/acre to 2,060 plants/acre.

The understory vegetation is composed of a variety of grasses and forbs. Common grasses include mutton bluegrass, bottlebrush squirreltail, blue grama, and western wheatgrass. Blue grama and bottlebrush squirreltail decreased significantly in nested frequency in 2004, but sedge, mutton bluegrass, and sandberg bluegrass significantly increased. Increases in perennial herbaceous species were rare in 2004 for southeastern Utah. Mutton bluegrass increased from 5% to 6% cover. Forbs are diverse but most species occur only

occasionally. The most abundant forb was the low growing pussytoes which had over 2% cover in 1999, but in 2004 it decreased significantly in nested frequency and cover was only 0.2%.

1985 APPARENT TREND ASSESSMENT

Basically, the range trend appears stable to slightly down. There is a minimal amount of erosion which will not be a problem unless the ground is severely disturbed. Species diversity is high and the key species are vigorous and reproducing. Increaser species should be monitored closely as an indication of deteriorating range conditions.

1991 TREND ASSESSMENT

Soil trend would be considered improving since 1985 because there is less bare ground, but still considered a stable trend. However, it is still considered in poor condition because percent bare ground is still relatively high at 34%. Key browse species (mountain big sagebrush and black sagebrush) have shown some notable changes. The black sagebrush population has decreased by 12%, but it was already over 10,000 plants per acre. Percent decadency has gone from 7% to 55%. This would be expected with the prolonged drought. Mountain big sagebrush has increased dramatically. Density has more than doubled, but percent decadency has gone up from 6% to 51%. With increased moisture, this decadency rate would be expected to go decrease. Broom snakeweed was picked up in 1991 with an estimated population of 133 plants per acre. Browse trend would be considered slightly down. The principal grass species have been stable since 1985, with the exception of western wheatgrass which has gone from an 8% to 33% quadrat frequency. The forbs are stable with some losses and some gains, depending on their tolerance to drought.

TREND ASSESSMENT
soil - stable (3), but in poor condition
browse - slightly down (2)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is stable to slightly improving, but still poor condition. Relative percent bare ground has decreased but litter cover has also gone down. There is little erosion occurring on the site due to the high vegetation cover combined with the gentle terrain. Trend for the key species, mountain big sagebrush and black sagebrush, is considered stable. The populations contain few dead plants indicating that the difference in densities between 1991 and 1999 is mainly due to the much larger sample now used which gives more accurate estimates for browse densities. Both populations show light to moderate use, improved vigor, and declining decadence. Both populations also show good young recruitment. Another positive aspect of the browse trend is the improvement in vigor for bitterbrush. During the 1991 reading, all of the bitterbrush were decadent and showed poor vigor. Now all show normal vigor and only 33% of the plants are considered decadent. Trend for the herbaceous understory is down slightly. Sum of nested frequency of grasses has declined slightly while nested frequency of perennial forbs has declined considerably. Nested frequency of *Carex* and bottlebrush squirreltail declined significantly while mutton bluegrass increased significantly. The forb composition is diverse but low growing species pussytoes, low fleabane, and desert phlox are the most abundant.

TREND ASSESSMENT
soil - stable to slightly improving (4)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 85 (good) Mountain brush type

2004 TREND ASSESSMENT

The soil trend is stable. Bare ground, litter, and vegetation cover have remained stable since 1999. Bare ground is high and moderate erosion is occurring. The browse trend is slightly down. Mountain big sagebrush and black sagebrush densities decreased substantially since 1999. The percentage of young plants decreased for each species and decadency increased. There are not currently enough young plants to replace those that are dying. This could improve with a return to normal precipitation patterns. Other palatable browse species such as Utah serviceberry, bitterbrush, curlleaf mountain mahogany, and winterfat are stable. Broom snakeweed and stickyleaf low rabbitbrush have decreased in density, which is positive. The herbaceous understory is stable, which is good considering the drought conditions that have affected this area four of the past five years. Herbaceous species have been negatively affected on most other sites in 2004. Sum of nested frequency is slightly up for perennial grasses, while it is slightly down for perennial forbs.

TREND ASSESSMENT
soil - stable, but poor (3)
browse - down slightly (2)
herbaceous understory - stable (3)
winter range condition (DC Index) - 68 (fair to good) Mountain brush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 16

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	$_{a}$19	$_{b}$84	$_{b}$109	$_{b}$90	1.16	1.09
G	Bouteloua gracilis	$_{b}$116	$_{b}$117	$_{b}$91	$_{a}$51	1.48	1.08
G	Bromus tectorum (a)	-	-	2	-	.00	-
G	Carex spp.	$_{c}$269	$_{c}$264	$_{a}$27	$_{b}$153	.69	1.56
G	Festuca ovina	$_{b}$11	$_{a}$-	$_{c}$62	$_{a}$4	.84	.06
G	Oryzopsis hymenoides	$_{b}$72	$_{a}$8	$_{a}$4	$_{a}$-	.01	-
G	Poa fendleriana	$_{a}$23	$_{a}$30	$_{b}$174	$_{c}$220	4.87	6.17
G	Poa pratensis	-	-	-	9	-	.12
G	Poa secunda	$_{ab}$9	$_{a}$-	$_{a}$2	$_{b}$17	.00	.06
G	Sitanion hystrix	$_{ab}$142	$_{c}$166	$_{b}$110	$_{a}$68	2.10	2.15
G	Stipa comata	8	5	5	-	.07	.00
G	Stipa lettermani	$_{a}$8	$_{a}$14	$_{b}$52	$_{b}$49	1.18	.71
Total for Annual Grasses		0	0	2	0	0.00	0
Total for Perennial Grasses		677	688	636	661	12.42	13.03
Total for Grasses		677	688	638	661	12.43	13.03
F	Agoseris glauca	-	5	-	-	-	-
F	Allium spp.	1	-	2	-	.03	-
F	Antennaria rosea	$_{a}$14	$_{b}$74	$_{a}$27	$_{a}$16	2.40	.20
F	Androsace septentrionalis (a)	-	-	28	20	.07	.08
F	Arabis demissa	$_{b}$47	$_{b}$116	$_{a}$13	$_{a}$2	.03	.00

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Astragalus convallarius	-	-	1	6	.03	.03
F	Astragalus spp.	1	1	9	4	.22	.03
F	Astragalus utahensis	-	-	-	2	-	.00
F	Castilleja chromosa	1	1	3	-	.01	-
F	Calochortus nuttallii	$_{a}$23	$_{b}$50	$_{a}$5	$_{a}$-	.01	-
F	Collinsia parviflora (a)	-	-	-	6	-	.01
F	Crepis acuminata	-	2	-	-	-	-
F	Cymopterus spp.	-	3	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	1	-	.00
F	Erigeron eatonii	$_{a}$6	$_{a}$1	$_{ab}$13	$_{b}$22	.08	.09
F	Erigeron flagellaris	-	-	-	4	-	.01
F	Erigeron pumilus	$_{a}$110	$_{b}$39	$_{a}$14	$_{a}$13	.03	.09
F	Eriogonum racemosum	$_{a}$3	$_{a}$-	$_{b}$13	$_{ab}$10	.13	.13
F	Hymenoxys richardsonii	$_{a}$-	$_{a}$-	$_{b}$13	$_{b}$17	.18	.18
F	Ipomopsis aggregata	-	-	3	-	.03	-
F	Machaeranthera canescens	-	1	2	-	.01	-
F	Microsteris gracilis (a)	-	-	-	3	-	.01
F	Penstemon comarrhenus	-	-	-	3	-	.01
F	Penstemon spp.	-	-	8	5	.07	.06
F	Penstemon pachyphyllus	3	2	2	-	.06	-
F	Phlox austromontana	$_{a}$2	$_{a}$-	$_{b}$21	$_{ab}$10	.22	.22
F	Phlox longifolia	-	-	-	3	-	.00
F	Polygonum douglasii (a)	-	-	9	24	.02	.05
F	Potentilla gracilis	-	-	3	-	.00	-
F	Ranunculus testiculatus (a)	-	-	-	6	-	.01
F	Sphaeralcea coccinea	$_{c}$83	$_{bc}$60	$_{a}$34	$_{ab}$45	.34	.37
F	Taraxacum officinale	-	-	4	3	.01	.01
F	Unknown forb-perennial	-	-	2	-	.00	-
Total for Annual Forbs		0	0	37	60	0.09	0.17
Total for Perennial Forbs		294	355	192	165	3.94	1.47
Total for Forbs		294	355	229	225	4.03	1.64

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

BROWSE TRENDS --
Management unit 25A, Study no: 16

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Amelanchier utahensis	4	5	.38	.41
B	Artemisia nova	69	65	3.59	6.27
B	Artemisia tridentata tridentata	1	2	.15	.66
B	Artemisia tridentata vaseyana	85	79	13.40	10.92
B	Ceratoides lanata	5	8	.00	.07
B	Cercocarpus ledifolius	0	0	.00	-
B	Chrysothamnus depressus	5	10	.03	.09
B	Chrysothamnus viscidiflorus viscidiflorus	84	95	5.66	7.72
B	Echinocereus triglochidatus	0	1	.00	-
B	Gutierrezia sarothrae	53	43	.93	1.83
B	Juniperus osteosperma	0	1	-	.00
B	Opuntia spp.	15	21	.26	.42
B	Pinus edulis	2	3	-	.03
B	Purshia tridentata	8	10	2.97	3.17
B	Symphoricarpos oreophilus	4	4	.21	.00
B	Tetradymia canescens	3	4	-	.00
Total for Browse		338	351	27.61	31.63

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 16

Species	Percent Cover '04
Amelanchier utahensis	.63
Artemisia nova	11.01
Artemisia tridentata tridentata	1.26
Artemisia tridentata vaseyana	14.75
Chrysothamnus viscidiflorus viscidiflorus	13.63
Gutierrezia sarothrae	3.00
Opuntia spp.	.15
Pinus edulis	.06
Purshia tridentata	1.91
Symphoricarpos oreophilus	.13
Tetradymia canescens	.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 16

Species	Average leader growth (in) '04
Artemisia nova	1.0
Artemisia tridentata vaseyana	1.4

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 16

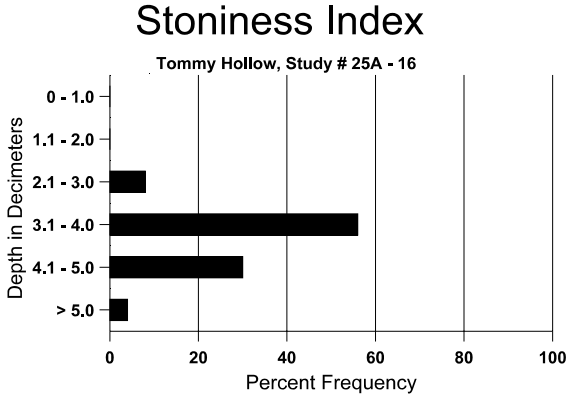
Species	Trees per Acre '99	Trees per Acre '04	Average diameter (in) '99	Average diameter (in) '04
Juniperus osteosperma	6	-	6.5	-
Pinus edulis	12	-	4.7	-

BASIC COVER --
Management unit 25A, Study no: 16

Cover Type	Average Cover % '85	'91	'99	'04
Vegetation	13.50	9.75	45.80	44.76
Rock	.25	0	.04	.05
Pavement	1.50	1.75	.53	2.88
Litter	43.25	46.00	36.16	38.02
Cryptogams	0	8.50	6.69	9.32
Bare Ground	41.50	34.00	27.71	25.63

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 16, Study Name: Tommy Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
18.8	50.3 (15.0)	6.5	52.9	15.8	31.3	1.6	4.1	163.2	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 16

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	67	65	-	-
Elk	32	17	93 (229)	13 (33)
Deer	15	21	96 (237)	12 (30)
Cattle	3	3	9 (22)	9 (21)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**132**	-	66	-	66	-	50	0	50	-	0	-/-
99	**100**	-	40	60	-	-	40	40	0	-	0	38/29
04	**120**	20	60	60	-	20	33	33	0	-	0	15/15
Artemisia nova												
85	**10866**	800	4933	5200	733	-	4	2	7	-	.61	8/11
91	**9533**	600	2400	1933	5200	-	37	37	55	4	13	7/10
99	**7800**	140	1880	5200	720	320	17	.25	9	4	4	9/16
04	**6280**	100	60	5140	1080	740	0	0	17	6	6	8/17
Artemisia tridentata tridentata												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**132**	-	66	-	66	-	50	50	50	-	0	-/-
99	**20**	-	-	-	20	-	0	0	100	-	0	-/-
04	**40**	-	-	-	40	100	0	0	100	50	50	69/69
Artemisia tridentata vaseyana												
85	**7732**	2466	3800	3466	466	-	10	2	6	-	.86	11/11
91	**16532**	8466	5933	2133	8466	-	36	33	51	5	18	11/18
99	**6880**	260	1980	3480	1420	240	31	.29	21	3	3	21/32
04	**4340**	180	300	2440	1600	220	29	26	37	24	24	18/28
Ceratoides lanata												
85	**2733**	66	400	2133	200	-	0	0	7	-	0	4/3
91	**3332**	133	266	2933	133	-	2	94	4	.60	2	1/2
99	**220**	20	-	200	20	-	27	73	9	-	0	3/3
04	**360**	-	20	340	-	-	50	44	0	-	6	4/3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus ledifolius												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	34/44
Chrysothamnus depressus												
85	**66**	-	-	-	66	-	0	0	100	-	0	-/-
91	**798**	-	66	666	66	-	17	83	8	-	0	2/2
99	**180**	-	-	180	-	-	33	33	0	-	0	3/5
04	**400**	-	100	300	-	-	0	25	0	-	0	4/8
Chrysothamnus viscidiflorus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**24732**	533	6733	17333	666	-	33	23	3	.32	1	5/5
99	**12580**	-	400	11980	200	40	.31	0	2	-	0	4/9
04	**7120**	360	100	6980	40	-	0	0	1	.28	.28	5/10
Echinocereus spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	2/3
Gutierrezia sarothrae												
85	**17933**	1200	3133	14800	-	-	0	0	-	-	0	5/7
91	**133**	-	-	133	-	-	0	0	-	-	0	4/5
99	**5780**	40	820	4960	-	-	0	0	-	-	0	6/7
04	**2060**	-	-	2060	-	-	0	0	-	-	0	6/8
Juniperus osteosperma												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**399**	66	266	133	-	-	0	0	0	-	0	2/1
99	**580**	-	160	380	40	-	0	0	7	7	7	3/12
04	**920**	-	20	900	-	-	0	0	0	-	0	2/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**40**	20	40	-	-	-	0	0	0	-	0	-/-
04	**60**	-	40	-	20	-	0	0	33	-	0	-/-
Purshia tridentata												
85	**199**	-	66	133	-	-	33	33	0	-	0	20/23
91	**266**	-	-	-	266	-	0	75	100	30	100	-/-
99	**180**	-	40	80	60	-	33	33	33	-	0	20/48
04	**280**	20	20	220	40	20	0	93	14	7	7	16/44
Symphoricarpos oreophilus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**120**	-	40	80	-	-	0	0	0	-	0	14/27
04	**100**	-	40	40	20	-	20	0	20	-	0	9/14
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	40	20	-	-	0	33	-	-	0	12/15
04	**160**	-	140	20	-	-	0	0	-	-	0	3/8

Trend Study 25A-18-04

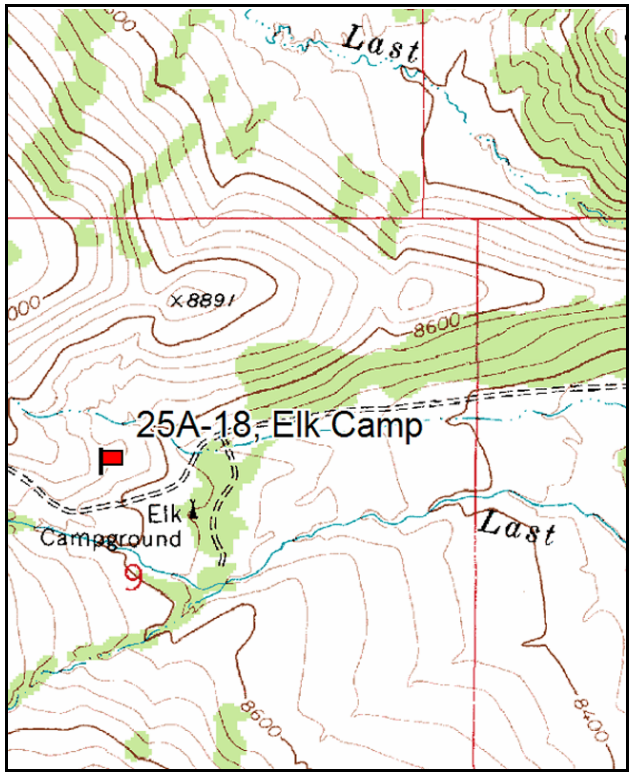
Study site name: Elk Camp . Vegetation type: Mixed Mountain Brush .

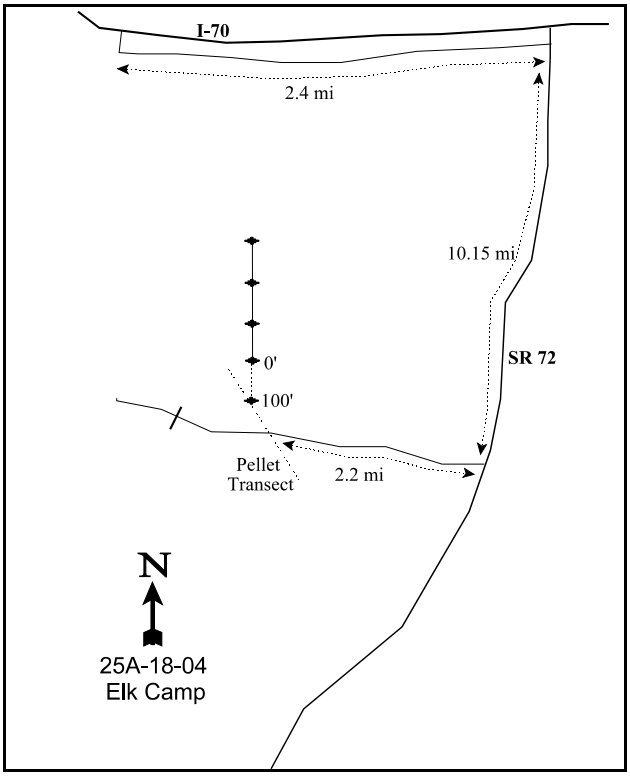
Compass bearing: frequency baseline Line 1- 170 degrees magnetic, Lines 2-4- 352 degrees magnetic.

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

LOCATION DESCRIPTION

Go east from Salina on I-70 for approximately 37.5 miles to the rest area. From the exit, go 2.4 miles east on the frontage road to the junction with SR72. Travel south on SR 72 for 10.15 miles to a gravel road to the right with a sign for Last Chance Road. Turn and go 2 miles to the Elk Camp Road, and continue straight for another 0.2 miles. Stop here, approximately 90 yards short of a cattleguard, and look for a small yellow stake 10 feet off the south side of the road. The yellow pellet group transect stakes run northwest, with one stake every 30 feet. Follow the yellow stakes 90 feet up from the road to a large rebar which marks the 100-foot end of the frequency baseline. The 0-foot baseline stake is 100 feet north and is tagged #7040.





Map Name: John's Peak, Utah

Diagrammatic Sketch

Township 25S , Range 4E , Section 9

GPS: NAD 27, UTM 12S 4278135 N, 458328 E

DISCUSSION

Elk Camp - Trend Study No. 25A-18

The Elk Camp trend study is located alongside a DWR pellet group transect on the south side of a hill overlooking Elk Campground and South Last Chance Creek. The hill has a slope of about 30-35% near the base, but it levels out to 10-15% further up the baseline. Elevation is approximately 8,680 feet. The surrounding gentle hills are covered by open sagebrush, grass slopes, scattered pinyon and juniper, and patches of aspen. The vegetation type of the trend study is a mixed mountain brush, dominated by black sagebrush and antelope bitterbrush.

Pellet group counts demonstrate that deer use varies greatly from year to year (Jense et al. 1985, 1991). The site is above the normal limits of deer winter range as described by Huff and Blotter (1964), but is good range for mild winters and as a transitional range during the spring and fall. Elk use is low but it has increased steadily since 1980 (Jense et al. 1985, 1991). In the past, the area was grazed by sheep, but in 1978 the permits were converted to cattle and it became a part of the Last Chance Cattle Allotment (Fish Lake National Forest). However, sheep were noted on a hillside nearby the transect in July of 1985. The area is within the Lower Last Chance pasture of the Last Chance allotment. Grazing occurs for 25 days on odd years, then the area is rested on even years. Grazing use is light on the slope, but heavier in the valley below along the riparian corridor. Pellet group data taken along the study site baseline in 1999 estimated 53 deer, 21 elk and 11 cow days use/acre (130 ddu/ha, 52 edu/ha, 27 cdu/ha). All of the cattle pats were from the previous season. Most of the deer and elk pellet groups were from winter use, but some were more recent. A fawn that had recently died was found near the site in 1999. Pellet group data in 2004 estimated 65 deer and 4 cow days use/acre (162 ddu/ha and 9 cdu/ha). Cattle pats were from the previous year.

Soil on the site is moderately shallow due to the rocky nature of the site. Effective rooting depth was estimated at only 11 inches. Soil texture is a loam with a slightly acid pH (6.5). There are many large rocks on the surface and throughout the soil. These rocks are of volcanic origin, as is the soil. Infiltration of water is good, but minor sheet erosion has removed some of the top soil leaving an erosion pavement. Pedestaling and terracing is evident on the steeper slopes but erosion is minimal and was rated as stable in 2004 due to the high protective ground cover.

There are several species of shrubs present on the site. The key browse species are black sagebrush, mountain big sagebrush, and bitterbrush. Black sagebrush appeared to be declining in 1985 and 1991. Over 50% of the population was decadent in 1985 and many plants had poor vigor. In 1991, percent decadency increased to 70%. The plants had been lightly to moderately utilized. In 1999, the study baseline was lengthened from 100 feet to 400 feet in order to get a better sample. This much larger sample is more effective at estimating shrub densities which often have aggregated and/or discontinuous distributions. Density of black sagebrush with the new sample was 3,560 plants/acre in 1999. Utilization was light to moderate but vigor has improved and decadency has declined from 70% to 21%. The change in density is due primarily to the much larger sample since there were only 160 dead plants sampled. In 2004, black sagebrush density declined 16% to 2,980 plants/acre. Decadence increased to 28%, while the percent of the population that was classified as dying increased from 2% to 11%. Utilization was still light to moderate.

The mountain big sagebrush occurs in larger numbers further up the slope where it levels out and the soil is deeper. Cover for mountain big sagebrush increased from about 8% in 1999 to 10% in 2004. Density remained stable with 2,600 plants/acre in 2004. In 2004, the number of seedlings sampled was very high, while the percentage of young plants has always been good. Use of the mountain big sagebrush has been moderate and vigor has been good since 1985. Dead plants were common in 1999 due in part to a spotty prescribed burn which effected one of the frequency/density belts. Many of the dead sagebrush were actually burned stems.

The most preferred browse on the site is bitterbrush which has a low spreading growth form on this site. Bitterbrush has been classified as heavily utilized each time this site has been sampled. This population has steadily declined in density since 1985. In 1985 density was 5,599 plants/acre and declined to 3,866 plants/acre in 1991. In 1999, the baseline was lengthened to get a more representative sample and density was 2,560 by 1999. It is difficult to say if the density had declined in 1999 or if the new sample size was the cause for the lower density. However in 2004, density decreased 20% to 2,060 plants/acre. During the 1999 and 2004 readings, many bitterbrush plants had been browsed to the point where they have become partly unavailable and some mature plants were classified as unavailable due to heavy use. None of the bitterbrush were producing seed on the site in 1999, but some seedlings and young were encountered. Decadence was extremely high in 1991 at 90%, although it was only 5% and 9% in 1999 and 2004 respectively.

There is a variety of other browse on the site such as snowberry, gray horsebrush, rubber rabbitbrush, and stickyleaf low rabbitbrush. Broom snakeweed density increased by 64% from 580 plants/acre in 1999 to 1,620 plants/acre in 2004.

The site supports a variety of grasses and forbs. The most abundant grasses include mutton bluegrass, sedge, and blue grama. Mutton bluegrass declined significantly in 2004 in nested frequency, but cover remained stable. Blue grama is abundant on the south facing slopes, while the sedge is abundant on the north facing slopes. Forbs are diverse but not very abundant. The more frequently encountered species are low growing and offer little forage.

1985 APPARENT TREND ASSESSMENT

The range appears healthy and well-balanced. The vegetative trend is considered stable. The age class composition information alone would indicate a declining population for black sagebrush. However, over the area as a whole, it appears well-established with adequate regeneration. The bitterbrush population is quite healthy, although heavily hedged. The plant composition is unlikely to change over the next five years, as the diversity should help protect it from any sudden changes. The soil trend is also stable, although it sustains a small amount of top soil loss because of the slope and rockiness of the site.

1991 TREND ASSESSMENT

The soil trend is down because of the increase in percent bare ground which has increased from 9 to 21% and the loss of litter from 61% down to 44%. These data would indicate the propensity for accelerated soil loss to high intensity summer storms. Overall, there are three key browse species, black sagebrush, mountain big sagebrush, and bitterbrush. Black sagebrush decreased in density by 6% (8,532 down to 7,999) and decadency went from 56% to 70%. Mountain big sagebrush density increased by 52% and was the only species to increase. Bitterbrush density decreased by 31%. Percent decadency for bitterbrush increased from 1% to 90%. The trend for browse would be slightly down. For the herbaceous understory, the grasses as a group slightly increased, while the forbs were stable. The forbs that did increase were small and insignificant as a forage for wildlife.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is stable to slightly improving. Percent cover of bare ground has declined from 21% to 14% and litter cover declined from 44% to 34%. Erosion is minimal. Trend for browse is stable. Density of black

sagebrush declined 55% since 1991 but most of the change is due to the larger sample taken in 1999. Use remains moderate to heavy but vigor has improved and percent decadence has declined from 70% to 21%. Mountain big sagebrush has increased in density. It too shows moderate use but displays good vigor and low decadence. Bitterbrush, the most preferred species, continues to be heavily browsed. Vigor has improved and percent decadence has declined from 90% in 1991 to only 5% now. The population currently appears stable but no plants were producing seed in 1999 due to the heavy use and drought. Trend for the herbaceous understory is stable with similar sum of nested frequency values for perennial grasses and forbs compared to 1991.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

2004 TREND ASSESSMENT

The trend for soil is stable. The ratio of protective cover (vegetation, litter, and cryptogams) to bare ground remained stable at 1:3.1, which is good. Erosion is rated as stable. The browse trend is slightly down. The key species are bitterbrush, mountain big sagebrush, and black sagebrush. Density for each of these three species declined slightly. Decadence was slightly higher for all three, but percent decadence is not very high for any of them. Utilization is very heavy for bitterbrush, which is the most preferred species and can tolerate heavy use. Young plants make up only 5% of the population for bitterbrush. Cover was stable for black sagebrush, slightly up for mountain big sagebrush, and slightly down for bitterbrush. Broom snakeweed, an increaser species, has substantially higher density and cover. The herbaceous understory trend is still considered stable with some slight decreases in perennial nested frequency for both grasses and forbs. However, this is not enough change to warrant a change in trend. It appears that at this higher elevation drought conditions have not been as detrimental to the herbaceous understory as has been the case for sites at lower elevations. Sum of nested frequency was down 6% for grasses and 14% for perennial forbs. Perennial grasses contribute to over 80% of the herbaceous production. Mutton bluegrass is the only species to be significantly less abundant than it was in 1999.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 25A, Study no: 18

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	$_{a}$-	$_{b}$13	$_{bc}$18	$_{c}$32	.11	.25
G	Bouteloua gracilis	73	76	96	67	3.65	2.12
G	Carex spp.	$_{ab}$112	$_{a}$88	$_{ab}$106	$_{b}$147	3.25	2.18
G	Festuca ovina	2	4	9	3	.09	.15
G	Poa fendleriana	$_{b}$192	$_{b}$186	$_{b}$194	$_{a}$138	3.56	3.93
G	Sitanion hystrix	$_{b}$83	$_{b}$109	$_{a}$47	$_{a}$32	.42	.59

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Stipa comata	-	-	-	5	-	.07
G	Stipa lettermani	$_{a}$20	$_{ab}$46	$_{ab}$46	$_{b}$61	.90	1.95
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		482	522	516	485	12.00	11.26
Total for Grasses		482	522	516	485	12.00	11.26
F	Agoseris glauca	$_{a}$-	$_{b}$14	$_{a}$-	$_{a}$-	-	-
F	Allium spp.	-	2	7	11	.03	.02
F	Antennaria rosea	$_{bc}$23	$_{a}$9	$_{c}$36	$_{ab}$18	.83	.78
F	Androsace septentrionalis (a)	-	-	5	-	.01	-
F	Arabis demissa	$_{b}$12	$_{a}$8	$_{a}$7	$_{a}$-	.18	-
F	Artemisia ludoviciana	2	3	-	-	-	-
F	Astragalus spp.	$_{a}$-	$_{a}$-	$_{b}$22	$_{a}$9	.14	.05
F	Castilleja chromosa	$_{b}$13	$_{b}$13	$_{a}$-	$_{a}$-	-	-
F	Chaenactis douglasii	2	-	-	3	-	.00
F	Chenopodium spp. (a)	-	-	-	8	-	.05
F	Cirsium spp.	-	-	4	7	.18	.09
F	Comandra pallida	-	-	5	7	.06	.04
F	Collinsia parviflora (a)	-	-	9	-	.02	-
F	Cryptantha spp.	-	2	-	-	-	-
F	Erigeron eatonii	-	-	-	5	-	.03
F	Erigeron pumilus	-	-	6	8	.18	.04
F	Eriogonum racemosum	25	34	24	31	.27	.52
F	Eriogonum umbellatum	$_{b}$16	$_{ab}$11	$_{ab}$4	$_{a}$-	.01	-
F	Gayophytum ramosissimum(a)	-	-	-	5	-	.03
F	Hymenoxys richardsonii	$_{b}$18	$_{a}$7	$_{a}$-	$_{a}$-	-	.00
F	Lappula occidentalis (a)	-	-	-	4	-	.01
F	Lithospermum incisum	-	3	-	1	-	.03
F	Lupinus argenteus	-	-	-	2	-	.03
F	Machaeranthera canescens	$_{ab}$11	$_{a}$3	$_{ab}$12	$_{b}$15	.05	.17
F	Machaeranthera grindelioides	-	-	-	2	-	.03
F	Penstemon spp.	$_{a}$-	$_{ab}$2	$_{b}$10	$_{ab}$5	.05	.01
F	Phlox austromontana	$_{a}$-	$_{a}$-	$_{b}$32	$_{b}$24	.35	.48
F	Phlox longifolia	$_{b}$19	$_{c}$48	$_{a}$4	$_{a}$6	.01	.01
F	Polygonum douglasii (a)	-	-	$_{a}$1	$_{b}$18	.00	.05
F	Senecio multilobatus	2	-	7	-	.04	-
F	Sphaeralcea coccinea	6	3	3	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Unknown forb-perennial	$_{b}$14	$_{a}$-	$_{a}$-	$_{ab}$3	-	.03
F	Zigadenus paniculatus	3	-	-	-	-	-
Total for Annual Forbs		0	0	15	35	0.03	0.15
Total for Perennial Forbs		166	162	183	157	2.42	2.39
Total for Forbs		166	162	198	192	2.46	2.55

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

BROWSE TRENDS --
Management unit 25A, Study no: 18

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia frigida	4	5	-	.06
B	Artemisia nova	52	51	5.33	5.49
B	Artemisia tridentata vaseyana	58	61	7.46	9.98
B	Chrysothamnus nauseosus hololeucus	7	13	.48	.51
B	Chrysothamnus viscidiflorus viscidiflorus	69	69	3.28	7.94
B	Coryphantha vivipara	2	2	.00	-
B	Eriogonum microthecum	0	0	-	-
B	Gutierrezia sarothrae	12	28	.70	1.05
B	Mahonia repens	7	9	.04	.15
B	Opuntia spp.	0	3	-	-
B	Pediocactus simpsonii	0	5	-	.00
B	Pinus edulis	3	4	2.51	1.69
B	Purshia tridentata	49	46	6.53	5.57
B	Rosa woodsii	17	12	1.89	.69
B	Symphoricarpos oreophilus	23	27	.75	.88
B	Tetradymia canescens	11	15	.06	.09
Total for Browse		314	350	29.08	34.14

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 18

Species	Percent Cover	
	'99	'04
Artemisia frigida	-	.11
Artemisia nova	-	5.73
Artemisia tridentata vaseyana	-	9.53
Chrysothamnus nauseosus hololeucus	-	.68
Chrysothamnus viscidiflorus viscidiflorus	-	7.61
Gutierrezia sarothrae	-	.95
Mahonia repens	-	.13
Pinus edulis	4.19	4.30
Purshia tridentata	-	8.36
Rosa woodsii	-	1.26
Symphoricarpos oreophilus	-	2.38
Tetradymia canescens	-	.75

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 18

Species	Average leader growth (in)
	'04
Artemisia tridentata vaseyana	2.9
Purshia tridentata	6.2

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 18

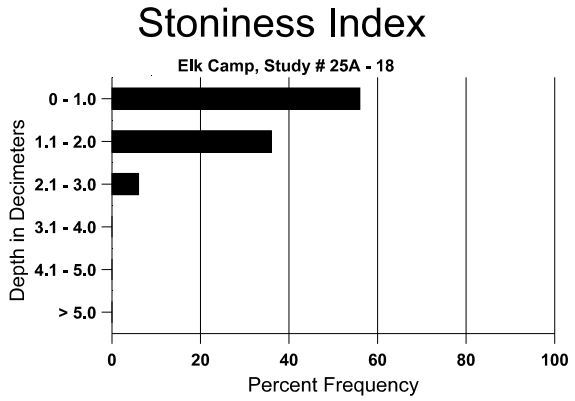
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus scopulorum	10	24	3.8	3.8
Pinus edulis	10	26	3.8	6.4

BASIC COVER --
Management unit 25A, Study no: 18

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	5.50	13.00	42.04	45.70
Rock	17.25	21.50	15.66	16.39
Pavement	7.00	.75	2.48	3.81
Litter	60.75	44.25	33.96	31.74
Cryptogams	.25	0	.06	.04
Bare Ground	9.25	20.50	14.08	19.52

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 18, Study Name: Elk Camp

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.0	46.0 (15.6)	6.5	50.9	29.8	19.3	3.0	16.8	211.2	0.5



PELLET GROUP DATA --
Management unit 25A, Study no: 18

Type	Quadrat Frequency	
	'99	'04
Rabbit	23	27
Elk	18	4
Deer	27	49
Cattle	4	1

Days use per acre (ha)	
'99	'04
-	-
21 (52)	-
53 (130)	66 (162)
11 (27)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**666**	-	66	600	-	-	0	0	-	-	0	3/2
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	40	80	-	-	33	0	-	-	0	3/8
04	**240**	-	20	220	-	-	50	8	-	-	0	6/7
Artemisia nova												
85	**8532**	200	1066	2666	4800	-	47	3	56	.70	11	10/16
91	**7999**	-	466	1933	5600	-	37	44	70	2	13	11/16
99	**3560**	60	360	2460	740	160	35	7	21	2	2	10/20
04	**2980**	80	140	2020	820	220	25	14	28	11	11	9/19
Artemisia tridentata vaseyana												
85	**933**	66	333	400	200	-	57	0	21	-	7	18/20
91	**1932**	66	666	666	600	-	52	7	31	4	17	22/23
99	**2740**	180	640	1680	420	880	44	3	15	7	7	27/37
04	**2600**	700	480	1660	460	260	40	22	18	9	9	19/31
Chrysothamnus nauseosus hololeucus												
85	**66**	-	-	-	66	-	0	100	100	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**280**	-	20	260	-	20	7	21	0	-	0	9/13
04	**360**	-	-	360	-	-	39	0	0	-	0	12/18
Chrysothamnus viscidiflorus viscidiflorus												
85	**8065**	66	1866	6133	66	-	0	0	1	-	0	5/10
91	**10866**	-	2733	7733	400	-	31	21	4	.18	.61	3/7
99	**4060**	-	500	3460	100	-	5	1	2	.98	.98	6/12
04	**4740**	-	140	4540	60	-	0	0	1	.42	.42	9/15
Coryphantha vivipara												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	3/2
04	**40**	-	-	40	-	-	0	0	-	-	0	2/3
Eriogonum microthecum												
85	**133**	-	-	133	-	-	0	0	-	-	0	1/4
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**580**	-	-	580	-	-	0	0	-	-	0	5/7
04	**1620**	-	-	1620	-	-	0	0	-	-	0	9/10
Juniperus scopulorum												
85	**66**	-	-	66	-	-	0	0	-	-	0	46/41
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**780**	-	140	640	-	-	0	0	-	-	0	2/2
04	**580**	-	-	580	-	-	0	0	-	-	0	3/4
Opuntia spp.												
85	**599**	-	66	533	-	-	0	0	0	-	0	2/1
91	**398**	-	66	266	66	-	0	0	17	-	0	2/5
99	**0**	-	-	-	-	-	0	0	0	-	0	2/5
04	**80**	-	40	40	-	-	0	0	0	-	0	3/8
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**120**	-	80	40	-	-	0	0	-	-	0	3/5
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	20	40	-	-	0	0	-	-	0	-/-
04	**80**	-	40	40	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	**5599**	333	2333	3200	66	-	30	46	1	-	0	13/21
91	**3866**	-	-	400	3466	-	2	97	90	12	40	6/16
99	**2560**	20	360	2060	140	20	32	57	5	3	3	13/29
04	**2060**	-	100	1780	180	100	9	90	9	7	7	13/31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**1480**	60	620	860	-	-	0	0	-	-	0	12/14
04	**1100**	-	40	1060	-	-	0	0	-	-	0	8/8
Symphoricarpos oreophilus												
85	**866**	-	266	600	-	-	38	0	0	-	0	18/16
91	**1265**	-	133	1066	66	-	11	53	5	-	0	19/16
99	**560**	20	100	460	-	-	39	18	0	-	0	18/30
04	**800**	20	100	700	-	-	8	0	0	-	0	16/32
Tetradymia canescens												
85	**399**	-	66	133	200	-	17	0	50	-	0	7/5
91	**465**	-	66	133	266	-	14	43	57	9	29	13/10
99	**260**	-	20	160	80	-	54	0	31	8	8	10/10
04	**320**	-	60	260	-	-	38	6	0	-	0	11/12
Yucca spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	7/9

Trend Study 25A-19-04

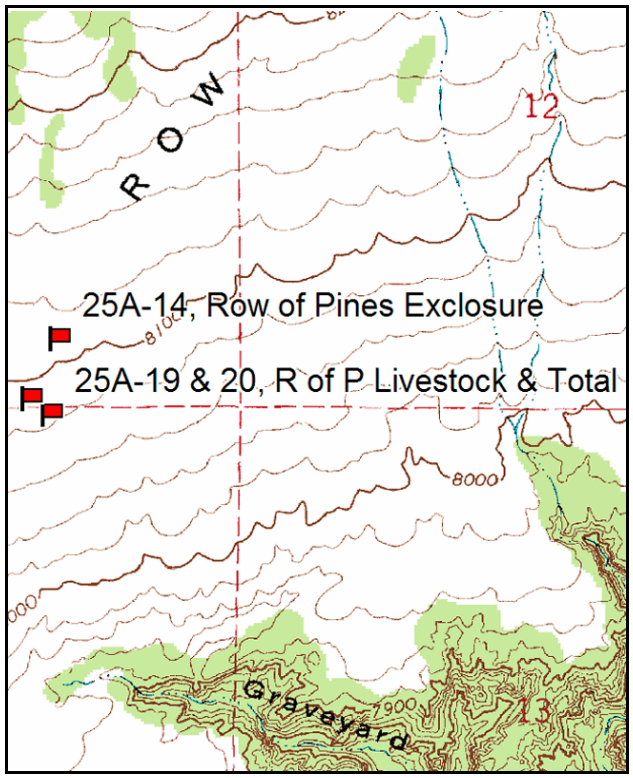
Study site name: Row of Pines - Cattle Exclosure . Vegetation type: Wyoming Big Sagebrush .

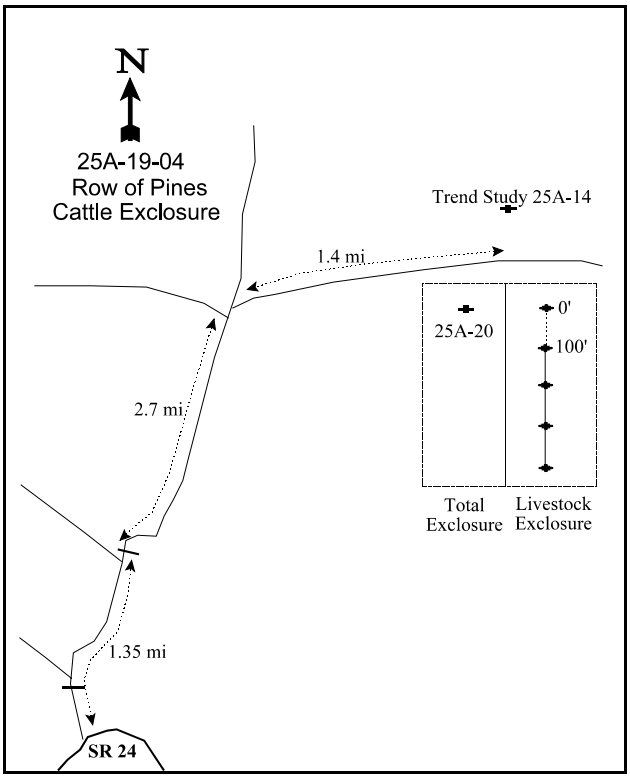
Compass bearing: frequency baseline 210 degrees magnetic.

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

LOCATION DESCRIPTION

From the Chappell Cheese Factory northwest of Loa on SR 24, go west 2.6 miles to a side road on the north where the highway makes a sharp turn (0.95 miles west of mile marker #49). Take this road 0.65 miles and turn right after crossing a cattleguard. After 0.7 more miles, turn right at the fork and cross another cattleguard. Go 2.7 miles to another fork where you will again turn right. After ~60', turn right (east) and go 1.4 miles to an exclosure. The baseline runs down through the middle of the livestock exclosure (east side), with the 0 ft stake having browse tag #409 attached.





Map name: Loa, Utah

Diagrammatic Sketch

Township 27S , Range 2E , Section 14 .

GPS: NAD 27, UTM 12S 4257846 N, 442709 E

DISCUSSION

Row of Pines Livestock Exclosure - Trend Study No. 25A-19

The Row of Pines Livestock Exclosure trend study was established in 1999 inside the livestock exclosure. The exclosure was built in the late 1980's after the area was chained and seeded. Trend study 25A-14 was established in 1991 about 200 feet to the north of the exclosure. In 1999 it was determined that data was needed within the livestock exclosure and the total exclosure. The area supports a sagebrush grass type which is nearly level (3-5% slope) and has a slight south aspect. Deer and elk use within the livestock exclosure was relatively heavy. Pellet group data from 1999 estimated 48 deer and 58 elk days use/acre (119 ddu/ha and 143 edu/ha), most of which was winter use. Data from 2004 showed an increase in deer use with an estimated 126 deer and 11 elk days use/acre (312 ddu/ha and 28 edu/ha).

Soil depth is moderately shallow with an estimated effective rooting depth of just over 11 inches. Texture is a sandy clay loam to a loam with a neutral pH (7.0). Soil parent material is basalt. Phosphorus is marginal at 8.5 ppm. Values less than 10 ppm may limit normal plant growth and development. The soil surface is mostly a combination of pavement and bare ground with some evidence of soil erosion. Due to the lack of slope, water erosion is not a major problem in this area.

The key browse species in this area is Wyoming big sagebrush, which had an estimated density of 5,820 plants/acre in 1999 in the livestock exclosure. Decadence was moderately high at 27% with 17% of the population classified as dying. In 2004, most of these plants must have died as density declined 16% 4,900 plants/acre. This trend worsened in 2004 as 69% of the population was decadent with percent dying doubling to 34%. Cover decreased from 8% in 1999 to 5% in 2004. Utilization has been moderate to heavy. Sixty percent of the plants showed signs of heavy use in 2004. Recruitment has been very poor with no seedlings and only 2-3% of the population consisting of young plants. This is not enough recruitment to replace the dying plants. The only other common shrubs found in the exclosure are increasers, thinleaf low rabbitbrush and broom snakeweed. Rabbitbrush density is stable at about 800 plants/acre. Broom snakeweed density declined 77% in 2004 to 540 plants/acre.

The herbaceous understory is dominated by grasses which are diverse for a Wyoming big sagebrush site. Common species include seeded species such as crested wheatgrass and Russian wildrye, and native blue grama and bottlebrush squirreltail. Crested wheatgrass and bottlebrush squirreltail declined significantly in nested frequency in 2004. Other seeded grasses, intermediate wheatgrass and smooth brome, occur occasionally. Forbs are rare and produce less than half of 1% cover.

Precipitation has been below normal 4 of 5 years prior to 2004, which would help explain some of the decline for sagebrush and herbaceous species.

1999 APPARENT TREND ASSESSMENT

The soil trend appears stable due to abundant protective ground cover. However, rock and pavement provide most of this cover. Erosion is minimal due to the armored nature of the soil surface combined with the gentle terrain. Trend for the key browse, Wyoming big sagebrush, appears to be declining due to low recruitment combined with a high number of decadent dying plants. Utilization is moderate to heavy with most plants not currently producing seed. The increasers, thinleaf low rabbitbrush and broom snakeweed, appear to have mature and stable populations. The herbaceous understory is dominated by a variety of seeded and native grasses. The livestock exclosure contains more seeded grasses than outside. The low abundance of cool season perennial grasses outside of the exclosure and higher numbers of cool season grasses inside of the livestock exclosure indicates higher grazing pressure outside of the exclosure in the spring by livestock. Forbs are lacking here as well as outside of the exclosure.

winter range condition (DC Index) - 42 (fair to good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The trend for soil is slightly down. Even with the slight decrease in relative percent bare ground cover from 25% to 20%, pavement increased from 25% to 37% indicating a possible loss of soil. Vegetation cover decreased due to drought conditions and litter increased with the death of sagebrush plants. The slight slope prevents erosion from being worse. The browse trend is down. Wyoming big sagebrush density declined 16%, while decadency increased to 69% which is very high. Percent dying also increased to 34% while there are very few young plants to replace those that are dying. The herbaceous understory trend is also down. Nested frequency for perennial grasses decreased 42% and perennial forbs decreased 59%. The Desirable Components Index (see methods) rating is poor due to the loss of preferred browse cover and the high percentage of decadent sagebrush.

TREND ASSESSMENT
soil - down slightly (2)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 20 (poor) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 19

Type	Species	Nested Frequency '99	Nested Frequency '04	Average Cover % '99	Average Cover % '04
G	Agropyron cristatum	b130	a66	2.66	2.07
G	Agropyron intermedium	1	-	.00	-
G	Bouteloua gracilis	91	99	3.86	2.81
G	Bromus inermis	10	1	.09	.03
G	Elymus junceus	40	42	1.20	1.77
G	Oryzopsis hymenoides	10	7	.27	.24
G	Sitanion hystrix	b136	a25	2.01	.80
G	Stipa comata	1	2	.06	.03
G	Stipa pinetorum	2	2	.15	.15
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		421	244	10.33	7.94
Total for Grasses		421	244	10.33	7.94
F	Androsace septentrionalis (a)	2	-	.01	-
F	Astragalus spp.	3	5	.00	.00
F	Chenopodium leptophyllum(a)	a-	b15	-	.51
F	Cryptantha spp.	3	-	.03	-
F	Descurainia pinnata (a)	-	3	-	.00
F	Eriogonum ovalifolium	1	-	.03	-
F	Erigeron pumilus	b32	a3	.15	.00

Type	Species	Nested Frequency '99	Nested Frequency '04	Average Cover % '99	Average Cover % '04
F	Salsola iberica (a)	-	1	-	.00
F	Sphaeralcea coccinea	10	14	.04	.25
F	Unknown forb-perennial	4	-	.03	-
Total for Annual Forbs		2	19	0.00	0.52
Total for Perennial Forbs		53	22	0.30	0.25
Total for Forbs		55	41	0.31	0.78

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

BROWSE TRENDS --
Management unit 25A, Study no: 19

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia tridentata wyomingensis	91	78	8.23	5.31
B	Chrysothamnus viscidiflorus stenophyllus	28	25	.11	.25
B	Gutierrezia sarothrae	67	23	1.06	.22
B	Opuntia fragilis	6	11	.18	.06
B	Pediocactus simpsonii	0	2	-	.00
Total for Browse		192	139	9.59	5.86

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 19

Species	Percent Cover '04
Artemisia tridentata wyomingensis	6.11
Chrysothamnus viscidiflorus stenophyllus	.18
Gutierrezia sarothrae	.26
Opuntia fragilis	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 19

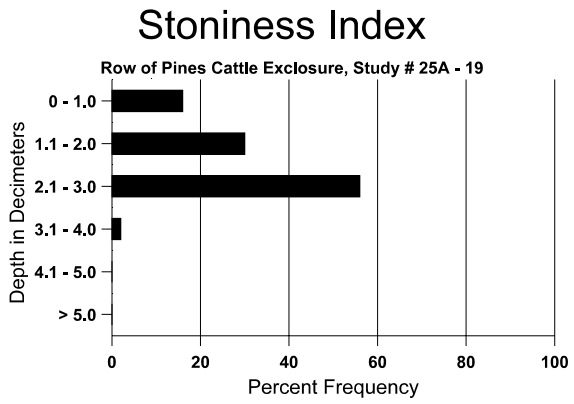
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.1

BASIC COVER --
Management unit 25A, Study no: 19

Cover Type	Average Cover % '99	'04
Vegetation	21.47	13.96
Rock	12.68	15.14
Pavement	22.53	40.84
Litter	11.73	19.00
Cryptogams	.00	.03
Bare Ground	22.28	21.76

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 19, Study Name: Row of Pines Cattle Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.2	57.0 (11.6)	7.0	47.3	27.4	25.3	1.6	8.5	163.2	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 19

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	1	8	-	-
Elk	24	11	58 (143)	11 (28)
Deer	22	38	48 (119)	126 (312)
Cattle	-	1	-	-

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
99	**5820**	-	160	4100	1560	940	49	46	27	17	18	12/23
04	**4900**	-	100	1440	3360	2060	38	60	69	34	35	10/20
Chrysothamnus viscidiflorus stenophyllus												
99	**880**	-	20	820	40	-	18	5	5	5	5	5/8
04	**800**	20	40	700	60	20	0	0	8	5	5	5/11
Gutierrezia sarothrae												
99	**2380**	20	80	2300	-	80	0	0	-	-	0	7/8
04	**540**	-	40	500	-	-	0	0	-	-	0	5/7
Opuntia fragilis												
99	**200**	-	-	200	-	-	0	0	-	-	0	2/5
04	**440**	-	80	360	-	-	0	0	-	-	0	2/8
Pediocactus simpsonii												
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	-	40	-	-	0	0	-	-	0	1/2

Trend Study 25A-20-04

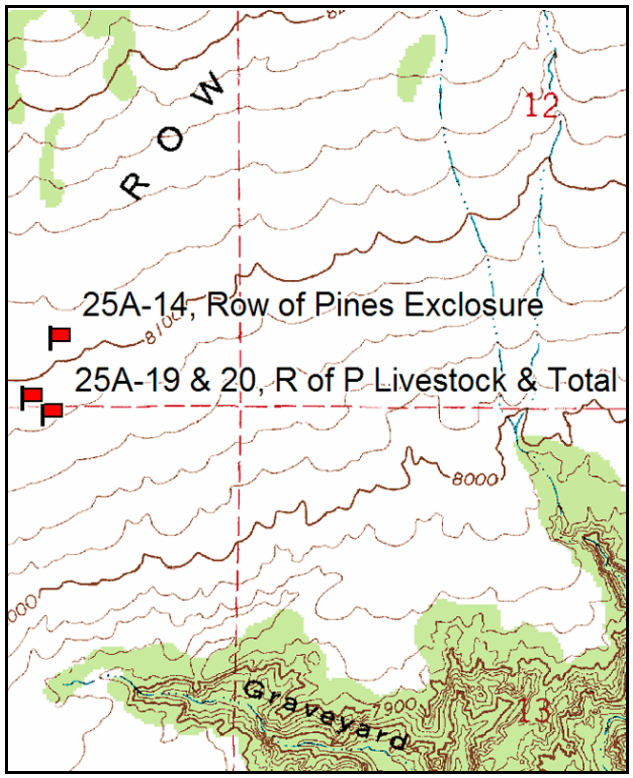
Study site name: Row of Pines - Total Exclosure . Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 205 degrees magnetic.

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

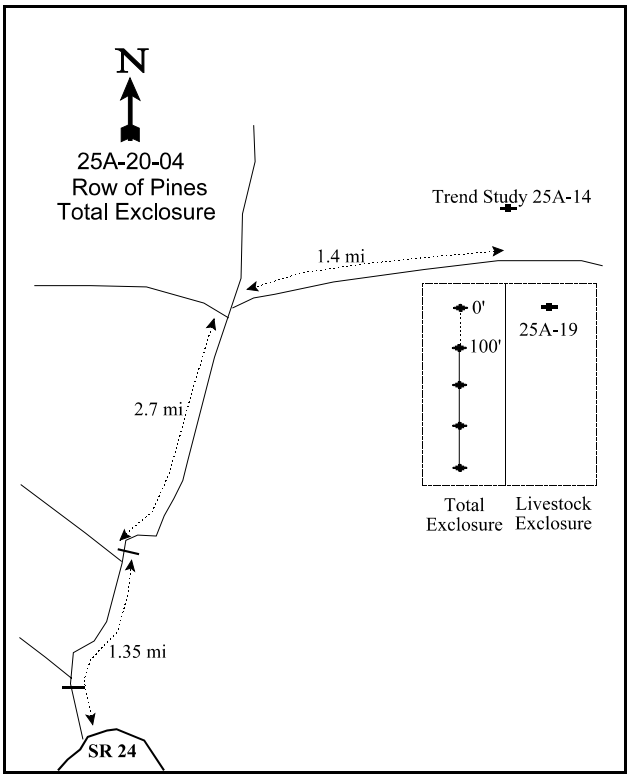
LOCATION DESCRIPTION

From the Chappell Cheese Factory northwest of Loa on SR 24, go west 2.6 miles to a side road on the north where the highway makes a sharp turn (0.95 miles west of mile marker #49). Take this road 0.65 miles and turn right after crossing a cattleguard. After 0.7 more miles, turn right at the fork and cross another cattleguard. Go 2.7 miles to another fork where you will again turn right. After ~60', turn right (east) and go 1.4 miles to an exclosure. The baseline runs down through the middle of the total exclosure (west side), with the 0 ft stake having browse tag #410 attached.



Map name: Loa, Utah

Township 27S , Range 2E , Section 14 .



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4257887 N, 442656 E

DISCUSSION

Row of Pines Total Exclosure - Trend Study No. 25A-20

The Row of Pines Total Exclosure trend study was established in 1999. The exclosure was built in the late 1980's after the area was chained and seeded. The total exclosure excludes wildlife and livestock from grazing. Trend study 25A-14 was established in 1991 about 200 feet to the north of the exclosure. During the 1999 reading of this study site, it was determined that data was needed within both the livestock exclosure and the total exclosure. The area supports a sagebrush grass type which is nearly level (3-5% slope) and has a slight south aspect. The general area is used by deer and elk in the winter and early spring, and by cattle in the spring and summer. One old cattle pat was encountered in 1999 within the total exclosure but the fences appeared to be in good repair.

Soil conditions in the total exclosure are nearly identical to that of the livestock exclosure and outside. Soil depth is moderately shallow with an estimated effective rooting depth of just over 11 inches. Texture is a sandy clay loam to a loam with a neutral pH (7.0). Soil parent material is basalt. Phosphorus is marginal at 8.5 ppm. Values less than 10 ppm may limit normal plant growth and development. The soil surface is mostly a combination of pavement and bare ground with some evidence of soil erosion. Vegetation cover is moderate at 28% and litter cover is low at just 11%. However, due to the lack of slope, water erosion is not a major problem in this area.

The key browse species is Wyoming big sagebrush. Density was 6,160 plants/acre in 1999, which was slightly more than the in the livestock exclosure and outside the exclosure. In 2004, density increased 16% to 7,340 plants/acre. Decadency was 27% in 1999, but increased to 52% in 2004. The percent of plants classified as dying increased from 18% in 1999 to 32% in 2004. Seedlings have been rare and young plants have made up 5% of the population in both 1999 and 2004. Since the sagebrush is not utilized within the total exclosure, this decadence would be caused by drought or winter injury, or a combination of both. Density of the increaser, thinleaf low rabbitbrush is similar to the livestock exclosure at about 900 plants/acre. Broom snakeweed density was over two-times higher than the livestock exclosure at 6,320 plants/acre in 1999, but declined 90% to about the same density (620 plants/acre) of the livestock exclosure (540 plants/acre) in 2004.

The total exclosure supports a similar perennial grass understory as the livestock exclosure. Crested wheatgrass and Russian wildrye are the most abundant seeded species. Blue grama is the most abundant native grass, but not as abundant as it is in the livestock exclosure. Crested wheatgrass and bottlebrush squirreltail declined significantly inside both enclosures and outside the exclosure due to drought conditions. Russian wildrye nested frequency increased significantly and cover increased from 2.5% to 5.4%. There was no increase for Russian wildrye outside the exclosure or in the livestock exclosure. Forbs are rare and less diverse in the total exclosure. Low fleabane is the most abundant forb, but declined significantly in 2004.

1999 APPARENT TREND ASSESSMENT

Soil conditions are very similar to the livestock exclosure and outside of the exclosure. Vegetation and litter cover are low and most of the protective ground cover comes from rock and pavement. Erosion is minimal due to the armored nature of the soil surface. The browse trend appears to be declining, similar to the livestock exclosure. There is no use here but recruitment is still low, vigor poor, percent decadence moderate, and a large proportion of the decadent plants appear to be dying. Another negative aspect is the large population of the increaser, broom snakeweed, which is more abundant here compared to the livestock exclosure. The herbaceous understory is similar to the livestock exclosure but grasses produce slightly less cover. Forbs are rare with low fleabane being the most abundant with nearly 1% cover.

winter range condition (DC Index) - 50 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The trend for soil is similar to the livestock exclosure and is slightly down. Relative bare ground cover decreased from 20% to 15%, but pavement increased from 31% to 36% and rock increased from 9% to 14% indicating a possible loss of soil. Relative vegetation cover decreased from 28% to 20%. The browse trend for the key species, Wyoming big sagebrush, is slightly down. Although density increased 20% to 7,400 plants/acre, decadency nearly doubled from 27% to 52%. The percent of the population that was classified as dying increased from 18% in 1999 to 32% in 2004. Drought conditions 4 of the past 5 years are probably to blame for the downward trend if vigor for this sagebrush population. If drought conditions persist it would be expected that density will decline. The density of broom snakeweed declined 90% which is positive. The trend for the herbaceous understory is down. The two most abundant species in 1999, bottlebrush squirreltail and crested wheatgrass, declined significantly in nested frequency. This was also seen outside the exclosure and in the livestock exclosure. The overall sum of nested frequency for perennial grasses declined 32% since 1999. Protection from grazing has benefitted Russian wildrye, which increased significantly in nested frequency and doubled in cover. Forbs also have declined and are very rare.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - down (1)
winter range condition (DC Index) - 39 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 20

Type	Species	Nested Frequency		Average Cover %	
		'99	'04	'99	'04
G	Agropyron cristatum	$_{b}$99	$_{a}$58	2.69	1.43
G	Agropyron intermedium	2	-	.00	-
G	Bouteloua gracilis	49	50	1.08	1.02
G	Bromus inermis	4	-	.05	-
G	Elymus junceus	$_{a}$63	$_{b}$110	2.51	5.40
G	Oryzopsis hymenoides	18	24	.62	.51
G	Sitanion hystrix	$_{b}$125	$_{a}$3	2.01	.01
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		360	245	8.99	8.38
Total for Grasses		360	245	8.99	8.38
F	Androsace septentrionalis (a)	5	-	.01	-
F	Astragalus spp.	-	2	-	.01
F	Castilleja spp.	3	-	.00	-
F	Chenopodium leptophyllum(a)	-	2	-	.03
F	Erigeron pumilus	$_{b}$54	$_{a}$12	.92	.07
F	Phlox longifolia	-	3	-	.00
F	Sphaeralcea coccinea	10	12	.02	.10

Type	Species	Nested Frequency '99	Nested Frequency '04	Average Cover % '99	Average Cover % '04
Total for Annual Forbs		5	2	0.00	0.03
Total for Perennial Forbs		67	29	0.94	0.19
Total for Forbs		72	31	0.95	0.22

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

BROWSE TRENDS --
Management unit 25A, Study no: 20

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia tridentata wyomingensis	91	93	13.97	13.35
B	Chrysothamnus viscidiflorus stenophyllus	25	27	.25	.45
B	Gutierrezia sarothrae	85	26	3.00	.10
B	Opuntia fragilis	2	5	-	.03
Total for Browse		203	151	17.23	13.94

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 20

Species	Percent Cover '04
Artemisia tridentata wyomingensis	12.58
Chrysothamnus viscidiflorus stenophyllus	.20
Gutierrezia sarothrae	.18

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 20

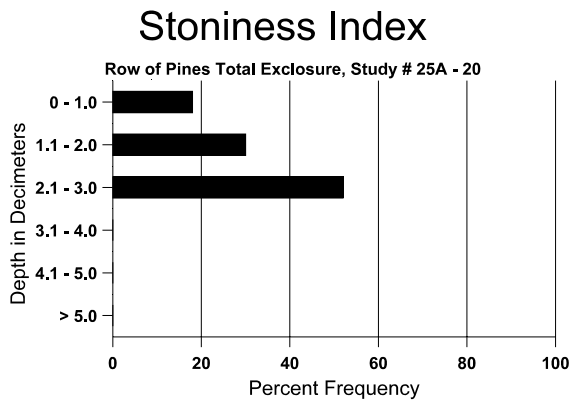
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.0

BASIC COVER --
Management unit 25A, Study no: 20

Cover Type	Average Cover %	
	'99	'04
Vegetation	28.20	22.57
Rock	9.11	15.25
Pavement	31.69	40.29
Litter	10.99	18.40
Cryptogams	0	.06
Bare Ground	20.04	16.37

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 20, Study Name: Row of Pines Total Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.1	58.3 (9.6)	7.0	47.3	27.4	25.3	1.6	8.5	163.2	0.6



PELLET GROUP DATA --
Management unit 25A, Study no: 20

Type	Quadrat Frequency	
	'99	'04
Cattle	1	-

Days use per acre (ha)	
'99	'04
-	-

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
99	**6160**	-	320	4180	1660	620	0	0	27	18	19	11/21
04	**6300**	20	360	2120	3820	1320	0	0	61	37	37	10/19
Chrysothamnus viscidiflorus stenophyllus												
99	**900**	-	-	740	160	-	0	0	18	18	20	4/7
04	**880**	-	20	580	280	160	0	0	32	9	9	5/9
Gutierrezia sarothrae												
99	**6320**	-	240	6040	40	260	0	0	1	.63	2	7/9
04	**620**	-	80	520	20	-	0	0	3	-	0	5/7
Opuntia fragilis												
99	**40**	-	20	20	-	-	0	0	-	-	0	-/-
04	**100**	-	-	100	-	-	0	0	-	-	0	2/9

ROW OF PINES EXCLOSURE COMPARISON SUMMARY 25A-14, 19, & 20

Ground cover characteristics are similar between sites in that vegetation and litter cover are low and most of the ground cover is made up of rock and pavement. Vegetation cover has declined for all three studies, while the total exclosure has the most vegetation cover. Litter cover was similar for each study in 2004. Rock and pavement cover increased inside each exclosure, which may indicate soil loss, while bare ground increased outside the exclosure. Due to the study sites close proximity, soil conditions are nearly identical. The soil is moderately shallow with effective rooting depths at just over 11 inches. Soil texture is a sandy clay loam to a loam with an identical neutral pH (7.0). Soil temperatures were about equal for each site at about 58°F for each treatment in 2004. There is minimal soil movement occurring but the armored nature of the soil surface limits erosion.

Wyoming big sagebrush (see table below) densities were similar in 1999, ranging from 5,580 plants/acre outside to 5,820 plants/acre in the livestock exclosure, and 6,160 in the total exclosure. In 2004, density outside the exclosure and inside the livestock exclosure declined by about 15% for each, however inside the total exclosure density increased by 20%. Decadence increased for each study from about 27% in 1999 to 42% outside, 69% in the livestock exclosure, and 52% in the total exclosure in 2004. The percent of dying plants also increased for each study. Utilization is moderate outside of the exclosure and much heavier in the livestock exclosure. Outside the exclosure, deer use increased from 29 days use/acre (72 ddu/ha) in 1999 to 76 days use/acre (190 ddu/ha) in 2004. In the livestock exclosure, deer use increased from 48 days use/acre (118 ddu/ha) to 126 days use/acre (312 ddu/ha). Elk and cattle use has been low. Seed production and recruitment is poor on all sites and young plants are not abundant enough to maintain the current populations. The combination of drought 4 of the past 5 years in addition to increased utilization outside the exclosure and inside the livestock exclosure appear to have caused the decline of this sagebrush population. Inside the total exclosure, where plants receive no browsing, sagebrush vigor has declined, but density actually increased. Continued drought may prove to be detrimental as 32% of the population appears to be dying.

	Outside Exclosure 25A-14		Livestock Exclosure 25A-19		Total Exclosure 25A-20	
	1999	2004	1999	2004	1999	2004
Cover	13.11	11.14	8.23	5.31	13.97	13.35
Density (Plants/acre)	5580	4780	5820	4900	6160	7340
% young (Plants/acre)	6 (340)	2 (80)	3 (160)	2 (100)	5 (320)	5 (360)
% mature (Plants/acre)	65 (3620)	56 (2700)	70 (4100)	29 (1440)	68 (4180)	44 (3200)
% decadent (Plants/acre)	29 (1620)	42 (2000)	27 (1560)	69 (3360)	27 (1660)	52 (3820)
% dying (Plants/acre)	14 (760)	19 (900)	17 (980)	34 (1680)	18 (1080)	31 (2320)
% heavy use	17	22	46	60	0	0
Average height/crown	13/24	13/25	12/23	10/20	11/21	10/19

Density of the increaser, thinleaf low rabbitbrush, is similar between sites at about 900 plants/acre. Another increaser, broom snakeweed, was extremely abundant outside of the exclosure at 10,000 plants/acre in 1999, but density decreased 86% to 1,420 in 2004. Density also decreased for both exclosure transcects to about 600 plants/acre in each exclosure.

The herbaceous understories are similar on all sites in composition, but abundance differs. Outside of the exclosure, the warm season species blue grama dominates the grass composition by providing 85% of the grass cover. This indicates heavy spring grazing. Inside the exclosures composition is similar, but no single species dominates. Crested wheatgrass and bottlebrush squirreltail each declined significantly in nested frequency in 2004 for all three studies, which indicates the effects of drought. With the absence of grazing in the total exclosure, Russian wildrye increased significantly. Forbs are rare and declined for each study in 2004.

Trend Study 25R-1-04

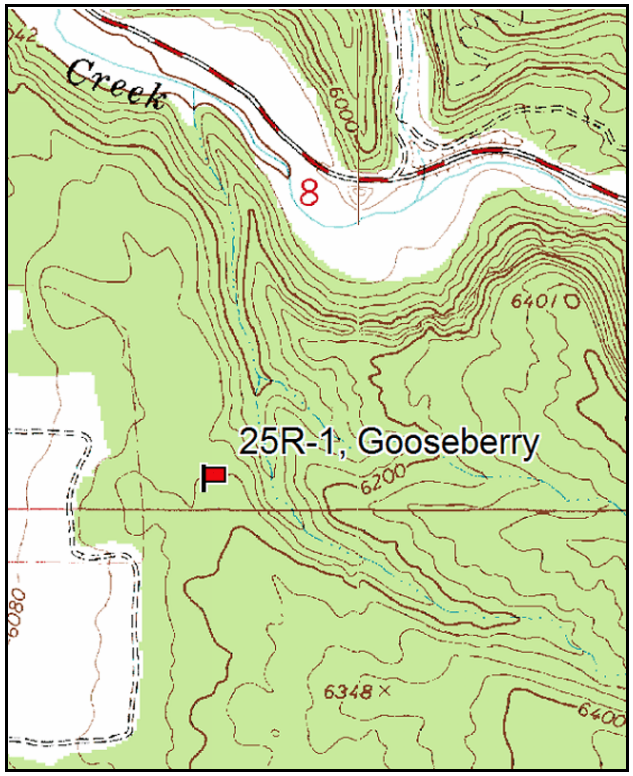
Study site name: Gooseberry . Vegetation type: Pinyon-Juniper .

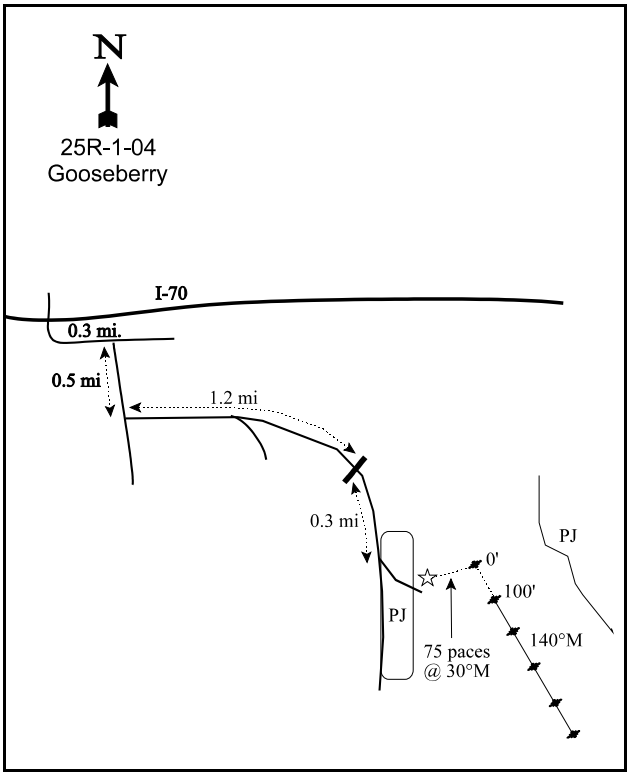
Compass bearing: frequency baseline 140 degrees magnetic.

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

LOCATION DESCRIPTION

Take exit #61 from I-70 and turn south. Go 0.3 miles to a right turn. Take this turn and go 0.5 miles to a left (east) turn. Take this turn and go 0.6 miles to a fork. Take the left fork and go 0.6 miles to a gate. Go another 0.3 miles past the gate to a small road leading into the chaining. The half-high witness post is located inside the chaining where the road ends. The browse tag for the transect is #150.





Map name: Gooseberry Creek . Diagrammatic Sketch

Township 22 S, Range 2 E, Section 32 GPS: NAD 27, UTM 12S 4306060 N, 438211 E

DISCUSSION

Gooseberry - Trend Study No. 25R-1

The Gooseberry study site was established in 1997 prior to being chained in the fall of 1997. The chaining was done to improve wildlife habitat to try and prevent deer from going onto nearby alfalfa fields to the west. Prior to treatment, the site was dominated by pinyon and juniper situated on a northwest aspect at an elevation of 6,200 feet with a 7% slope. It presently supports a few heavily grazed seeded grasses and forbs. Pellet group data from 1997 estimated 13 deer (33 ddu/ha) and 18 elk days use/acre (45 edu/ha). Pellet group data from 2004 estimated 40 cows days use/acre (98 cdu/ha). Cow use was from late spring to early summer.

The soil is a light brown loam texture and has a neutral pH (7.1). Organic matter is moderately high at 4.0%. Rock is prevalent on the surface and throughout the profile, resulting in an estimated effective rooting depth of just under 11 inches. The rocks have a calcium carbonate coating and a calcium carbonate layer was found in the soil at about 11 inches. Bare ground was relatively low before the chaining at about 20% in and increased to 46% in 2004. Litter before the chaining made up 62% of the ground cover and dropped to 30% by 2004. Typically litter is greater after a chaining and the differences is the slash from the chaining was piled into clumps. Erosion is minimal due to the heavily armored surface from pavement and rock. The erosion condition class determined soil movement as stable in 2004.

Pinyon and juniper was the dominate browse species before the chaining and accounted for 68% of the total vegetation cover. Before the chaining, pinyon was estimated at 104 trees/acre with an average diameter of 5.4 inches. Juniper was estimated at 112 trees/acre with an average diameter of 19.1 inches. There is still good cover of pinyon and juniper surrounding the site. No preferred browse was observed before or after the chaining and only broom snakeweed was found after the chaining. The high percentage of bare ground creates the potential for broom snakeweed to expand rapidly.

Prior to the chaining, the herbaceous understory was dominated by cheatgrass and a few native grasses such as Indian ricegrass and bottlebrush squirreltail. Forbs consisted of a few small annual species. The herbaceous understory accounted for 27% of the total vegetation cover before the chaining and increased to 93% after the chaining. Perennial grasses such as crested wheatgrass and intermediate wheatgrass established well after the chaining, although were heavily utilized by cows earlier in the summer. Cheatgrass was still found on the site, but decreased significantly from 1997 observations. Alfalfa is the dominate forb and makes up 27% of the total vegetation cover.

The original goal of this project was to keep deer off of the alfalfa fields by creating better habitat in the pinyon/juniper zone. Unfortunately, pellet group data suggest that no deer or elk are using the site. It would appear that there is some conflict with management if the area was treated to create habitat for deer, but cows are utilizing all the forage. Continued heavy livestock use will continue to decrease the value of this site.

2004 TREND ASSESSMENT

Trend for soil is down. Percent bare ground increased from 20% in 1997 to 46% in 2004. Litter from chaining was collected in large piles, which is not as effective at reducing erosion or creating safe sites for seed establishment. Trend for browse species is slightly down. No preferred browse species are found on this site and with broom snakeweed on the site it may rapidly become a weed problem. Trend for herbaceous understory is up. Perennial grasses and forbs increased significantly and provide protection for the soil. Heavy use by cows was observed, and if continued may have detrimental effects on this site. The Desirable Components Index rated this site as very poor with a score of 27 due to no preferred shrub cover and moderate to good perennial grass and forb cover.

TREND ASSESSMENT

soil - down (1)
browse - slightly down (2)
herbaceous understory - up (5)
1997 winter range condition (DC Index) - 6 (very poor) P-J chaining type
2004 winter range condition (DC Index) - 27 (very poor) P-J chaining type

HERBACEOUS TRENDS --
Management unit 25R, Study no: 1

Type	Species	Nested Frequency		Average Cover %	
		'97	'04	'97	'04
G	Agropyron cristatum	a-	b135	-	4.57
G	Agropyron intermedium	a-	b112	-	3.18
G	Bromus tectorum (a)	b235	a100	1.55	.82
G	Carex spp.	b15	a-	.15	-
G	Dactylis glomerata	a-	b21	-	.16
G	Oryzopsis hymenoides	b51	a4	.66	.05
G	Poa fendleriana	-	-	-	.00
G	Poa pratensis	-	-	-	.00
G	Poa secunda	25	38	.14	.58
G	Sitanion hystrix	b27	a3	.18	.03
G	Vulpia octoflora (a)	b19	a-	.03	-
Total for Annual Grasses		254	100	1.59	0.81
Total for Perennial Grasses		118	313	1.14	8.59
Total for Grasses		372	413	2.74	9.40
F	Alyssum alyssoides (a)	b235	a84	1.11	.24
F	Chenopodium fremontii (a)	-	7	-	.04
F	Cirsium spp.	-	1	-	.15
F	Cryptantha spp.	25	17	.53	.20
F	Descurainia pinnata (a)	a-	b14	-	.14
F	Eriogonum cernuum (a)	5	-	.01	-
F	Erigeron pumilus	-	3	-	.00
F	Gilia spp. (a)	a-	b19	-	.08
F	Lappula occidentalis (a)	7	-	.01	-
F	Leucelene ericoides	7	-	.07	-
F	Medicago sativa	-	148	-	4.19
F	Phlox austromontana	-	2	-	.03
F	Physaria spp.	-	3	-	.00
F	Ranunculus testiculatus (a)	a51	b78	.14	.49
F	Sanguisorba minor	-	25	-	.46

Type	Species	Nested Frequency '97	Nested Frequency '04	Average Cover % '97	Average Cover % '04
F	Senecio integerrimus	-	2	-	.00
F	Senecio multilobatus	$_{a}$-	$_{b}$28	-	.10
F	Streptanthus cordatus	-	2	-	.00
Total for Annual Forbs		298	202	1.28	1.00
Total for Perennial Forbs		32	231	0.60	5.17
Total for Forbs		330	433	1.88	6.17

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

BROWSE TRENDS --
Management unit 25R, Study no: 1

Type	Species	Strip Frequency '97	Strip Frequency '04	Average Cover % '97	Average Cover % '04
B	Cercocarpus montanus	2	0	-	-
B	Gutierrezia sarothrae	15	28	.25	1.08
B	Juniperus osteosperma	2	0	5.34	-
B	Opuntia spp.	26	0	.47	-
B	Pinus edulis	4	1	6.31	-
Total for Browse		49	29	12.37	1.08

CANOPY COVER, LINE INTERCEPT --
Management unit 25R, Study no: 1

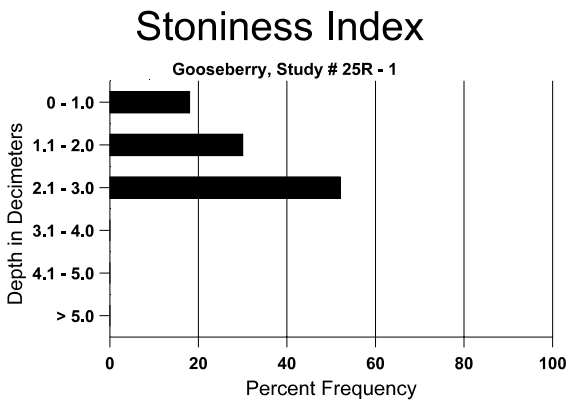
Species	Percent Cover '97	Percent Cover '04
Gutierrezia sarothrae	-	2.26
Juniperus osteosperma	14.00	-
Pinus edulis	12.39	-

BASIC COVER --
Management unit 25R, Study no: 1

Cover Type	Average Cover %	
	'97	'04
Vegetation	18.26	14.71
Rock	7.30	6.22
Pavement	5.50	9.72
Litter	61.62	29.93
Cryptogams	.65	.18
Bare Ground	20.44	46.09

SOIL ANALYSIS DATA --
Management unit 25R, Study no: 1, Study Name: Gooseberry

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
10.9	54.0 (14.1)	7.1	38.0	35.4	26.6	4.0	16.1	192.0	2.9



PELLET GROUP DATA --
Management unit 25R, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'04	'04
Rabbit	9	49	-
Elk	2	2	-
Deer	9	1	-
Cattle	-	10	40 (98)

BROWSE CHARACTERISTICS --
Management unit 25R, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus montanus												
97	**40**	-	-	40	-	-	0	100	-	-	0	21/21
04	**0**	-	-	-	-	-	0	0	-	-	0	19/16
Gutierrezia sarothrae												
97	**1140**	20	60	1080	-	-	0	0	0	-	4	10/10
04	**1280**	-	20	1220	40	60	0	0	3	-	2	9/11
Juniperus osteosperma												
97	**40**	-	-	40	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
97	**980**	-	-	960	20	-	0	0	2	2	2	3/5
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Pinus edulis												
97	**80**	40	-	80	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-

SUMMARY

WILDLIFE MANAGEMENT UNIT 25A - PLATEAU, FISH LAKE

Twelve trend study sites on the Fish Lake Unit were originally established in 1985. These were reread in 1991 and an additional three summer or transitional sites were established. All 15 sites were reread in 1999 and two new sites were established within the Row of Pines Exclosure. Overall, the trend study sites show a lack of forbs. The only sites with a moderately high proportion of forbs in the understory occur at East Tidwell (#25A-12) a high elevation summer range site, and Ox Spring (#25A-13) which samples a prescribed burn. Both of these sites currently display a downward trend with respect to forbs. Forb cover for the other 13 trend study sites averages only 1.7% . Seven of these sites show declining trends for forbs while the other 6 are stable.

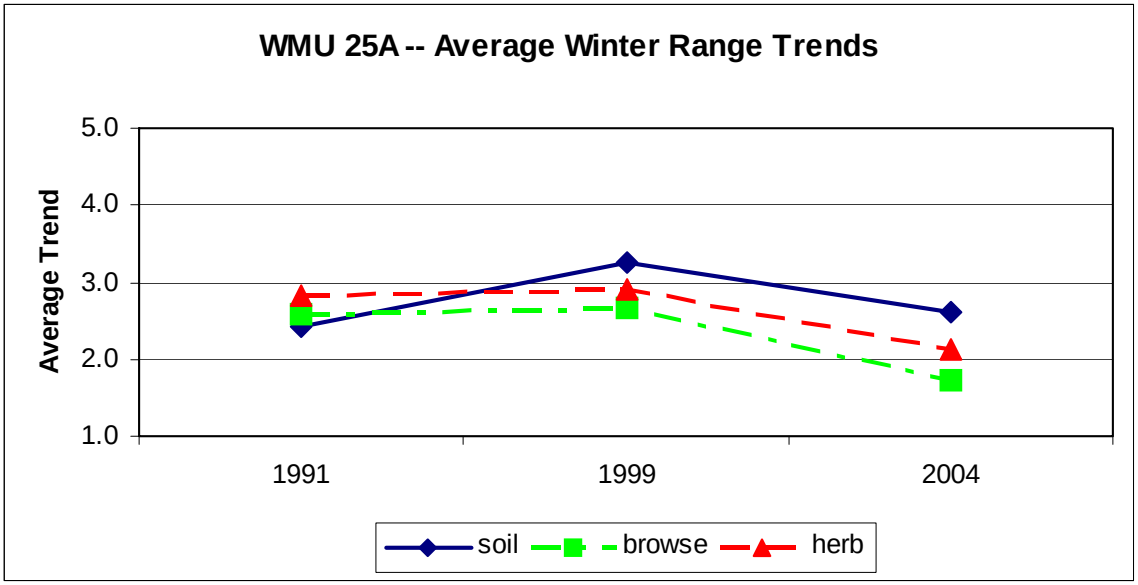
Of the 10 winter range sites on the Fish Lake unit, three sites, Triangle Mountain (#25A-1) and Black Mountain (#25A-2), and Durfee Homestead (#25A-4) monitor pinyon-juniper chainings on deer and elk winter range. The trend study at Lower Dog Flat (#25A-8) samples a chaining on mountain big sagebrush. The Triangle and Black Mountain studies have little browse on site.

Other winter range sites which sample mostly sagebrush include; Sage Flat (#25A-3), Praetor Slope (#25A-5), Row of Pines (#25A-9), Cedarless Flat (#25A-10), Forsyth Reservoir (#25A-11), and Tommy Hollow (#25A-16). The trend study at Evans Reservoir (#25A-7) samples primarily pronghorn range but it is also used by deer and elk in the winter.

Four trend study sites sample deer and elk summer and/or transitional range on the Fish Lake unit. These include; East Tidwell (#25A-12), Ox Spring (#25A-13), Row of Pines Exclosure (#25A-14), and Elk Camp (#25A-18).

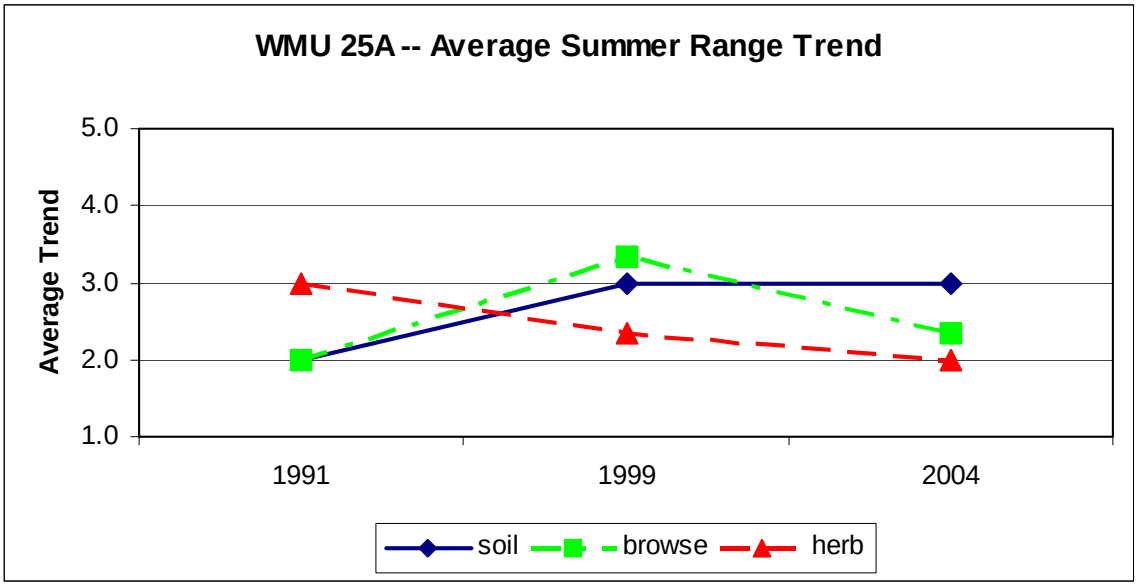
Average Winter Range Trends -- WMU 25A
Plateau, Fish Lake

	1991	1999	2004
soil	2.4	3.3	2.6
browse	2.6	2.7	1.7
herb	2.8	2.9	2.1
	11 sites	12 sites	15 sites

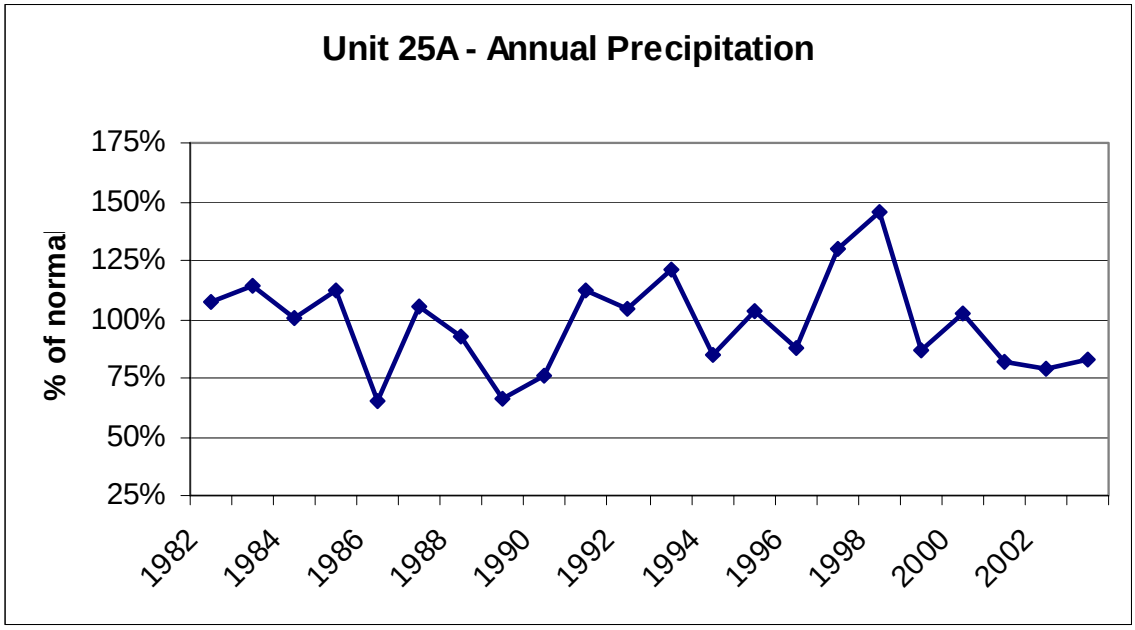


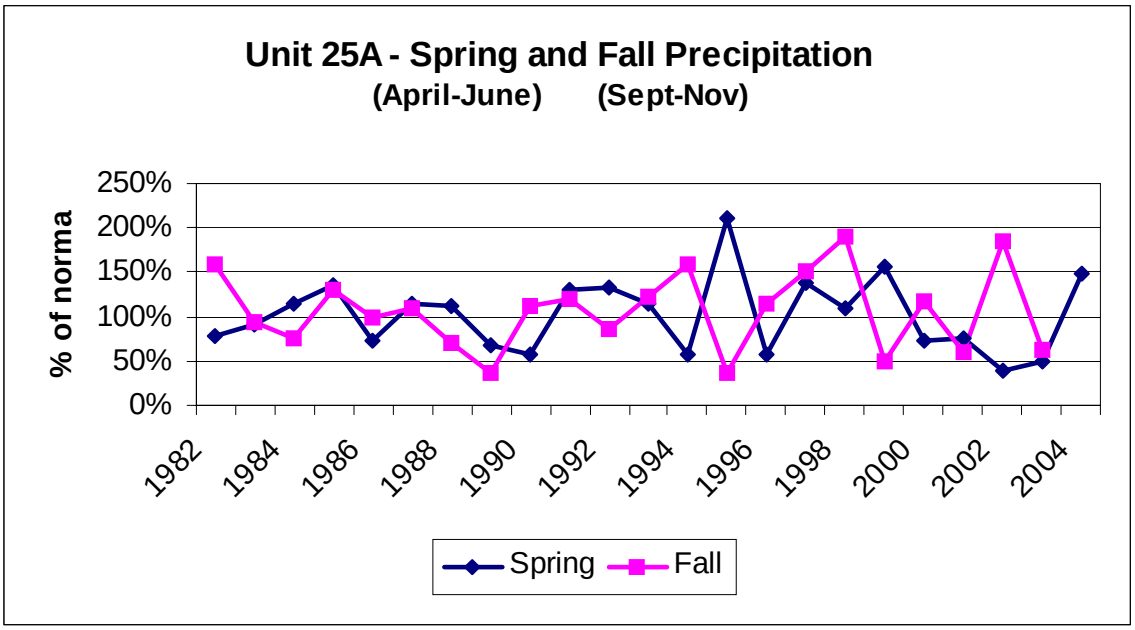
Average Summer Range Trends -- WMU 25A Plateau, Fish Lake

	1991	1999	2004
soil	2.0	3.0	3.0
browse	2.0	3.3	2.3
herb	3.0	2.3	2.0
	1 site	3 sites	3 sites



Precipitation graphs for the Plateau, Fish Lake unit. Data is percent of normal precipitation averaged for 3 weather stations in Salina, Richfield, and Koosharem (Utah Climate Summaries 2004).





TREND SUMMARY

	Category	1985	1991	1999	2004
25A-1 Triangle Mountain	soil	est	4	3	3
	browse	est	5	3	3
	herbaceous understory	est	4	3	2
25A-2 Black Mountain	soil	est	2	3	2
	browse	est	1	3	1
	herbaceous understory	est	4	3	3
25A-3 Sage Flat	soil	est	3	3	3
	browse	est	5	3	1
	herbaceous understory	est	1	1	1
25A-4 Durfee Homestead	soil	est	1	3	3
	browse	est	1	1	3
	herbaceous understory	est	1	4	2
25A-5 Praetor Slope	soil	est	3	3	3
	browse	est	2	3	1
	herbaceous understory	est	3	3	4
25A-7 Evans Reservoir	soil	est	2	3	3
	browse	est	2	2	1
	herbaceous understory	est	4	2	3
25A-8 Lower Dog Flat	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	3	3	1
25A-9 Row of Pines	soil	est	2	4	3
	browse	est	2	2	1
	herbaceous understory	est	3	5	1

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up,
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

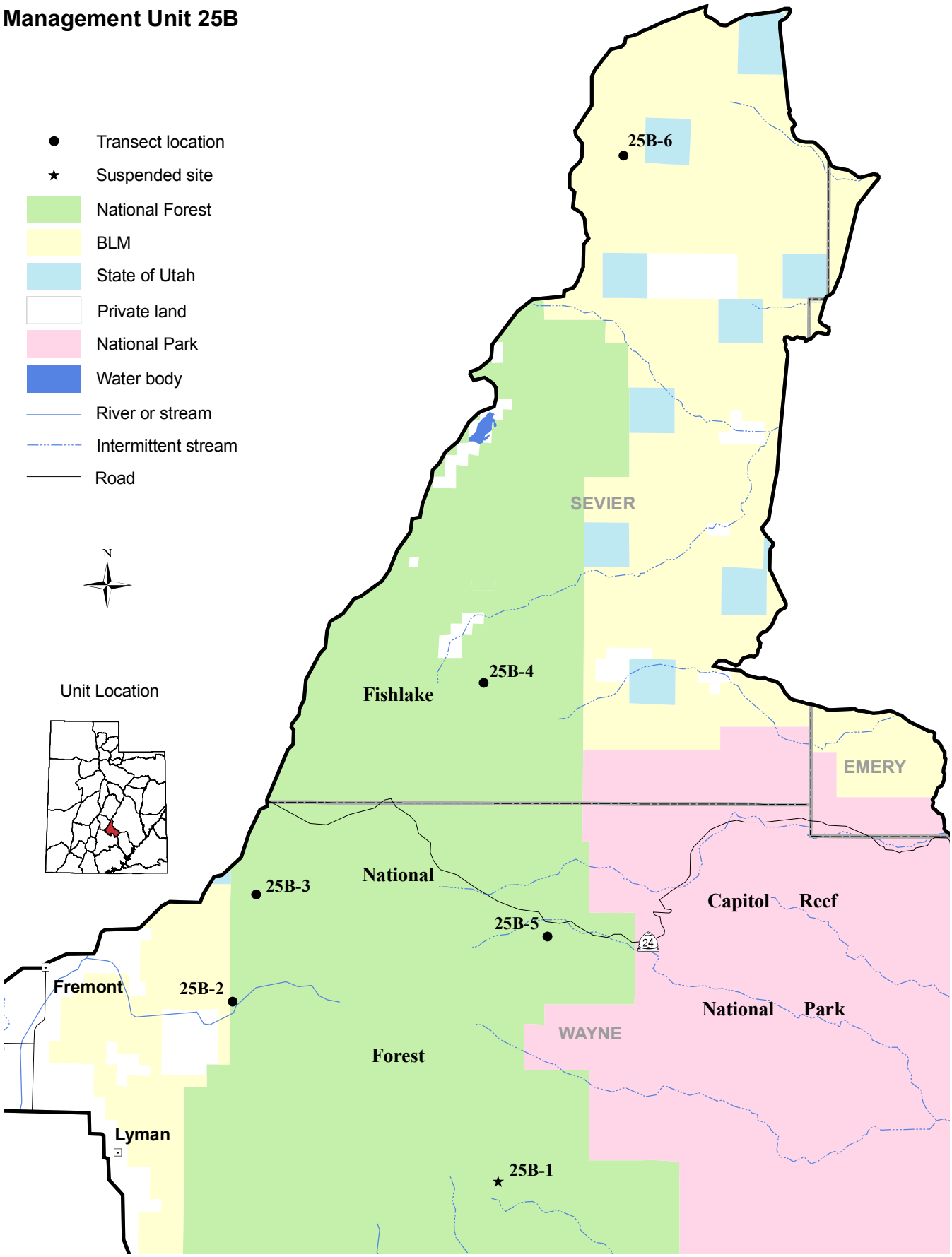
	Category	1985	1991	1999	2004
25A-10 Cedarless Flat	soil	est	3	3	3
	browse	est	4	3	2
	herbaceous understory	est	5	2	1
25A-11 Forsyth Reservoir	soil	est	3	3	3
	browse	est	4	3	1
	herbaceous understory	est	3	3	3
25A-12 East Tidwell	soil		est	3	3
	browse		est	3	3
	herbaceous understory		est	2	2
25A-13 Ox Spring	soil		est	3	3
	browse		est	4	2
	herbaceous understory		est	2	1
25A-14 Row of Pines Exclosure	soil		est	4	2
	browse		est	2	2
	herbaceous understory		est	4	1
25A-16 Tommy Hollow	soil	est	3	4	3
	browse	est	2	4	2
	herbaceous understory	est	3	2	3
25A-18 Elk Camp	soil	est	2	3	3
	browse	est	2	3	2
	herbaceous understory	est	3	3	3
25A-19 Row of Pines Livestock Exclosure	soil			est	2
	browse			est	1
	herbaceous understory			est	1
25A-20 Row of Pines Total Exclosure	soil			est	2
	browse			est	2
	herbaceous understory			est	1

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up,
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

	Category	1997	2004
25R-1 Gooseberry	soil	est	1
	browse	est	2
	herbaceous understory	est	5

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up,
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Management Unit 25B



Map scale 1:190,000 (1 inch = 3 miles)

WILDLIFE MANAGEMENT UNIT 25B - PLATEAU, THOUSAND LAKE MOUNTAIN

Boundary Description

Wayne, Emery, and Sevier Counties - Boundary begins at Highway SR-24 and Highway SR-72; north on SR-72 to Interstate 70; east on I-70 to Cainesville road; south on this road to SR-24; west on SR-24 to SR72 and beginning point.

Unit Description

The Thousand Lake Wildlife Management unit is part of the large management unit 25 - Plateau. This unit is divided into three sub units, Fish Lake (25A), Thousand Lake (25B), and Boulder Mountain (25C). Management unit 25B was named after Thousand Lake Mountain, a lava-capped plateau with numerous small natural lakes. This mountain reaches an elevation of 11,295 feet and overlooks Capital Reef National Park and the desert country east of the unit. At the extreme southeastern corner of the unit is the lowest point elevationally in the herd unit at Cainesville (about 4,100 feet). The vegetative composition varies greatly throughout the unit with respect to topographical relief and elevation. Cainesville averages about 185 frost-free days and 5 to 6 inches of rainfall a year, while Thousand Lake Mountain receives 25 to 30 inches of rainfall a year and averages only 20 to 40 frost-free days. Grazing, uranium exploration, and logging are the three uses that have had the most impact on the Thousand Lakes unit.

Grazing of cattle, horses, and sheep commenced with the settlement of the region in the 1860's. The range was open to anyone and was used from the time the snow melted enough in the spring to get livestock on the mountain, until the snow drove them off in the fall. Much of the east side, especially the Solomon Basin area, was used year-round by cattle. Because of the plentiful, well-dispersed water sources, the relatively flat mountain top was also heavily grazed each summer. This overgrazing resulted in soil compaction and soil loss at water sources, erosion problems, decreased water quality, and a decrease of the valuable grass-forb component in the vegetative community until nearly monotypic shrub types remained. The Forest Service has gradually increased grazing restrictions in order to allow the range to recover. Currently many areas are beginning to show improvements, but it will take a long time for the land to recover naturally.

Uranium prospectors have also left their mark on the land. Four-wheel drive vehicles and heavy equipment tracks crisscross the unit and are still quite visible.

Stands of ponderosa pine, Douglas-fir, and Engelmann spruce are found on the mountain with many areas having been logged in the past. Fire suppression has helped to accelerate succession of the high mountain aspen-meadow parklands toward climax stands of Engelmann spruce. Canopy closure in these spruce forests nearly eliminates all understory species, resulting in a significant loss of forage production. Timber sales and prescribed burns which open up the canopy and encourage resprouting of aspen would be necessary to retain sufficient acreage of the already limited big game summer range.

Despite human impacts, portions of Thousand Lake Mountain are under consideration for wilderness designation. However, gas and oil exploration is an ongoing activity and coal deposits in the Last Chance area have drawn proposals for both underground and strip mining. Also, Highway U-72 which forms the western boundary, has been paved and will now be maintained for year-round use. This will tend to encourage more recreation and tourism through the area.

The unit has good winter range with ample protective cover, large basins, draws, and open ridges. The upper limits of the normal winter range vary from 8,400 feet at the northern boundary to 9,000 feet on the south end of the mountain. The lower normal winter range limit is between 6,000 and 7,400 feet in elevation. At present, the winter range appears ample to support the deer and elk from the Thousand Lakes unit and also

many wintering deer from the adjacent Fish Lake unit. Solomon Basin, Sage Flat, Horse Valley, Sand Flat, Paradise Flat, and Lyman Slopes are all winter concentration areas.

Several different estimates of the size of the unit's big-game ranges can be found. Many of these estimates are discussed here. Huff and Blotter (1964) conducted the original survey of the area's deer ranges and reported 90,489 acres of winter range. Jense et al. (1985) quoted this estimate but rounded it off. Mann (1985) used the same figure to arrive at an estimate of 3,800 acres that needs to be acquired from the private sector and maintained to help maintain the deer herd. In the deer herd unit management plan, Bogedahl (1983) gave markedly different estimates of the range sizes. This project planimetered the boundaries of the winter range as drawn on the original base map by Huff and Blotter to arrive at an estimate of 103,733 acres.

Huff and Blotter (1964) inventoried the vegetation on the winter range in 1963. They reported acreage and cover density for three major vegetative types. Pinyon-juniper made up 73% of the winter range with about 9% cover for desirable browse species. The sagebrush and mixed browse types accounted for 10% and 4% of the winter range and had 19% and 18% of the cover respectively for the key browse species. Ponderosa pine, with a healthy understory of antelope bitterbrush, is located along the upper edge of the winter range between Water Canyon and Sand Creek.

The condition of the spring and summer range is the current management concern. As the snow begins to recede in the spring, deer seek green grasses and forbs which are very scarce on the heavily overgrazed spring ranges. At this time, the early green-up in the alfalfa and grain fields on private land near Loa, Fremont, Lyman and Torrey are very attractive to wildlife and depredation problems become serious. The DWR has been working in cooperation with the BLM and Forest Service on revegetation projects immediately above these private lands to provide spring forage and alleviate this problem. Most of the big game summer range is in fairly good condition and adequate for present needs, but it is limited in size and should be managed carefully to insure that the necessary quality and quantity of summer range is maintained in order to maintain herds at current levels. Small sage flats on top of the mountain which have been sprayed with 2,4-D, have displayed increased summer use by deer as forb and grass production increases. Limited use of these treatments in combination with logging and prescribed burns in spruce and aspen stands could be helpful in maintaining and improving the summer range.

Wildlife Management Unit Objectives

The current management plan is to achieve a target wintering population of 2,000 deer with a postseason buck to doe ratio of 15:100, with 30% of these bucks being 3 point or better. The objective for elk is to achieve a population of 4,800 wintering elk on sub units 25A - Fish Lake and 25B - Thousand Lake with a herd composition of 8 bulls to 100 cows with at least 4 of those bulls being 2 ½ years or older.

Trend Study Site Description

Forest Service, BLM, and DWR personnel met in August, 1985 to discuss range trend studies and to select critical areas of big game range where trend should be monitored. Five sites were chosen for permanent range trend studies on the herd unit. These studies; Thousand Lake (25B-1), Horse Valley (25B-2), Sage Flat (25B-3), Solomon Basin (25B-4), and Polk Creek (25B-5), were established in 1985. Another site, Little Deer Peak (25B-6), has been added to the Thousand Lake unit. It originally was from a neighboring unit, but was switched to Thousand Lake unit with the latest alignment of the management unit boundaries. All of these sites were reread in 1991 and 4 of the 6 sites were read in 1994. All 6 sites were revisited in 1999. In 2004, all sites were monitored, except for Thousand Lake (25B-1) due to poor access.

Trend Study 25B-2-04

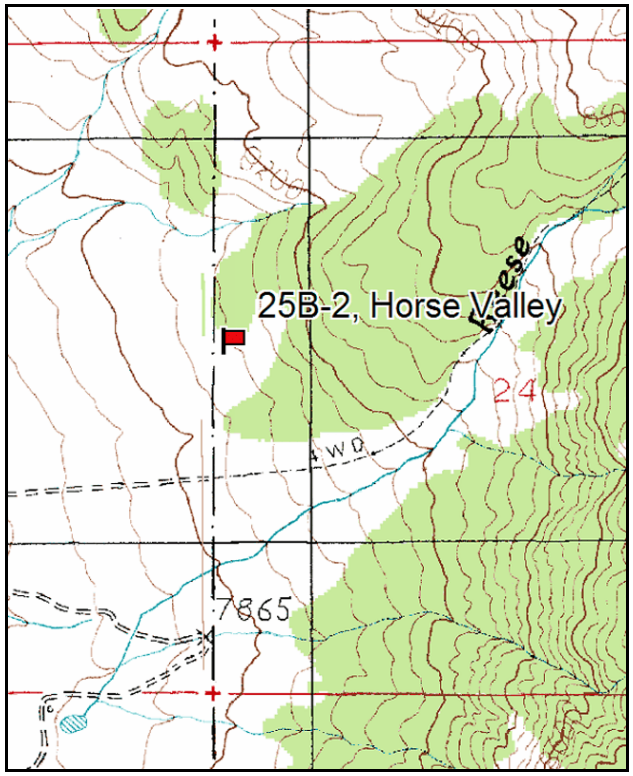
Study site name: Horse Valley . Vegetation type: Wyoming Big Sagebrush .

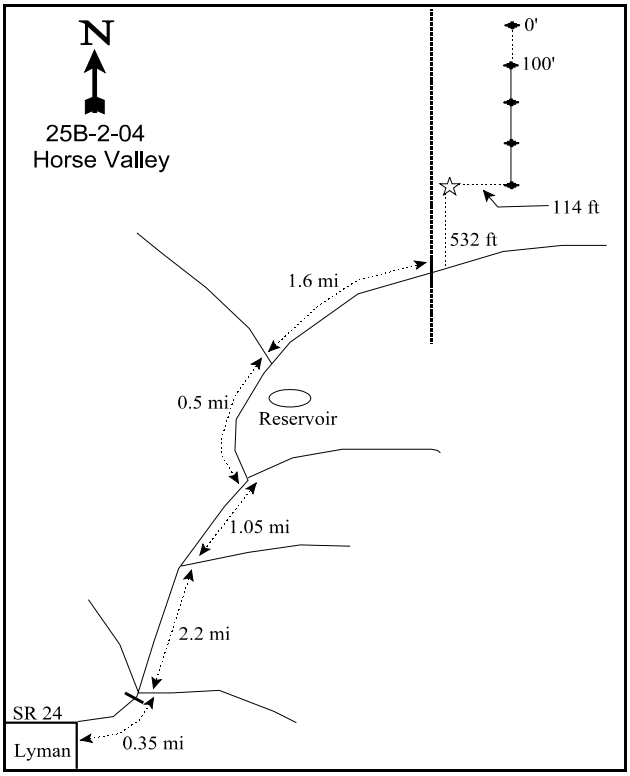
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

At the north end of main street (SR 24) in Lyman, SR 24 turns west towards Loa. Turn east here and go 0.35 miles to a 3-way split just beyond a cattleguard. Take the middle fork (the main road) and go 2.2 miles to a fork. Stay left and continue 1.05 miles on the main road to another fork. Again stay left and proceed 0.5 miles north just past a small reservoir to an intersection. Take the right fork toward Neffs Reservoir. On the main road, go 1.6 miles up and east across the top of some private land to a cattleguard at the Forest Service boundary. Park here, then walk 532 feet north along the east side of the fence to a witness post (rebar) next to the fence. The 400' stake is 114 feet east of the witness post. The 0-foot baseline stake lies 400 feet north, and has a red browse tag #7065 attached.





Map Name: Loa 1 NE, Utah

Diagrammatic Sketch

Township 27S , Range 3E , Section 24

GPS: NAD 27, UTM 12S 4255460 N, 452786 E

DISCUSSION

Horse Valley - Trend Study No. 25B-2

This transect is located in a sagebrush opening just east of the Forest Service boundary fence in Horse Valley. The west side of the fence is a strip of BLM land which has been proposed for a pinyon-juniper chaining and seeding treatment. Most of the valley is privately owned farmland. The study site has a gentle slope (5-10%) with a southwest aspect at an elevation of 8,000 feet. The key species is Wyoming big sagebrush. Cattle graze in the area as part of the Thousand Lakes allotment. The area is thought to be a winter deer concentration area, with many moving into the lower fields in late winter or early spring. However, the pellet group transect read along the baseline has shown very light use in both 1999 and 2004. In 1999, pellet group data estimated 1 days use/acre (3 du/ha) for both cattle and deer. In 2004, 1 deer and 1 elk days use/acre (3du/ha) were estimated.

The light brown-orange soil appears to be moderate deep with an effective rooting depth of almost 15 inches. It is composed mainly of sand and some silt with little organic matter. Textural analysis indicates it is a sandy clay loam soil that is mildly alkaline (pH of 7.6). Soil phosphorus (7.7 ppm) could be limiting to plant growth and development because it is below what is thought the minimal value of 10 ppm. Rocks and pavement together make up over 30% of the ground cover. Percent bare soil has varied from year to year, however the ratio of bare soil to protective cover improved from 1:1.8 in 1994 to 1:2.1 in 1999, but declined slightly in 2004 to 1:1.9. This would indicate a stable trend for soil, but still poor condition with herbaceous cover only contributing 8% of the total vegetative cover. Active gullies up to 1.5 feet deep are common. Movement of soil and rock fragments is detectable and in some places plant roots are exposed. A soil erosion condition rating rated erosion as slight in 2004.

Wyoming big sagebrush provides almost all of the browse cover on this site. However, there has been a lot difficulty through the years differentiating between black sagebrush and Wyoming big sagebrush on this site. There is obviously a high occurrence of hybridizing between the two and the great deal of variation expressed in the plants within the area sampled. Wyoming big sagebrush is the most dominant species. The population has many individuals that have hybridized with black sagebrush or with mountain big sagebrush. Forty percent of the leaf samples fluoresced with a black light, indicating regression with the higher elevation mountain big sagebrush. These sagebrush average 1.5 feet in height and 2.5 feet crowns. Wyoming big sagebrush was generally vigorous and growing well in 1985, but since then decadency has increased and remained between 37 and 45%. Utilization has been light and was very light in 2004. A few individuals have been more heavily utilized, usually individuals that are hybrids of mountain big sagebrush and Wyoming big sagebrush. The young age class was higher in 1985 and 1991, but has been smaller in subsequent readings with only 4% classified as young in 2004. Density has been stable since 1985 with the exception of 1994 when some plants were classified as black sagebrush.

Broom snakeweed and narrowleaf low rabbitbrush are also commonly found here. The narrowleaf low rabbitbrush is moderately abundant, but is generally small in stature. It displayed moderate to heavy use in past years (57% in ‘91 and 37% in ‘94), with some of the plants displaying poor vigor. Density has been lower in recent readings and utilization has been very light. Broom snakeweed density was very high in 1985 and 1991, but decreased rapidly by a factor of more than four times in 1994. It increased to 4,890 plants/acre in 1999 and remained relatively stable at 5,320 plants/acre in 2004. These kind of fluctuations in density occur often for this species with the variable precipitation patterns of southern Utah. Pinyon density was 53 trees/acre in 1999 using the point-quarter method. Average diameter was 2.3 inches. In 2004, this density increased to 118 trees/acre with an average diameter of only 1.0 inch. In 2004, 89% of the trees sampled were classified less than 4 feet tall.

Forbs and grasses are scarce and diversity is low with Wyoming big sagebrushes cover at nearly 20%. Grass frequency is very low and the most common species are blue grama and bottlebrush squirreltail. The total cover from grasses and forbs was just over 4% in 1999 and less than 2% in 2004. The most abundant forb has been pingue hymenoxys, an increaser which is often poisonous to sheep and sometimes to cattle. It decreased significantly in 2004.

1985 APPARENT TREND ASSESSMENT

Soil trend appears to be down. The soil is fairly unstable and has a low amount of cover. Small gullies are common and active. Vegetative trend appears slightly down because of the increase of undesirable increasers. The Wyoming big sagebrush population appears stable and moderately used. A proposed chaining would be helpful on the adjacent mature pinyon-juniper woodlands and older sagebrush stands as long as adequate cover is left for wildlife. More herbaceous vegetation is needed in the area to provide green forage for transitional spring range.

1991 TREND ASSESSMENT

Soil trend appears to be continuing slightly down because percent bare ground increased substantially with a corresponding loss of litter cover. Key browse species have decreased densities. Black sagebrush has decreased with percent decadency going from 14% up to 75%. Wyoming big sagebrush densities decreased only slightly, but percent decadency went from 14% up to 45%. Narrowleaf low rabbitbrush density decreased 13% due to drought and 96% are decadent. Broom snakeweed density increased by 24% from 6,199 to 8,199 plants per acre. This trend for broom snakeweed is contrary to most other sites in Utah this year.

TREND ASSESSMENT
soil - slightly down, poor condition (2)
browse - slightly down (2)
herbaceous understory - slightly up, but still very poor condition (4)

1994 TREND ASSESSMENT

Soil trend now appears to be stabilizing with percent bare ground cover slightly lower than 1991 estimates. The soils are considered in poor condition, but the trend has remained stable at this time. The key browse species (Wyoming big sagebrush) has a lower density, although this is primarily because of the increased sample size giving better density estimates for populations with discontinuous and/or clumped distributions. The principal feature changes noted for monitoring the condition and trend of this sagebrush population is that there are no seedlings (which is not unusual for Wyoming big sagebrush), the percent young is about 3%, and the percent of the population that are classified as decadent has slightly improved from 45% to 41%. However, 24% are now displaying poor vigor, up from 13% in 1991. Of major concern is that one in six Wyoming big sagebrush plants are dead. The proportion of black sagebrush displaying poor vigor has decreased to 33%, which is an improvement from 1991 when it was 75%. The increasers, narrowleaf low rabbitbrush and broom snakeweed, have experienced large decreases in their respective populations, 61% and 83%. Trend for browse is slightly down. The herbaceous understory trend is down for nested frequency values for both grasses and forbs has gone down since 1991. The Desirable Components Index (see methods) rating is fair at 32.

TREND ASSESSMENT
soil - stable, but poor condition (3)
browse - slightly down (2)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 32 (fair) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Soil trend appears to be improving slightly with improving ratios of bare soil to protective cover. However, soils would still be considered in poor condition, but slightly improved at this time. Protective cover is still very low (herbaceous, litter, and cryptogamic cover), as illustrated by the number of active small gullies and pedestaling of most all the sagebrush. The key browse species (Wyoming big sagebrush) has a higher density, primarily because some of the plants were classified as black sagebrush during past readings. The principal feature changes noted for monitoring the condition and trend of this population is that there are few seedlings, the percent young is about 10%, and the percent of the population that are classified as decadent has remained in the low 40's (41%, still considered high). Although, those classified with poor vigor have decreased to 13%. The proportion of the sagebrush population classified as black sagebrush has gone down to where it is a very small portion of the sagebrush population. The increasers, low rabbitbrush and broom snakeweed, have again experienced a large decrease and increase in their respective populations, -65% and +71%. The herbaceous understory trend is stable for nested frequency values for grasses and forbs, but herbaceous vegetation is lacking.

TREND ASSESSMENT
soil - slightly up, but still poor condition (4)
browse - stable (3)
herbaceous understory - stable, but still very poor (3)
winter range condition (DC Index) - 45 (fair to good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The soil trend is stable, but still in poor condition. Herbaceous cover is very low and active gullies are found on the site. Rock and pavement help to prevent erosion from being worse. The trend for browse is stable. Wyoming big sagebrush density and cover has remained stable since 1999. Recruitment is poor as young and seedling plants are rare. Percent decadence improved slightly to 37%, but is still higher than desired. Broom snakeweed and low rabbitbrush increased in density and cover since 1999 and make up 21% of the total browse cover. The herbaceous understory is in poor condition and the trend is slightly down. Perennial grass frequency decreased slightly (15%) while perennial forb frequency decreased by 70%.

TREND ASSESSMENT
soil - stable, but still poor condition (3)
browse - stable (3)
herbaceous understory - slightly down, and very poor (2)
winter range condition (DC Index) - 36 (fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25B, Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
G	Bouteloua gracilis	48	66	61	64	56	1.16	1.66	1.24
G	Carex spp.	-	6	-	-	-	-	-	-
G	Oryzopsis hymenoides	$_{a}$1	$_{a}$3	$_{a}$-	$_{a}$1	$_{b}$14	-	.00	.12
G	Sitanion hystrix	$_{ab}$43	$_{b}$72	$_{ab}$56	$_{ab}$50	$_{a}$29	.34	.55	.18

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
G	Stipa comata	$_{ab}$9	$_{b}$17	$_{a}$-	$_{a}$1	$_{a}$-	.00	.00	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		101	164	117	116	99	1.50	2.22	1.54
Total for Grasses		101	164	117	116	99	1.50	2.22	1.54
F	Androsace septentrionalis (a)	-	-	-	7	-	-	.02	-
F	Arabis demissa	-	3	-	-	-	-	-	-
F	Astragalus convallarius	1	2	3	3	-	.00	.01	-
F	Chaenactis douglasii	-	3	-	-	-	-	-	-
F	Cryptantha jamesii	$_{c}$30	$_{bc}$24	$_{ab}$6	$_{a}$-	$_{bc}$11	.04	-	.06
F	Cryptantha spp.	-	-	3	-	-	.03	-	-
F	Erigeron pumilus	4	8	3	3	-	.01	.01	-
F	Hymenoxys richardsonii	$_{b}$39	$_{b}$59	$_{b}$42	$_{b}$51	$_{a}$7	1.16	2.17	.15
F	Phlox longifolia	-	-	-	3	-	-	.00	-
F	Townsendia incana	-	3	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	7	0	0	0.01	0
Total for Perennial Forbs		74	102	57	60	18	1.25	2.19	0.21
Total for Forbs		74	102	57	67	18	1.25	2.21	0.21

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

BROWSE TRENDS --
Management unit 25B, Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia tridentata wyomingensis	82	84	83	15.11	18.95	17.78
B	Atriplex canescens	0	3	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	46	25	36	1.06	.46	1.72
B	Echinocereus spp.	0	1	1	-	-	-
B	Gutierrezia sarothrae	41	68	75	.18	1.15	3.43
B	Leptodactylon pungens	0	1	0	-	-	-
B	Opuntia spp.	7	17	13	.04	.13	.21
B	Pinus edulis	0	4	5	-	.15	.21
Total for Browse		176	203	213	16.39	20.85	23.37

CANOPY COVER, LINE INTERCEPT --
Management unit 25B, Study no: 2

Species	Percent Cover '04
Artemisia tridentata wyomingensis	18.28
Chrysothamnus viscidiflorus stenophyllus	.75
Gutierrezia sarothrae	4.80
Pinus edulis	.65

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25B, Study no: 2

Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.4

POINT-QUARTER TREE DATA --
Management unit 25B, Study no: 2

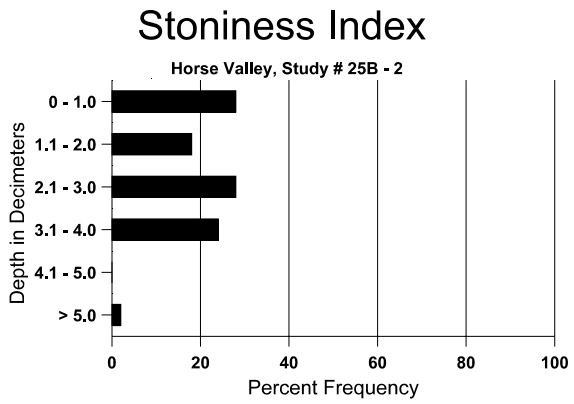
Species	Trees per Acre '99	Trees per Acre '04	Average diameter (in) '99	Average diameter (in) '04
Pinus edulis	53	118	2.3	1.0

BASIC COVER --
Management unit 25B, Study no: 2

Cover Type	Average Cover % '85	'91	'94	'99	'04
Vegetation	6.50	5.75	18.79	24.79	24.46
Rock	11.00	17.25	18.92	12.81	16.38
Pavement	31.50	25.75	8.72	22.56	27.48
Litter	23.50	14.50	16.85	21.91	23.25
Cryptogams	1.75	.75	1.15	2.45	1.54
Bare Ground	25.75	36.00	34.85	24.42	25.75

SOIL ANALYSIS DATA --
Management unit 25B, Study no: 2, Study Name: Horse Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
14.5	59.3 (10.5)	7.6	50.9	27.8	21.3	2.2	7.7	112.0	0.5



PELLET GROUP DATA --
Management unit 25B, Study no: 2

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'99	'04	'99	'04
Rabbit	14	9	3	-	-
Elk	-	-	-	-	1 (3)
Deer	8	3	-	1 (2)	1 (3)
Cattle	-	-	-	1 (2)	-

BROWSE CHARACTERISTICS --
Management unit 25B, Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	-	66	-	-	0	0	-	-	0	3/3
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata wyomingensis												
85	**4799**	266	733	3400	666	-	69	6	14	-	8	19/25
91	**4399**	66	600	1733	2066	-	29	14	47	3	17	17/23
94	**3820**	200	100	2100	1620	1100	24	3	42	26	26	19/35
99	**4520**	60	440	2240	1840	980	28	3	41	14	14	18/28
04	**4400**	100	180	2600	1620	980	7	0	37	23	23	17/27

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex canescens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**80**	-	-	60	20	-	25	0	25	25	25	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
85	**8666**	400	1000	3733	3933	-	22	10	45	.69	13	5/7
91	**7532**	-	66	266	7200	-	35	22	96	16	62	5/7
94	**2940**	-	-	2040	900	420	30	7	31	12	12	4/6
99	**1180**	20	180	740	260	220	0	0	22	12	12	6/10
04	**1480**	-	80	940	460	120	8	7	31	12	12	7/11
Echinocereus triglochidatus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	4/6
04	**20**	-	-	20	-	-	0	0	-	-	0	3/6
Gutierrezia sarothrae												
85	**6199**	9466	1000	5066	133	-	9	0	2	.64	9	7/6
91	**8199**	66	666	6533	1000	-	2	.81	12	-	2	5/4
94	**1420**	-	200	1120	100	380	0	0	7	1	1	7/6
99	**4980**	2340	3180	1300	500	200	0	0	10	.40	.40	7/8
04	**5320**	-	120	5180	20	40	0	0	0	-	0	7/9
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
85	**1799**	-	133	1466	200	-	0	0	11	-	33	3/4
91	**932**	-	266	466	200	-	7	0	21	-	0	3/4
94	**160**	-	-	140	20	-	0	0	13	-	0	3/7
99	**600**	20	160	320	120	60	0	0	20	20	20	3/11
04	**400**	-	-	400	-	-	0	0	0	-	0	3/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	**66**	266	66	-	-	-	0	0	-	-	0	-/-
91	**66**	133	66	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**80**	40	80	-	-	-	0	0	-	-	0	-/-
04	**120**	20	100	20	-	-	0	0	-	-	0	-/-

Trend Study 25B-3-04

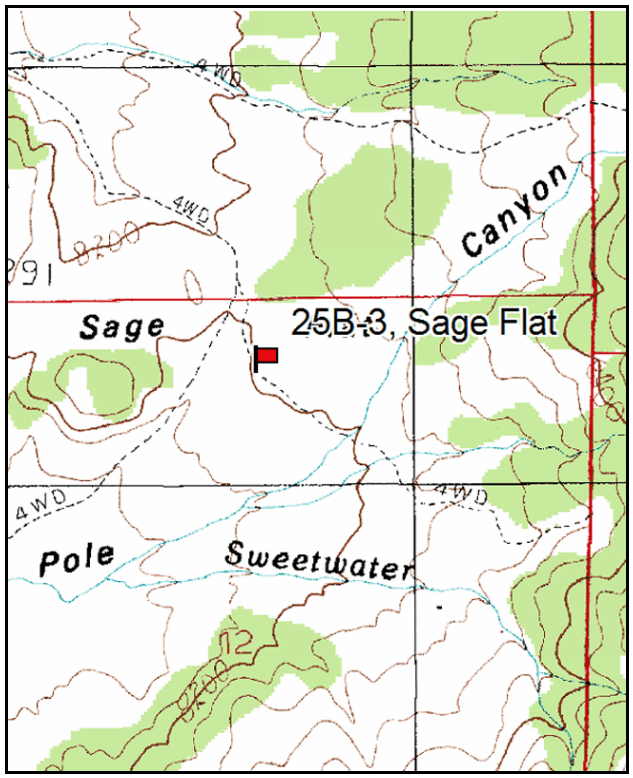
Study site name: Sage Flat . Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic.

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

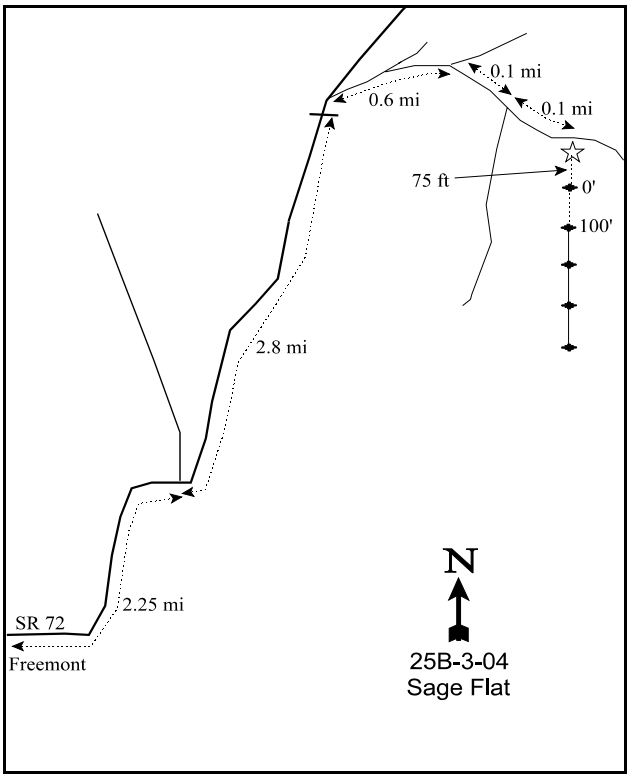
LOCATION DESCRIPTION

From Fremont travel north on SR 72 for 2.25 miles to a major fork, bear right and continue 2.8 miles on SR 72 to a cattleguard at the Forest Service boundary. One hundred yards beyond the cattleguard turn right. At 0.15 miles, a road forks off to the right. Go up this rough road 0.45 miles to a fork. Turn right and go 0.1 miles to another fork. Turn left at the fork and go 0.1 miles into the flat to a witness post on the right side of the road. The witness post and transect stakes are green steel fence posts with a white top. The frequency baseline, with browse tag #149, starts 75' due south of the witness post.



Map Name: Loa 1 NE, Utah

Township 27S , Range 3E , Section 12



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4259262 N, 453619 E

DISCUSSION

Sage Flat - Trend Study No. 25B-3

The Sage Flat trend study is located in an open valley dominated by Wyoming big sagebrush. The elevation is 8,200 feet with a southwest aspect and a slope of less than 5%. The area has been heavily grazed by livestock since the area was settled. The past abuses have led to an almost monotypic shrub type with few herbaceous plants. The area is considered a priority for a chaining and seeding treatment by the Forest Service and Division of Wildlife Resources. The flat is thought to be an important deer concentration area in winter and spring and would be enhanced by more early season herbaceous species. A deer pellet group transect in the flat monitored since 1981 shows an increase in deer use, up to a high of 19 deer days use/acre (47 ddu/ha) in 1984-85. It slowly decreased to 7 deer days use/acre (17 ddu/ha) in 1991-1992 (Jense et al. 1992). A pellet group transect read in conjunction with the vegetative transect in 1999 estimated 21 deer days use/acre (52 ddu/ha), 15 cow days use/acre (37 cdu/ha), and 6 elk days use/acre (15 edu/ha). Rabbit pellets were very high in 1999, which can have a detrimental effect on the herbaceous component because it is so limited on this site. The pellet group transect in 2004 estimated only 9 deer days use/acre (23ddu/ha) and 3 elk days use/acre (7 edu/ha).

Erosion is evident on the site. The soil surface is rough, composed of mounds of sandy soil. Plant pedestalling is abundant. A soil erosion condition class assessment rated erosion as moderate in 2004. Ground cover is provided only by the scattered sagebrush and underlying litter with only a few herbaceous plants. On average, about 50% of the soil surface is exposed and unprotected. The soil texture for the site is a loam, with a mildly alkaline pH (7.7). Effective rooting depth is moderate at more than 18 inches. Amounts of phosphorus (4.7ppm) and potassium (67.2ppm) in the soil could be limiting for plant growth and development. There are several small active gullies through the transect area. In 1994, small trees had been put into many of the small gullies to help them heal and help prevent further damage from high intensity summer storms.

Wyoming big sagebrush is the key species and accounts for most of the vegetation cover. From 1991 to 1999 sagebrush density was stable between 12,000-13,000 plants/acre. In 2004 density was 23% lower at 9,120 plants/acre. Cover has remained high with over 20% in each of the last three readings. Decadence has remained stable between 16-25% from 1991-2004. Percent dying increased in 2004 to 14% which was its highest. The amount of seedlings in the population was extremely high in 1985, but has been low ever since. The percentage of young plants in the population has been variable, but has always been at least 17%, which indicates good seedling survival and good recruitment. Utilization has been light to moderate with the highest amount of use seen in 1985 and 1999. Utilization was mostly light in 2004. Broom snakeweed density has been highly variable. It was highest in 1991 with nearly 10,000 plants/acre. It decreased to its lowest density in 1999 at 1,200 plants/acre and increased to 3,500 plants/acre in 2004. Cover of broom snakeweed was highest in 2004 at nearly 3%. Black sagebrush is uncommon in the valley with the deeper soils, but is dominant up the slope with shallow soils along with mature pinyon and juniper.

The herbaceous understory is sparse and has decreased since 1994. Western wheatgrass is the most abundant grass species, a desirable species for the site especially since it enhances water infiltration and also provides good forage. It was most abundant in 1994 with 2.4% cover. Since then it has decreased significantly. Bluebunch wheatgrass decreased significantly in 2004. The other grass species occur only occasionally, as do a few forbs. Total cover for the herbaceous understory is poor, as it does not usually amount to more than 3 to 4% total cover.

1985 APPARENT TREND ASSESSMENT

Soil trend appears down, as more top soil is lost and gullies become deeper. The unstable soil makes it difficult for grass and forb seedlings to become established. The presence of undesirable increaser shrubs, generally poor vigor of sagebrush, and low diversity and lack of herbaceous vegetation would indicate a downward vegetative trend. A chaining and seeding would be beneficial on the nearly flat areas of this valley. Also, further grazing restrictions may be necessary for recovery.

1991 TREND ASSESSMENT

Soil trend appears to be stable but very poor condition. Small pine tees have been set in the small gullies to help stabilize them. The key browse species have increased in density and decreased in percent decadency from 43% down to 24%. Wyoming big sagebrush now has a density of more than 12,000 plants per acre. The grasses have increased with the forbs also showing some change.

TREND ASSESSMENT
soil - stable, but very poor condition (3)
browse - up (5)
herbaceous understory - slightly up, but still poor condition (4)

1994 TREND ASSESSMENT

Soil is considered stable as there are only slight changes in cover values. However, at this time it is still in very poor condition with about 50% bare ground. There has been some effort to stabilize the small gullies that run through the sagebrush flat. The key shrub on this winter range is Wyoming big sagebrush. The percent young age class is quite high at 39%. Percent decadence has steadily gone down since 1985, from 43% to 24% and is now 16%. Broom snakeweed density has decreased by over 62% since 1985. Trend for browse is slightly up. The trend for the herbaceous understory is stable, for the grasses make up 94% of the herbaceous understory and they are almost the same nested frequency values as in 1991. The Desirable Components Index (see methods) rating is good at 51. The herbaceous understory is lacking, but the sagebrush is abundant and healthy.

TREND ASSESSMENT
soil - stable (3)
browse - slightly up (4)
herbaceous understory - stable (3) stable for grasses, the forbs went down, but they only make up a very small portion of the herbaceous cover, total cover is still barely 4%
winter range condition (DC Index) - 51 (good) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Soil trend is stable and still in very poor condition with relative bare ground cover at 45%. There has been some effort to stabilize the small gullies that run through the sagebrush flat but the gully plugs are not stopping continued gully erosion. The key shrub on this winter range is Wyoming big sagebrush. The percent young age class is quite high at 43%. Percent decadence had steadily gone down since 1985, from 43% to 24% and then 16%. However, it has now gone up again to 24%. This is still not alarming because of the relatively high density. Broom snakeweed density have a decreased density again. It cannot compete with the much more competitive sagebrush at these high densities and with drought. Trend for browse is stable. The trend for the herbaceous understory is stable, for the grasses make up 94% of the herbaceous understory and they are almost the same nested frequency values as in 1991.

TREND ASSESSMENT
soil - stable, but still very poor (3)
browse - stable (3)
herbaceous understory - stable, but still poor with 4% total cover (3)
winter range condition (DC Index) - 60 (good) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The soil trend is stable, but still in very poor condition with active erosion on site. The browse trend is stable. Wyoming big sagebrush is the key species and is very abundant with over 22% cover and a very high density. Density did decline 23% since 1999, but decadence remained stable. The percent of plants dying did increase to 14% from 8% in 1999, but the percent of young plants is high (20%) and is adequate for replacing dying plants. Reproduction is good on this site, especially with the poor reproductive conditions seen for other Wyoming big sagebrush stands around the state. The absence of winter annuals competing for the limited resources allows sagebrush to reproduce without problems at this location. Broom snakeweed density and cover is higher than it was in 1999. The herbaceous understory trend is slightly down. Frequency of perennial grasses and perennial forbs declined to its lowest since this site was established. The herbaceous understory makes up less than 3% total cover.

soil - stable, but still very poor (3)
browse - stable (3)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 53 (good) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25B, Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	a137	b182	b196	a133	a133	2.41	1.15	.72
G	Agropyron spicatum	a-	a-	a-	b62	a3	-	.50	.06
G	Bouteloua gracilis	a-	b10	b17	b16	b15	.25	.36	.74
G	Oryzopsis hymenoides	a5	ab9	a6	b22	b29	.21	.29	.51
G	Poa secunda	5	-	-	-	-	-	-	-
G	Sitanion hystrix	b94	ab74	a57	a42	a41	1.14	.66	.69
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		241	275	276	275	221	4.03	2.98	2.73
Total for Grasses		241	275	276	275	221	4.03	2.98	2.73
F	Arabis spp.	-	-	-	2	3	-	.01	.03
F	Cryptantha spp.	b11	c30	bc13	a-	b5	.09	-	.02
F	Cymopterus spp.	-	2	-	-	-	-	-	-
F	Erigeron pumilus	32	45	22	40	19	.12	.15	.13
F	Hymenoxys richardsonii	4	1	-	2	-	.00	.15	-
F	Penstemon spp.	-	-	-	1	-	.00	.00	-
F	Phlox longifolia	b38	c64	a6	a13	a5	.01	.04	.01

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
F	Senecio multilobatus	-	1	-	-	-	-	-	-
F	Unknown forb-perennial	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	0	0	0	0	0
Total for Perennial Forbs		86	143	41	58	32	0.23	0.35	0.18
Total for Forbs		86	143	41	58	32	0.23	0.35	0.18

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

BROWSE TRENDS --
Management unit 25B, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia frigida	7	13	6	.15	.30	.15
B	Artemisia nova	0	3	2	-	.63	.63
B	Artemisia tridentata wyomingensis	99	98	99	21.47	20.11	22.17
B	Ceratoides lanata	1	0	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	9	11	12	.01	.00	.03
B	Coryphantha vivipara arizonica	0	3	0	-	-	-
B	Eriogonum microthecum	0	0	1	-	-	-
B	Gutierrezia sarothrae	64	36	64	.69	.33	2.59
Total for Browse		180	164	184	22.33	21.37	25.57

CANOPY COVER, LINE INTERCEPT --
Management unit 25B, Study no: 3

Species	Percent Cover '04
Artemisia nova	.08
Artemisia tridentata wyomingensis	23.20
Gutierrezia sarothrae	1.79

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25B, Study no: 3

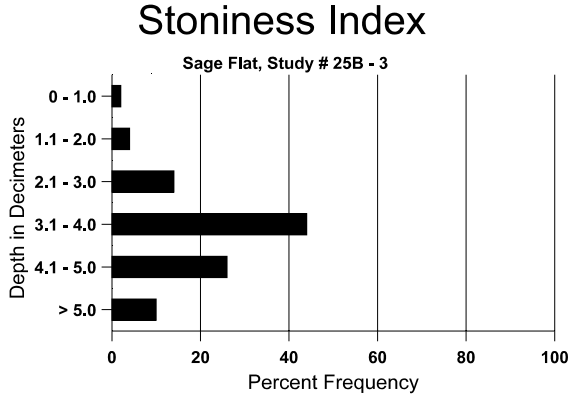
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.5

BASIC COVER --
Management unit 25B, Study no: 3

Cover Type	Average Cover % '85	'91	'94	'99	'04
Vegetation	6.00	2.50	24.93	24.49	26.55
Rock	.50	.50	1.67	.54	2.04
Pavement	2.50	4.00	.98	4.90	4.84
Litter	30.00	27.00	18.25	19.50	19.04
Cryptogams	5.00	10.50	7.34	7.58	10.43
Bare Ground	56.00	55.50	50.48	46.57	46.81

SOIL ANALYSIS DATA --
Management unit 25B, Study no: 3, Study Name: Sage Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
18.3	49.0 (16.4)	7.7	42.6	31.8	25.6	1.9	4.7	67.2	0.7



PELLET GROUP DATA --
Management unit 25B, Study no: 3

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	25	53	11
Elk	4	3	3
Deer	1	2	2
Cattle	4	2	1

Days use per acre (ha)	
'99	'04
-	-
6 (15)	3 (7)
21 (52)	9 (23)
15 (37)	-

BROWSE CHARACTERISTICS --
Management unit 25B, Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**132**	-	66	66	-	-	0	50	0	-	0	5/7
94	**320**	-	-	320	-	-	0	0	0	-	0	3/5
99	**500**	20	120	340	40	-	44	32	8	-	0	3/5
04	**220**	-	-	220	-	-	27	0	0	-	0	3/4
Artemisia nova												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**140**	-	80	40	20	-	57	0	14	-	0	6/10
04	**140**	-	-	100	40	-	0	0	29	14	14	9/16
Artemisia tridentata wyomingensis												
85	**7399**	9200	1266	2933	3200	-	47	33	43	.27	4	19/20
91	**12665**	933	6333	3266	3066	-	16	11	24	.94	5	20/26
94	**12960**	40	5060	5840	2060	1000	.46	0	16	7	8	19/29
99	**11920**	280	5160	3940	2820	1580	54	10	24	8	8	18/27
04	**9120**	20	1860	5020	2240	1680	29	9	25	14	14	15/23
Ceratoides lanata												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	20	-	-	-	0	0	-	-	0	2/2
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**240**	-	20	140	80	-	0	0	33	-	0	4/6
99	**280**	-	60	40	180	200	0	29	64	43	43	4/6
04	**360**	-	120	220	20	-	17	0	6	6	6	4/5
Coryphantha vivipara arizonica												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	60	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Eriogonum microthecum												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**0**	-	-	-	-	-	0	0	0	-	0	-/-
04	**40**	-	-	20	20	-	0	100	50	50	50	7/2
Gutierrezia sarothrae												
85	**8999**	2066	1600	6133	1266	-	1	.74	14	-	.74	7/5
91	**9932**	133	4333	5133	466	-	7	.67	5	.60	3	3/2
94	**3760**	60	260	3180	320	180	0	0	9	-	.53	5/5
99	**1200**	840	560	600	40	80	0	0	3	2	2	6/6
04	**3500**	-	-	3500	-	-	0	0	0	-	0	6/8
Opuntia spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	3/9
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25B-4-04

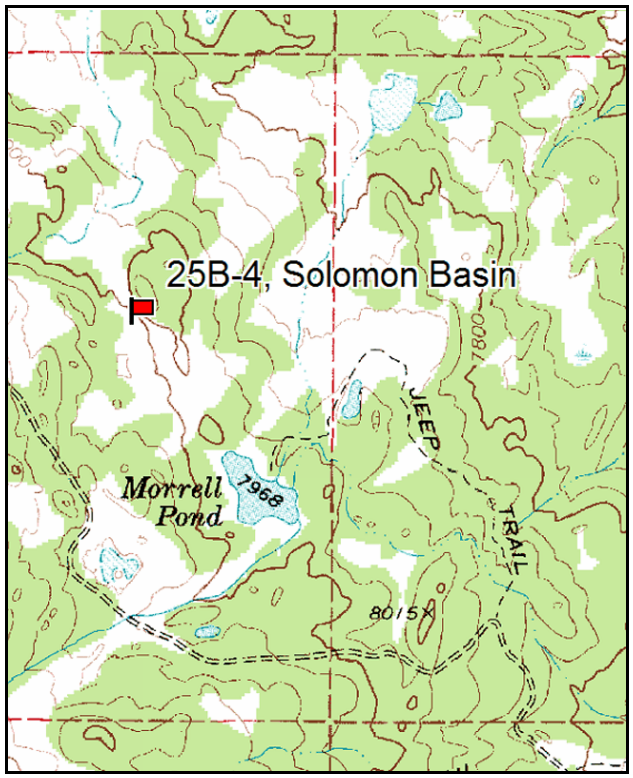
Study site name: Solomon Basin . Vegetation type: Black/Big Sagebrush .

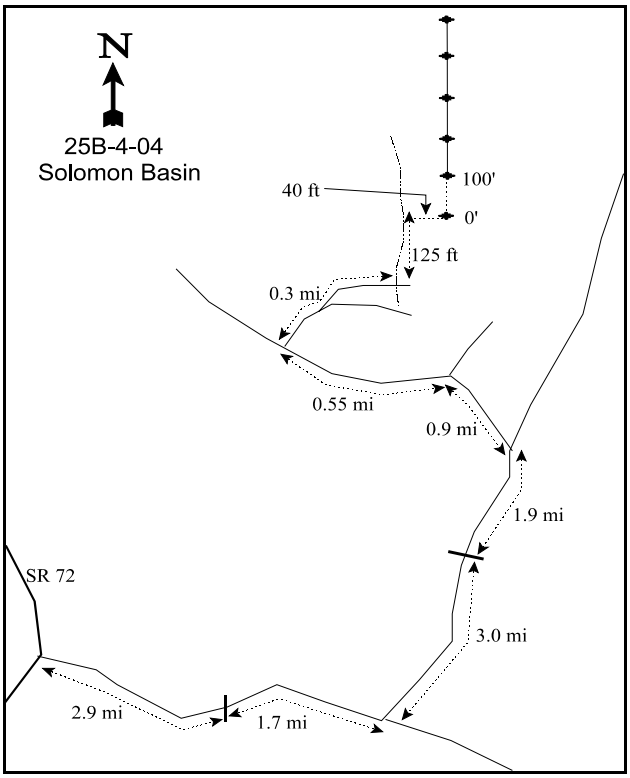
Compass bearing: frequency baseline 320 degrees magnetic.

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

LOCATION DESCRIPTION

Travel north from Fremont on SR 72 for 7.3 miles to the Elkhorn-Torrey Road. Turn right and go 2.9 miles to a cattleguard. From the cattleguard go 1.7 miles to an intersection by Heart Lake. Turn left toward Meeks Lake and go 3.0 miles to a cattleguard. Go another 1.9 miles on the main road to an intersection. Stay left and go 0.9 miles toward Solomon Basin. Stay left again, bypassing the Morrell Pond Road and continue 0.55 miles, passing a doughnut-shaped pond. Take a sharp right turn here and go 0.2 miles to another fork. Bear left (the right fork takes you to Morrells Pond) and drive less than 0.1 miles to a ditch. Park here (very faint) and walk down the ditch for approximately 125 feet. The 0-foot stake is approximately 40 feet east of the ditch and marked with browse tag #26.





Map Name: Geyser Peak, Utah

Diagrammatic Sketch

Township 26S , Range 4E , Section 14

GPS: NAD 27, UTM 12S 4266794 N, 461715 E

DISCUSSION

Solomon Basin - Trend Study No. 25B-4

This study samples important deer winter range on the gentle rolling terrain of Solomon Basin. The original site had to be relocated in 1994 because of a new road that went through the middle of the original transect. This new site is located between two low parallel ridges, within a moderately shallow and narrow ravine. The elevation is 8,000 feet. Slope varies from 0% to 20%, but on average it is about 5%. Aspect of the site is generally east. The site is dominated by mature pinyon and in the vicinity are stands of aspen and open sagebrush flats. There is a pond nearby, which would tend to concentrate grazing in the area. The area is considered important to both livestock and wildlife. Pellet group data from the site in 1999 estimated 19 deer, 1 elk, and 42 cow days use/acre (47 ddu/ha, 2 edu/ha, and 104 cdu/ha). Data from 2004 estimated 28 deer, 9 elk, and 11 cow days use/acre (69 ddu/ha, 23 edu/ha, and 27 cdu/ha).

The area is also recognized as a key wintering area for deer. Heavy year-long livestock grazing historically has led to deterioration of the range and watershed values until the establishment of a management plan and rest-rotation grazing in 1967. There have been several projects proposed by the Forest Service for the basin, including chaining and seeding pinyon-juniper woodlands and sagebrush treatments. Treatment of the mature pinyon-juniper community is a priority in the DWR management plan in order to provide more herbaceous spring forage and improve protective ground cover.

Excessive livestock trampling, removal of herbaceous vegetation, and rocky soil has led to soil loss. The soil is moderately deep with an effective rooting depth of almost 19 inches with a neutral pH (7.3). The soil texture is a clay loam. Soil phosphorus was low at only 4.6 ppm, where 10 ppm may be limiting for normal plant growth and development. The ratio of bare ground to protective cover (vegetation, litter, and bare ground) has remained stable since 1994 and an erosion condition class rating rated this erosion as stable in 2004.

The dominant overstory is a mixture of mature pinyon pine with a few scattered juniper. The key browse species are mountain big sagebrush and black sagebrush. Together they contribute over 50% of the browse cover. The plants on average have only received light to moderate use. Black sagebrush density and cover has slowly increased since 1994, while decadence has decreased. Mountain big sagebrush density has decreased slightly with each reading since 1994, but decadency has been low and vigor good. Some plants exhibit characteristics of basin big sagebrush. The browse species that appear to be more preferred are coryombed eriogonum, Utah serviceberry, and winterfat. Coryombed eriogonum density decreased about 20% in both 1999 and 2004. Nearly 50% of the plants showed signs of heavy use in 2004. Broom snakeweed density was stable between 1994 and 1999, but dropped by about half in 2004. Pinyon cover has increased with each reading to 10% in 2004. Point quarter data estimated 82 pinyon trees/acre in 1999 and increased to 97 trees/acre in 2004. Average diameter was 2.1 inches in 1999 and 1.9 inches in 2004. A few junipers were also found on the site.

Even though there are about 10 species of grasses on the site, three species (blue grama, Salina wildrye, and Kentucky bluegrass) are found in the greatest abundance. Kentucky bluegrass is a valuable species because it is sod forming and somewhat resistant to grazing, however it is an increaser with moderate to heavy grazing pressure. Along with the other grass species, they provide a small amount of fall forage. Salina wildrye and Kentucky bluegrass decreased significantly in 2004. Total grass cover was about 50% lower in 2004. Forbs are not very abundant. Dandelion and Pingue hymenoxys are the most common species.

1994 APPARENT TREND ASSESSMENT

The original study site had to be relocated because the road was moved and put through the middle of the

baseline. Therefore, the data collected for the first site (1985 and 1991) are not included here so that there will be no confusion by trying to unknowingly compare the two sites. Soil trend would be considered stable at this time, but only in fair condition with 31% bare ground and only 30% litter cover. The two most abundant key browse species on the site are black sagebrush and mountain big sagebrush. The basic trend for the original site since 1985 is that black sagebrush are slowly increasing while mountain big sagebrush was decreasing. The loss of mountain big sagebrush would be more significant because they are about three times taller than black sagebrush, making them more available for winter use. Trend for browse on the relocated site appears stable. They are both about equal in the amount of cover each contributes to the total browse cover. The trend for the herbaceous understory also appears stable without any previous data.

winter range condition (DC Index) - 56 (fair) Mountain big sagebrush

1999 TREND ASSESSMENT

Trend for soil is stable at this time, with little changes in percent bare soil and litter cover. The ratio of protective cover to bare soil is slightly better, but still considered poor at less than 2:1. The two most abundant browse species on the site are black sagebrush and mountain big sagebrush. The basic trend for the new site is that black sagebrush appears to be slowly increasing, while mountain big sagebrush is slowly decreasing. The mountain big sagebrush would be more effected by drought than black sagebrush. The loss of mountain big sagebrush would be more significant in that they are about three times taller than black sagebrush, making them more available for winter use with moderately deep snow. Trend for browse would still be stable with some losses to mountain big sagebrush, but gains to black sagebrush. They are both about equal in the amount of cover each contributes to the total browse cover. As indicated by the lower sum of nested frequency values, the trend for the herbaceous understory is down for both grasses and forbs. The Desirable Components Index (see methods) rating is good at 72. Palatable browse and herbaceous cover has increased.

TREND ASSESSMENT
soil - stable, but only fair condition (3)
browse - stable overall (3)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 72 (good) Mountain big sagebrush

2004 TREND ASSESSMENT

The trend for soil is stable. The ratio of are ground to protective cover has not changed. The browse trend is slightly down as the more palatable and taller mountain big sagebrush density and cover has decreased slightly. Black sagebrush density and cover has increased slightly, but is less preferred by wildlife. Coryombed eriogonum density decreased also. Pinyon density and cover is increasing. The herbaceous understory trend is slightly down as drought conditions have affected many areas around the state. Perennial grass and forb frequency and nested frequency has decreased substantially, by about 20%.

TREND ASSESSMENT
soil - stable, but only fair condition (3)
browse - slightly down (2)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 57 (fair) Mountain big sagebrush

HERBACEOUS TRENDS --
Management unit 25B, Study no: 4

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
G	Agropyron smithii	-	1	11	-	.00	.36
G	Agropyron spicatum	-	4	-	-	.03	-
G	Bouteloua gracilis	56	35	23	.78	1.45	.53
G	Carex spp.	23	16	18	.16	.12	.31
G	Elymus salina	$_{b}$201	$_{b}$168	$_{a}$135	5.25	4.33	3.33
G	Festuca ovina	10	3	-	.18	.03	-
G	Oryzopsis hymenoides	16	3	21	.09	.15	.07
G	Poa fendleriana	-	6	4	-	.06	.18
G	Poa pratensis	$_{b}$65	$_{b}$76	$_{a}$25	2.55	5.40	.60
G	Poa secunda	7	-	3	.01	-	.03
G	Sitanion hystrix	11	12	18	.05	.12	.11
G	Stipa columbiana	4	-	-	.03	-	-
G	Stipa comata	6	-	2	.03	-	.18
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		399	324	260	9.16	11.73	5.73
Total for Grasses		399	324	260	9.16	11.73	5.73
F	Achillea millefolium	-	-	4	-	-	.09
F	Antennaria rosea	5	5	5	.15	.38	.15
F	Androsace septentrionalis (a)	-	2	-	-	.00	-
F	Arabis demissa	-	5	-	-	.01	-
F	Artemisia ludoviciana	3	4	3	.03	.15	.00
F	Astragalus convallarius	6	6	1	.01	.04	.03
F	Astragalus miser	-	1	2	-	.00	.00
F	Aster spp.	$_{a}$5	$_{ab}$18	$_{b}$39	.01	.36	.76
F	Astragalus spp.	$_{b}$11	$_{a}$1	$_{a}$3	.02	.00	.01
F	Castilleja linariaefolia	7	3	8	.02	.03	.10
F	Cirsium spp.	9	9	9	.07	.22	.18
F	Cryptantha spp.	11	3	3	.05	.04	.03
F	Cymopterus spp.	-	-	4	-	-	.03
F	Erigeron pumilus	$_{b}$18	$_{a}$4	$_{a}$-	.03	.01	-
F	Eriogonum racemosum	-	-	-	-	.00	-
F	Hymenoxys richardsonii	$_{b}$57	$_{b}$38	$_{a}$8	.62	.69	.05
F	Lesquerella spp.	3	-	-	.00	-	-
F	Machaeranthera canescens	$_{b}$36	$_{a}$11	$_{a}$10	.38	.49	.26
F	Microsteris gracilis (a)	3	-	-	.00	-	.00

Type	Species	Nested Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
F	Penstemon comarrhenus	-	-	1	-	-	.00
F	Penstemon spp.	2	4	8	.00	.04	.03
F	Phlox longifolia	11	9	9	.02	.01	.05
F	Schoencrambe linifolia	7	-	-	.04	-	-
F	Senecio multilobatus	-	3	2	-	.00	.00
F	Sphaeralcea coccinea	4	2	9	.01	.03	.06
F	Taraxacum officinale	$_{a}$18	$_{b}$52	$_{a}$3	.49	1.85	.03
F	Tragopogon dubius	-	-	4	-	-	.00
F	Unknown forb-perennial	-	1	-	-	.00	-
Total for Annual Forbs		3	2	0	0.00	0.00	0.00
Total for Perennial Forbs		213	179	135	2.00	4.40	1.92
Total for Forbs		216	181	135	2.00	4.41	1.92

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

BROWSE TRENDS --
Management unit 25B, Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	9	5	8	.63	.03	-
B	Artemisia frigida	1	1	0	-	-	-
B	Artemisia nova	39	57	55	4.28	6.84	7.03
B	Artemisia tridentata vaseyana	24	32	32	3.94	6.73	6.41
B	Ceratoides lanata	9	10	7	.21	.33	.19
B	Chrysothamnus nauseosus	17	18	14	2.23	3.11	2.32
B	Chrysothamnus viscidiflorus viscidiflorus	50	42	47	2.21	1.47	4.39
B	Coryphantha vivipara arizonica	0	1	0	-	.00	-
B	Eriogonum corymbosum	22	21	23	.88	1.17	1.48
B	Gutierrezia sarothrae	53	49	39	1.27	1.00	1.52
B	Juniperus osteosperma	0	1	1	.15	.15	.03
B	Opuntia spp.	2	2	1	.01	-	-
B	Pediocactus simpsonii	0	2	1	-	.03	.00
B	Pinus edulis	0	13	12	3.49	4.09	6.13
B	Symphoricarpos oreophilus	5	8	9	.16	.48	.74
B	Tetradymia canescens	14	17	15	.10	.24	.93
B	Yucca harrimaniae	0	2	3	-	.18	-
Total for Browse		245	281	267	19.60	25.92	31.19

CANOPY COVER, LINE INTERCEPT --
Management unit 25B, Study no: 4

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	1.60	.93
Artemisia nova	-	9.69
Artemisia tridentata vaseyana	-	8.16
Ceratoides lanata	-	.50
Chrysothamnus nauseosus	-	4.66
Chrysothamnus viscidiflorus viscidiflorus	-	5.30
Eriogonum corymbosum	-	1.98
Gutierrezia sarothrae	-	.58
Pinus edulis	8.39	9.25
Symphoricarpos oreophilus	-	1.76
Tetradymia canescens	-	1.06
Yucca harrimaniae	-	.50

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25B, Study no: 4

Species	Average leader growth (in)
	'04
Amelanchier utahensis	5.2
Artemisia tridentata vaseyana	1.4

POINT-QUARTER TREE DATA --
Management unit 25B, Study no: 4

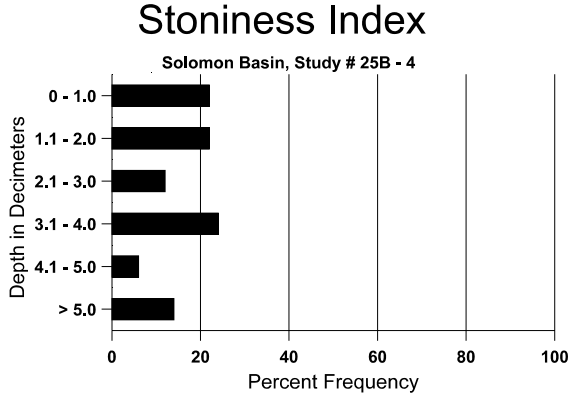
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	27	24	2.9	3.2
Pinus edulis	82	97	2.1	1.9

BASIC COVER --
Management unit 25B, Study no: 4

Cover Type	Average Cover %		
	'94	'99	'04
Vegetation	27.32	38.12	37.22
Rock	5.05	2.79	4.19
Pavement	4.77	10.95	16.01
Litter	29.63	31.77	30.99
Cryptogams	.30	.43	.68
Bare Ground	31.40	29.84	28.35

SOIL ANALYSIS DATA --
Management unit 25B, Study no: 4, Study Name: Solomon Basin

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
18.7	51.7 (16.7)	7.3	44.2	20.2	35.6	2.0	4.6	208.0	0.5



PELLET GROUP DATA --
Management unit 25B, Study no: 4

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	5	12	6
Elk	-	1	-
Deer	11	6	11
Cattle	1	9	3
Mosse	-	-	-

Days use per acre (ha)	
'99	'04
-	-
1 (2)	9 (23)
19 (47)	28 (69)
42 (104)	11 (27)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 25B, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
94	**280**	-	20	260	-	-	7	7	0	-	0	33/42
99	**120**	40	20	40	60	-	33	0	50	17	33	50/57
04	**200**	-	60	120	20	-	20	60	10	10	10	57/55
Artemisia frigida												
94	**40**	-	-	40	-	-	0	0	-	-	0	1/2
99	**20**	-	-	20	-	-	0	0	-	-	0	2/6
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
94	**4140**	40	140	3100	900	60	5	.48	22	6	6	10/16
99	**4680**	180	900	3080	700	240	22	3	15	.42	.42	8/17
04	**4880**	200	720	3620	540	280	0	0	11	7	8	9/19
Artemisia tridentata vaseyana												
94	**1500**	-	540	860	100	140	1	0	7	4	4	19/28
99	**1360**	-	100	1080	180	-	18	3	13	3	3	23/36
04	**1000**	380	140	760	100	80	18	2	10	4	4	24/40
Atriplex canescens												
94	**0**	-	-	-	-	-	0	0	-	-	0	28/23
99	**0**	-	-	-	-	-	0	0	-	-	0	37/32
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Ceratoides lanata												
94	**380**	-	-	380	-	-	58	26	0	-	0	6/6
99	**460**	40	60	360	40	-	22	74	9	-	0	4/7
04	**380**	-	-	340	40	-	5	89	11	5	5	7/8
Cercocarpus montanus												
94	**0**	-	-	-	-	-	0	0	-	-	0	15/24
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus depressus												
94	**0**	-	-	-	-	-	0	0	-	-	0	6/12
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
94	**640**	20	40	580	20	-	0	3	3	-	0	27/29
99	**820**	-	120	580	120	20	0	0	15	5	7	34/39
04	**460**	-	20	360	80	20	0	0	17	13	13	32/34
Chrysothamnus viscidiflorus viscidiflorus												
94	**2720**	-	200	2200	320	20	3	2	12	5	5	9/16
99	**2020**	20	320	1340	360	20	0	0	18	6	6	12/16
04	**2240**	40	340	1700	200	40	4	0	9	4	10	12/16
Coryphantha vivipara arizonica												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	100	-	-	0	1/4
04	**0**	-	-	-	-	-	0	0	-	-	0	2/3
Eriogonum corymbosum												
94	**2660**	40	340	2320	-	-	40	24	0	-	0	4/8
99	**2100**	-	460	1380	260	-	20	11	12	2	2	9/16
04	**1620**	-	320	1280	20	80	19	48	1	-	0	9/16
Gutierrezia sarothrae												
94	**4280**	40	460	3740	80	100	0	0	2	-	0	6/5
99	**4020**	100	420	3600	-	100	0	.49	0	-	0	7/7
04	**2060**	-	200	1860	-	-	0	0	0	-	0	8/8
Juniperus osteosperma												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	20	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Opuntia spp.												
94	**40**	-	-	40	-	-	0	0	-	-	0	1/2
99	**40**	-	-	40	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	4/15
Pediocactus simpsonii												
94	**0**	-	-	-	-	-	0	0	-	-	0	2/3
99	**40**	-	-	40	-	-	0	0	-	-	0	2/3
04	**20**	-	-	20	-	-	0	0	-	-	0	1/2
Pinus edulis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**280**	140	260	20	-	40	0	0	-	-	0	-/-
04	**280**	80	160	120	-	20	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ribes spp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	26/35
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
94	**120**	-	-	120	-	-	0	17	0	-	0	15/23
99	**280**	40	60	200	20	-	7	0	7	7	7	16/28
04	**300**	-	120	160	20	-	0	0	7	-	7	16/25
Tetradymia canescens												
94	**520**	-	60	440	20	-	0	0	4	4	8	10/17
99	**580**	40	120	340	120	-	14	3	21	7	7	10/15
04	**660**	-	260	360	40	-	6	0	6	-	0	11/18
Yucca harrimaniae												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**180**	-	-	180	-	60	0	0	-	-	0	13/16
04	**240**	-	40	200	-	-	0	0	-	-	0	7/12

Trend Study 25B-5-04

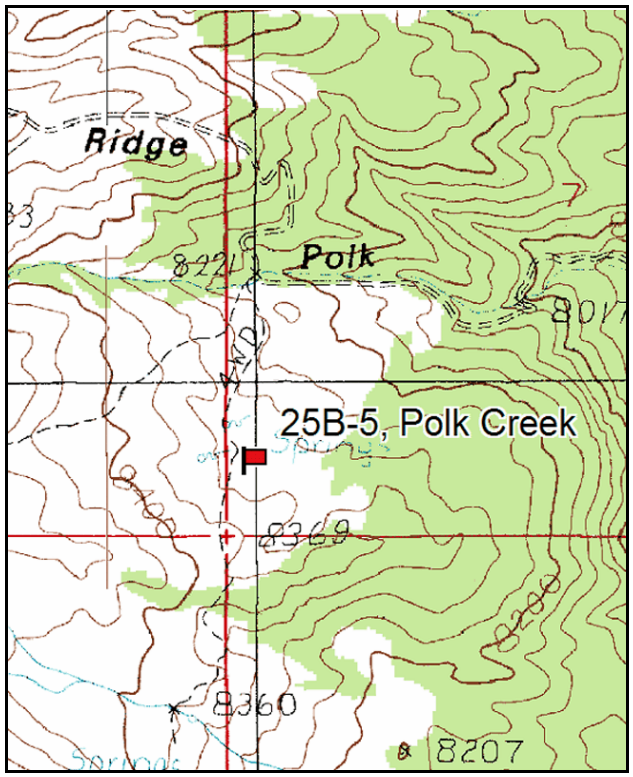
Study site name: Polk Creek . Vegetation type: Mixed Mountain Brush .

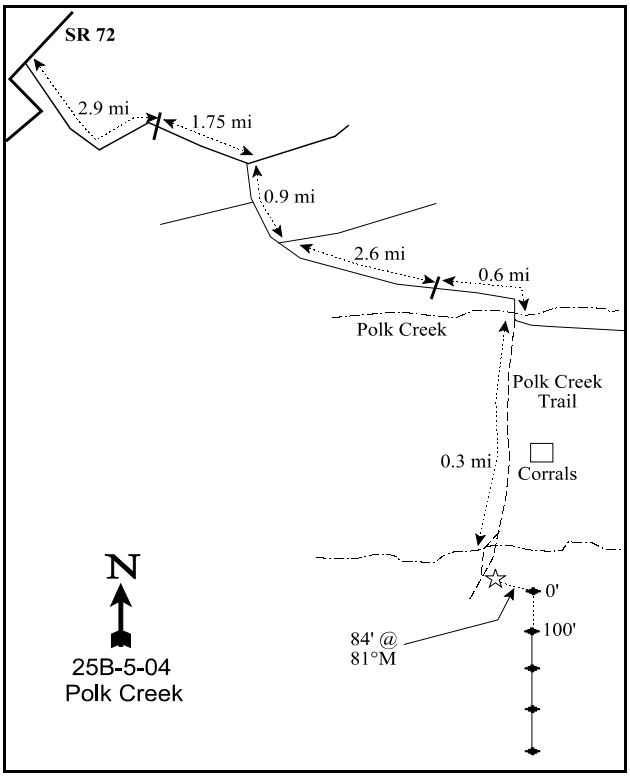
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

Travel north from Fremont on SR 72 for 7.3 miles to the Elkhorn-Torrey Road. Turn right and go 2.9 miles to a cattleguard. From the cattleguard go 1.75 miles to an intersection by Heart Lake. Take the right fork (#206) and go 0.4 miles toward Cathedral Valley. At the intersection, turn left (#22) toward Cathedral Valley. Proceed 0.5 miles to another fork (Round Lake turnoff). Stay right and go 2.6 miles to a cattleguard. From the cattleguard, proceed 0.6 miles down to Polk Creek. Immediately after crossing the creek, turn right on the Polk Creek Trail. Go 0.3 miles past a camp and some corrals on your left to another creek. Cross the creek, then look 110 feet beyond the creek (along the left fork of the road) for a steel rebar witness post on the left side of the road. The frequency baseline of the study starts 84 feet east (81°M) of the witness post. The 0-foot baseline stake has a red browse tag #7060 attached.





Map Name: Flat Top, Utah

Diagrammatic Sketch

Township 27S , Range 5E , Section 7

GPS: NAD 27, UTM 12S 4257776 N, 463973 E

DISCUSSION

Polk Creek - Trend Study No. 25B-5

The Polk Creek study is on the east side of Thousand Lake Mountain. The transect begins on nearly level ground and then gently slopes (10%) toward a northern aspect. The vegetation type is mixed mountain brush. Although the site is moderately high at 8,310 feet in elevation and probably above the limits for a severe winter range, it is still utilized moderately by deer in winter. The pellet group transect in 1999 indicated that there was 20 deer days use/acre (49 ddu/ha), 7 cow days use/acre (18 cdu/ha), and 1 elk days use/acre (2 edu/ha). Data from 2004 estimated 66 deer days use/acre (162 ddu/ha), 5 elk days use/acre (12 edu/ha), 1 moose days use/acre (2 mdu/ha), and 6 cow days use/acre (14 cdu/ha). As part of a three pasture, rest-rotation system on the Thousand Lake Cattle Allotment, the Polk Creek unit is grazed the first half of the season one year, the last half of the next season, and rested the third year.

Soil depth is variable, depending on the location on the slope. Effective rooting depth varies from shallow (8-10 inches) and rocky on the slope, to 16-18 inches with good litter cover in the flat (first hundred feet). Overall, average effective rooting depth is 11 inches. The soil has a neutral pH (6.8) and a sandy clay loam texture. There is some erosion, especially along washes and trails near the bottom of the slope. The ratio of bare ground to protective cover (vegetation, litter, and bare ground) has increased from 1:2.7 in 1994 to 1:3.8 in 2004, which is good. Soil erosion was classified as stable in 2004.

There is a variety of browse species present, with black sagebrush and bitterbrush being the key species. Bitterbrush is the species with the highest utilization. Use has been moderate to heavy with nearly each reading. In 2004, nearly all plants were classified as moderately or heavily utilized with many only being partially available. Cover has been between 10-15% since 1994. Density was 34% higher in 2004. Decadency was slightly up, but only by 16%. No young or seedlings were encountered in 2004. Seedlings were especially abundant in 1985. Bitterbrush on this site are a prostrate form, averaging a little over one-foot in height with a crown of more than three feet. They appear to spread by layering. Black sagebrush cover was about 15% in 1994 and 1999, but decreased to about 10% in 2004. Density was stable in 1994 and 1999, but declined 28% in 2004 to 6,580 plants/acre. Decadency has been stable with each reading at about 34%, but percent dying increased to 20% in 2004 from 11% in 1999. Utilization has been light on black sagebrush. The number of seedlings found in 2004 was high and the percent young (9%) was good. Other shrub species include broom snakeweed, rabbitbrush, snowberry, gray horsebrush, squawbush, and a few basin big sagebrush. None of these displayed more than light to moderate use and appeared to have stable populations. Broom snakeweed density increased by 74% in 2004.

Pinyon pine cover has increased with each of the last three readings and was over 12% in 2004 using the line intercept method. Pinyon density was estimated at 199 trees/acre in 1999 and 236 trees/acre in 2004 using the point-quarter method. Mean diameter was 2.5 inches in 1999 and 2.8 inches in 2004. In 2004, 65% of the trees sampled were classified as 4 feet tall or shorter. Utah juniper density was 46 trees/acre in 1999 and 51 trees/acre in 2004. Mean diameter was about 2 inches in both 1999 and 2004. Increased density and cover of pinyon and juniper may result in reduced production for the herbaceous understory and palatable browse species. A thinning treatment would be good for this site before canopy cover for pinyon gets beyond 15%. This is where it begins to exhibit more noticeable negative effects on the herbaceous understory (Tausch and West 1994).

Grass species show moderate diversity, but only fair forage production. The most common grass species are: blue grama, sedge, needle-and-thread, and bottlebrush squirreltail which could provide some spring-fall forage. Utilization appeared moderate from the recent cattle grazing in 1994. Nested frequency has been stable for most species, except blue grama which has slowly declined since 1994. Overall, sum of nested frequency declined slightly for perennial grasses. Forbs are fairly common in the bottom and under the

protective cover of sagebrush. However, none are very valuable as forage and several are low value increasers. All the forbs together provide little forage and only provide 2% to 5% cover. Nested frequency of forbs declined by over half in 2004.

1985 APPARENT TREND ASSESSMENT

Aside from the small washes on the flat, the soil appears stable. The bitterbrush population appears to be increasing with a very high percentage of seedlings and young and few decadent plants. The black sagebrush appears to be slightly decreasing.

1991 TREND ASSESSMENT

There are still signs of soil movement, e.g. loss of pavement cover mostly due to soil movement. There was an increase in vegetative basal cover. The trend for soil is slightly down at this time. Both key browse species (black sagebrush and bitterbrush) have increased their respective densities. Bitterbrush has almost doubled in density with a increase in percent decadency from 3 to 36%. Most of the more important grass and forb species have also shown a slight increase nested and quadrat frequency, but not enough to warrant an up change in trend.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly up (4)
herbaceous understory - stable (3)

1994 TREND ASSESSMENT

There is continuing signs of some soil movement, especially on the steeper slopes. Percent bare ground has gone down from the reading of 1991 and even slightly lower than that of 1985. Percent litter cover has decreased, as it has throughout the state with the extended drought we have been experiencing. Soil trend is considered stable at this time. There are two key browse species on this site, black sagebrush and bitterbrush. The black sagebrush trend is up with increased densities, fairly stable rate of decadency, and decreasing use. The bitterbrush density has bounced around somewhat, but this could be partially explained because the plants are an ecotype that can reproduce by layering, which can make counting them difficult. Those that have been utilized moderately have now decreased to only 2%, while percent decadency has also decreased to only 3%. Browse trend for the key species is up. The herbaceous understory has noted decreases in nested frequency values for both perennial grasses and forbs. Trend for the understory is slightly down. The Desirable Components Index (see methods) rating is poor to fair due to lack of understory production and poor browse reproduction.

TREND ASSESSMENT
soil - stable (3)
browse - up (5)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 53 (poor to fair) Mountain brush type

1999 TREND ASSESSMENT

There is continuing signs of some soil movement, especially on the steeper slopes. Percent bare ground has continued to go down from the reading of 1991. It is now at its lowest value since the study began in 1985. Percent litter cover has increased substantially with increases in precipitation. Soil trend is considered slightly improved at this time. There are two key browse species on this site, black sagebrush and bitterbrush. The

black sagebrush trend is stable. Density and decadency are stable, while use continues to decrease. The bitterbrush density has bounced around somewhat, but this can mostly be explained because the plants are an ecotype that can reproduce by layering, which can make counting their density difficult. But, those that have been utilized moderately has fluctuated from year to year with no notable harm. Browse trend for the key species is stable. The herbaceous understory trend has stabilized. The sum of nested frequency has stabilized, while percent cover for the herbaceous understory has increased with increases in precipitation.

TREND ASSESSMENT
soil - slightly improving (4)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 73 (fair to good) Mountain brush type

2004 TREND ASSESSMENT

The soil trend is fairly stable as the ratio of bare ground to protective cover (vegetation, litter, and bare ground) increased from 1:2.7 in 1994 to 1:3.8 in 2004. Bare ground cover has remained stable at about 7 or 8% relative cover. Erosion was classified as stable in 2004. The browse trend is stable for bitterbrush as cover and strip frequency has remained stable. Density is higher, but the prostate growth form makes counting problematic as it is difficult to differentiate between individuals. Use has increased without detrimental effects. Black sagebrush density and cover is down, but percent decadency has remained stable. Broom snakeweed density is substantially higher and cover has increased. Pinyon and juniper density and cover has increased, which could be detrimental to other species in the long term. The overall browse trend is slightly down, but stable for the most important species, bitterbrush. The herbaceous understory trend is slightly down. Grasses are slightly down in frequency and cover, while forb abundance has dropped by more than half.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - slightly down (2)
winter range condition (DC Index) - 61 (fair) Mountain brush type

HERBACEOUS TRENDS --
Management unit 25B, Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
G	Agropyron smithii	$_{a}$-	$_{a}$-	$_{a}$3	$_{b}$16	$_{ab}$4	.03	.13	.07
G	Bouteloua gracilis	$_{bc}$106	$_{bc}$105	$_{c}$102	$_{ab}$72	$_{a}$61	1.81	1.50	1.33
G	Carex spp.	$_{b}$176	$_{b}$186	$_{a}$86	$_{a}$102	$_{a}$91	1.01	3.33	2.84
G	Festuca ovina	-	-	-	9	5	-	.21	.02
G	Oryzopsis hymenoides	-	-	-	-	-	-	-	.00
G	Poa fendleriana	$_{bc}$32	$_{abc}$20	$_{c}$35	$_{ab}$7	$_{a}$6	.51	.10	.07
G	Sitanion hystrix	$_{bc}$152	$_{c}$180	$_{ab}$113	$_{a}$99	$_{a}$102	1.26	2.81	2.57
G	Sporobolus cryptandrus	-	-	7	-	-	.04	-	-
G	Stipa comata	$_{ab}$7	$_{a}$5	$_{ab}$7	$_{b}$32	$_{b}$30	.04	.94	1.77
G	Stipa spp.	$_{A}$-	$_{b}$18	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
G	Stipa lettermani	-	-	-	5	-	-	.30	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		473	514	353	342	299	4.73	9.34	8.71
Total for Grasses		473	514	353	342	299	4.73	9.34	8.71
F	Alyssum alyssoides (a)	-	-	-	-	2	-	-	.00
F	Antennaria parvifolia	$_{b}$6	$_{a}$1	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Antennaria rosea	-	-	3	-	1	.01	-	.03
F	Androsace septentrionalis (a)	-	-	-	1	1	-	.00	.03
F	Arabis demissa	12	11	2	15	3	.00	.17	.04
F	Artemisia dracunculus	-	-	-	-	1	-	-	.00
F	Artemisia ludoviciana	4	6	-	1	-	-	.00	-
F	Astragalus convallarius	3	-	-	-	-	-	-	-
F	Aster spp.	-	8	-	3	7	-	.00	.07
F	Astragalus spp.	4	-	7	-	2	.01	-	.03
F	Castilleja chromosa	-	5	1	-	-	.00	-	-
F	Chenopodium album (a)	-	-	-	2	-	-	.00	-
F	Chaenactis douglasii	6	5	1	-	2	.00	-	.00
F	Comandra pallida	$_{b}$13	$_{b}$7	$_{b}$16	$_{b}$14	$_{a}$-	.18	.42	-
F	Cryptantha spp.	$_{a}$15	$_{a}$14	$_{b}$40	$_{a}$14	$_{a}$6	.32	.07	.04
F	Cymopterus spp.	-	4	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	9	-	-	.02	-
F	Eriogonum alatum	$_{a}$-	$_{a}$3	$_{a}$-	$_{a}$7	$_{b}$8	-	.12	.12
F	Eriogonum cernuum (a)	-	-	1	-	-	.00	-	-
F	Erigeron pumilus	$_{b}$37	$_{ab}$15	$_{ab}$21	$_{ab}$16	$_{a}$7	.10	.11	.02
F	Eriogonum racemosum	24	22	17	28	18	.04	.53	.27
F	Gayophytum ramosissimum(a)	-	-	1	7	2	.00	.06	.01
F	Hymenoxys richardsonii	$_{ab}$9	$_{a}$5	$_{b}$24	$_{a}$14	$_{a}$3	.41	.45	.03
F	Lepidium spp. (a)	-	-	$_{a}$-	$_{b}$8	$_{a}$2	-	.02	.00
F	Lithospermum incisum	-	-	-	-	-	.00	-	-
F	Lupinus argenteus	1	-	-	-	-	-	-	-
F	Lygodesmia spinosa	$_{b}$55	$_{b}$58	$_{ab}$32	$_{a}$24	$_{a}$24	.70	1.16	.71
F	Machaeranthera canescens	$_{a}$3	$_{ab}$8	$_{a}$5	$_{b}$25	$_{a}$2	.04	.20	.03
F	Microsteris gracilis (a)	-	-	-	-	12	-	-	.04
F	Oenothera spp.	-	-	1	-	-	.00	-	-
F	Penstemon humilis	-	1	3	3	4	.03	.03	.03
F	Phlox longifolia	9	24	10	14	4	.03	.06	.01

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'99	'04	'94	'99	'04
F	Polygonum douglasii (a)	-	-	3	1	3	.01	.00	.00
F	Potentilla spp.	-	1	-	-	-	-	-	-
F	Senecio multilobatus	$_{b}$25	$_{a}$1	$_{a}$1	$_{c}$62	$_{b}$19	.00	1.71	.19
F	Sphaeralcea coccinea	3	-	1	3	2	.03	.03	.03
F	Taraxacum officinale	-	5	-	3	-	-	.00	-
F	Tragopogon dubius	-	3	-	3	4	-	.00	.01
F	Unknown forb-perennial	2	-	-	-	-	-	-	-
F	Zigadenus paniculatus	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	5	28	22	0.01	0.12	0.10
Total for Perennial Forbs		232	207	185	249	117	1.94	5.10	1.70
Total for Forbs		232	207	190	277	139	1.96	5.23	1.80

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

BROWSE TRENDS --
Management unit 25B, Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Artemisia nova	98	95	91	15.72	14.35	9.55
B	Artemisia tridentata vaseyana	3	10	14	.53	.84	.93
B	Ceratoides lanata	2	2	2	.00	.00	.00
B	Chrysothamnus depressus	15	15	24	.12	.15	.40
B	Chrysothamnus nauseosus	9	10	16	.72	.09	.71
B	Chrysothamnus viscidiflorus lanceolatus	54	46	46	1.80	1.43	1.33
B	Coryphantha vivipara arizonica	0	0	1	-	-	-
B	Gutierrezia sarothrae	23	16	41	.10	.16	1.71
B	Juniperus osteosperma	0	2	3	-	.63	.15
B	Opuntia spp.	4	4	4	.18	.15	.15
B	Pediocactus simpsonii	0	3	8	-	.00	-
B	Pinus edulis	0	13	19	4.33	5.49	7.28
B	Purshia tridentata	47	47	48	10.00	15.23	13.23
B	Symphoricarpos oreophilus	5	7	5	-	.41	.38
B	Tetradymia canescens	20	28	25	.44	.79	.85
B	Yucca spp.	0	0	1	-	-	.03
Total for Browse		280	298	348	33.96	39.76	36.74

CANOPY COVER, LINE INTERCEPT --
Management unit 25B, Study no: 5

Species	Percent Cover	
	'99	'04
Artemisia nova	-	9.26
Artemisia tridentata vaseyana	-	.63
Chrysothamnus depressus	-	.70
Chrysothamnus nauseosus	-	1.41
Chrysothamnus viscidiflorus lanceolatus	-	2.75
Gutierrezia sarothrae	-	1.25
Juniperus osteosperma	-	1.46
Opuntia spp.	-	.48
Pinus edulis	5.00	12.68
Purshia tridentata	-	18.33
Symphoricarpos oreophilus	-	.75
Tetradymia canescens	-	.61
Yucca spp.	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25B, Study no: 5

Species	Average leader growth (in)
	'04
Artemisia nova	1.3
Artemisia tridentata vaseyana	3.7
Purshia tridentata	5.3

POINT-QUARTER TREE DATA --
Management unit 25B, Study no: 5

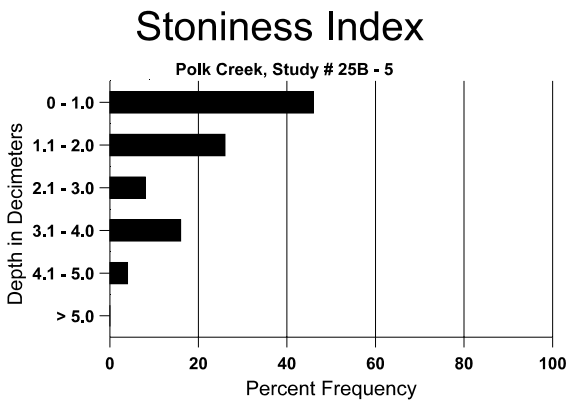
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus osteosperma	46	51	2.0	2.1
Pinus edulis	199	236	2.5	2.8
Pinus ponderosa	19	-	5.9	-

BASIC COVER --
Management unit 25B, Study no: 5

Cover Type	Average Cover %				
	'85	'91	'94	'99	'04
Vegetation	8.75	11.00	38.57	48.68	42.66
Rock	4.75	6.25	17.39	18.85	18.57
Pavement	17.25	7.75	9.53	8.58	10.69
Litter	54.25	53.50	30.89	43.84	38.29
Cryptogams	0	.75	.05	.15	.11
Bare Ground	15.00	20.75	13.78	8.48	9.40

SOIL ANALYSIS DATA --
Management unit 25B, Study no: 5, Study Name: Polk Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.2	52.0 (11.2)	6.8	53.8	22.5	23.6	2.2	12.7	198.4	0.5



PELLET GROUP DATA --
Management unit 25B, Study no: 5

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	23	32	15
Elk	7	2	3
Deer	23	9	23
Cattle	4	7	-
Moose	-	-	-

Days use per acre (ha)	
'99	'04
-	-
1 (2)	5 (12)
20 (49)	66 (162)
7 (18)	6 (14)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 25B, Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**6732**	933	600	3666	2466	-	46	22	37	3	14	7/9
91	**7466**	133	1600	3333	2533	-	29	2	34	4	13	8/14
94	**9120**	5120	460	5560	3100	600	7	0	34	9	9	10/21
99	**9160**	800	1500	4600	3060	2000	20	2	33	11	11	11/19
04	**6580**	1140	560	3800	2220	2100	9	0	34	20	20	9/16
Artemisia tridentata vaseyana												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**266**	-	-	66	200	-	0	0	75	-	0	11/7
94	**100**	-	-	100	-	-	0	0	0	-	0	21/30
99	**300**	40	100	180	20	-	7	0	7	-	0	20/27
04	**360**	240	80	200	80	220	22	0	22	11	11	15/20
Ceratoides lanata												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**60**	-	-	60	-	-	0	0	0	-	0	6/4
99	**100**	-	-	80	20	-	20	80	20	-	0	5/6
04	**80**	-	40	20	20	-	0	50	25	25	25	5/5
Chrysothamnus depressus												
85	**1466**	-	66	1000	400	-	5	0	27	-	5	3/6
91	**2533**	-	333	600	1600	-	32	42	63	3	11	3/6
94	**420**	-	-	420	-	-	0	0	0	-	0	5/10
99	**480**	-	20	460	-	-	21	25	0	-	0	4/7
04	**720**	-	-	660	60	-	17	42	8	8	8	7/11
Chrysothamnus nauseosus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**240**	-	-	120	120	-	0	0	50	8	8	15/19
99	**220**	-	40	120	60	-	9	9	27	-	0	22/28
04	**500**	-	100	260	140	-	16	0	28	20	20	17/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus lanceolatus												
85	**866**	66	66	800	-	-	0	0	0	-	0	7/5
91	**66**	-	-	66	-	-	0	0	0	-	0	4/13
94	**2120**	60	100	1960	60	-	0	0	3	-	0	18/27
99	**1740**	120	80	1600	60	20	1	0	3	1	1	10/15
04	**2060**	60	280	1680	100	-	8	0	5	3	3	11/15
Coryphantha vivipara arizonica												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	2/2
Echinocereus spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	5/19
Gutierrezia sarothrae												
85	**4932**	-	400	3866	666	-	1	0	14	-	1	6/4
91	**1399**	-	600	733	66	-	19	0	5	-	0	4/5
94	**920**	100	480	440	-	-	0	0	0	-	0	5/5
99	**580**	360	40	540	-	-	0	0	0	-	0	7/8
04	**2260**	20	200	2060	-	-	0	0	0	-	0	8/9
Juniperus osteosperma												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**60**	-	40	20	-	-	0	0	-	-	0	-/-
Opuntia spp.												
85	**399**	-	333	66	-	-	0	0	-	-	0	1/5
91	**333**	-	-	333	-	-	0	0	-	-	0	4/5
94	**120**	-	60	60	-	-	0	17	-	-	0	3/6
99	**80**	-	-	80	-	-	0	0	-	-	0	5/16
04	**200**	-	40	160	-	-	0	0	-	-	0	5/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	2/3
99	**60**	-	40	20	-	-	0	0	-	-	0	-/-
04	**220**	-	60	160	-	-	0	0	-	-	0	3/3
Pinus edulis												
85	**332**	266	266	66	-	-	0	0	-	-	0	69/128
91	**333**	333	200	133	-	-	0	0	-	-	0	81/87
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**260**	200	180	80	-	-	0	0	-	-	0	-/-
04	**460**	20	320	140	-	-	0	0	-	-	13	-/-
Purshia tridentata												
85	**1865**	1000	666	1133	66	-	36	46	4	-	4	13/41
91	**3065**	333	266	1666	1133	-	33	22	37	-	0	7/21
94	**2520**	40	-	2440	80	-	2	2	3	-	0	12/36
99	**1840**	20	180	1480	180	120	30	38	10	7	7	15/43
04	**2800**	-	-	2340	460	80	46	49	16	12	12	16/38
Rhus trilobata												
85	**66**	-	-	66	-	-	100	0	-	-	0	12/20
91	**66**	-	-	66	-	-	100	0	-	-	0	18/23
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**120**	-	20	100	-	-	0	0	-	-	0	13/23
99	**140**	-	-	140	-	-	29	0	-	-	0	19/26
04	**140**	-	20	120	-	-	0	0	-	-	0	11/21
Tetradymia canescens												
85	**866**	-	200	466	200	-	0	0	23	-	0	5/4
91	**998**	-	66	666	266	-	27	0	27	-	0	7/4
94	**480**	-	40	400	40	20	0	0	8	4	4	9/11
99	**700**	-	140	460	100	-	14	3	14	3	3	9/10
04	**600**	20	100	440	60	-	23	0	10	3	3	10/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Yucca spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	20	-	-	-	0	0	-	-	0	-/-

Trend Study 25B-6-04

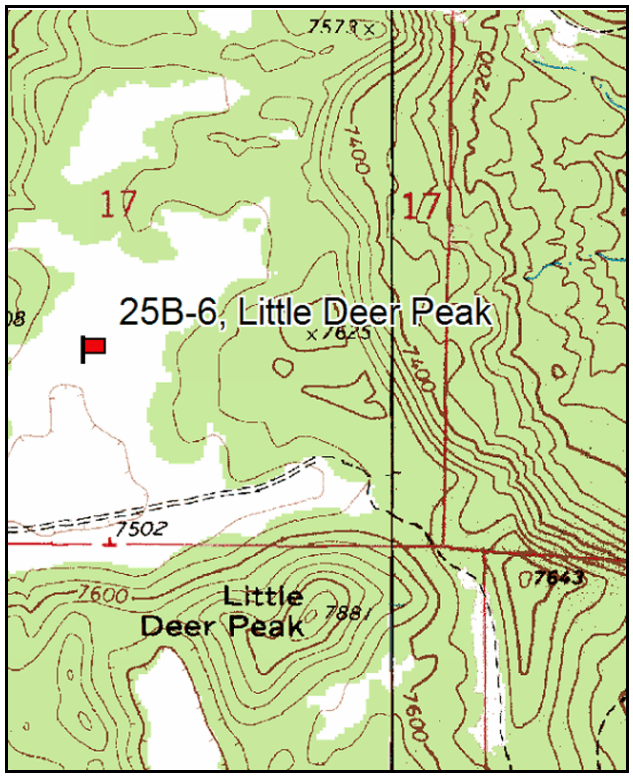
Study site name: Little Deer Peak . Vegetation type: Wyoming Big Sagebrush .

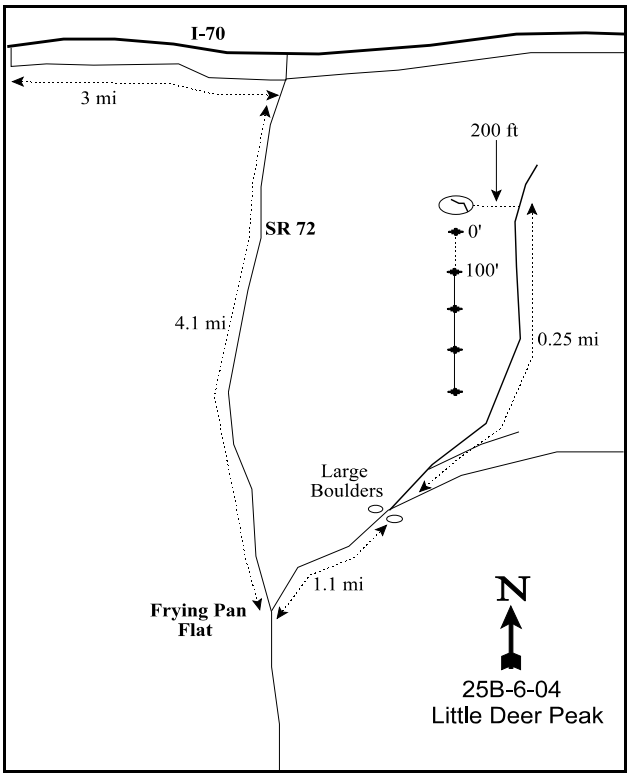
Compass bearing: frequency baseline 160 degrees magnetic.

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

LOCATION DESCRIPTION

From Salina, go 37.5 miles east on I-70 to a rest area. From the rest area, go approximately 3 miles east on the frontage road to Fremont Junction. Turn south on SR 72 and drive 4.1 miles to a left turn across from Frying Pan Flat. Go left down this road for 1.1 miles to a fork between 2 large boulders. Take the left fork 0.05 miles to another fork. Go left 0.2 miles to a large split boulder which is 200 feet to the left of the road. The 0-foot baseline stake is 15 feet south of the split boulder and has a red browse tag #7082 attached.





Map Name: John's Peak, Utah

Diagrammatic Sketch

Township 24S , Range 5E , Section 17

GPS: NAD 27, UTM 12S 4285555 N, 466677 E

DISCUSSION

Little Deer Peak - Trend Study No. 25B-6

The Little Deer Peak transect samples a sagebrush flat of about 260 acres that is surrounded by low hills of pinyon-juniper woodland. The flat has a slope of a little over 1% and an elevation of 7,490 feet. The BLM Little Deer Peak grazing allotment is for cattle from March 16 to May 31. Grazing pressure appears to have been heavy in the past as most cool season grasses are gone and a warm season grass dominates the area by contributing 84% of the total grass cover. It has not received much use since 1982 and there were no recent signs of livestock or big game use in 1985. No deer pellet groups were found on the study area in 1985, but in 1991 there were 5 deer days use/acre (12 ddu/ha) and 9 elk days use/acre (22 edu/ha) estimated. In 1999, the pellet group transect showed 31 deer days use/acre (76 ddu/ha), 41 elk days use/acre (100 edu/ha), and 7 cow days use/acre (18 cdu/ha). In 2004 wildlife use was lower with an estimated 3 deer days use/acre (8 ddu/ha), 21 elk days use/acre (53 edu/ha), and 4 cow days use/acre (11 cdu/ha). Escape cover is good on the nearby slopes.

The soil texture is a sandy clay loam with a neutral pH (7.3). Infiltration is poor, as evidenced by the puddles that formed from small amounts of rain which have fallen on the site. Effective rooting depth is just over 12 inches with little surface rock and pavement cover. Pavement and rock accounts for about 10% of the ground cover. Bare ground has varied between 37-42%. It appears that the bare interspaces have been subject to soil loss and compaction from trampling. Moderate pedestalling is evident for grasses and shrubs. Many of the large bare areas present are the result of red harvester ant activities. Some areas are denuded of vegetation up to 20 feet in diameter by the harvester ant activities. Grasshoppers were also present in moderately high numbers in 1991. The large patches of blue grama appear to grow on the more clay soils where the soil pentrometer had more shallow readings or 4-5 inches. There was a noticeable caliche layer at approximately 12 inches in depth which could be restrictive to plant roots.

Wyoming big sagebrush is the most abundant browse plant with about 13% cover. The plants are scrubby and stunted and look very similar to black sagebrush in stature. Average size is only 12 inches high with about a 16 to 25 inch crown. Density has remained stable since 1999 at 6,200 plants/acre. Decadence has also remained stable at about 30%. Plants showing poor vigor was high in 1985 at 21%. Percent dying increased to 13% in 2004, which is higher than it had ever been due to drought. Utilization has been light to moderate with some heavier use in 1985. Percentage of young plants present in the population has been quite variable through the years and was very low in 2004. Low rabbitbrush and broom snakeweed are also abundant and appear to be stable.

Quadrat frequency and diversity of herbaceous species is low. Two species of grass, blue grama and bottlebrush squirreltail, are fairly common. Blue grama dominates, provides about 80% of the grass cover. Bottlebrush squirreltail significantly decreased in frequency from 77% of quadrats sampled in 1999 to 56% by 2004. Crested wheatgrass was not sampled in 1985 or 1991. In 1999, it was noted that it was on site, but not sampled. In 2004 crested wheatgrass increased and was sampled in 18% of the quadrats. Scarlet globemallow and low fleabane are the only common forbs and they do not provide much usable forage. Scarlet globemallow nested frequency decreased significantly in 2004.

1985 APPARENT TREND ASSESSMENT

The soil trend appears to be stable. Although there is a lot of bare soil exposed, the area is very level and no gullies are present. Vegetative trend appears down as the Wyoming big sagebrush appears to be declining. There are no desirable species to move in and replace it. The herbaceous species provide little forage and include several species of increasers.

1991 TREND ASSESSMENT

Soil trend is stable for now even though percent bare soil increased slightly. The minor change was not enough to change the trend slightly down. This turn around with an increase in precipitation. The key browse species, Wyoming big sagebrush, has lost 47% of its population since 1985. However, it should be noted that about 25% of the population were young plants which can be lost to drought fairly easy. Percent decadency has decreased from 35 to 29%. This would indicate that the initially high densities and the extended drought have thinned out the sagebrush thereby lowering the percentage of the population classified as being in poor vigor from 21% down to only 6%. Low rabbitbrush has more than doubled it's density in the interim. Trend for browse would be considered slightly down. There is very low diversity of species for the grasses and forbs. Nested frequency and quadrat frequency for perennial grasses and forbs show an increase that warrants a trend of slightly up.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - slightly up (4)

1999 TREND ASSESSMENT

Soil trend would be considered stable with a decrease in percent bare ground, but still in poor condition overall. With the sample size for browse being increased by more than three times, the browse density will be changed somewhat. The key browse species, Wyoming big sagebrush, now has a density of 6,200 plants/acre. What is more important to note for changes in trend is that percent decadency has stayed about the same; percent young is still moderately high at 11%; the percentage of the decadent class that were classified as dying has remained almost unchanged since 1985; those classified with poor vigor have gone from 21% and remained stable at 6%; the number of plants with heavy use has decreased from 42% to 8%, now it is only 2%. All these changes would indicate a slightly improving trend for sagebrush on this site. There is very low diversity of species for the grasses and forbs. It has stayed about the same, with some gains and some losses for both groups of plants. The Desirable Components Index (see methods) rating is good to excellent with a high amount of grass cover and a healthy stand of sagebrush.

TREND ASSESSMENT
soil - stable, but poor condition (3)
browse - slightly improving (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 65 (good to excellent) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The soil trend is stable as the percent cover of vegetation, litter, and bare ground is nearly unchanged since 1999. The browse trend is stable. Wyoming big sagebrush cover, density, and decadence are also unchanged. The percent of young plants is low and percent dying has increased, but is not extremely high at this time. Broom snakeweed and low rabbitbrush densities are also stable. The herbaceous understory trend is stable. The sum of nested frequency for perennial grasses and forbs has declined slightly since 1999, however it is not enough to warrant a change in trend. Bottlebrush squirreltail and scarlet globemallow were the species that have decreased most significantly. The Desirable Components Index (see methods) rating is good with a high amount of grass cover and a healthy stand of sagebrush.

TREND ASSESSMENT
soil - stable, but poor condition (3)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 58 (good) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 25B, Study no: 6

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$35	.00	.90
G	Bouteloua gracilis	$_{a}$286	$_{b}$321	$_{a}$278	$_{a}$279	14.19	14.63
G	Carex spp.	$_{b}$9	$_{a}$-	$_{a}$-	$_{a}$-	-	-
G	Oryzopsis hymenoides	$_{a}$-	$_{b}$11	$_{a}$-	$_{a}$1	-	.00
G	Sitanion hystrix	$_{a}$92	$_{a}$115	$_{b}$188	$_{a}$129	2.71	2.75
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		387	447	466	444	16.92	18.30
Total for Grasses		387	447	466	444	16.92	18.30
F	Arabis spp.	-	-	7	-	.01	-
F	Astragalus spp.	6	-	-	-	-	-
F	Chaenactis douglasii	1	-	-	-	-	-
F	Chenopodium fremontii (a)	-	-	$_{a}$-	$_{b}$13	-	.03
F	Chenopodium leptophyllum(a)	-	-	$_{a}$-	$_{b}$28	-	.08
F	Descurainia pinnata (a)	-	-	-	3	-	.00
F	Draba spp. (a)	-	-	1	-	.00	-
F	Erigeron pumilus	$_{bc}$33	$_{c}$50	$_{a}$8	$_{ab}$21	.07	.17
F	Gayophytum ramosissimum(a)	-	-	-	3	-	.00
F	Penstemon comarrhenus	3	-	-	1	-	.03
F	Penstemon spp.	2	6	2	-	.00	-
F	Sanguisorba minor	-	-	-	1	-	.00
F	Sphaeralcea coccinea	$_{a}$105	$_{ab}$119	$_{b}$152	$_{ab}$114	1.43	1.03
Total for Annual Forbs		0	0	1	47	0.00	0.12
Total for Perennial Forbs		150	175	169	137	1.52	1.24
Total for Forbs		150	175	170	184	1.52	1.37

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

BROWSE TRENDS --
Management unit 25B, Study no: 6

Type	Species	Strip Frequency '99	Strip Frequency '04	Average Cover % '99	Average Cover % '04
B	Artemisia frigida	9	4	.09	.33
B	Artemisia nova	1	0	-	-
B	Artemisia tridentata wyomingensis	84	86	13.93	12.68
B	Chrysothamnus viscidiflorus viscidiflorus	62	65	1.35	2.10
B	Echinocereus triglochidatus	4	0	-	-
B	Gutierrezia sarothrae	50	58	1.60	2.32
B	Leptodactylon pungens	4	2	-	-
B	Opuntia spp.	12	11	.01	.06
B	Pediocactus simpsonii	2	7	-	.02
Total for Browse		228	233	17.00	17.53

CANOPY COVER, LINE INTERCEPT --
Management unit 25B, Study no: 6

Species	Percent Cover '04
Artemisia frigida	.23
Artemisia tridentata wyomingensis	16.70
Chrysothamnus viscidiflorus viscidiflorus	6.31
Gutierrezia sarothrae	2.63
Opuntia spp.	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25B, Study no: 6

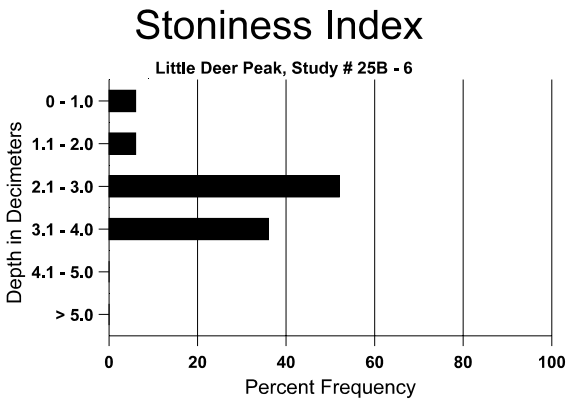
Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	2.0

BASIC COVER --
Management unit 25B, Study no: 6

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	17.50	14.75	34.75	36.79
Rock	2.00	2.00	2.86	2.88
Pavement	13.50	7.25	4.82	7.90
Litter	29.00	32.25	23.83	24.63
Cryptogams	1.25	1.75	1.10	2.19
Bare Ground	36.75	42.00	38.14	41.32

SOIL ANALYSIS DATA --
Management unit 25B, Study no: 6, Study Name: Little Deer Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.5	54.0 (12.5)	7.3	49.8	25.2	24.9	1.4	13.1	153.6	0.5



PELLET GROUP DATA --
Management unit 25B, Study no: 6

Type	Quadrat Frequency	
	'99	'04
Rabbit	41	20
Elk	17	8
Deer	12	8
Cattle	1	1

Days use per acre (ha)	
'99	'04
-	-
41 (100)	21 (53)
31 (76)	3 (8)
7 (18)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 25B, Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**66**	-	-	66	-	-	0	0	-	-	0	10/10
91	**66**	-	-	66	-	-	0	100	-	-	0	2/6
99	**300**	100	40	260	-	-	13	13	-	-	0	5/5
04	**160**	-	-	160	-	-	0	0	-	-	0	7/9
Artemisia nova												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**100**	-	-	-	100	-	0	0	100	100	100	-/-
04	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata wyomingensis												
85	**9599**	66	2266	4000	3333	-	45	42	35	2	21	10/15
91	**5132**	-	266	3400	1466	-	19	8	29	2	6	10/16
99	**6200**	180	680	3640	1880	1020	35	2	30	6	6	12/24
04	**6220**	20	60	4340	1820	1540	21	26	29	13	13	13/25
Chrysothamnus viscidiflorus viscidiflorus												
85	**4533**	-	1533	3000	-	-	4	0	0	-	0	9/10
91	**7733**	66	1933	4800	1000	-	24	9	13	1	3	3/6
99	**3540**	-	240	3020	280	-	5	0	8	4	7	6/10
04	**3300**	-	40	3220	40	-	0	0	1	.60	.60	9/14
Echinocereus triglochidatus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**100**	-	20	80	-	-	0	0	-	-	0	1/3
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**2940**	340	180	2760	-	40	.68	0	-	-	0	6/9
04	**2820**	-	-	2820	-	-	0	0	-	-	0	7/9
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**80**	-	-	60	20	-	0	0	25	25	25	5/7
04	**120**	-	-	120	-	-	0	0	0	-	0	5/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia spp.												
85	**200**	-	-	200	-	-	0	0	0	-	0	5/7
91	**133**	-	-	133	-	-	0	0	0	-	0	2/9
99	**380**	40	40	320	20	-	0	0	5	5	11	3/9
04	**320**	-	20	300	-	-	0	0	0	-	0	2/7
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	1/3
04	**160**	-	20	140	-	-	0	0	-	-	0	1/2
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	66	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

SUMMARY

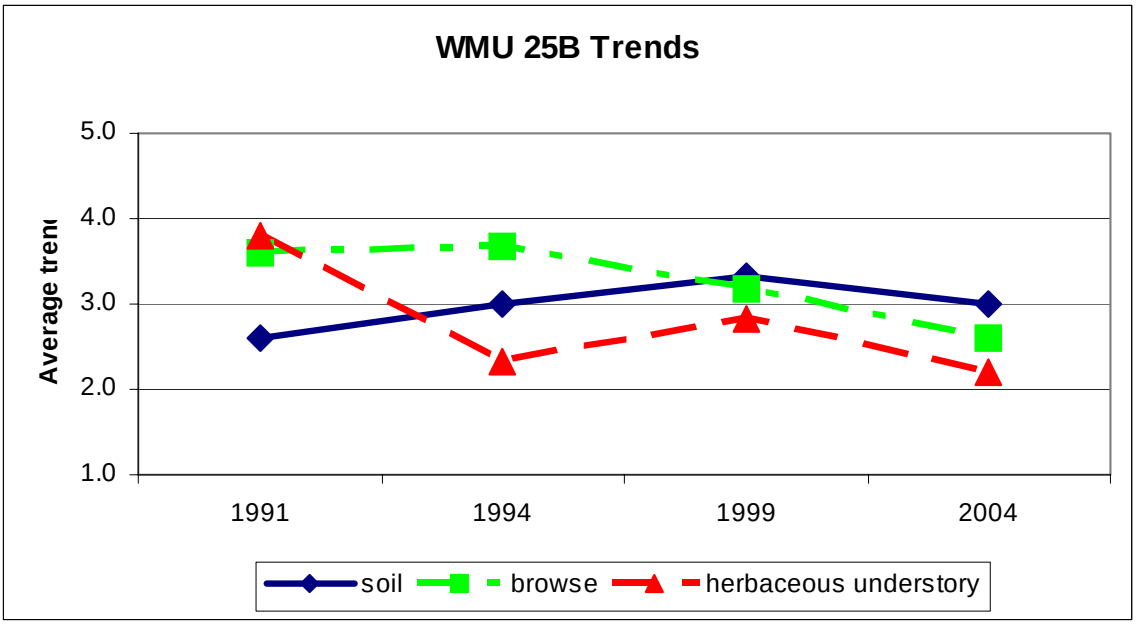
WILDLIFE MANAGEMENT UNIT 25B - THOUSAND LAKE

Five of the six trend studies were monitored on this unit in 2004. Thousand Lake (25B-1) was not monitored due to poor access. Soil trends for each site are stable, but in poor condition for most sites except Polk Creek. Browse trends are stable for the three Wyoming big sagebrush sites on this unit (Horse Valley, Sage Flat, and Little Deer Peak), which is generally contrary to many of the trends currently seen around the state. Browse trends for Solomon Basin and Polk Creek are slightly down due to increases in pinyon and juniper and other increaser species. The herbaceous trends are slightly down for each sites except for Little Deer Peak which had a stable trend. Drought conditions have resulted in reduced abundance of perennial grasses and forbs, which were already sparse in 1999 for most sites.

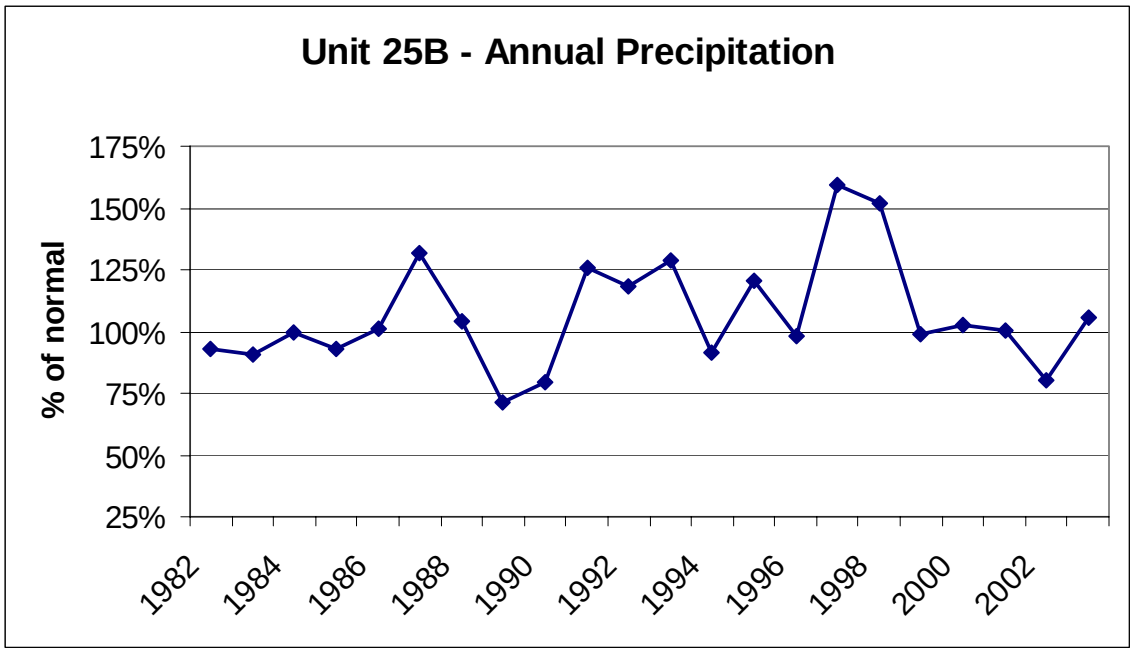
Many of these range trends are driven by precipitation patterns. Utah has been in a drought for the past five years. Data from three weather stations near this subunit (Loa, Salina, and Capitol Reef National Park) were analyzed to look at precipitation patterns since 1982 (Utah Climate Summaries 2004). Precipitation was averaged for each station and analyzed as percent of normal precipitation. Below normal precipitation is defined as less than 90% and drought as less than 75% of normal. Total annual precipitation was below normal in 2002 (80%), but was near normal or above for most of the last decade. Drought conditions were seen from 1989-1990. In 1997 and 1998, precipitation was near 150%. Seasonal distribution of precipitation was also analyzed for spring (April-June) and fall (September-November). Spring precipitation is important for cool season grasses and forbs, as well as shrubs that initiate growth during this period. Spring precipitation was only 20% of normal in 2002. 2000 and 2003 also had spring conditions that were very dry. Dry spring conditions like these may have led to declines in cool season herbaceous species. Warm season species, such as blue grama, have not been affected by the recent dry period.

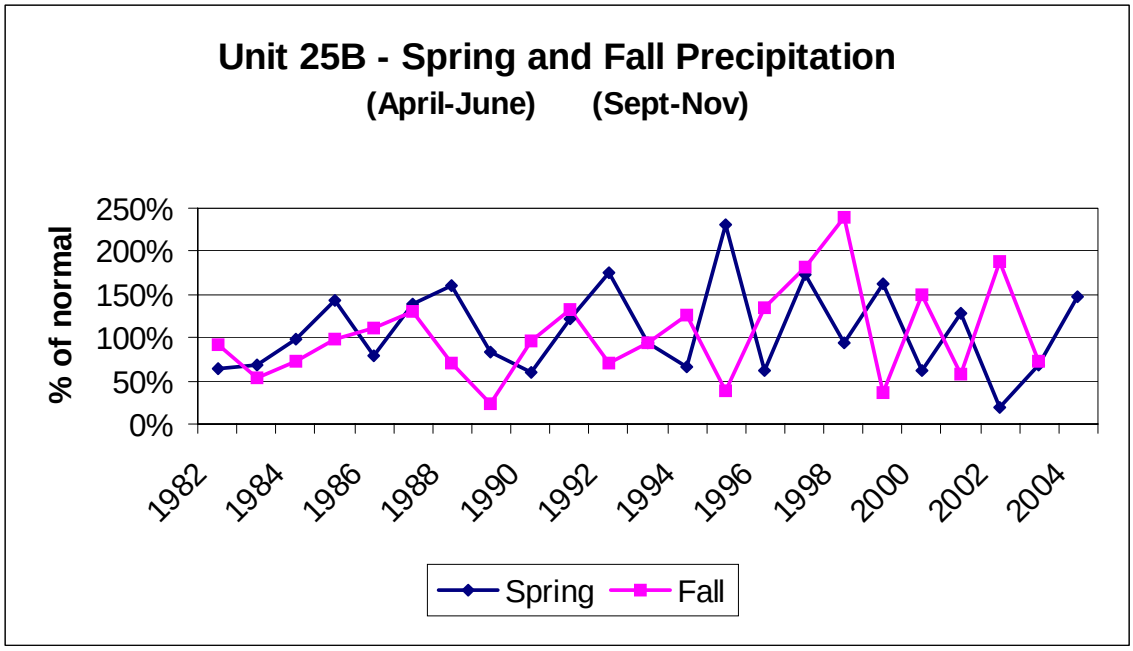
Average Trends -- WMU 25B Thousand Lake

	1991	1994	1999	2004
Soil	2.6	3.0	3.3	3.0
Browse	3.6	3.7	3.2	2.6
Herb	3.8	2.3	2.8	2.2
	6 sites	4 sites	6 sites	5 sites



Precipitation graphs for Thousand Lake unit. Data is percent of normal precipitation averaged for 3 weather stations at Loa, Salina, and Capitol Reef National Park (Utah Climate Summaries 2004).





Trend Summary

	Category	1985	1991	1994	1999	2004
25B-1 Thousand Lake	soil	est	3	NR	3	susp
	browse	est	5	NR	3	susp
	herbaceous understory	est	4	NR	3	susp
25B-2 Horse Valley	soil	est	2	3	4	3
	browse	est	2	2	3	3
	herbaceous understory	est	4	2	3	2
25B-3 Sage Flat	soil	est	3	3	3	3
	browse	est	5	4	3	3
	herbaceous understory	est	4	3	3	2
25B-4 Solomon Basin	soil			est	3	3
	browse			est	3	2
	herbaceous understory			est	2	2
	Category	1985	1991	1994	1999	2004
25B-5 Polk Creek	soil	est	2	3	4	3
	browse	est	4	5	3	2
	herbaceous understory	est	3	2	3	2
25B-6 Little Deer Peak	soil	est	3	NR	3	3
	browse	est	2	NR	4	3
	herbaceous understory	est	4	NR	3	3

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up,
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

REFERENCES

Beck, J. L. and D. L. Mitchell. 1997. Brief guidelines for maintaining and enhancing sage grouse habitat on private lands in Utah. UT 190-7-3. U.S. Natural Resources Conservation Service. Salt Lake, Utah.

Bogedahl, L. C. 1983. Draft deer herd unit 46 management plan. Utah Dept. of Natural Resources, Division of Wildlife Resouces. Salt Lake City, Utah. 36 pp.

BLM Henry Mountains Office, Unpublished data. 2004. Bureau of Land Management-Henry Mountains 2004 rain gauge data. BLM Henry Mountains Office, Hanksville, Utah.

Bureau of Land Management, Richfield District. 1983. Henry Mountains Grazing EIS.

Coles, F. H. and J. C. Pederson. 1967. Utah big game range inventory, 1966. Publ No. 67-1. Utah Department of Fish and Game, Salt Lake City, Utah. 171 pp.

Coles, F. H. and J. C. Pederson. 1968. Utah big game range inventory, 1967. Publ No. 68-2. Utah Department of Fish and Game, Salt Lake City, Utah. 120 pp.

Evans, G., W. Shields and others. 1995. Utah big game annual report, 1995. Publ. No. 95-12. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah. 127 pp.

Evans, G., W. Shields and others. 1997. Utah big game annual report, 1997. Publ. No. 97-17. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah. 302 pp.

Inglet, Corey. 1983. Deer herd unit management plan, herd unit 52. Utah division of Wildlife Resources.

Giunta, B. C. 1982. Utah Big game range inventory, 1980. Utah Division of Wildlife Resources. Publ. No. 82-5.

Guinta, B. C. and R. Musclow. 1983. Utah big game range inventory, 1981. Publ. No. 83-1. Utah Dept of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah. 189 pp.

Huff, C. L., and R. Blotter. 1964. Utah big game range inventory, 1962-63. Publ. No. 64-2. Utah Dept. of Fish and Game. Salt Lake City, Utah.

Jense, G. K., et al. 1985. Utah big game annual report, 1985. Publ. No. 85-1. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Jense, G. K., et al. 1986. Utah big game annual report, 1986. Publ. No. 86-3. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Jense, G. K., et al. 1991. Utah big game annual report, 1991. Publ. No. 91-3. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Jense, G. K., et al. 1992. Utah big game annual report, 1993. Publ No. 92-13. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Jense, G. K., W. Shields and others. 1993. Utah big game annual report, 1993. Publ. No. 93-3. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah.

Mann, D. 1985. Deer winter range needs. August 20, 1985 update. Utah Division of Wildlife Resources.

Mann, R. P. and G. Wallace. 1983. Draft deer herd unit 31A management plan. Utah Dept of Natural Resources. Division of Wildlife Resources. 23 pp.

Nelson, K. L. 1965. Status and habits of the American Buffalo in the Henry Mountains area of Utah. Utah State Fish and Game Bulletin No. 65-2. 142 pp.

Mueggler, W. F. and R. B. Campbell, Jr. 1986. Aspen community types of Utah. USDA Forest Service Intermountain Research Paper INT-362.

Rawley, E. V. 1985. Early records of wildlife in Utah. Publ. No. 86-2. Utah Dept. of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah. 102 pp.

Shields, Wes. 1995. Utah Big Game Annual Report 1995. Utah Division of Wildlife Resources. Publ. No. 95-12.

Stokes, W. L. 1986. Geology of Utah. Utah Museum of Natural History Occasional Paper No. 6. 280 pp.

Tausch, R. J. and N. E. West. 1994. Plant species composition patterns with differences in tree dominance on southwestern Utah Pinion-Juniper site. *In*: D. W. Shaw, E. F. Aldon, and C. LoSapio (tech. coords.), Desired future conditions for Pinion-Juniper ecosystems. 1994. Gen tech report RM-258. Fort Colins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, p. 16-23.

Utah Climate Summaries. Sept. 2004. Western regional climate center. Sept. 2004. <http://www.wrcc.dri.edu/summary/climsmut.html>.

Utah Division of Wildlife Resources. In Press. 1998 Utah Big Game Management Plan (Draft Copy). Utah Dept. of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah.

Utah State Interagency Committee. 1983. A manual of Utah big game range trend study guidelines. Utah Dept. of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah. 112 pp.