

# UTAH BIG GAME RANGE TREND STUDIES 2002 Volume 1 Central Region



**PUBLICATION NUMBER 03-14  
REPORT FOR FEDERAL AID PROJECT W-82-R-47**

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

**UTAH BIG GAME  
RANGE TREND STUDIES  
2002 Volume 1**

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## PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

### Need:

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

### Objective:

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

### Expected Results or Benefits:

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

## REMARKS

The work completed during the 2002 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Central Region. Trend studies surveyed in these management units were established in 1983, 1984, and 2002, with rereads in 1989, 1990, 1996, 1997, 1999, and 2002.

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 Salt Lake Field Office

Uinta National Forest

Pleasant Grove Ranger District

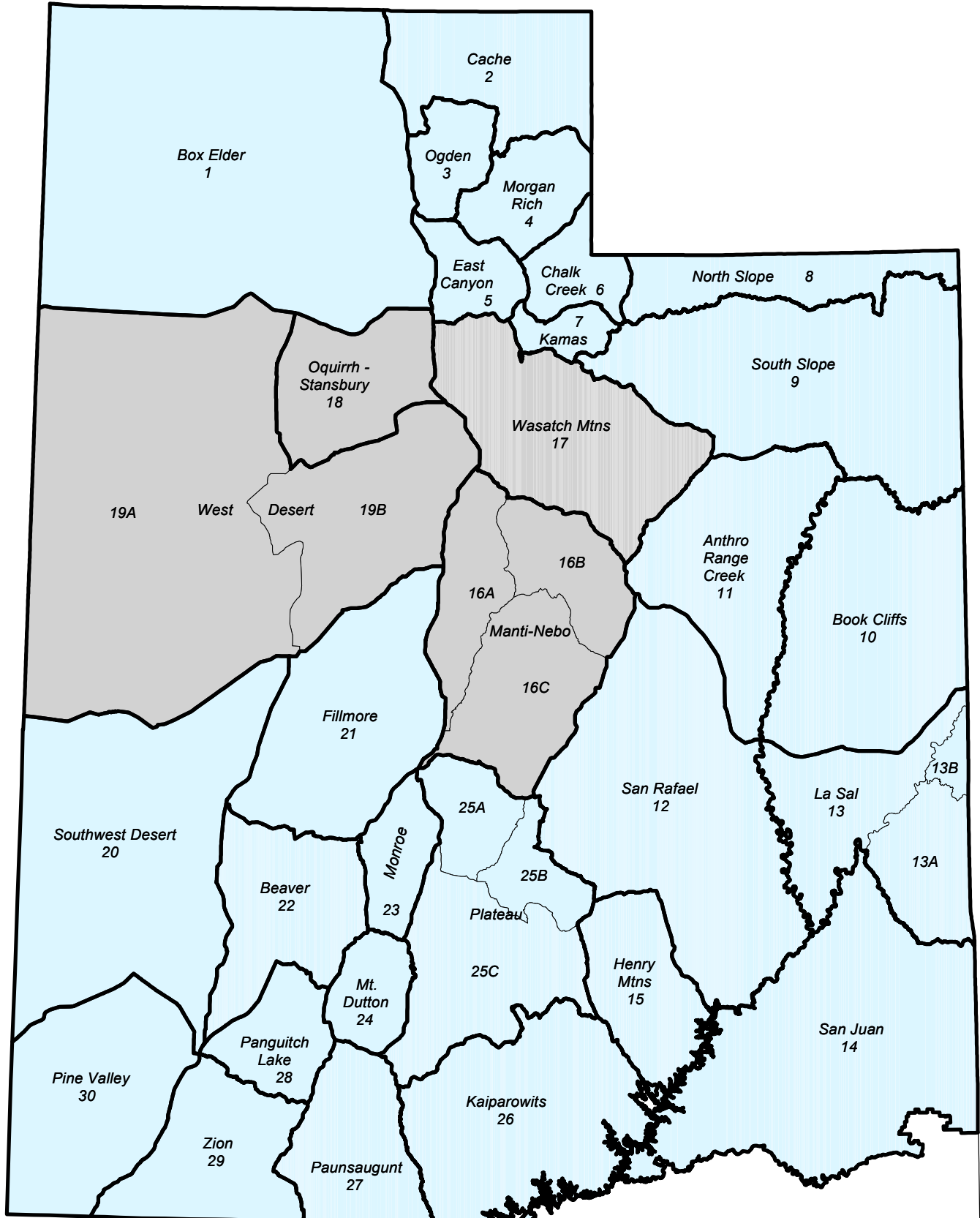
Spanish Fork Ranger District

Manti-La Sal National Forest

Sanpete Ranger District

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

# Utah Management Units Surveyed in 2002



## RANGE TREND STUDY METHODS

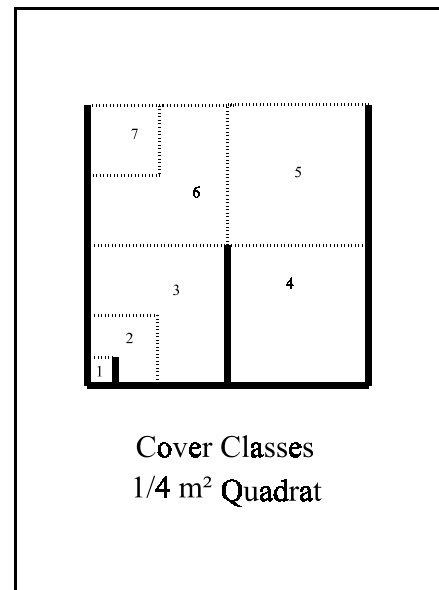
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be 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. The beginning of each belt is marked by rebar to ensure a more precise alignment of the originally sampled belt.

### Vegetative composition

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

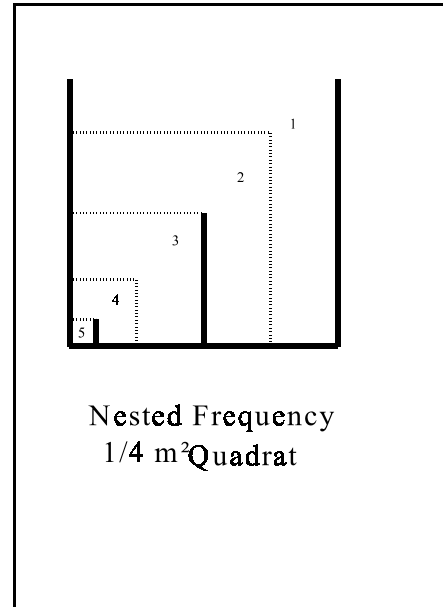
Cover is determined using a slightly modified Daubenmire (1959) cover class method (Bailey and Poulton, 1968). The seven cover class are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, 7) 95.1-100%. For example, to estimate vegetative cover with this method, an observer would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

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



Higher nested frequency scores represent a higher abundance for that plant species. These summed values are used to help determine changes in trend and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (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. Quadrat frequency is used as another quantitative, but less sensitive measure to help corroborate the trends being illustrated by the sum of nested frequency values.

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

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

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

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

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

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

Dead: A plant which is no longer living.

Shrubs are also rated according to the amount of use by placing shrubs in form classes 1 through 9.

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

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

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

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

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

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

Shrubs are also rated on their health by vigor classes 1-4.

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

In addition, each mature shrub species closest to every 10 foot mark along a sampling belt is measured to determine average height and crown. This allows a possible sample of 50 plants per species depending on their respective densities. Annual leader growth is estimated for key browse species on each trend 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 by the point-center quarter method centered on two-hundred foot intervals. 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, used to estimate shrub density, can in most cases effectively inventory seedling and young tree densities.

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

### TREND DETERMINATION

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

- 1) changes in density or number of plants/acre
- 2) proportion of decadent plants and percentage of decadent plants that are 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 and quadrat frequency values between readings. Attention is also given to changes in species composition of grasses and forbs through time. A non-parametric statistical test (Friedman test which is analogous to analysis of variance) (Conover 1980) is conducted on nested frequencies of each species to determine significant changes at  $\alpha = .10$ . 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. The ratio of bare soil nested frequency values to protective cover nested frequency values can also be used to help determine changes in soil trend. 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, quadrat frequency, and nested frequency data for individual grass and forb species. The table contains all the

grass and forb species found on site 23-1. Readings prior to mid-1992 include only nested and quadrat frequency data for *perennial* species. Beginning in mid-1992, all trend studies have data for perennial and annual species as well as cover estimates for individual species.

In the following example, grasses have a combined total cover of 11.39%. In 1985, *Agropyron spicatum* had a sum of nested frequency value of 227. In 1991, the sum of nested frequency value slightly decreased to 220. By 1998, sum of nested frequency declined to 183. The subscript letters indicate that the sum of nested frequency value between 1985 and 1991 were not statistically different. However, the 1998 sum of nested frequency for *A. spicatum* shows a significant decrease compared to 1985 and 1991. Quadrat frequency showed a slight increase from 1985 to 1991 and then a marked decrease in 1998. Cover was estimated at 7.78% for *A. spicatum* in 1998. Trend for this grass is down due to a significant decline in sum of nested frequency.

HERBACEOUS TRENDS --

Herd unit 23 , Study no: 1

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % 98
		'85	'91	'98	'85	'91	'98	
G	<i>Agropyron spicatum</i>	<sub>b</sub> 227	<sub>b</sub> 220	<sub>a</sub> 183	79	84	68	7.78
G	<i>Bromus tectorum</i> (a)	-	-	42	-	-	14	.43
G	<i>Oryzopsis hymenoides</i>	4	12	12	2	4	4	.17
G	<i>Poa fendleriana</i>	<sub>a</sub> 6	<sub>b</sub> 36	<sub>b</sub> 49	3	16	21	.98
G	<i>Poa secunda</i>	<sub>a</sub> 3	<sub>b</sub> 18	<sub>c</sub> 94	1	10	40	2.00
G	<i>Sitanion hystrix</i>	<sub>b</sub> 25	<sub>ab</sub> 20	<sub>a</sub> 6	13	9	3	.01
Total Annual Grasses		0	0	42	0	0	14	.43
Total Perennial Grasses		265	313	344	98	123	136	10.96
Total for Grasses		265	313	386	98	123	150	11.39
F	<i>Agoseris glauca</i>	-	10	1	-	5	1	.00
F	<i>Arabis</i> spp.	<sub>a</sub> -	<sub>b</sub> 18	<sub>a</sub> 1	-	9	1	.00
F	<i>Astragalus convallarius</i>	<sub>a</sub> 2	<sub>a</sub> 4	<sub>b</sub> 6	1	1	6	.15
F	<i>Calochortus nuttallii</i>	<sub>ab</sub> 4	<sub>b</sub> 8	<sub>a</sub> -	2	4	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	3	-	-	1	.00
F	<i>Crepis acuminata</i>	-	6	7	-	2	2	.06
F	<i>Eriogonum racemosum</i>	-	-	4	-	-	1	.03
F	<i>Eriogonum umbellatum</i>	-	1	9	-	1	5	.16
F	<i>Phlox austromontana</i>	-	6	4	-	3	2	.16
F	<i>Phlox longifolia</i>	<sub>a</sub> 8	<sub>b</sub> 27	<sub>a</sub> 16	4	14	6	.20
Total Annual Forbs		0	0	3	0	0	1	.00
Total Perennial Forbs		14	80	48	0	0	24	.78
Total for Forbs		14	80	51	7	39	25	.78

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

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

The following browse trends table summarizes strip frequency and cover for all shrub species occurring on this site. All of the shrubs encountered at study number 23-1 are listed. For example, mountain big sagebrush had a strip frequency of 40 out of a possible 100. Cover is determined using the 1/4m<sup>2</sup> quadrat and estimating the percent of the quadrat covered below eye level (~4 feet). In this case, mountain big sagebrush cover is estimated to be 2.54%.

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

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

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

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

Species	Percent Cover '98
Juniperus osteosperma	7
Pinus edulis	3

The basic cover table summarizes nested frequency and average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Average cover prior to mid-1992 adds up to only 100%, while cover with the current method (post mid-1992) estimates several layers of plant and ground cover and will usually exceed 100%. For vegetation cover, the previous method only determined basal vegetative cover (2.0 and 5.75), while the new method estimates projected vegetational cover (30.04). Therefore, comparisons can be made for all cover measurements except for general vegetation cover which now examines projected foliar cover rather than just basal cover.

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

Cover Type	Nested Frequency 08	Average Cover %		
		'85	'91	'98
Vegetation	274	2.00	5.75	30.04
Rock	216	6.00	5.25	11.18
Pavement	279	30.50	24.25	26.32
Litter	381	46.50	46.50	42.49
Cryptogams	46	5.00	3.00	.93
Bare Ground	254	10.00	15.25	21.42

A summary of the soil data is found in the soil analysis data table. Effective rooting depth is an average of 25 soil penetrometer readings, 5 of the deepest probes possible near each of the 5 baseline starting stakes. The effective rooting depth is a relative index that can be used for site comparisons with regard to individual species differences, site preferences, and abundance. Average soil temperature is taken from the deepest probe, one at each of the 5 baseline starting stakes. The temperature is listed in the table as the top measurement (e.g., 64.4°F), with the average depth (in inches) as the lower measurement (12.7). Chemical and textural characteristics are also listed and were determined by laboratory analysis of a composite sample taken near each of the 5 baseline starting stakes.

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

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

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

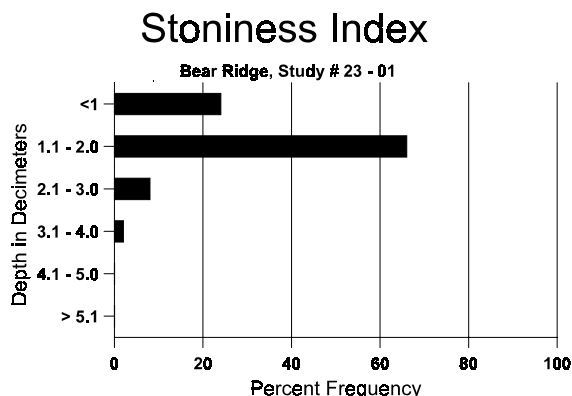
Ultra acid	<3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	>9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of soil. Parts per million of phosphorus and potassium are also included. Values for phosphorus and potassium less than 10 ppm and 70 ppm respectively have been shown to 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 help become more aware of how rock is distributed throughout the upper soil profile, a stoniness index is determined for each of the sites. Depth to the nearest rock is estimated at the first 10 feet (at one-foot intervals) of each of the 5 baselines, which allows 50 measurements. These data are then analyzed for each of the 5 incremental decimeter measurements, making it possible to visually determine the proportion (relative percent of rock at each depth) of rock from <1 decimeter to >5 decimeters.



The pellet group frequency table summarizes the quadrat frequency of wildlife and livestock droppings found on the site. This data was not included in reports done prior to mid-1992. For example in 1998, rabbit pellet groups were found in 25% of the quadrats placed on study 23-1, indicating the relative amount of rabbit use. With future readings, this data can help characterize changes in wildlife use patterns on the site.

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

Type	Quadrat Frequency		Pellet Transect	
	'93	'98	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	6	25	08	08
Elk	2	4	-	-
Deer	9	36	35	3 (5)
			357	25 (62)

It was determined additional information on pellet groups was necessary. Therefore, a larger sample distributed over a larger area is now read in conjunction with the vegetative transects. The pellet group transect utilizes 50, 100ft<sup>2</sup> circular plots which are placed through the 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. If more precision is required, the transect is marked permanently (rebar) and the pellet groups within the circular plots are removed or marked.

On the following page is a section of a browse table which summarizes characteristics of shrubs on study 23-1. Total plants/acre for Mountain big sagebrush, excluding seedlings (S) and dead (X) was 1,400 in 1985, 1,065 in 1991, and 1,100 in 1998. Seedlings are excluded from the population estimate because with summer drought, they will most likely all 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 species 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 decadency, vigor, percent heavy hedging, biotic potential, etc. should be given more weight in determining shrub trend when comparing sampled years where sample sizes are different.

The following data on mountain big sagebrush shows the proportion of decadent shrubs (abbreviated as Dec: in the table) in the population has steadily increased from 57% in 1985, to 63% in 1991, and to 67% by 1998. More seedlings were encountered in 1985 and 1991, with slight fluctuations in the numbers of young plants. The percentage of plants displaying poor vigor has increased from 14% in 1985 to 38% in 1991, and is estimated at 40% in 1998. This percentage is determined by dividing the number of shrubs in vigor classes 3 and 4 by the total number of shrubs sampled (yearly totals for each grouping; Y, M, and D). The proportion of shrubs displaying heavy hedging declined from 24% in 1985, to 6% in 1991, and only 2% by 1998. This is determined by dividing the number of shrubs in form classes 3, 6 and 9 by the total number of shrubs sampled (total column). The proportion of shrubs displaying moderate use has fluctuated from 67% in 1985, down to 19% in 1991, and up to 56% in 1998. This is determined by dividing the number of shrubs in form classes 2 and 5 by the total number of shrubs sampled. The dead to live ratio is 2:1. This ratio is determined by dividing the number of dead plants by the number of live plants. The average height of sagebrush (mature plants) and crown diameter has fluctuated from 13" x 15" to 12" x 13", and finally 15" x 23". Considering all these factors, trend for sagebrush in 1998 is slightly downward due to increased poor vigor and increased percent decadency. Also the number of dead plants encountered is more than double the number of live plants inventoried. An additional statistic to look at is the proportion of plants classified as dying in the decadent age class. For example, 60% of the decadent plants were reported as dying in 1991 and 41% of the decadent plants were reported as dying in 1998. This number is determined by dividing the number of plants in vigor class 4 by the total number of plants in the decadent age class. Both the dead to live ratio and the percentage of dying plants in the decadent age class indicate there has been a large shrub die-off in the past and this might continue into the future.



BROWSE CHARACTERISTICS --

Herd unit 23, Study no: 1

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	85	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	91	-	-	-	1	-	-	4	-	-	5	-	-	-	333		5	
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	85	-	2	1	-	-	-	-	-	-	3	-	-	-	200		3	
	91	4	-	-	1	-	-	-	-	-	5	-	-	-	333		5	
	98	2	-	-	3	-	-	-	-	-	5	-	-	-	100		5	
M	85	1	4	1	-	-	-	-	-	-	4	-	2	-	400	13	15	6
	91	-	-	1	-	-	-	-	-	-	1	-	-	-	66	12	13	1
	98	2	9	1	1	-	-	-	-	-	12	-	1	-	260	15	23	13
D	85	1	8	3	-	-	-	-	-	-	11	-	1	-	800		12	
	91	5	3	-	2	-	-	-	-	-	4	-	-	6	666		10	
	98	14	22	-	1	-	-	-	-	-	16	-	6	15	740		37	
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	2300		115	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'85		67%			24%			14%			-24%							
'91		19%			06%			38%			+ 3%							
'98		56%			02%			40%										
Total Plants/Acre (excluding Dead & Seedlings)												'85	1400	Dec:	57%			
												'91	1065		63%			
												'98	1100		67%			

Management background information, photographs, and knowledgeable plant identification add to the data base for each site. Management and background information for each site is obtained from the administering agency. Permanently located photographs are taken; a general view down and back up the line, then a close-up of each half-high baseline post to further characterize individual sites. Correct plant identification is critical for a complete and accurate site analysis. Species identification mostly follows "A Utah Flora" (Welsh et al. 1987). In some cases, most notably *Agropyron* and *Purshia*, the species names used by the Range Trend Study Plant Species List (Giunta 1983) and the Intermountain Flora (Cronquist et al. 1977) are retained to maintain continuity and alleviate confusion with earlier published reports.

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

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- <sup>1</sup>U.S. Department of Interior Bureau of Land Management. 1996. *Utilization Studies and Residual Measurements*, Interagency Technical Reference, BLM/RS/ST-96/004+1730.
- <sup>2</sup>U.S. Department of Interior Bureau of Land Management. 1996. *Sampling vegetation attributes*, Interagency Technical Reference, BLM/RS/ST-96/002+1730.
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## REPORT FORMAT

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

The name of the site and directions for locating the site are given on the location page. 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, Friedman test, is performed on the nested frequency values between years. This analysis indicates significance levels, between species over time, at  $\alpha = 0.10$ . Significant change is indicated in the herbaceous trends table.

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

## WILDLIFE MANAGEMENT UNIT - 16 - MANTI-NEBO

### Boundary Description

**Utah, Carbon, Emery, Juab, Sevier and Sanpete counties** - Boundary begins at the junction of US-6 and I-15 in Spanish Fork; southeast on US-6 to Price and SR-10; south on SR-10 to I-70; west on I-70 to US-89; north on US-89 to SR-28 at Gunnison; north on SR-28 to I-15 at Nephi; north on I-15 to US-6 in Spanish Fork and beginning point.

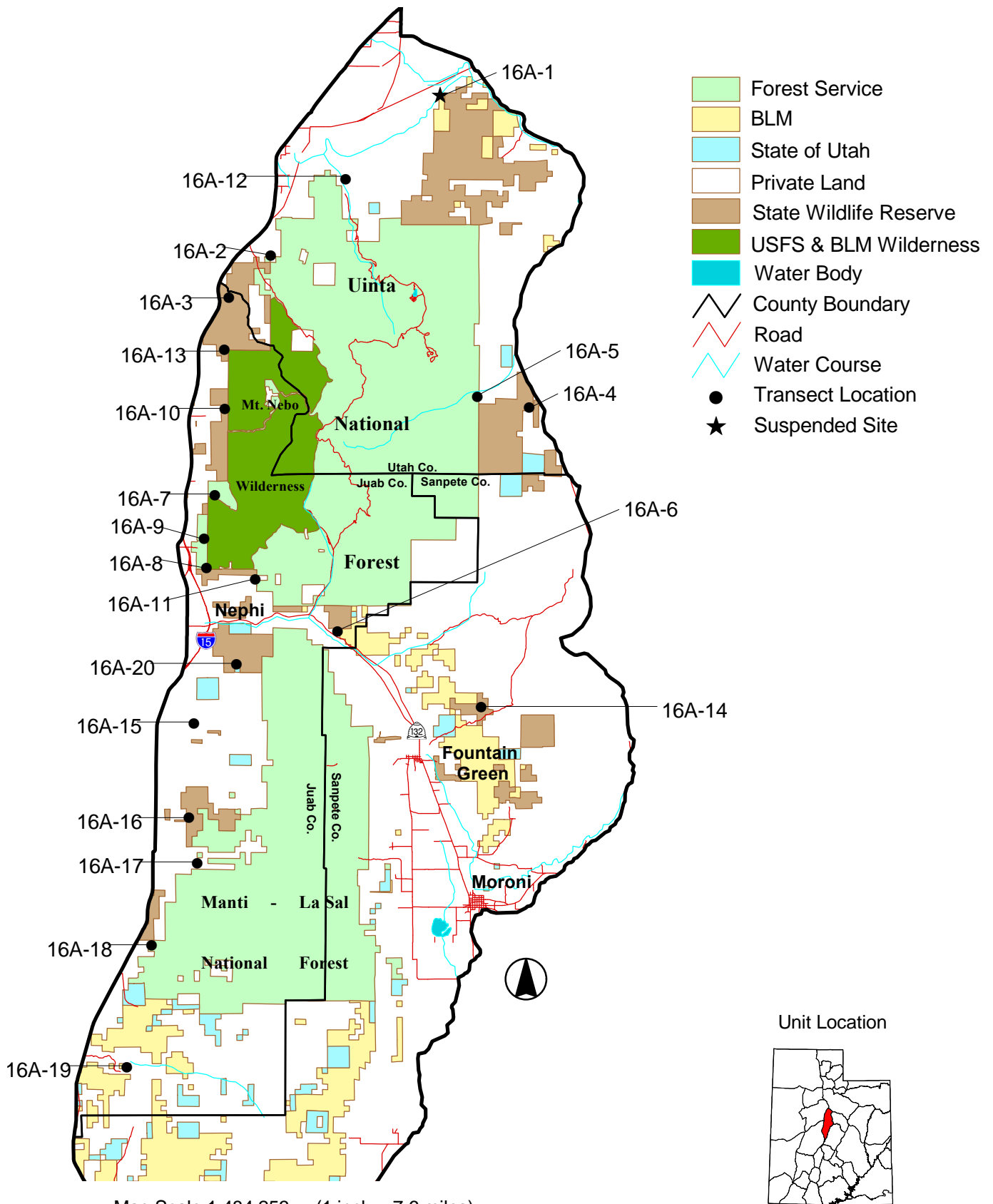
The Manti-Nebo wildlife management unit incorporates a total area of almost 2,250,000 acres. For deer, 47% is winter range, 46% summer range, and 7% is considered yearlong range. The majority of the summer range is on U.S. Forest lands (72%), while as much as 35% of the winter range is on private lands. For elk, 36% is winter range, 40% summer range, and 24% is classified as yearlong range. Again, the majority of the summer range is on U.S. Forest lands (78%), while as much as 28% of the winter range is on private lands. The one aspect of elk range that could emerge as a problem is that 64% of the yearlong range is on private property.

This unit has been subdivided into 3 subunits, 16A - Nebo, 16B - Manti North, and 16C - Manti South. Each subunit will be discussed separately in this report. Due to logistic problems, the portion of subunits 16B and 16C that lie west of the Wasatch Plateau are read with the Central Region, while the portions east of the Wasatch Plateau are read with the Southeast Region.

### Big Game Management

Unit management goals for deer are to achieve a target population size of 60,600 deer; 38,000 wintering deer on the Wasatch Plateau or Manti Mountain portion of the unit, and 22,600 on the Nebo portion. The management objective for post season buck to doe ratio is 15 to 100 with 30% of these bucks being three point or better. The target winter herd size for elk on the unit is 1,000 for the North Nebo area and 12,000 for the Wasatch Plateau. Management objectives for the herd composition are to attain a minimum bull to cow ratio of 8 bulls to 100 cows with a minimum of 4 mature bulls to 100 cows.

# Management Unit 16A



## WILDLIFE MANAGEMENT SUBUNIT - 16A - Manti-Nebo, Nebo

### Boundary Description

**Utah, Juab, Millard and Sanpete counties** - Boundary begins at the junction of Interstate 15 and Highway US-6 in Spanish Fork; southeast on US-6 to Highway US-89 at Thistle Junction; south on US-89 to Gunnison and Highway SR-28; north along SR-28 to Interstate 15 at Nephi; north along I-15 to US-6 in Spanish Fork.

### Management Unit Description

The Manti-Nebo management unit incorporates most of the old North and South Nebo deer herd units.

The old North Nebo deer herd unit included about 490,240 acres. Physiographically, the unit was dominated by high mountains such as Santaquin Peak, Bald Mountain, and Mount Nebo. Mount Nebo represents the southernmost extension of the Wasatch Range. These mountains constitute the heart of a diverse and productive summer range making up about 29% of the unit. Normal winter range makes up about 32% of the area. The Mount Nebo summer range has a long history of high hunting success and depredation problems, a growing elk herd, and limited winter range.

The principal limiting factor and management concern on the unit is the lack of good condition winter range, especially severe range on the west side of the unit. In this area, from Spanish Fork Canyon south to Nephi, the normal winter range averages 2 miles or less in width. Severe winter range is even more narrow, ranging from as narrow as a few hundred yards, up to 1½ miles. Total severe winter range accounts for only about 12% of the area. However, the winter range on the east and south sides of the unit is more expansive, and not nearly as critical. Some of the major problems related to the limited winter range on the unit, especially low elevation severe winter range, include: restricted access to traditional wintering areas west of I-15, predominately private ownership of critical ranges (63% of normal winter range), and agricultural depredation. To remedy the situation, the Division of Wildlife Resources has acquired approximately 12,800 acres of winter range in the unit (7% of winter range) and has attempted treatments and rehabilitation in these critical areas. The Nebo unit remains on the list of top deer herd units requiring winter habitat revegetation action. The available winter range, especially critical areas on the west side of the unit, remains threatened by development, mismanagement, and a high fire hazard from cheatgrass.

### Key Areas

The key areas identified and sampled with 12 trend studies in 1983 are still priority areas. Three new studies were added in 1989. A majority of the studies are on Division land. However, much of the critical range is under private ownership and was not sampled due to restricted access and limited management opportunities. The 15 permanently marked trend studies originally read in early August 1983 were reread in mid-July of the drier year of 1989, and then again in late May of 1997 and 2002. All sample big game winter range areas, although many sites had some evidence of summer deer occupancy. The studies range in elevation from 5,000 feet to higher elevation sites (about 6,500 feet) in Rees Flat and Big Hollow. The prominent winter range vegetation types that were sampled include: mixed oak/big sagebrush, sagebrush/grass, mountain brush, bitterbrush, and cliffrose.

The San Pitch Mountains make up the majority of the old South Nebo herd unit. This low mountain range contains all of the summer range on the unit, 40% of the area. The surrounding foothills and western slopes provide winter range which makes up the remaining 60% of the range. The upper limit of the winter range approximately follows the 7,000 foot contour, but extends to 8,000 feet on the south exposure in canyons on the west side of the unit. Twenty-five percent of the winter range was classified as severe winter range in the

1976 range inventory. The upper limit of severe winter range is 6,000 feet, while the lower limit (5,200 feet) of the winter range is restricted by highways, reservoirs, agriculture, and small communities.

In 1983, four of the permanent range trend studies were established on severe winter range. Their elevation ranged from 5,520 to 6,000 feet. Two chained areas were also sampled. One study is in a cliffrose type, the other in a mountain brush community. These studies were initially read in mid-August 1983. They were reread in mid-July 1989, then again in late May and early June of 1997 and 2002. Three new trend studies were established in 1989 and reread in 1997 and 2002.

The Division has acquired several parcels of land totaling 7,200 acres, or 5% of the winter range. Further habitat acquisition and rehabilitation are necessary to adequately maintain the winter range. This unit has been put on the list of most important deer herd units for future winter range land purchases.

Trend Study 16A-2-02

Study site name: Santaquin Bench.

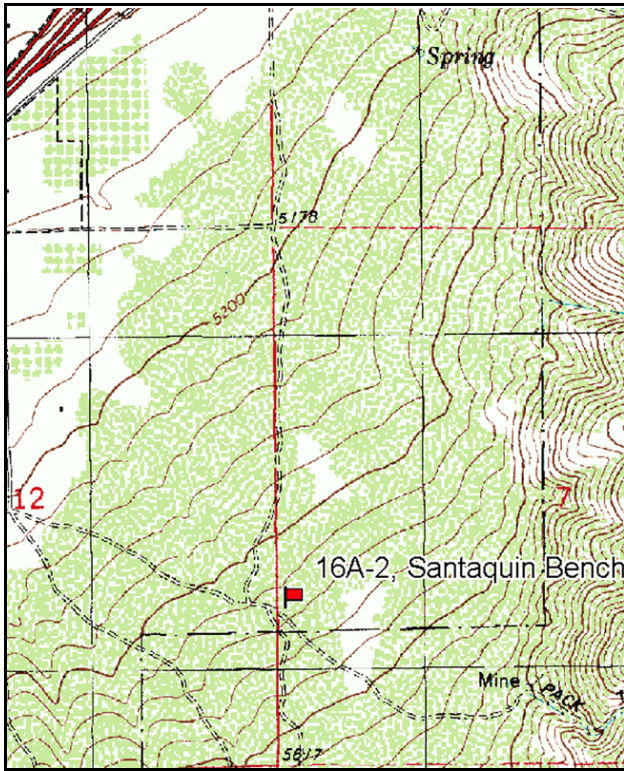
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 28 degrees magnetic (lines 2-3 @ 290°M).

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

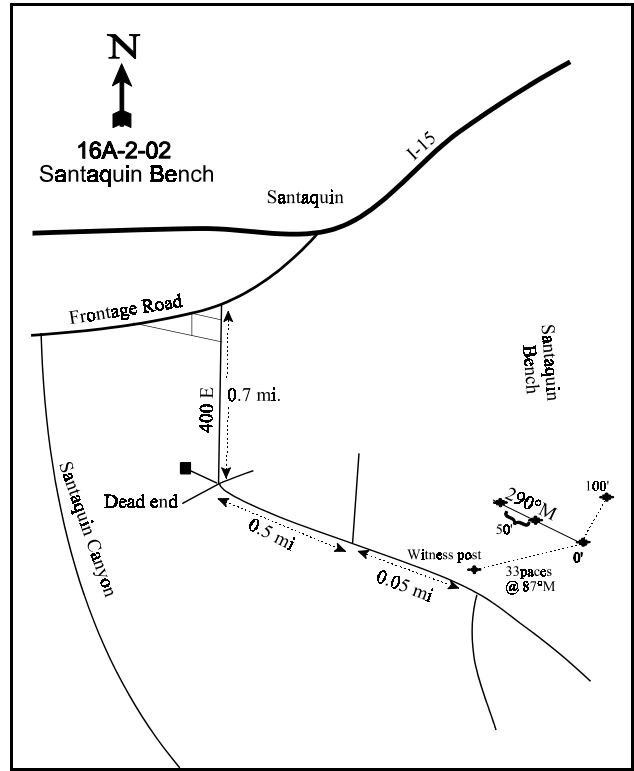
LOCATION DESCRIPTION

From the I-15 interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland Drive) for a short distance to where there are several forks. Turn left on 400 East that turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left (east) and travel 0.50 miles to a fork in the road. Stop at the witness post on the left. The 0-foot baseline stake is located 33 paces from the witness post at an azimuth of 87°M. The study markers are green steel fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake is marked by browse tag #3929. The last baseline is only 50 feet long.



Map Name: Santaquin

Township 10S, Range 2E, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4423177 N 434581 E



## DISCUSSION

### Santaquin Bench - Trend Study No. 16A-2

This study is located on deer and elk winter range on the Santaquin Bench within the Uinta National Forest. Physically the site is nearly level, having a slight west aspect and an elevation of approximately 5,480 feet. Closely intermixed patches of Gambel oak and mountain big sagebrush made up the dominant overstory prior to 2001. The entire area burned in 2001 as part of the Molly fire. Prior to the burn, Stansbury cliffrose, antelope bitterbrush, and Utah juniper were occasionally abundant. Surrounding oak clones were thick and appeared to be increasing leaving smaller openings for sagebrush. Deer and elk pellet groups were common in 1983, but few deer and elk pellet groups were found in 1997 and 2002. This site offered good escape and thermal cover prior to the fire but better winter range can be found on nearby west facing slopes. A pellet group transect read in 2002 sampled only 2 deer pellet groups (1 deer day use/acre, 3 ddu/ha).

Soil is derived from sedimentary alluvial deposits. Texture is described as a "cobbly loam" in the surface horizons. Surface soil is slightly acidic. The subsoil tends to be more alkaline and strongly calcareous (USDA-SCS 1972). Soil at the site is relatively deep with an effective rooting depth of almost 14 inches. Parent material is limestone. Texture is a loam with a moderately acidic pH (6.0). Large cobble can be found on the surface and throughout the profile. The soil surface is well protected by grass and litter cover in the openings and by abundant litter under the oak clones. After the fire, percent bare ground increased dramatically from 2% to 56%. However, grasses and forbs have come back relatively well and there is sufficient protective ground cover to limit severe erosion. The soil erosion condition classification was determined to be stable in 2002.

Prior to the fire, the key browse species included Gambel oak and mountain big sagebrush. Oak accounted for half of the shrub cover and formed relatively dense clumps of variable height. Overhead canopy cover of oak was estimated at 24% in 1997. Some oak forage was physically unavailable due to either excessive height and/or density. Age structure was indicative of an expanding population with many young plants, especially near the edges of the clones. Utilization was mostly light. Vigor had been depressed in the past due to "crank worm" infestations which severely defoliated the oak in 1997. Forty-one percent of the oak sampled in 1997 was impacted by these insects. All Gambel oak on the site was burned in the 2001 fire. Burned stems were left standing with abundant young shoots coming back. Density of resprouting oak was estimated at nearly 8,000 stems/acre in 2002.

Mountain big sagebrush occurred in the oak interspaces. Between 1983 and 1989, density declined by 37% from 1,266 plants/acre to only 799. Percent decadence also increased from 26% to 42%. Recruitment was limited with few seedlings and young encountered during either year. Use remained mostly light during these years so the decline was most likely due to oak competition combined with drought which occurred between 1987 and 1992. When the baseline was lengthened (sample size was increased) in 1997, the extended baseline was placed in more open areas to better sample the preferred mountain big sagebrush. As a result, density estimates were significantly larger compared to the 1983 and 1989 data. In 1997, there were about 2,540 sagebrush plants/acre which accounted for 47% of the shrub cover on the site. About 74% of the population was estimated to be mature and percent decadence declined to 16%. No seedlings were found in 1997, with only 10% of the population consisting of young plants. In addition, 70% of the decadent sagebrush sampled were classified as dying. The only other shrub found on the site in 1997 was a small number of broom snakeweed. The fire in 2001 eliminated all of the sagebrush plants and broom snakeweed. Only 1 sagebrush seedling was encountered within the shrub density strips in the 2002 sample.

This site possesses a better herbaceous understory than site #16A-1, Strawberry Highline Canal. Total grass cover was nearly 20% in 1997. Abundance and composition varied greatly between the oakbrush and the sagebrush dominated openings. Under the oak canopy, Kentucky bluegrass was perhaps the most important herbaceous plant. In contrast, it occurred rarely within the sagebrush openings. In these areas, bluebunch wheatgrass and Sandberg bluegrass dominated. Annual grasses occurred at relatively low densities. Forbs were moderately diverse with few species being abundant. Two species, annual bedstraw and peavine, accounted for 81% of the forb cover in 1997. Use of the grasses and forbs appeared light. After the fire, grasses and forbs have come back relatively well. Total herbaceous cover has declined from 36% to 15%, but the number of species sampled declined from only 34 to 30. Bluebunch wheatgrass and Kentucky bluegrass are the most abundant grasses accounting for 81% of the grass cover in 2002. Forbs are diverse but only a few species are abundant. Peavine is the most abundant perennial in 2002 accounting for 62% of the forb cover.

### 1983 APPARENT TREND ASSESSMENT

The soil appears stable. The area has very little slope and vegetative cover is adequate to prevent erosion. Vegetative condition is fair. The most disturbing possibility is the potential decline or loss of mountain big sagebrush due to encroachment of Gambel oak. Understory cover, composition, and density are poor to fair. The abundance of annual grasses poses a distinct fire hazard, especially in late summer when they have fully cured.

### 1989 TREND ASSESSMENT

The soil trend is down slightly due to an increase in percent bare ground cover and a decline in litter cover. Litter cover decreased due to less annual grass production in 1989. Density of Gambel oak increased on the density plots due to the number of young sprouts encountered. The sagebrush openings appear to be becoming smaller and sagebrush on the edges are declining in vigor due to shading and competition. Sagebrush vigor is generally normal concerning growth and seed production, but there is an increased level of decadence to 42% of the population. The sagebrush still displays light hedging. The data show some increases in the herbaceous understory. Bluebunch wheatgrass increased in frequency in the sagebrush openings, while Kentucky bluegrass remains dense in association with the oakbrush. Peavine is common, otherwise forbs are rather insignificant.

#### TREND ASSESSMENT

soil - down slightly (2)

browse - down (1)

herbaceous understory - up (5)

## 1997 TREND ASSESSMENT

The soil trend has bounced back from the dry years of the late 1980's. Percent bare ground cover has declined from 7% to only 2%. Litter cover declined with some of the difference being attributed to the larger sample which includes more sagebrush openings and less oak with its associated litter. Soil trend is up slightly. The browse trend for sagebrush is currently stable. The larger sample used in 1997 is partly responsible for the change in density. Percent decadency declined from 42% to 16% and vigor is slightly improved. Recruitment is still limited. Density of oak is similar to 1983 estimates and appears stable. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Kentucky bluegrass has increased significantly in nested frequency.

### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

This site burned during the summer of 2001. The soil trend is down with an increase in bare ground from only 2% in 1997 to 56% in 2002. Litter cover has declined from 68% to 20%. Even with this decline in protective ground cover, erosion is still minimal and the erosion condition classification was determined to be stable in 2002. The browse trend is down due to the elimination of the preferred browse, sagebrush. Oak was also burned but it is resprouting and the density of young sprouts is currently estimated at nearly 8,000 per acre. The herbaceous understory is down but most of the species sampled in 1997 have come back. Total herbaceous cover has declined from 36% in 1997 to 15% in 2002. The most abundant grasses are still bluebunch wheatgrass and Kentucky bluegrass. Forbs are diverse but only a few species are abundant. Sum of nested frequency for perennial forbs has actually increased slightly and cover is similar to 1997 estimates (9% to 8%). Peavine is the most abundant perennial forb which currently provides 62% of the forb cover.

### TREND ASSESSMENT

soil - down (1)

browse - down due to fire (1)

herbaceous understory - down (1)

## HERBACEOUS TRENDS --

Herd unit 16A, Study no: 2

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	a <sup>89</sup>	b <sup>126</sup>	b <sup>136</sup>	a <sup>86</sup>	35	45	48	35	6.75	2.00
G	Bromus tectorum (a)	-	-	50	56	-	-	16	27	.30	.23
G	Festuca myuros (a)	-	-	3	1	-	-	1	1	.00	.00
G	Poa bulbosa	-	-	30	21	-	-	10	9	.96	.32
G	Poa fendleriana	-	-	6	-	-	-	2	-	.18	-
G	Poa pratensis	a <sup>52</sup>	b <sup>124</sup>	c <sup>202</sup>	a <sup>71</sup>	17	43	58	27	10.03	2.16
G	Poa secunda	c <sup>167</sup>	b <sup>127</sup>	a <sup>63</sup>	a <sup>43</sup>	65	46	27	21	1.23	.43
G	Sitanion hystrix	b <sup>26</sup>	b <sup>24</sup>	a <sup>-</sup>	a <sup>-</sup>	13	10	-	-	-	-
G	Unknown grass - annual (a)	-	-	b <sup>47</sup>	a <sup>-</sup>	-	-	19	-	.39	-
Total for Annual Grasses		0	0	100	57	0	0	36	28	0.69	0.23
Total for Perennial Grasses		334	401	437	221	130	144	145	92	19.16	4.91
Total for Grasses		334	401	537	278	130	144	181	120	19.86	5.15

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Alyssum alyssoides</i> (a)	-	-	46	32	-	-	19	13	.12	.09
F	<i>Allium</i> spp.	<sub>a</sub> 22	<sub>a</sub> 46	<sub>b</sub> 81	<sub>b</sub> 90	13	23	36	45	.30	.30
F	<i>Antennaria</i> spp.	-	3	2	1	-	1	1	1	.00	.00
F	<i>Arabis</i> spp.	-	-	4	-	-	-	2	-	.01	-
F	<i>Aster</i> spp.	-	-	4	-	-	-	2	-	.01	-
F	<i>Astragalus</i> spp.	-	-	6	-	-	-	3	-	.07	-
F	<i>Cirsium</i> spp.	1	2	8	6	1	1	4	3	.23	.01
F	<i>Collomia linearis</i> (a)	4	-	-	-	2	-	-	-	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	<sub>a</sub> 103	<sub>b</sub> 158	-	-	41	68	.35	1.15
F	<i>Cymopterus</i> spp.	<sub>a</sub> 7	<sub>a</sub> 5	<sub>b</sub> 30	<sub>a</sub> 5	2	3	14	3	.12	.04
F	<i>Descurainia pinnata</i> (a)	-	-	3	1	-	-	1	1	.00	.00
F	<i>Draba</i> spp. (a)	-	-	<sub>b</sub> 16	<sub>a</sub> -	-	-	6	-	.03	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	<sub>b</sub> 84	<sub>a</sub> 3	-	-	36	2	.30	.01
F	<i>Eriogonum racemosum</i>	<sub>ab</sub> 15	<sub>b</sub> 20	<sub>a</sub> 6	<sub>a</sub> 3	9	12	3	2	.01	.01
F	<i>Eriogonum umbellatum</i>	<sub>b</sub> 22	<sub>a</sub> 2	<sub>a</sub> 8	<sub>a</sub> -	10	2	4	-	.04	-
F	<i>Galium aparine</i> (a)	-	-	<sub>b</sub> 192	<sub>a</sub> 87	-	-	66	37	5.72	.89
F	<i>Geranium</i> spp.	-	-	2	-	-	-	1	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	-	-	7	4	-	-	4	2	.02	.01
F	<i>Hymenoxys acaulis</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 8	-	-	-	5	-	.45
F	<i>Hydrophyllum capitatum</i>	-	1	-	-	-	1	-	-	-	-
F	<i>Lathyrus brachycalyx</i>	<sub>a</sub> 43	<sub>c</sub> 157	<sub>c</sub> 153	<sub>b</sub> 120	17	57	55	42	7.55	6.11
F	<i>Lappula occidentalis</i> (a)	-	-	-	2	-	-	-	1	-	.03
F	<i>Lactuca serriola</i>	-	-	3	1	-	-	1	1	.00	.00
F	<i>Microsteris gracilis</i> (a)	-	-	<sub>b</sub> 29	<sub>a</sub> 6	-	-	12	4	.11	.04
F	<i>Phlox longifolia</i>	<sub>a</sub> 9	<sub>ab</sub> 19	<sub>ab</sub> 25	<sub>b</sub> 25	4	9	12	15	.13	.15
F	<i>Polygonum douglasii</i> (a)	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 18	<sub>c</sub> 83	-	-	6	38	.03	.31
F	<i>Ranunculus testiculatus</i> (a)	-	-	<sub>b</sub> 56	<sub>a</sub> 38	-	-	19	17	.19	.11
F	<i>Solidago</i> spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 13	-	-	-	5	-	.02
F	<i>Taraxacum officinale</i>	-	-	-	-	-	-	-	-	-	.00
F	<i>Tragopogon dubius</i>	<sub>a</sub> -	<sub>ab</sub> 3	<sub>b</sub> 12	<sub>ab</sub> 7	-	2	5	3	.67	.04
F	<i>Trifolium</i> spp.	-	-	-	1	-	-	-	1	-	.00
F	Unknown forb-annual (a)	-	-	<sub>b</sub> 63	<sub>a</sub> -	-	-	28	-	.31	-
F	<i>Zigadenus paniculatus</i>	2	4	5	3	1	2	2	2	.06	.06
Total for Annual Forbs		4	0	617	414	2	0	238	183	7.21	2.66
Total for Perennial Forbs		121	262	349	283	57	113	145	128	9.25	7.25
Total for Forbs		125	262	966	697	59	113	383	311	16.46	9.92

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	71	0	10.86	.01
B	Gutierrezia sarothrae	3	0	.56	-
B	Quercus gambelii	48	52	11.56	2.68
Total for Browse		122	52	22.99	2.69

CANOPY COVER --  
Herd unit 16A , Study no: 2

Species	Percent Cover	
	'97	'02
Quercus gambelii	9.6	-

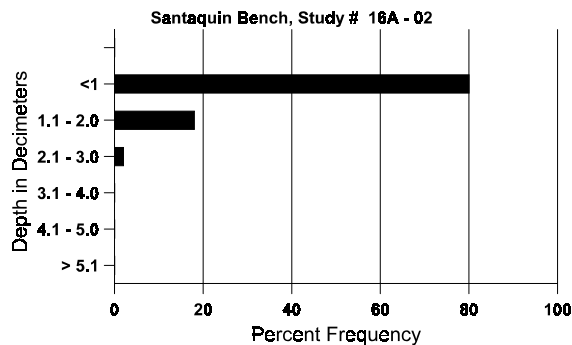
BASIC COVER --  
Herd unit 16A, Study no: 2

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	385	314	1.25	3.25	54.34	18.60
Rock	74	187	2.25	3.75	3.68	4.94
Pavement	87	309	.25	2.00	1.83	12.90
Litter	398	340	91.75	81.75	67.93	19.62
Cryptogams	42	4	.25	2.25	.23	.03
Bare Ground	111	370	4.25	7.00	2.00	55.59

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 02, Santaquin Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.5	46.5 (16.7)	6.0	46.4	29.1	24.6	3.9	20.2	211.2	.7

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 2

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	02	02
Elk	1	1	-	-
Deer	7	2	17	1 (3)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 2

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	12	-	1	-	-	-	-	-	-	13	-	-	-	260			13
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	7	4	1	-	-	-	-	-	-	12	-	-	-	800	21	21	12
	89	6	1	-	-	-	-	-	-	-	7	-	-	-	466	22	28	7
	97	64	27	3	-	-	-	-	-	-	94	-	-	-	1880	27	39	94
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	4	1	-	-	-	-	-	-	-	1	-	4	-	333			5
	89	5	-	-	-	-	-	-	-	-	3	-	-	2	333			5
	97	11	8	1	-	-	-	-	-	-	6	-	-	14	400			20
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	860			43
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		26%			05%			21%			-37%							
'89		08%			00%			17%			+69%							
'97		28%			04%			11%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1266	Dec:	26%			
												'89	799		42%			
												'97	2540		16%			
												'02	0		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133	7	9	2
	'97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	9	12	2
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			-40%							
'97		00%			00%			25%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	133		0%			
												'97	80		25%			
												'02	0		0%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
Quercus gambelii															
S	83	28	-	-	-	-	-	-	28	-	-	-	1866		28
	89	17	-	-	4	-	-	1	-	-	-	-	1466		22
	97	1	-	-	13	-	-	-	-	-	-	-	280		14
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	27	-	-	-	-	-	-	-	-	-	-	1800		27
	89	121	-	-	11	-	-	-	-	-	-	-	8800		132
	97	82	1	-	-	-	-	-	-	-	-	-	1660		83
	02	386	-	12	-	-	-	-	-	-	-	-	7960		398
M	83	23	2	-	4	-	-	-	16	-	-	-	3000	66 39	45
	89	4	-	-	-	-	-	-	36	-	-	-	2666	120 39	40
	97	157	9	4	-	-	-	-	-	-	-	-	3400	69 46	170
	02	-	-	-	-	-	-	-	-	-	-	-	0	7 9	0
D	83	1	-	-	-	-	-	-	-	-	-	-	66		1
	89	2	-	-	2	-	-	-	1	-	-	-	333		5
	97	-	2	-	-	-	-	-	-	-	-	-	40		2
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	520		26
	02	-	-	-	-	-	-	-	-	-	-	-	200		10
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>				
'83		03%			00%			01%			+59%				
'89		00%			00%			.56%			-57%				
'97		05%			02%			00%			+36%				
'02		00%			03%			00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	4866	Dec:	1%		
										'89	11799		3%		
										'97	5100		1%		
										'02	7960		0%		



Trend Study 16A-3-02

Study site name: Santaquin Hill.

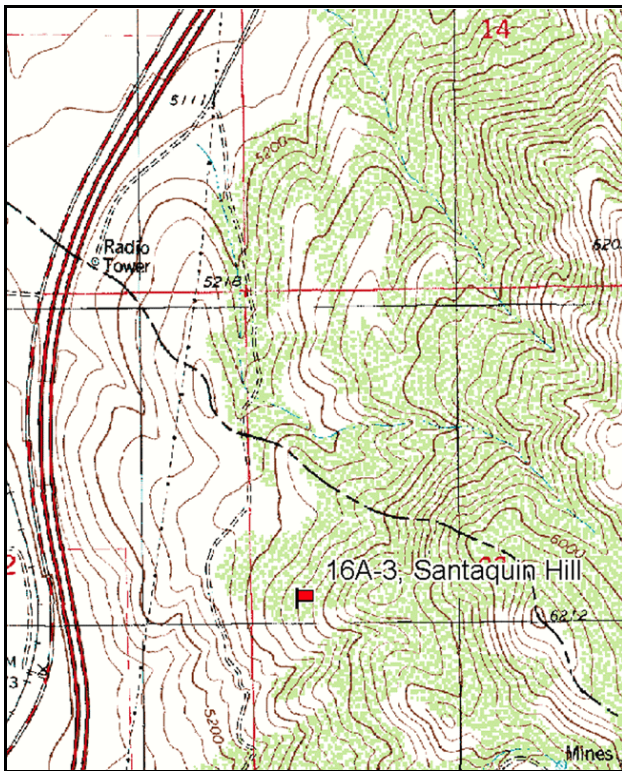
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 350 degrees magnetic (lines 2-4 @ 143°M).

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

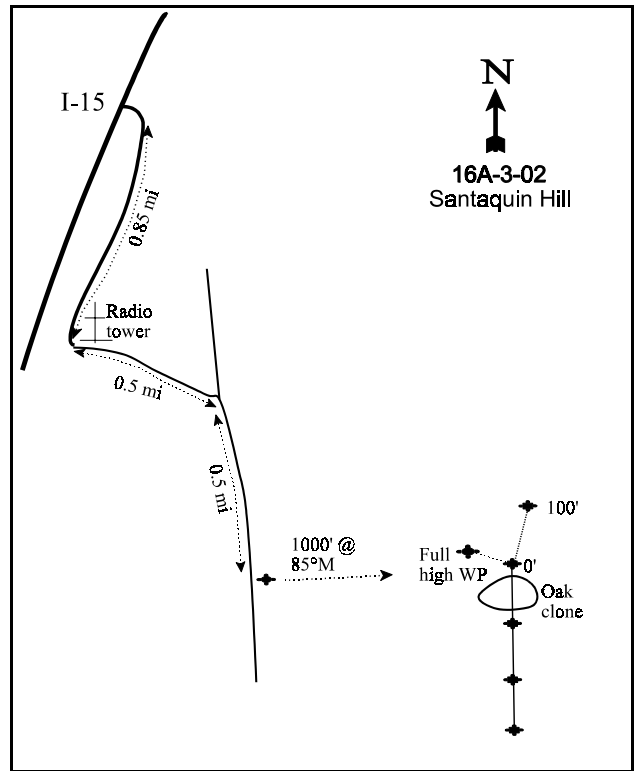
LOCATION DESCRIPTION

From the south Santaquin exit on I-15, proceed easterly under the overpass and then southerly onto the frontage road for 0.85 miles to the radio tower. Proceed over the ridge to the east of the radio tower on faint rd for 0.5 miles to an intersection with a dirt road. Proceed south for 0.5 miles to a half high witness post on the east side of the road. From the witness post, walk 1,000 feet at 85 degrees magnetic up the ridge to a full high witness post. The 0-foot baseline stake is 20 feet south of the witness post. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, #3967, is attached to the 0-foot baseline stake.



Map Name: Santaquin

Township 10S, Range 1E, Section 22



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4420039 N 431487 E

## DISCUSSION

### Santaquin Hill - Trend Study No. 16A-3

This trend study is located on critical deer and elk winter range on Division property. The area straddles the Juab county line near the top of Santaquin Hill. The study is on a broad ridge which slopes moderately (16%) to the west and has an elevation of approximately 5,500 feet. It is a big sagebrush-grass community which contains large numbers of low-growing Gambel oak. Higher up on the hill, Gambel oak becomes increasingly more dominant and taller. Considerable evidence of deer and elk use in the form of pellet groups, antler drops, and forage use was apparent in 1983. Pellet group data from 1997 and 2002 estimate moderate deer use with a quadrat frequency of deer pellet groups at 22% and 33% respectively. A pellet group transect read along the study site baseline in 2002 estimated 112 deer days use/acre (276 ddu/ha).

Soil at the study site is shallow and exceptionally rocky. The soil survey classifies this soil as an “extremely stony loam” with a 2 to 8 inch deep surface horizon. A typical profile of the surface layer is grey-brown in color, slightly calcareous, and mildly alkaline. The soil also possesses a thick lime hardpan beginning about 13 inches below the surface. Root penetration through the hardpan is very difficult (USDA-SCS, 1972). Soil at the site is relatively deep with an effective rooting depth of 15 inches. Texture is a clay loam with a neutral pH of 6.8. Protective ground cover appears adequate to prevent serious erosion. The erosion condition classification was determined to be stable in 2002.

Browse on the site consists of mountain big sagebrush and low growing Gambel oak. Sagebrush accounts for the largest majority of the shrub cover with a population density of 2,780 plants/acre in 1997 and 2,940 plants/acre in 2002. Density has been relatively stable since 1983 even though about 1/3 of the population consisted of dead plants in 1997 and 2002. This would suggest a relatively rapid turnover for sagebrush on this site. Use was moderate to heavy in 1983 with lighter use in 1989. Use was again moderate in 1997 and 2002, with heavy use reported on 12% and 28% of the sagebrush respectively. Percent decadency was high in 1989 at 63%, but that has since declined to 27% in 1997 and 39% in 2002. Young recruitment is low at only 5% in 2002 and not adequate to replace the decadent and dying sagebrush (766 plants/acre). Density of mature plants has remained stable between 1997 and 2002. Vigor of mature plants is good and annual leader growth averaged 1.7 inches in 2002.

Gambel oak provided 42% of the browse cover on the site in 1997 and 35% in 2002. The original 100 foot baseline established in 1983 had a higher density of oak than the extended 400 foot baseline established in 1997. As a result, the sampled population density declined from 9,332 plants/acre in 1989 to 3,140 in 1997. Oak on the site is low growing and averages only about 30 inches in height. Use has previously been light to moderate, but was reported moderate to heavy in 1997 when nearly half (43%) of the oak was classified as heavily hedged. Oak is often difficult to classify with regard to the degree of hedging. Some of the increase in use may be due to observer differences combined with the stunted growth habit of the oak on this site. Use of oak was reported to be mostly light in 2002. About 9% of the mature oak sampled had poor vigor due to a late spring frost in 2002. Overall, the oak is healthy and vigorous with good vigor and a low rate of decadency.

The herbaceous understory is relatively depleted. Bluebunch wheatgrass is abundant providing 75% of the grass cover in 1997, increasing to 82% in 2002. Sandberg bluegrass is also numerous, but does not produce much forage. The annual grasses, cheatgrass and Japanese brome, are also common. Forbs are diverse yet are totally dominated by annuals. Common species include pale alyssum, annual bedstraw, and bur buttercup. Perennial forbs are rare. All forbs combined produced only about 4% cover in 1997 and 2002.

### 1983 APPARENT TREND ASSESSMENT

The soil appears stable. Aerial cover from shrubs, rock cover, and a limited amount of litter help prevent serious erosion. However, the lack of a strong perennial understory has allowed some soil movement to continue. No improvement appears to be coming in the near future. The sagebrush community appears stable with oak likely to gradually increase in density and cover.

### 1989 TREND ASSESSMENT

The soil trend has improved due to a decline in percent bare ground from 18% to only 7%. In addition, ground cover estimates show an increase in the percentage of basal vegetative cover to almost 8%. Although not in direct competition with oakbrush in most places and generally only lightly hedged, the mountain big sagebrush on this site is declining. In 1989, the population was classified as 63% decadent, with few young shrubs. Sagebrush decreased slightly in density from 3,199 plants/acre in 1983 to 2,732 plants/acre in 1989. Sagebrush cover on the site averages about 8%. The density of young oak increased, but some of the increase may be do to classification problems between observers caused by the low growth habit of the oak. Trend for the herbaceous understory is up due to a significant increase in the sum of nested frequency of bluebunch wheatgrass and Sandberg bluegrass. Nested frequency of perennial forbs also increased. The most common perennial forb species remain longleaf phlox, sego lily, and Astragalus, yet total forb cover is low.

#### TREND ASSESSMENT

soil - up (5)

browse - down slightly (2)

herbaceous understory - up (5)

### 1997 TREND ASSESSMENT

Soil trend is stable. Percent cover of bare ground has remained at about 7%. Trend for mountain big sagebrush is now stable. Population density is similar to 1989 estimates and percent decadency has declined from 63% to 27%. Dead plants are abundant (ratio of 1:3.4) and most of the decadent plants sampled (68%) were classified as dying. However, the constant density and good recruitment would indicate a relatively rapid turn over for sagebrush on this site. Population of Gambel oak declined 66% primarily due to the larger sample size used. Oak is healthy and vigorous and appears stable. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses. Nested frequency of bluebunch wheatgrass and Sandberg bluegrass both declined. Perennial forbs are still rare with sum of nested frequency remaining similar to that in 1989.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

## 2002 TREND ASSESSMENT

Trend for soil is stable. There is good protective ground cover leaving only about 6% bare ground. In addition, the soil erosion condition classification was determined as stable in 2002. Trend for the key browse species, mountain big sagebrush, is stable. However, there are several areas of concern. Recruitment is poor with only 5% of the population consisting of young plants and seedlings are rare. The number of decadent plants has increased from 27% in 1997 to 39% in 2002. In addition, 66% or 760 plants/acre of the decadent sagebrush sampled were classified as dying. These trends are most likely the result of drought. A continuation of drought conditions will cause a future population decline, but for now, the population appears stable. Trend for the herbaceous understory is stable. Sum of nested frequency of the dominant grasses, bluebunch wheatgrass and Sandberg bluegrass, has remained stable. Forbs are diverse but perennial forbs are rare.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 16A, Study no: 3

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	<sub>a</sub> 181	<sub>b</sub> 246	<sub>b</sub> 230	<sub>b</sub> 253	76	86	82	93	10.56	10.89
G	<i>Bromus japonicus</i> (a)	-	-	<sub>b</sub> 129	<sub>a</sub> -	-	-	43	-	1.89	-
G	<i>Bromus tectorum</i> (a)	-	-	117	125	-	-	49	46	.76	1.83
G	<i>Poa pratensis</i>	8	7	-	3	4	3	-	1	-	.03
G	<i>Poa secunda</i>	<sub>a</sub> 74	<sub>b</sub> 153	<sub>a</sub> 102	<sub>a</sub> 85	35	66	40	35	.85	.50
Total for Annual Grasses		0	0	246	125	0	0	92	46	2.66	1.83
Total for Perennial Grasses		263	406	332	341	115	155	122	129	11.42	11.42
Total for Grasses		263	406	578	466	115	155	214	175	14.09	13.26
F	<i>Alyssum alyssoides</i> (a)	-	-	293	302	-	-	92	90	2.36	3.38
F	<i>Antennaria rosea</i>	-	-	1	2	-	-	1	1	.00	.00
F	<i>Arabis</i> spp.	2	10	7	-	2	7	4	-	.02	-
F	<i>Astragalus beckwithii</i>	-	-	2	1	-	-	2	1	.05	.00
F	<i>Astragalus cibarius</i>	<sub>b</sub> 11	<sub>ab</sub> 5	<sub>b</sub> 11	<sub>a</sub> -	6	3	6	-	.21	-
F	<i>Astragalus eurekaensis</i>	1	3	-	2	1	2	-	2	-	.01
F	<i>Castilleja linariaefolia</i>	-	-	-	1	-	-	-	1	.00	.00
F	<i>Calochortus nuttallii</i>	5	23	12	18	5	10	7	10	.03	.07
F	<i>Chaenactis douglasii</i>	6	5	7	-	4	3	3	-	.04	-
F	<i>Cirsium undulatum</i>	-	-	-	-	-	-	-	-	-	.00
F	<i>Comandra pallida</i>	-	-	-	4	-	-	-	2	-	.01
F	<i>Collinsia parviflora</i> (a)	-	-	21	17	-	-	10	10	.05	.07
F	<i>Crepis acuminata</i>	-	2	4	2	-	2	1	1	.00	.00
F	<i>Draba</i> spp. (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	36	20	-	-	16	10	.08	.05

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Eriogonum brevicaulle	-	-	-	1	-	-	-	1	-	.00
F	Erigeron pumilus	-	-	1	-	-	-	1	-	.00	-
F	Galium aparine (a)	-	-	43	40	-	-	19	19	.48	.14
F	Helianthus annuus (a)	-	-	3	-	-	-	1	-	.00	-
F	Holosteum umbellatum (a)	-	-	5	7	-	-	2	3	.01	.01
F	Lactuca serriola	-	-	9	1	-	-	4	1	.02	.00
F	Microsteris gracilis (a)	-	-	30	27	-	-	12	14	.06	.07
F	Petradoria pumila	-	-	1	3	-	-	1	2	.03	.15
F	Phlox longifolia	<sub>a</sub> 8	<sub>b</sub> 30	<sub>ab</sub> 28	<sub>ab</sub> 24	6	18	11	11	.05	.05
F	Ranunculus testiculatus (a)	-	-	50	67	-	-	16	26	.13	.25
F	Streptanthus cordatus	1	3	-	-	1	1	-	-	-	-
F	Taraxacum officinale	-	-	-	1	-	-	-	1	-	.00
F	Tragopogon dubius	8	-	2	5	4	-	1	2	.03	.01
Total for Annual Forbs		0	0	484	480	0	0	169	172	3.19	4.00
Total for Perennial Forbs		42	81	85	65	29	46	42	36	0.52	0.35
Total for Forbs		42	81	569	545	29	46	211	208	3.71	4.35

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

BROWSE TRENDS --

Herd unit 16A, Study no: 3

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	70	72	10.42	8.92
B	Chrysothamnus nauseosus albicaulis	7	3	.66	.16
B	Gutierrezia sarothrae	23	10	.81	.03
B	Quercus gambelii	30	33	8.67	4.98
Total for Browse		130	118	20.58	14.10

Key Browse Annual Leader Growth

Herd unit 16A , Study no: 3

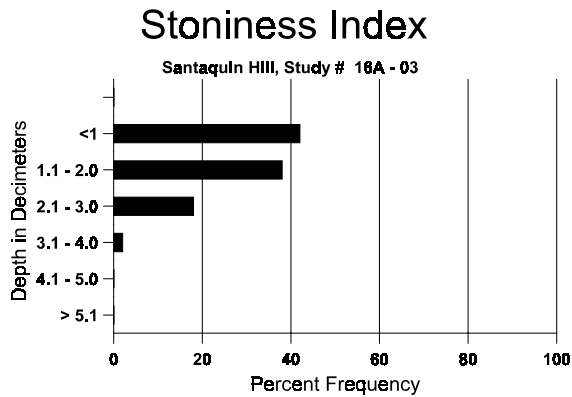
Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.7

BASIC COVER --  
Herd unit 16A, Study no: 3

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	357	357	0	7.50	35.97	33.26
Rock	281	302	17.00	15.00	23.06	25.70
Pavement	157	167	4.00	14.00	3.11	4.19
Litter	393	386	61.50	55.25	47.94	47.63
Cryptogams	92	34	0	1.25	.57	.31
Bare Ground	211	178	17.50	7.00	7.12	5.78

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 03, Santaquin Hill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.3	54.8 (16.0)	6.8	40.4	29.1	30.6	3.2	16.3	204.8	.6



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 3

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	11	15	02	02
Elk	2	2	-	-
Deer	20	33	1453	112 (276)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 3

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
Artemisia tridentata vaseyana												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	100		5	
	02	1	-	-	-	-	-	-	20		1	
Y	83	2	-	-	-	-	-	-	133		2	
	89	2	-	-	-	-	-	-	133		2	
	97	26	-	-	-	-	-	-	520		26	
	02	4	4	-	-	-	-	-	160		8	
M	83	6	24	4	-	-	-	-	2266	18	21	34
	89	9	3	-	1	-	-	-	866	17	22	13
	97	31	41	2	-	1	-	-	1500	17	25	75
	02	22	29	27	2	-	-	1	1620	20	31	81
D	83	1	10	1	-	-	-	-	800			12
	89	21	5	-	-	-	-	-	1733			26
	97	5	18	13	-	-	2	-	760			38
	02	18	23	13	-	-	1	3	1160			58
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	1140			57
	02	-	-	-	-	-	-	-	1700			85
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		71%		10%		00%		-15%				
'89		20%		00%		20%		+ 2%				
'97		43%		12%		19%		+ 5%				
'02		38%		28%		26%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	3199	Dec:	25%			
						'89	2732		63%			
						'97	2780		27%			
						'02	2940		39%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	5	1	-	-	-	1	-	-	-	7	-	-	-	140	27	35	7
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60	29	47	3
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		14%			14%			00%			-43%							
'02		00%			00%			25%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	140		0%			
												'02	80		25%			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	12	-	-	-	-	-	-	-	-	12	-	-	-	800		12	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	16	10	8
	89	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	9	12	24
	97	33	-	-	-	-	-	-	-	-	33	-	-	-	660	8	7	33
	02	10	-	-	-	-	-	-	-	-	8	2	-	-	200	6	7	10
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	240		12	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+80%							
'89		00%			00%			00%			-72%							
'97		00%			00%			00%			-65%							
'02		00%			00%			15%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	0%			
												'89	2666		10%			
												'97	740		3%			
												'02	260		15%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	'83	11	-	-	-	-	-	-	-	-	11	-	-	-	733		11	
	'89	-	-	-	-	-	-	19	-	-	19	-	-	-	1266		19	
	'97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	16	12	-	-	-	-	-	-	-	28	-	-	-	1866		28	
	'89	78	24	-	24	-	-	-	-	-	126	-	-	-	8400		126	
	'97	35	7	-	-	-	-	-	-	-	42	-	-	-	840		42	
	'02	5	1	2	-	-	-	-	-	-	8	-	-	-	160		8	
M	'83	-	75	-	-	-	-	-	-	-	75	-	-	-	5000	27 18	75	
	'89	4	8	-	1	-	-	-	-	-	13	-	-	-	866	33 21	13	
	'97	13	9	62	-	25	2	-	-	-	111	-	-	-	2220	30 29	111	
	'02	280	1	54	-	-	-	-	-	-	306	-	29	-	6700	32 20	335	
D	'83	-	4	-	-	-	-	-	-	-	4	-	-	-	266		4	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	'97	-	-	2	-	-	2	-	-	-	3	-	-	1	80		4	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		85%			00%			00%			+24%							
'89		23%			00%			00%			-66%							
'97		26%			43%			.63%			+54%							
'02		.58%			16%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	7132	Dec:	4%			
												'89	9332		1%			
												'97	3140		3%			
												'02	6860		0%			

Trend Study 16A-4-02

Study site name: Wash Canyon.

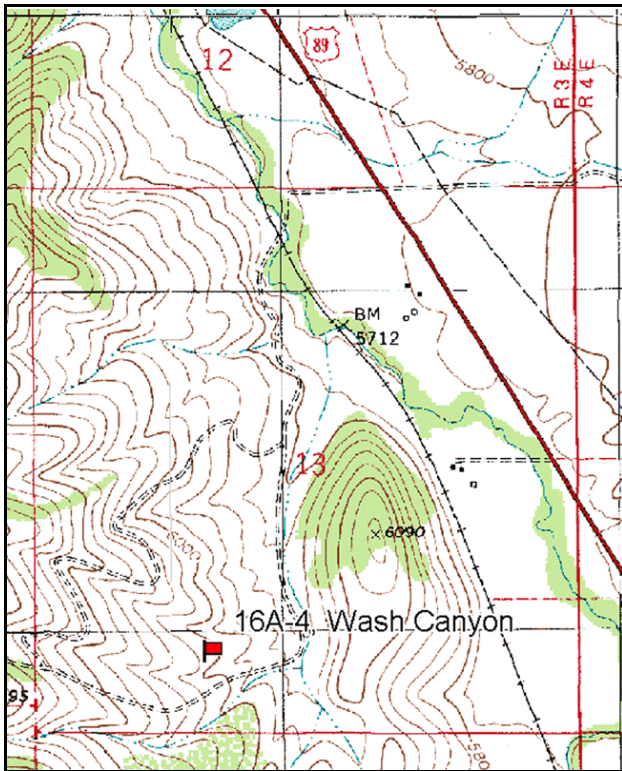
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 315 degrees magnetic (lines 3-4 @ 49°M).

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

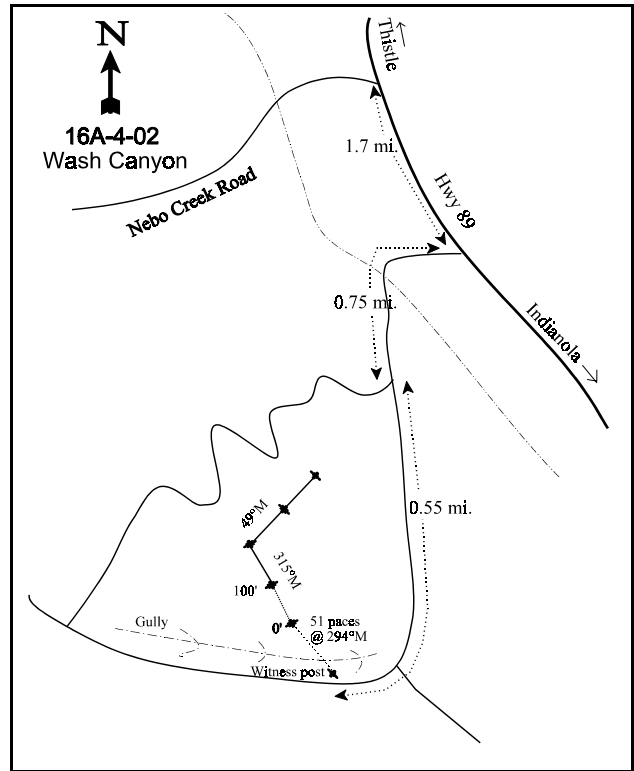
LOCATION DESCRIPTION

From the intersection of the Nebo Creek Road and U.S. 89, proceed south on U.S. 89 for 1.7 miles (0.5 miles from mile marker 269) to a road to the west. Turn right and proceed westerly for 0.75 miles, crossing a stream at 0.25 miles and an old railroad bed at 0.30 miles in route to a faint fork in the road. Take the left fork and proceed 0.55 miles to a half high witness post on the north side of the road. From the witness post, walk 51 paces at an azimuth of 295 degrees magnetic to the 0-foot baseline stake (the baseline stake is 17 paces away from lone juniper at an azimuth of 56 degree TRUE). The 0-foot baseline stake is a green post located just north of a clump of oak.



Map Name: Spencer Canyon

Township 11S, Range 3E, Section 13



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4411893 N 453768 E

## DISCUSSION

### Wash Canyon - Trend Study No. 16A-4

The Wash Canyon study samples deer winter range located in Lower Wash Canyon. The study is on Division property surrounded by privately owned land. Elevation of the site is approximately 6,000 feet. Slope is 21% with a northeast aspect. The area is a mountain brush site that currently supports a moderately low density of mountain big sagebrush associated with smaller numbers other palatable species. Deer and elk pellet groups were abundant in 1997 with quadrat frequencies of 58% and 21% respectively. Some cattle use and sign was also evident in 1997. Antler drops and winter killed deer were encountered during the initial 1983 reading. A pellet group transect read along the study site baseline in 2002 estimated heavy deer use at 169 deer days use/acre (417 ddu/ha). Elk use was estimated at 12 days use/acre (30 edu/ha). Most of the deer and elk pellet groups were from winter use.

Soil on the site is deep with an effective rooting depth of over 15 inches. Soil texture is a loam with a neutral pH of 6.8. Parent material appears to be limestone. Ground cover is highly variable, and many areas of bare soil and pavement are subject to erosion. Percent cover of bare ground is high, estimated at 32% in 2002. However, protective ground cover still appears adequate to limit erosion and the erosion condition classification was determined as stable in 2002.

Browse composition is diverse, but the only abundant preferred species is mountain big sagebrush. Invasion by large numbers of stickyleaf low rabbitbrush and broom snakeweed appears to have displaced some of the original browse population. The mountain big sagebrush, which was previously classified as basin big sagebrush (*Artemisia tridentata tridentata*), has characteristics more common of mountain big sagebrush (*A. tridentata vaseyana*). There appears to be some hybridizing between the two subspecies. For this report, all big sagebrush will be classified as mountain big sagebrush. Its density was estimated at 1,800 plants/acre in 1997 and 1,980 plants/acre in 2002. Use was light in 1983, more moderate to heavy in 1989, and light in 1997. In 2002, use was again rated as moderate to heavy. Heavier use occurs on plants with more mountain big sagebrush characteristics (*A. tridentata vaseyana*). Vigor is generally good and the number of decadent plants is within acceptable limits (18%).

Several other preferred browse species occur in small numbers. These include serviceberry, true mountain mahogany, and antelope bitterbrush. Due to their low numbers and high palatability, use of these species has been heavy. Bitterbrush is especially hard hit. Heavy use has increased from 29% of the bitterbrush sampled in 1997 to 83% in 2002. There was no apparent flowering or seed production in 2002 and many bitterbrush plants have been hedged to the point of decadence. No plants were classified as decadent in 1997, but 67% were considered decadent in 2002.

The undesirable increasers, stickyleaf low rabbitbrush and broom snakeweed, were abundant and increased in density between 1983 and 1989. Numbers declined slightly in 1997 and age class compositions indicated mostly mature populations. Due to drought conditions, density of broom snakeweed has declined from 6,420 plants/acre in 1997 to only 1,600 plants/acre in 2002. The population will likely continue to decline since 84% of the plants sampled were classified as decadent and 91% of the decadent snakeweed appear to be dying. Stickyleaf low rabbitbrush has remained stable in density but 34% of the population was classified as decadent in 2002 and about half of those appear to be dying.

The herbaceous understory is diverse yet not particularly abundant. Cheatgrass was the most abundant grass sampled in 1997, providing 40% of the total grass cover. Abundant perennial species included bluebunch wheatgrass, Indian ricegrass, and Kentucky bluegrass. Due to drought conditions in 2002, cheatgrass declined significantly in nested frequency and cover which dropped from 6% to less than 1%. Bluebunch wheatgrass increased significantly in nested frequency and all other perennial grasses remained stable.

Forbs are abundant with 33 total species encountered in 1997. Most species occur only occasionally with a few important species like Lewis flax and scarlet globemallow being fairly abundant. Total forb cover was estimated at only 4% in 1997. Drought conditions in 2002 caused a decline in perennial forb cover and sum of nested frequency. The once abundant blue flax was not encountered.

#### 1983 APPARENT TREND ASSESSMENT

Soil conditions are marginal. The dispersion of effective ground cover is highly variable and has allowed an excessive rate of soil erosion to continue. Vegetative trend also appears to be declining. The most palatable browse species appear to be declining and are gradually being replaced by broom snakeweed and stickyleaf low rabbitbrush. Herbaceous composition and density is fair but include few desirable, succulent or highly productive species.

#### 1989 TREND ASSESSMENT

Soil trend appears stable. Percent bare ground and litter declined. Rock and pavement cover increased from 12% to 24%. Low rabbitbrush and snakeweed still have the highest densities and have increased greatly. They remain mainly mature populations, with approximately 20% young plants. Young sagebrush are common and comprise 57% of the sagebrush population. The mature sagebrush are moderately to heavily hedged. The number of mature shrubs declined to 733 plants/acre due to an increase in the number of sagebrush classified as decadent. Sagebrush cover averages about 8%. Except for a slightly increased number of bitterbrush counted, other browse species were not well sampled on the density plots. They are all heavily hedged and display poor vigor. Plant numbers and species composition have improved slightly within the herbaceous community. Bluebunch wheatgrass, needle-and-thread, and Kentucky bluegrass increased in sum of nested frequency. There is a high diversity of forbs. Composition is unchanged and there was a slight increase in the sum of nested frequency for forbs.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

#### 1997 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground from 30% to 14% between 1989 and 1997. Litter cover increased slightly while rock and pavement cover declined. Sum of nested frequency for perennial grasses increased slightly. Density of the increasers, stickyleaf low rabbitbrush and broom snakeweed, have declined 32% and 15% respectively, however they are still abundant. Mountain big sagebrush shows slightly higher decadence (14% to 28%) even with lighter use. It would appear that with 60% of the decadent plants being classified as dying, that there will continue to be some losses to the sagebrush population. Trend for key browse, mountain big sagebrush which makes up 37% of the browse cover, is slightly down. Trend for the herbaceous understory is stable for grasses but down for forbs. Sum of nested frequency of forbs declined 36%. Since grasses comprise 79% of the herbaceous cover, overall trend is considered stable.

##### TREND ASSESSMENT

soil - up (5)

browse - slightly down (2)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in cover of bare ground and a decline in vegetation cover. There is still adequate protective ground cover to prevent most erosion and the erosion condition classification was determined as stable in 2002. Trend for browse is mixed. The key browse species, mountain big sagebrush has a stable population density, generally good vigor, and moderately low decadency. However, use is heavy with 74% of the sagebrush sampled displaying moderate or heavy use. Recruitment is poor with no seedlings and few young sampled in 2002. Other palatable shrubs, serviceberry, mountain mahogany, and bitterbrush, occur in low densities. They show heavy use and increased decadence. The undesirable increaser broom snakeweed, has declined by 75% and the remaining population is mostly decadent. Another increaser, stickyleaf low rabbitbrush, is also showing the effects of drought with decadence increasing from 6% to 34% of the population. Taking all of these factors into consideration, trend for browse is stable. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has remained similar to 1997 while annual grasses declined significantly. Composition has changed somewhat. Nested frequency of Kentucky bluegrass has declined significantly while bluebunch wheatgrass increased significantly. All other perennial grasses remained stable. Perennial forbs are diverse but don't provide much forage. They have declined considerably in nested frequency. Since perennial grasses make up 80% of the total herbaceous cover, the herbaceous trend is considered stable.

### TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 16A, Study no: 4

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	a19	a31	a76	b113	8	13	26	45	2.19	4.51
G	Bromus japonicus (a)	-	-	-	4	-	-	-	2	-	.01
G	Bromus tectorum (a)	-	-	b270	a157	-	-	86	63	6.14	.70
G	Dactylis glomerata	-	-	1	-	-	-	1	-	.00	-
G	Melica bulbosa	-	-	-	2	-	-	-	1	-	.15
G	Oryzopsis hymenoides	c145	bc128	a86	a87	51	53	37	37	1.75	3.75
G	Poa bulbosa	-	-	-	11	-	-	-	4	-	.09
G	Poa fendleriana	-	-	4	-	-	-	1	-	.15	-
G	Poa pratensis	a43	b74	a77	a25	17	27	25	11	3.04	.22
G	Poa secunda	a3	a3	b47	b38	1	1	20	18	.86	.46
G	Sitanion hystrix	b35	a4	b49	b34	17	2	19	19	.58	.84
G	Stipa comata	a19	b75	a25	a22	8	35	9	9	.61	1.52
Total for Annual Grasses		0	0	270	161	0	0	86	65	6.14	0.70
Total for Perennial Grasses		264	315	365	332	102	131	138	144	9.19	11.58
Total for Grasses		264	315	635	493	102	131	224	209	15.34	12.29
F	Agoseris glauca	-	-	4	8	-	-	2	4	.01	.04
F	Alyssum alyssoides (a)	-	-	a107	b185	-	-	44	65	.29	.80
F	Allium spp.	ab6	a1	b13	a-	4	1	7	-	.03	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Antennaria rosea</i>	-	-	1	1	-	-	1	1	.03	.00
F	<i>Aster chilensis</i>	-	-	1	4	-	-	1	2	.00	.01
F	<i>Astragalus convallarius</i>	<sub>b</sub> 30	<sub>b</sub> 35	<sub>a</sub> 9	<sub>a</sub> 1	16	17	5	1	.07	.03
F	<i>Astragalus</i> spp.	-	-	-	2	-	-	-	1	-	.00
F	<i>Astragalus utahensis</i>	-	-	1	-	-	-	1	-	.03	-
F	<i>Castilleja chromosa</i>	5	-	-	-	2	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	4	1	5	-	1	1	3	-	.01	-
F	<i>Chaenactis douglasii</i>	<sub>b</sub> 29	<sub>a</sub> 4	<sub>a</sub> 1	<sub>a</sub> -	14	2	1	-	.00	-
F	<i>Chenopodium</i> spp. (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Cirsium</i> spp.	<sub>b</sub> 84	<sub>b</sub> 56	<sub>a</sub> 18	<sub>a</sub> 15	40	28	11	8	.17	.24
F	<i>Collomia linearis</i> (a)	-	-	9	1	-	-	4	1	.02	.00
F	<i>Comandra pallida</i>	3	3	2	-	3	2	1	-	.00	-
F	<i>Collinsia parviflora</i> (a)	-	-	<sub>a</sub> 3	<sub>b</sub> 84	-	-	1	32	.00	.23
F	<i>Crepis acuminata</i>	2	4	3	-	1	2	1	-	.00	-
F	<i>Cryptantha</i> spp.	12	28	13	11	8	11	6	7	.10	.08
F	<i>Descurainia pinnata</i> (a)	-	-	<sub>b</sub> 39	<sub>a</sub> 1	-	-	17	1	.11	.00
F	<i>Epilobium brachycarpum</i> (a)	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 11	<sub>ab</sub> 2	-	-	5	2	.05	.01
F	<i>Erigeron divergens</i>	<sub>a</sub> -	<sub>b</sub> 5	<sub>a</sub> 1	<sub>a</sub> -	-	3	1	-	.00	-
F	<i>Erigeron pumilus</i>	6	-	-	-	2	-	-	-	-	-
F	<i>Eriogonum racemosum</i>	-	-	-	3	-	-	-	2	.00	.06
F	<i>Eriogonum umbellatum</i>	<sub>bc</sub> 9	<sub>c</sub> 14	<sub>ab</sub> 2	<sub>a</sub> 1	5	7	2	1	.03	.00
F	<i>Hackelia patens</i>	36	21	37	36	17	11	17	17	.36	.33
F	<i>Lathyrus brachycalyx</i>	<sub>a</sub> 21	<sub>b</sub> 55	<sub>a</sub> 3	<sub>a</sub> 8	9	23	2	3	.01	.01
F	<i>Lappula occidentalis</i> (a)	-	-	5	-	-	-	2	-	.01	-
F	<i>Linum lewisii</i>	<sub>c</sub> 125	<sub>b</sub> 98	<sub>b</sub> 81	<sub>a</sub> -	58	44	37	-	.72	-
F	<i>Lithospermum ruderale</i>	<sub>a</sub> 1	<sub>b</sub> 10	<sub>a</sub> -	<sub>a</sub> 1	1	5	-	1	-	.03
F	<i>Lithophragma</i>	-	-	6	-	-	-	2	-	.30	-
F	<i>Lomatium</i> spp.	-	4	-	-	-	3	-	-	-	-
F	<i>Machaeranthera canescens</i>	3	-	3	-	2	-	1	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	2	-	-	-	1	-	.00
F	<i>Oenothera</i> spp.	2	-	2	-	1	-	1	-	.03	-
F	<i>Orobanche fasciculata</i>	-	-	3	-	-	-	1	-	.00	-
F	<i>Phlox longifolia</i>	<sub>a</sub> 6	<sub>b</sub> 67	<sub>a</sub> 3	<sub>a</sub> 5	3	34	1	3	.00	.02
F	<i>Polygonum douglasii</i> (a)	-	-	<sub>b</sub> 19	<sub>a</sub> 1	-	-	8	1	.06	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 16	-	-	-	6	-	.05
F	<i>Schoenocrambe linifolia</i>	-	-	-	7	-	-	-	4	-	.02
F	<i>Senecio multilobatus</i>	-	2	-	-	-	2	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	<sub>b</sub> 137	<sub>b</sub> 168	<sub>a</sub> 88	<sub>a</sub> 77	58	68	40	38	1.04	.98
F	<i>Taraxacum officinale</i>	2	-	1	-	1	-	1	-	.00	-

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Tragopogon dubius	<sub>c</sub> 49	<sub>ab</sub> 28	<sub>c</sub> 67	<sub>a</sub> 4	25	16	32	3	.44	.04
	Total for Annual Forbs	0	0	196	292	0	0	82	109	0.56	1.11
	Total for Perennial Forbs	572	604	368	184	271	280	178	96	3.47	1.95
	Total for Forbs	572	604	564	476	271	280	260	205	4.03	3.06

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 4

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	2	3	-	.15
B	Artemisia tridentata vaseyana	56	57	7.28	9.81
B	Cercocarpus montanus	2	1	.15	.15
B	Chrysothamnus nauseosus albicaulis	1	2	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	90	86	8.12	6.80
B	Gutierrezia sarothrae	71	31	2.68	.58
B	Opuntia spp.	27	30	.73	1.15
B	Pinus edulis	1	1	-	.15
B	Purshia tridentata	7	6	.56	.42
B	Quercus gambelii	3	3	-	1.00
B	Ribes spp.	1	0	-	-
	Total for Browse	261	220	19.54	20.22

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 16A, Study no: 4

Species	Percent Cover '02
Amelanchier utahensis	.17
Artemisia tridentata vaseyana	7.25
Chrysothamnus nauseosus hololeucus	.25
Chrysothamnus viscidiflorus viscidiflorus	4.00
Gutierrezia sarothrae	.67
Opuntia spp.	.33
Pinus edulis	.33
Purshia tridentata	.50
Quercus gambelii	.17



Key Browse Annual Leader Growth  
Herd unit 16A , Study no: 4

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.3

Point-Quarter Tree Data  
Herd unit 16A , Study no: 4

Species	Trees per Acre '02	Average diameter (in) '02
Juniperus osteosperma	39	2.6

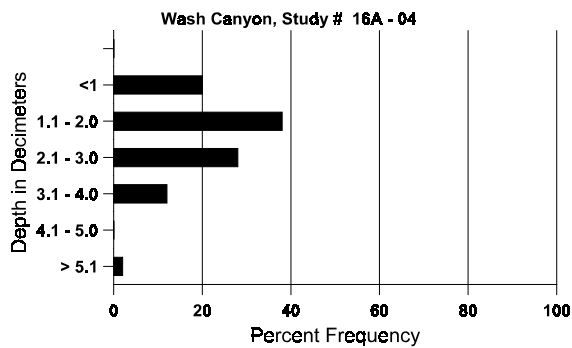
BASIC COVER --  
Herd unit 16A, Study no: 4

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	363	334	4.25	8.75	44.12	32.27
Rock	208	209	4.00	8.25	5.81	5.52
Pavement	320	310	8.00	15.50	9.30	6.17
Litter	399	378	45.25	37.75	40.90	40.87
Cryptogams	39	1	0	.25	.38	.00
Bare Ground	295	325	38.50	29.50	14.36	31.73

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 04, Wash Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.4	58.2 (16.6)	6.8	35.0	31.2	33.8	3.4	13.5	99.2	.6

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 4

Type	Quadrat Frequency		Pellet Transect			
			Pellet Groups per Acre		Days Use per Acre (ha)	
	'97	'02	'97	'02	'97	'02
Rabbit	2	14	-	-	-	-
Elk	21	12	853	157	64 (159)	12 (30)
Deer	58	68	1044	2192	80 (198)	169 (417)
Cattle	2	1	261	9	22 (54)	1 (2)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 4

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier alnifolia																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	97	-	-	-	-	-	1	-	-	-	1	-	-	-	20	-	-
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	17
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	1	-	-	-	-	-	-	-	-	1	20		1
	02	1	-	-	-	-	-	-	-	1	2	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			50%			50%			+33%						
'02		00%			33%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%		
												'89	0		0%		
												'97	40		50%		
												'02	60		67%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total					
		1	2	3	4		1	2						
<i>Artemisia tridentata vaseyana</i>														
Y	83	16	-	-	-	-	-	-	16	-	-	533		16
	89	24	17	-	1	-	-	-	38	2	2	1400		42
	97	18	-	-	-	-	-	-	18	-	-	360		18
	02	1	2	-	1	-	-	-	3	-	1	80		4
M	83	32	-	-	-	-	-	-	30	2	-	1066	27 24	32
	89	3	10	9	-	-	-	-	20	1	1	733	29 32	22
	97	37	10	-	-	-	-	-	47	-	-	940	31 38	47
	02	17	30	27	-	-	3	-	77	-	-	1540	25 32	77
D	83	2	-	-	-	-	-	-	1	-	1	66		2
	89	2	2	5	1	-	-	-	7	-	3	333		10
	97	20	3	-	2	-	-	-	10	-	-	500		25
	02	5	7	4	1	-	1	-	8	-	1	360		18
X	83	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	400		20
	02	-	-	-	-	-	-	-	-	-	-	360		18
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'83		00%		00%		02%		+32%						
'89		39%		19%		08%		-27%						
'97		14%		00%		17%		+ 9%						
'02		39%		35%		11%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	1665	Dec:	4%	
										'89	2466		14%	
										'97	1800		28%	
										'02	1980		18%	
<i>Cercocarpus montanus</i>														
Y	83	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	1	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	-	-	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	1	-	-	1	-	-	20	11 56	1
	02	-	-	-	-	1	-	-	1	-	-	20	18 23	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'83		00%		00%		00%								
'89		00%		00%		00%								
'97		00%		50%		00%		-50%						
'02		00%		100%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-	
										'89	0		-	
										'97	40		-	
										'02	20		-	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus nauseosus albicaulis</b>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	20	-	-	1
	02	-	2	-	-	-	-	-	-	-	2	-	-	40	25	25	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%			+50%						
'02		100%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	20		-		
												'02	40		-		
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	52	-	-	1	-	-	-	-	-	46	-	7	1766			53
	97	46	-	-	-	-	-	-	-	-	46	-	-	920			46
	02	7	-	-	-	-	-	-	-	-	7	-	-	140			7
M	83	126	-	-	-	-	-	-	-	-	126	-	-	4200	13	19	126
	89	205	-	-	13	-	-	-	-	-	157	-	26	7266	11	16	218
	97	297	-	-	-	-	-	-	-	-	297	-	-	5940	9	14	297
	02	241	2	-	-	-	-	-	-	-	243	-	-	4860	9	13	243
D	83	3	-	-	-	-	-	-	-	-	2	1	-	100			3
	89	47	-	-	1	-	-	-	-	-	30	-	15	1600			48
	97	21	-	-	-	-	-	-	-	-	15	-	-	420			21
	02	124	2	-	-	-	-	-	-	-	64	-	2	2520			126
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	580			29
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+60%						
'89		00%			00%			27%			-32%						
'97		00%			00%			02%			+ 3%						
'02		01%			00%			16%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	4300	Dec:	2%		
												'89	10632		15%		
												'97	7280		6%		
												'02	7520		34%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Gutierrezia sarothrae</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360		18	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	12	-	-	-	-	-	-	-	-	12	-	-	-	400		12	
	89	50	-	-	-	-	-	-	-	-	50	-	-	-	1666		50	
	97	45	-	-	2	-	-	-	-	-	46	-	-	1	940		47	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	68	-	-	-	-	-	-	-	-	68	-	-	-	2266	13 12	68	
	89	161	-	-	-	-	-	-	-	-	159	-	2	-	5366	11 12	161	
	97	272	-	-	-	-	-	-	-	-	272	-	-	-	5440	10 13	272	
	02	13	-	-	-	-	-	-	-	-	13	-	-	-	260	7 7	13	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	15	-	-	-	-	-	-	-	-	13	-	-	2	500		15	
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40		2	
	02	64	-	2	-	-	-	-	-	-	6	-	-	61	1340		67	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	19	-	-	-	-	-	-	-	-	19	-	-	-	2640		132	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+65%							
'89		00%			00%			02%			-15%							
'97		00%			00%			.62%			-75%							
'02		00%			03%			76%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2666	Dec:	0%			
												'89	7532		7%			
												'97	6420		1%			
												'02	1600		84%			
<b>Juniperus osteosperma</b>																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	47 30	1	
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	71 35	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			50%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'89	66		-			
												'97	0		-			
												'02	0		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Opuntia spp.																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	-	-	-	-	-	33		1
	97	-	-	-	1	-	-	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	8	-	-	1	-	-	-	-	-	-	-	-	-	300		9
	97	5	-	-	-	-	-	-	-	-	-	-	-	-	100		5
	02	2	-	-	-	-	-	-	-	-	-	-	-	-	40		2
M	83	14	-	-	-	-	-	-	-	-	-	-	-	-	466	8 17	14
	89	47	-	-	-	-	-	-	-	-	-	-	-	-	1566	8 10	47
	97	36	-	-	-	-	-	-	4	-	-	-	-	-	800	5 12	40
	02	48	-	-	-	-	-	-	-	-	-	-	-	-	960	5 10	48
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	1	-	20		1
	02	12	-	-	-	-	-	-	-	-	-	-	4	-	240		12
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+75%						
'89		00%			00%			00%			-51%						
'97		00%			00%			02%			+26%						
'02		00%			00%			06%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	466	Dec:	0%		
												'89	1866		0%		
												'97	920		2%		
												'02	1240		19%		
Pinus edulis																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1
	02	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%			+ 0%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	20		-		
												'02	20		-		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	1	-	1	-	-	1	-	-	-	3	-	-	-	100		3	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	-	-	4	-	-	-	-	-	-	-	-	4	-	133	23 37	4	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	'97	-	3	-	-	2	1	-	-	1	7	-	-	-	140	8 39	7	
	'02	-	-	-	-	-	2	-	-	-	2	-	-	-	40	9 13	2	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	1	3	-	-	-	-	-	-	3	-	-	1	133		4	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	1	-	1	-	-	-	-	-	2	2	-	-	2	80		4	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			80%			80%			+29%							
'89		14%			71%			14%			-40%							
'97		71%			29%			00%			-14%							
'02		00%			83%			33%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	0%			
												'89	233		57%			
												'97	140		0%			
												'02	120		67%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
	02	3	-	-	-	-	-	-	-	-	1	-	2	-	60		3	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	02	-	1	-	-	-	-	-	-	-	-	-	1	-	20	28	56	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		33%			00%			00%			+40%							
'02		20%			20%			80%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	0		0%				
											'97	60		0%				
											'02	100		20%				
Ribes spp.																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	40		-				
											'02	0		-				



Trend Study 16A-5-02

Study site name: Nebo Creek.

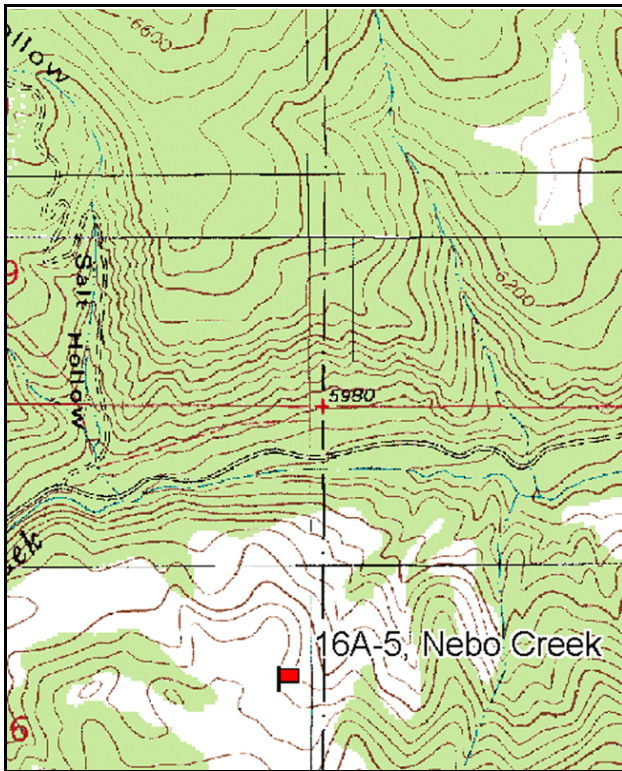
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 226 degrees magnetic.

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

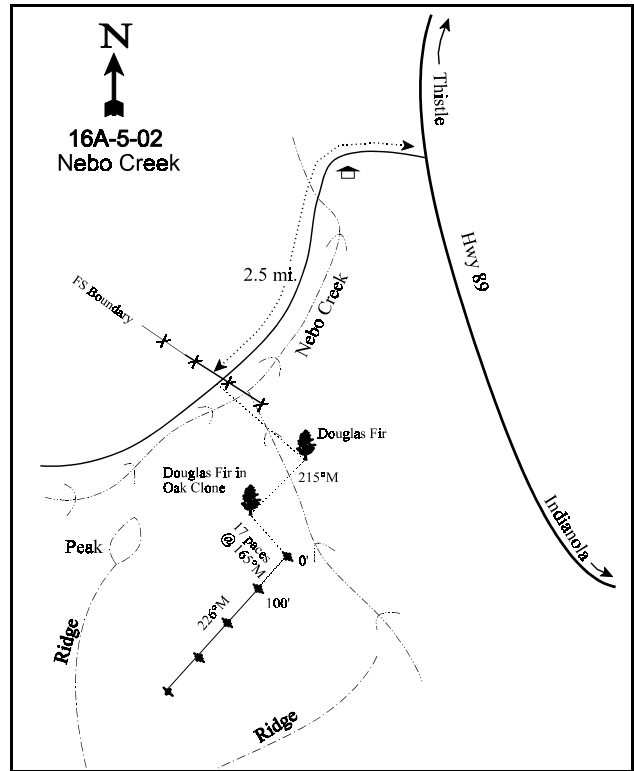
LOCATION DESCRIPTION

Beginning at the intersection of Highway US-89 and the Nebo Creek Road, proceed 2.5 miles westerly up Nebo Creek to the USFS boundary sign or the cattle guard. Park here. Take an azimuth of 185 degrees magnetic to the top of a lone Douglas fir. Proceed across Nebo Creek and uphill to the Douglas fir tree. From here walk at an azimuth of 215 degrees magnetic up a drainage to a fence line. From the fence line, walk 124 paces at the same azimuth to a second but smaller Douglas fir within a clump of oak brush. From this tree, the 0-foot baseline stake is 17 paces away at an azimuth of 165 degree magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Spencer Canyon

Township 11S, Range 3E, Section 16



Diagrammatic sketch

GPS: NAD 27, UTM 12S 4412676 N 449921 E

## DISCUSSION

### Nebo Creek - Trend Study No. 16A-5

The Nebo Creek study is located on National Forest land at an elevation of 6,320 feet in the Nebo Creek drainage. The site slopes gently (10%) to the northeast. It is an area which has had high winter or spring-fall use for both deer and elk in the past, and livestock graze the area in summer. During the 1983 reading, numerous fresh deer and elk pellet groups, as well as three live deer were observed. In addition, carcasses of two deer and one elk were observed, along with two separate antler drops. Pellet group quadrat frequency in 1997 indicated light use of the area by all classes of animals. The entire area was burned in 2001 as part of the Nebo Creek fire. All of the browse was eliminated with the exception of resprouting Gambel oak and rabbitbrush. There is still some light use by deer and elk with 7 deer and 3 elk days use/acre estimated (17 ddu/ha and 7 edu/ha) in 2002 from a pellet group transect. During severe or even moderate winters, accumulations of snow probably force animals to lower elevations.

Soils in this area are characterized as stony loams. These are calcareous alkaline soils derived from sedimentary alluvium composed primarily of limestone, sandstone, or shale. Soil texture is coarse and drainage is rapid with a root zone at least 60 inches deep. Erosion hazard is slight (USDA-SCS 1981). Soil at the site is moderately deep with an effective rooting depth estimated at just over 15 inches. Soil texture is a clay loam with a moderately acidic pH of 6.0. Soil temperature was relatively low averaging only 41° F at a depth of 16 inches. There is some large rock cobble found on the surface and throughout the profile. Vegetation and litter were abundant prior to the fire in 2001 and signs of erosion were minimal. After the fire, vegetation cover declined from 61% in 1997 to 18% in 2002 and litter cover dropped from 55% to 7%. Percent cover of bare ground increased from 8% in 1997 to 65% in 2002. The erosion condition classification was determined as slight in 2002, but with high intensity precipitation, the erosion hazard is high until the herbaceous vegetation becomes reestablished.

The original study sampled an oak clone in the middle of a sagebrush-grass basin. Oak is also found on some of the slopes surrounding the basin. In 1997, the baseline was lengthened and moved entirely into the sagebrush-grass type. As a result, density of some of the species differs, especially oak. The key browse on the old baseline was Gambel oak. It was a mixed age stand that varied in height from a few inches to a treelike 12 to 15 feet in height. Age structure suggests a stable population. The degree of hedging in 1983 was variable with young plants showing only light use, while available portions of mature individuals were heavily utilized. Presumably, the smaller plants were covered by snow in winter. Use of the oak in 1989 was light. The stand was vigorous with a high proportion of the population consisting of young plants. With the change in the baseline in 1997, little oak was sampled. The fire of 2001 burned all of the oak. It is resprouting but none was encountered in the sample in 2002.

The area was characterized by a sagebrush-grass type with a mixture of basin big sagebrush (*Artemisia tridentata tridentata*) and mountain big sagebrush (*A. tridentata vaseyana*). Basin big sagebrush was more abundant in all readings, and had an estimated density of 1,080 plants/acre in 1997. Mature plants were large and averaged 40 inches in height. Vigor was normal with no decadent individuals. Mountain big sagebrush numbered just 400 plants/acre in 1997. Use on both species was mostly light. All sagebrush was eliminated from the area by the Nebo Creek fire of 2001. It will take several years before sagebrush is reestablished in significant numbers.

Prior to the fire the most common shrub on the site consisted of stickyleaf low rabbitbrush which made up 53% of the shrub cover with a density of 3,540 plants/acre in 1997. The population was nearly all mature (98%), in good vigor, and unutilized. Other shrubs found on the site included a few threadleaf rubber rabbitbrush, prickly pear cactus, and a few heavily hedged serviceberry. After the fire, stickyleaf low rabbitbrush is resprouting and numbers 720 plants/acre. A few resprouting rubber rabbitbrush were also found on the site.

Grasses and forbs were abundant prior to the burn and provided a total of 57% cover in 1997. About half of the cover was provided by perennial grasses and half by forbs. The most common of these was Kentucky bluegrass and Sandberg bluegrass. Forbs were very abundant and diverse. Thirty-four species were encountered in 1997. Common species included peavine, American vetch, blue-eyed Mary, Beckwith milkvetch, stickseed, pacific aster and lambstongue groundsel. These and other species on the site provided important succulent spring and summer forage. Herbaceous cover in 2002, one year after the fire, averaged only 19%. The most abundant perennial grass is Sandberg bluegrass which has had fairly stable nested frequency values. Other perennial grasses are widely scattered and occur in small numbers. Perennial forbs have declined significantly since the burn. Common species sampled in 2002 include arrowleaf balsamroot, false dandelion, milkvetch, blue-eyed Mary, and peavine.

### 1983 APPARENT TREND ASSESSMENT

This site appears relatively stable. Ground cover is good, soil erosion is minimal, and vegetative composition is generally favorable.

### 1989 TREND ASSESSMENT

The soil trend is up slightly due to an increase in basal vegetation cover and a decline in percent bare ground. Sagebrush in the 1983 report was not divided into basin big sagebrush and mountain big sagebrush. Combined, big sagebrush remained at similar densities. They are lightly to moderately hedged and have normal vigor. The population has a high percentage of decadence, but there is a fair number of seedling and young plants. Sagebrush canopy cover averages 10%. On the density plots, a higher density and larger size of oakbrush was measured in 1989. Low rabbitbrush increased only slightly, and many display very poor vigor. Under the oakbrush, there is a low density of grass. Forbs are limited mainly to a rhizomatous aster. On the frequency lines, an improved diversity of forbs and grasses was sampled. There was a significant increase in the frequency of perennial grasses and forbs, possibly related to the lower amount of cheatgrass in 1989 compared to 1983 and/or no recent livestock use.

#### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up (5)

### 1997 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics as 1989. The decline in litter cover is related mostly to moving the baseline out of the oak and into the sagebrush-grass type. Trend for sagebrush appears stable with light use, good vigor, and low decadence. There is a large population of the increaser, stickyleaf low rabbitbrush. It is composed almost completely of mature plants which would indicate a stable or possibly a future declining trend. The herbaceous understory is abundant and diverse with many useful species. However, the composition is dominated by weedy species that occur in high densities under heavy grazing pressure. Currently, the grass component is dominated by Kentucky bluegrass, a sod forming increaser. Several species of weedy forbs are also abundant. Data from the previous baseline cannot be used to determine a trend due to the difference in the herbaceous understory composition that is in association with the sagebrush-grass community.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - appears stable, but dominated by weedy increasers (3)

2002 TREND ASSESSMENT

Trend for soil is down due to the 2001 fire and the elimination of most vegetation and litter cover. Exposed bare ground is abundant and the erosion potential is high with any high intensity precipitation. At the time of the 2002 reading (6/18/02) there had been no significant precipitation and the erosion condition classification was determined as slight. Trend for browse is down. All shrubs were eliminated by the fire and the only browse found on the site were low numbers of resprouting rabbitbrush and Gambel oak. Trend for the herbaceous understory is down. Perennial grasses and forbs are still diverse and they should recover with time. There are several desirable species present which provide some valuable spring and summer forage for big game.

TREND ASSESSMENT

soil - down due to fire (1)

browse - down due to fire (1)

herbaceous understory - down due to fire (1)

HERBACEOUS TRENDS --

Herd unit 16A, Study no: 5

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	-	-	2	-	-	-	1	-	.15	-
G	Agropyron spicatum	<sub>a</sub> 9	<sub>b</sub> 36	<sub>c</sub> 78	<sub>ab</sub> 28	5	15	27	13	3.05	.91
G	Bromus marginatus	<sub>b</sub> 16	<sub>c</sub> 27	<sub>a</sub> -	<sub>a</sub> -	6	10	-	-	-	-
G	Bromus tectorum (a)	-	-	<sub>b</sub> 131	<sub>a</sub> 34	-	-	48	16	2.50	.53
G	Elymus cinereus	1	-	5	2	1	-	2	1	.97	.15
G	Elymus junceus	-	-	-	6	-	-	-	2	-	1.41
G	Melica bulbosa	<sub>a</sub> 10	<sub>a</sub> 3	<sub>b</sub> 78	<sub>b</sub> 52	4	1	33	26	2.05	1.68
G	Oryzopsis hymenoides	-	-	1	-	-	-	1	-	.03	-
G	Poa fendleriana	<sub>b</sub> 22	<sub>c</sub> 57	<sub>a</sub> -	<sub>ab</sub> 7	9	26	-	3	-	.01
G	Poa pratensis	<sub>a</sub> 6	<sub>b</sub> 56	<sub>c</sub> 173	<sub>a</sub> 24	4	22	56	11	8.10	.35
G	Poa secunda	<sub>a</sub> 34	<sub>a</sub> 26	<sub>b</sub> 154	<sub>b</sub> 146	11	13	52	56	8.42	5.62
G	Sitanion hystrix	-	1	-	3	-	1	-	1	-	.03
G	Stipa columbiana	-	-	5	-	-	-	2	-	.01	-
G	Stipa lettermani	-	-	4	4	-	-	1	1	.03	.03
Total for Annual Grasses		0	0	131	34	0	0	48	16	2.50	0.53
Total for Perennial Grasses		98	206	500	272	40	88	175	114	22.83	10.20
Total for Grasses		98	206	631	306	40	88	223	130	25.34	10.74
F	Achillea millefolium	<sub>b</sub> 21	<sub>ab</sub> 20	<sub>ab</sub> 17	<sub>a</sub> 2	8	7	7	1	.88	.00
F	Agoseris glauca	<sub>a</sub> 10	<sub>a</sub> -	<sub>b</sub> 67	<sub>b</sub> 59	4	-	32	24	.84	.39
F	Alyssum alyssoides (a)	-	-	<sub>a</sub> 6	<sub>b</sub> 24	-	-	3	10	.04	.22
F	Allium campanulatum	<sub>a</sub> 8	<sub>b</sub> 47	<sub>b</sub> 62	<sub>a</sub> 10	6	20	31	6	.33	.13
F	Antennaria rosea	-	-	-	3	-	-	-	1	-	.00
F	Arabis spp.	-	3	-	-	-	1	-	-	-	-
F	Artemisia ludoviciana	7	7	3	-	2	2	1	-	.15	-
F	Astragalus beckwithii	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 49	<sub>b</sub> 13	-	-	21	5	1.82	.21

Type	Species	Nestled Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Aster chilensis</i>	<sub>b</sub> 35	<sub>b</sub> 43	<sub>c</sub> 76	<sub>a</sub> 1	15	15	28	1	1.86	.03
F	<i>Astragalus convallarius</i>	-	-	-	1	-	-	-	1	-	.03
F	<i>Balsamorhiza sagittata</i>	6	7	8	12	3	4	4	7	.73	1.23
F	<i>Camelina microcarpa</i> (a)	-	-	<sub>b</sub> 36	<sub>a</sub> -	-	-	17	-	.13	-
F	<i>Calochortus nuttallii</i>	-	-	6	7	-	-	2	3	.01	.01
F	<i>Chenopodium album</i> (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Cirsium</i> spp.	<sub>a</sub> -	<sub>b</sub> 14	<sub>b</sub> 13	<sub>a</sub> -	-	8	5	-	.07	-
F	<i>Collomia linearis</i> (a)	-	-	<sub>b</sub> 119	<sub>a</sub> -	-	-	56	-	.68	-
F	<i>Comandra pallida</i>	<sub>b</sub> 37	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	15	-	-	-	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	<sub>b</sub> 258	<sub>a</sub> 123	-	-	88	48	3.96	.63
F	<i>Crepis acuminata</i>	<sub>a</sub> 3	<sub>a</sub> 16	<sub>b</sub> 56	<sub>b</sub> 55	1	8	21	29	.82	1.85
F	<i>Cymopterus longipes</i>	3	7	7	-	1	4	3	-	.04	-
F	<i>Cynoglossum officinale</i>	<sub>a</sub> -	<sub>ab</sub> 6	<sub>b</sub> 12	<sub>a</sub> -	-	3	5	-	.17	-
F	<i>Delphinium nuttallianum</i>	-	-	5	1	-	-	4	1	.04	.00
F	<i>Descurainia pinnata</i> (a)	-	-	10	14	-	-	5	5	.06	.16
F	<i>Epilobium brachycarpum</i> (a)	-	-	<sub>b</sub> 16	<sub>a</sub> -	-	-	7	-	.11	-
F	<i>Eriogonum racemosum</i>	6	1	3	4	3	1	1	1	.03	.00
F	<i>Hackelia patens</i>	<sub>ab</sub> 16	<sub>b</sub> 41	<sub>c</sub> 72	<sub>a</sub> 5	7	16	28	3	2.07	.09
F	<i>Holosteum umbellatum</i> (a)	-	-	-	3	-	-	-	1	-	.00
F	<i>Hymenoxys acaulis</i>	-	-	2	-	-	-	1	-	.30	-
F	<i>Lathyrus brachycalyx</i>	<sub>a</sub> 97	<sub>a</sub> 54	<sub>b</sub> 172	<sub>b</sub> 164	42	25	57	63	9.14	2.15
F	<i>Lactuca serriola</i>	<sub>a</sub> -	<sub>bc</sub> 13	<sub>c</sub> 18	<sub>ab</sub> 1	-	6	8	1	.38	.33
F	<i>Lithospermum ruderales</i>	1	6	10	1	1	3	4	1	.48	.01
F	<i>Lupinus argenteus</i>	8	5	4	4	4	2	2	3	.06	.16
F	<i>Machaeranthera canescens</i>	-	2	-	-	-	1	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 23	-	-	-	12	-	.28
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>c</sub> 88	<sub>ab</sub> 17	<sub>a</sub> 1	-	44	6	1	.08	.00
F	<i>Polygonum douglasii</i> (a)	-	-	17	5	-	-	7	3	.06	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	28	20	-	-	10	7	.15	.06
F	<i>Senecio integerrimus</i>	<sub>a</sub> -	<sub>a</sub> 1	<sub>b</sub> 36	<sub>a</sub> -	-	1	17	-	1.08	-
F	<i>Sphaeralcea coccinea</i>	-	3	-	-	-	1	-	-	-	-
F	<i>Taraxacum officinale</i>	<sub>a</sub> 12	<sub>b</sub> 40	<sub>b</sub> 46	<sub>a</sub> 6	7	22	23	2	.38	.03
F	<i>Tragopogon dubius</i>	<sub>b</sub> 26	<sub>b</sub> 14	<sub>b</sub> 16	<sub>a</sub> -	14	9	10	-	.15	-
F	<i>Veronica biloba</i> (a)	-	-	<sub>b</sub> 17	<sub>a</sub> -	-	-	6	-	.27	-
F	<i>Vicia americana</i>	<sub>a</sub> 10	<sub>b</sub> 52	<sub>c</sub> 106	<sub>a</sub> 6	6	22	38	2	3.71	.18
F	<i>Viguiera multiflora</i>	-	3	-	5	-	1	-	2	.03	.01
Total for Annual Forbs		0	0	510	212	0	0	200	86	5.48	1.38
Total for Perennial Forbs		306	493	883	361	139	226	359	158	25.70	6.90
Total for Forbs		306	493	1393	573	139	226	559	244	31.18	8.28

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	1	0	.03	-
B	Artemisia tridentata tridentata	37	0	3.98	-
B	Artemisia tridentata vaseyana	15	0	2.98	-
B	Chrysothamnus nauseosus consimilis	1	1	.15	.03
B	Chrysothamnus viscidiflorus viscidiflorus	72	20	8.75	.35
B	Gutierrezia sarothrae	0	0	.00	-
B	Opuntia spp.	3	0	.06	-
B	Quercus gambelii	1	0	.63	-
Total for Browse		130	21	16.59	0.38

CANOPY COVER – LINE INTERCEPT  
Herd unit 16A, Study no: 5

Species	Percent Cover '02
Chrysothamnus viscidiflorus viscidiflorus	.42

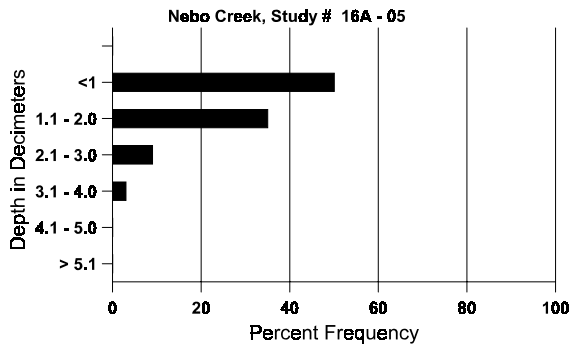
BASIC COVER --  
Herd unit 16A, Study no: 5

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	385	285	0	3.00	61.17	18.42
Rock	84	237	.50	1.50	1.88	5.83
Pavement	156	345	.25	2.00	1.65	10.49
Litter	396	300	88.00	84.75	55.32	7.27
Cryptogams	56	-	0	.25	.54	0
Bare Ground	209	378	11.25	8.50	8.40	64.55

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 05, Nebo Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.2	41.0 (13.3)	6.0	34.7	34.7	30.6	3.5	39.6	320.0	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 5

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	-	-	-	-
Sheep	-	2	17	1 (3)
Elk	4	1	35	3 (7)
Deer	7	1	87	7 (17)
Cattle	5	-	9	1 (2)

## BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 5

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total	
		1	2	3	4		Ht.	Cr.		
Amelanchier alnifolia										
M	'83	-	-	-	-	-	-	-	-	0
	'89	-	-	-	-	-	-	-	-	0
	'97	-	-	1	-	-	-	-	-	20
	'02	-	-	-	-	-	-	-	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>		
'83		00%		00%		00%				
'89		00%		00%		00%				
'97		00%		100%		00%				
'02		00%		00%		00%				
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-	
						'89	0		-	
						'97	20		-	
						'02	0		-	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	3	-	-	2	-	-	-	-	-	5	-	-	-	333		5	
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180		9	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	14	5	-	-	-	-	-	-	-	19	-	-	-	1266	28 38	19	
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	22 21	1	
	97	44	-	-	1	-	-	-	-	-	45	-	-	-	900	40 47	45	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
D	83	6	3	-	-	-	-	-	-	-	9	-	-	-	600		9	
	89	4	2	1	-	-	-	-	-	-	5	-	1	1	466		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	480		24	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		28%			00%			00%			-55%							
'89		23%			08%			15%			+20%							
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1932	Dec:	31%			
												'89	865		54%			
												'97	1080		0%			
												'02	0		0%			



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Artemisia tridentata vaseyana</i>												
S	83	-	-	-	-	-	-	-	0	-	0	
	89	3	-	-	-	-	-	-	200	-	3	
	97	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	0	-	0	
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	-	1	-	-	-	-	-	66	-	1	
	97	5	-	-	-	-	-	-	100	-	5	
	02	-	-	-	-	-	-	-	0	-	0	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	3	1	-	1	-	-	-	333	49	34	5
	97	11	1	-	1	-	-	-	260	27	39	13
	02	-	-	-	-	-	-	-	0	-	-	0
D	83	-	-	-	-	-	-	-	0	-	0	
	89	3	3	-	-	-	-	-	400	-	6	
	97	2	-	-	-	-	-	-	40	-	2	
	02	-	-	-	-	-	-	-	0	-	0	
X	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	100	-	5	
	02	-	-	-	-	-	-	-	0	-	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		42%		00%		00%		-50%				
'97		05%		00%		00%						
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	0	Dec:	0%		
							'89	799		50%		
							'97	400		10%		
							'02	0		0%		
<i>Chrysothamnus nauseosus consimilis</i>												
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	1	-	-	-	-	-	-	20	37	41	1
	02	1	-	-	-	-	-	-	20	9	8	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'97		00%		00%		00%		+ 0%				
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	0	Dec:	-		
							'89	0		-		
							'97	20		-		
							'02	20		-		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
Chrysothamnus viscidiflorus viscidiflorus												
Y	83	1	-	-	-	-	-	-	1	66		1
	89	3	-	-	1	-	-	-	2	266		4
	97	1	-	-	-	-	-	-	1	20		1
	02	22	-	-	-	-	-	-	22	440		22
M	83	24	-	-	-	-	-	-	24	1600	16 18	24
	89	15	-	-	2	-	-	1	15	1200	15 19	18
	97	173	-	-	-	-	-	-	173	3460	17 23	173
	02	14	-	-	-	-	-	-	13	280	6 7	14
D	83	-	-	-	-	-	-	-	-	0		0
	89	7	-	-	-	-	-	-	-	466		7
	97	3	-	-	-	-	-	-	-	60		3
	02	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+14%				
'89		00%		00%		41%		+45%				
'97		00%		00%		02%		-80%				
'02		00%		00%		03%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	1666	Dec:	0%			
						'89	1932		24%			
						'97	3540		2%			
						'02	720		0%			
Juniperus osteosperma												
M	83	1	-	-	-	-	-	-	1	66	67 79	1
	89	-	-	1	-	-	-	-	1	66	128 87	1
	97	-	-	-	-	-	-	-	-	0	- -	0
	02	-	-	-	-	-	-	-	-	0	- -	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+ 0%				
'89		00%		100%		00%						
'97		00%		00%		00%						
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	66	Dec:	-			
						'89	66		-			
						'97	0		-			
						'02	0		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Opuntia spp.</b>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	6	6	8
	89	8	-	-	2	-	-	-	-	-	10	-	-	-	666	5	8	10
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	5	12	4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+56%							
'89		00%			00%			00%			-93%							
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	-			
												'89	1199		-			
												'97	80		-			
												'02	0		-			
<b>Quercus gambelii</b>																		
S	83	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	23	-	-	-	-	-	-	-	-	23	-	-	-	1533		23	
	89	70	5	-	8	-	-	9	-	-	91	1	-	-	6133		92	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	9	57	-	9	3	-	-	-	78	-	-	-	5200	43	18	78
	89	25	13	-	-	-	-	-	-	-	38	-	-	-	2533	85	36	38
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	21	12	3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	-	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	89	1	2	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		18%			60%			00%			+23%							
'89		15%			00%			00%			-99%							
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6799	Dec:	1%			
												'89	8866		2%			
												'97	60		0%			
												'02	0		0%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Symphoricarpos oreophilus																	
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	1	-	-	-	-	-	-	-	-	-	-	-	66		1	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
	'83	00%			00%			00%									
	'89	00%			00%			00%									
	'97	00%			00%			00%									
	'02	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		
												'02	0		-		

Trend Study 16A-6-02

Study site name: Hop Creek Browse.

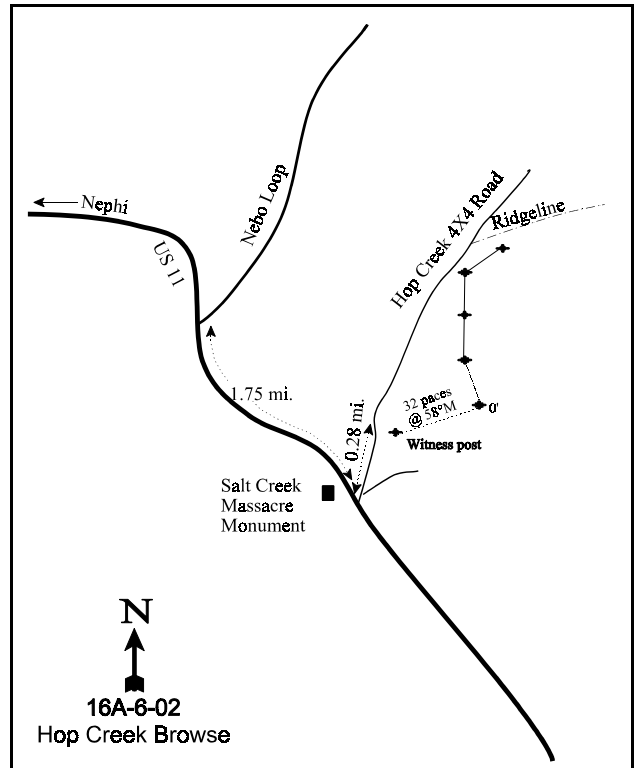
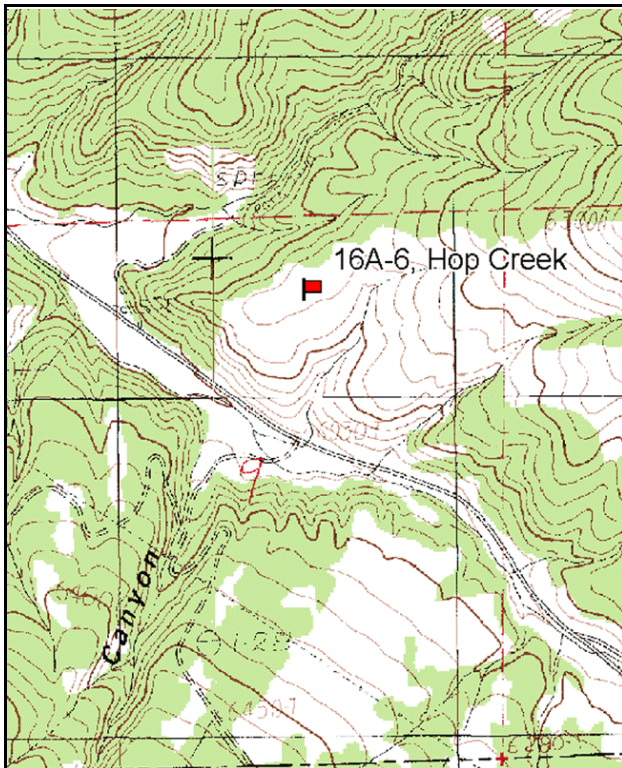
Vegetation type: Antelope Bitterbrush.

Compass bearing: frequency baseline 163 degrees magnetic (line 2-3 @ 1°M, line 4 @ 45°M).

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

LOCATION DESCRIPTION

From the intersection of Highway 132 and the Nebo Loop Road, proceed south on Highway 132 for 1.75 miles. Just past the Salt Creek Massacre Monument, stop at a turnoff on the north side of the road. Drive up the left fork of a four-wheel drive road 0.25 miles to a witness post. From the witness post walk 32 paces at 58°M to the 0-foot stake. The 0-foot baseline stake is located 2 paces to the east of an antelope bitterbrush plant with a browse tag, number E1318, attached. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Fountain Green North

Diagrammatic Sketch

Township 13S, Range 2E, Section 9

GPS: NAD 27, UTM 12S 4395286 N 439550 E

## DISCUSSION

### Hop Creek Browse - Trend Study No. 16A-6

The Hop Creek Browse study is located adjacent to the Hop Creek bitterbrush browse transect which is found on a broad ridge top just north of Salt Creek Canyon. The area has a gentle slope (3% to 5%) that faces south to southeast at an elevation of 6,300 feet. Vegetative composition is dominated by a mixed stand of mountain big sagebrush and antelope bitterbrush in association with a moderately diverse and vigorous herbaceous understory. This area is an important wintering area for both deer and elk. Abundant evidence (pellet groups, antler drops, etc.) of big game was found in 1983. Quadrat frequency from 1997 indicated moderate amounts of both deer and elk pellet groups at 34% and 24% respectively. Data from a pellet group transect read along the study site baseline in 2002 estimate high deer use at 146 deer days use/acre (360 ddu/ha). Elk use was estimated at 23 days use/acre (56 edu/ha). A few cattle pats were also encountered. Most of the big game use appears to be from winter use.

Soil is alluvial, very rocky, and appears well drained. Parent material is sedimentary rock, principally limestone. Effective rooting depth is estimated at just over 20 inches. Soil texture is a clay loam with a neutral pH of 6.9. A caliche layer was found about 10 to 12 inches in depth. However, the abundance of deeper rooted bitterbrush would suggest that the layer is relatively permeable. Rocks and pavement are uncommon on the surface. There are localized areas of bare ground which show signs of some soil movement. However, protective ground cover appears to be sufficient to prevent most erosion and the erosion condition classification was determined as stable in 2002.

The browse composition consists chiefly of mountain big sagebrush which accounted for 66% of the browse cover in 1997 and 63% in 2002. The more preferred antelope bitterbrush occurs in much smaller numbers and is more heavily utilized. The sagebrush population numbered approximately 2,320 plants/acre in 1997, increasing to 3,120 plants/acre in 2002. Plants are relatively large and vigorous with low percent decadence and light to moderate use. Recruitment is good with 33% of the population consisting of young plants.

Bitterbrush had a population density of only 540 plants/acre in 1997 yet produced 22% of the browse cover. Its density was similar to the initial 1983 estimates (533 plants/acre). Density declined slightly in 2002 to 480 plants/acre. Bitterbrush on the site are large, erect, and vigorous. Use has typically been heavy with 100% of the plants sampled in 1983 displaying heavy use. In 1997, 70% of the bitterbrush were classified as heavily browsed increasing to 92% in 2002. Recruitment has been poor with no seedlings or young sampled prior to 1997 and few seedling or young sampled in 1997 or 2002. Annual leader growth was also poor in 2002 averaging about 1 inch.

The herbaceous understory is diverse and productive. Perennial grasses combined to produce just under 20% cover in 1997 and 17% in 2002. Kentucky bluegrass, Sandberg bluegrass, western wheatgrass, and bluebunch wheatgrass are dominant. Mutton bluegrass and needle-and-thread grass are also fairly common. Forbs are diverse yet not particularly abundant. Common perennial species include pacific aster, bastard toadflax, Indian paintbrush, tapertip hawksbeard, and blue flax.

### 1983 APPARENT TREND ASSESSMENT

Soils appear stable on the ridge top, but show signs of erosion where the slope becomes steeper. On this soil type, a dense and uniform ground cover is necessary to prevent erosion. Given the dry character of this site, a dense herbaceous understory may not be possible. Mountain big sagebrush appears to have a growing population while antelope bitterbrush is stable or even in a state of decline. Lack of reproduction may be the problem. Spring or early summer livestock grazing to reduce grass vigor might be an advisable management practice on this site.

## 1989 TREND ASSESSMENT

Soil trend is slightly up. There was an increase in basal vegetative cover detected, and a corresponding decrease in the percentage of bare soil. The stand of large and generally vigorous mountain big sagebrush shows a 17% decline in density. Fewer mature sagebrush were counted in 1989, while there was an increase in the percentage of decadence from 13% to 33%. Hedging is mostly light. The less common bitterbrush tends to be heavily hedged. There were fewer bitterbrush counted in 1989, and heavy use declined from 100% in 1983 to 50% in 1989. Vigor also improved dramatically. Trend for the herbaceous understory is stable. Nested frequency of western wheatgrass increased while nested frequency of bluebunch wheatgrass and Kentucky bluegrass declined. Fewer sego lily and toadflax were counted, otherwise composition is similar and the data show slight declines in total forb frequency in 1989.

### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

The soil trend is stable with similar amounts of bare ground encountered. Litter cover declined while sum of nested frequency of perennial herbaceous plants increased. Trend for browse is also stable. Density of big sagebrush has remained similar to 1989 estimates. Use is mostly light, vigor good, and percent decadence moderately low at only 13%. Bitterbrush also displays a stable trend. Density is similar to 1983 estimates and percent decadence has declined from a high of 33% in 1989 to only 7% currently. The shrubs are still heavily hedged with 70% of the bitterbrush sampled displaying a heavily hedged growth form. A few seedlings and young were encountered this year. Trend for the herbaceous understory is up with an increase in the sum of nested frequency for perennial grasses and forbs. Nested frequency of Kentucky bluegrass and bluebunch wheatgrass increased significantly while nested frequency of western wheatgrass declined. Nearly all of the perennial forbs encountered in 1989 show increased frequencies.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Soil trend is stable with similar ground cover estimates compared to 1997. There is excellent protective ground cover and the erosion condition classification was considered as stable. Trend for browse is slightly improving for mountain big sagebrush but down slightly for bitterbrush. Mountain big sagebrush is the key browse species on this site since it accounts for 63% of the total browse cover. It has increased 26% in density since 1997 and age class analysis indicates an expanding population with 33% of the stand being young plants. Use remains light to moderate with generally good vigor and moderate amounts of decadence. Bitterbrush provides 16% of the total browse cover with a small population of 480 plants/acre. It is very heavily utilized and reproduction continues to be poor. Decadence has increased since 1997 from 7% to 29%. Continued increases in the density of mountain big sagebrush may come at the expense of bitterbrush. Overall the browse trend is considered slightly up. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses and forbs has slightly declined since 1997 but not enough to warrant a downward trend, especially in a drought year. Identification of some of the perennial grasses, mostly the *Poa*'s, was difficult in 2002 due to late flowering.

### TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 6

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron smithii	<sub>b</sub> 194	<sub>b</sub> 205	<sub>a</sub> 123	<sub>a</sub> 131	75	73	45	54	1.57	3.15
G	Agropyron spicatum	<sub>a</sub> 135	<sub>a</sub> 92	<sub>b</sub> 173	<sub>b</sub> 171	53	33	59	60	5.03	5.05
G	Bromus tectorum (a)	-	-	65	82	-	-	24	33	.67	.84
G	Festuca ovina	-	-	1	3	-	-	1	1	.03	.03
G	Melica bulbosa	<sub>ab</sub> 15	<sub>c</sub> 36	<sub>a</sub> 9	<sub>bc</sub> 33	6	13	3	11	.21	1.22
G	Oryzopsis hymenoides	-	-	-	3	-	-	-	1	-	.15
G	Poa fendleriana	<sub>ab</sub> 50	<sub>c</sub> 94	<sub>bc</sub> 71	<sub>a</sub> 27	22	40	30	11	1.61	.88
G	Poa pratensis	<sub>a</sub> 74	<sub>a</sub> 50	<sub>b</sub> 172	<sub>a</sub> 80	23	15	55	28	7.65	2.23
G	Poa secunda	<sub>a</sub> 35	<sub>ab</sub> 39	<sub>b</sub> 84	<sub>c</sub> 115	16	22	31	44	2.47	2.80
G	Stipa comata	59	53	36	41	24	25	16	16	1.04	1.17
Total for Annual Grasses		0	0	65	82	0	0	24	33	0.67	0.83
Total for Perennial Grasses		562	569	669	604	219	221	240	226	19.64	16.70
Total for Grasses		562	569	734	686	219	221	264	259	20.32	17.54
F	Achillea millefolium	-	1	-	-	-	1	-	-	-	-
F	Agoseris glauca	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 22	<sub>b</sub> 33	-	-	9	17	.11	.35
F	Alyssum alyssoides (a)	-	-	<sub>a</sub> 120	<sub>b</sub> 162	-	-	42	59	.51	.83
F	Allium spp.	-	2	-	1	-	1	-	1	.00	.00
F	Antennaria rosea	1	7	5	7	1	2	2	3	.03	.04
F	Arabis spp.	-	-	1	-	-	-	1	-	.00	-
F	Aster chilensis	<sub>a</sub> 2	<sub>ab</sub> 13	<sub>bc</sub> 25	<sub>c</sub> 28	2	6	8	11	1.18	.90
F	Astragalus convallarius	<sub>a</sub> 23	<sub>b</sub> 55	<sub>a</sub> 9	<sub>a</sub> 7	10	25	5	5	.10	.02
F	Astragalus spp.	-	-	1	2	-	-	1	1	.03	.00
F	Castilleja linariaefolia	<sub>ab</sub> 4	<sub>a</sub> -	<sub>c</sub> 31	<sub>b</sub> 8	2	-	14	6	.56	.08
F	Camelina microcarpa (a)	-	-	8	-	-	-	4	-	.02	-
F	Calochortus nuttallii	<sub>b</sub> 35	<sub>a</sub> 3	<sub>a</sub> 10	<sub>b</sub> 36	20	1	6	17	.03	.11
F	Chenopodium album (a)	-	-	-	3	-	-	-	1	-	.00
F	Chaenactis douglasii	-	-	2	-	-	-	2	-	.01	-
F	Chorispora tenella (a)	-	-	-	2	-	-	-	1	-	.15
F	Cirsium undulatum	3	3	18	16	2	3	8	9	.23	.33
F	Collomia linearis (a)	-	-	<sub>b</sub> 45	<sub>a</sub> 26	-	-	20	13	.12	.06
F	Conringia orientalis (a)	1	-	-	-	1	-	-	-	-	-
F	Comandra pallida	<sub>b</sub> 123	<sub>a</sub> 51	<sub>b</sub> 91	<sub>a</sub> 30	56	25	44	15	.91	.18
F	Collinsia parviflora (a)	-	-	171	183	-	-	62	60	1.26	2.20
F	Crepis acuminata	<sub>a</sub> 1	<sub>a</sub> 5	<sub>b</sub> 45	<sub>b</sub> 69	1	4	27	35	.48	1.25
F	Cymopterus longipes	<sub>a</sub> -	<sub>a</sub> 6	<sub>b</sub> 50	<sub>b</sub> 42	-	3	26	20	.35	.49
F	Descurainia pinnata (a)	-	-	3	6	-	-	1	3	.00	.01
F	Draba spp. (a)	-	-	3	-	-	-	1	-	.00	-



Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Epilobium brachycarpum</i> (a)	-	-	38	24	-	-	15	12	.07	.08
F	<i>Eriogonum racemosum</i>	5	3	1	4	3	1	1	2	.00	.06
F	<i>Eriogonum umbellatum</i>	-	3	3	3	-	2	2	1	.06	.00
F	<i>Erysimum</i> spp.	-	-	1	-	-	-	1	-	.00	-
F	<i>Galium</i> spp.	-	-	-	1	-	-	-	1	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	-	2	-	-	-	1	-	.00
F	<i>Lactuca serriola</i>	-	4	3	-	-	3	1	-	.00	-
F	<i>Linum lewisii</i>	<sub>a</sub> 25	<sub>a</sub> 3	<sub>b</sub> 91	<sub>a</sub> 21	11	2	38	11	.62	.11
F	<i>Lupinus argenteus</i>	-	-	2	1	-	-	1	1	.38	.00
F	<i>Machaeranthera canescens</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Microsteris gracilis</i> (a)	-	-	<sub>a</sub> 8	<sub>b</sub> 39	-	-	3	17	.01	.11
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 11	<sub>c</sub> 38	<sub>c</sub> 27	-	5	15	14	.07	.19
F	<i>Polygonum douglasii</i> (a)	-	-	3	4	-	-	2	2	.01	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	<sub>b</sub> 74	<sub>a</sub> 48	-	-	26	19	.52	.48
F	<i>Sphaeralcea coccinea</i>	-	7	3	1	-	2	1	1	.00	.00
F	<i>Tragopogon dubius</i>	13	10	16	15	7	4	10	7	.10	.13
F	<i>Zigadenus paniculatus</i>	<sub>a</sub> 5	<sub>a</sub> -	<sub>ab</sub> 24	<sub>b</sub> 32	2	-	10	16	.22	.26
Total for Annual Forbs		1	0	473	499	1	0	176	188	2.55	3.96
Total for Perennial Forbs		240	187	492	385	117	90	233	195	5.57	4.57
Total for Forbs		241	187	965	884	118	90	409	383	8.13	8.54

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Amelanchier alnifolia</i>	4	3	.15	.38
B	<i>Artemisia tridentata vaseyana</i>	56	72	9.17	9.92
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	10	16	.18	.34
B	<i>Gutierrezia sarothrae</i>	14	23	.07	1.24
B	<i>Juniperus osteosperma</i>	0	0	.85	.78
B	<i>Purshia tridentata</i>	22	19	2.97	2.51
B	<i>Tetradymia canescens</i>	3	9	.03	.48
Total for Browse		109	142	13.44	15.67

Key Browse Annual Leader Growth  
Herd unit 16A , Study no: 6

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.1
Purshia tridentata	1.0

CANOPY COVER --

Herd unit 16A , Study no: 6

Point-Quarter Tree Data

Species	Percent Cover		Trees per Acre '02	Average diameter (in) '02
	'97	'02		
Juniperus osteosperma	1.2	.20	24	8.5

BASIC COVER --

Herd unit 16A, Study no: 6

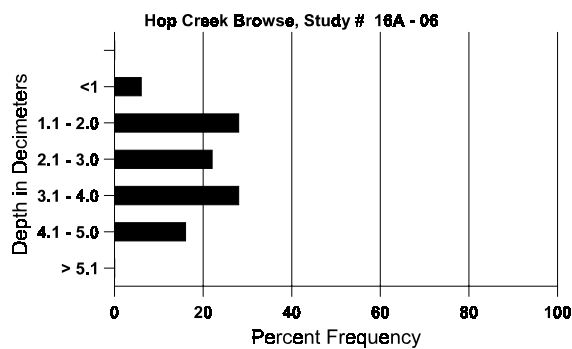
Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	379	361	4.75	11.75	44.00	43.48
Rock	31	38	.25	.25	.19	.15
Pavement	154	150	.50	0	1.93	1.25
Litter	399	386	71.25	69.75	51.30	51.80
Cryptogams	111	72	1.25	1.50	4.62	2.62
Bare Ground	235	235	22.00	16.75	17.71	17.85

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 06, Hop Creek Browse

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
20.2	44.0 (17.6)	6.9	42.4	27.1	30.6	3.2	9.6	67.2	.6

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 6

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Rabbit	4	18	-	-
Elk	24	17	296	23 (56)
Deer	34	43	1897	146 (360)
Cattle	-	1	26	2 (5)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 6

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Amelanchier alnifolia																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	3	-	-	-	-	-	-	-	3	-	-	-	60	30	31	3
	02	-	-	-	1	1	1	-	-	-	3	-	-	-	60	31	32	3
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		80%			00%			20%			-40%							
'02		33%			33%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	100		20%			
												'02	60		0%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		5	6		7	8	9	1	2	3	4	
<i>Artemisia tridentata vaseyana</i>																	
S	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
Y	83	9	1	-	-	-	-	-	-	-	10	-	-	-	666		10
	89	8	-	-	2	-	-	-	-	-	10	-	-	-	666		10
	97	38	-	-	-	-	-	-	-	-	38	-	-	-	760		38
	02	51	-	-	-	-	-	-	-	-	48	3	-	-	1020		51
M	83	29	2	-	-	-	-	-	-	-	31	-	-	-	2066	31 36	31
	89	11	4	1	-	-	-	-	-	-	13	2	1	-	1066	29 33	16
	97	32	28	3	-	-	-	-	-	-	63	-	-	-	1260	33 45	63
	02	30	23	2	1	-	-	-	-	-	56	-	-	-	1120	30 39	56
D	83	4	2	-	-	-	-	-	-	-	5	1	-	-	400		6
	89	7	5	1	-	-	-	-	-	-	11	-	2	-	866		13
	97	7	5	2	-	-	-	-	-	-	4	1	-	9	300		15
	02	22	19	3	2	-	3	-	-	-	29	-	-	20	980		49
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	620		31
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	740		37
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		11%			00%			00%			-17%						
'89		23%			05%			08%			-11%						
'97		28%			04%			08%			+26%						
'02		27%			05%			13%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	3132	Dec:	13%			
											'89	2598		33%			
											'97	2320		13%			
											'02	3120		31%			
<i>Chrysothamnus nauseosus consimilis</i>																	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	-			
											'89	0		-			
											'97	0		-			
											'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Chrysothamnus viscidiflorus viscidiflorus																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'02	4	-	-	1	-	-	-	-	-	5	-	-	-	100		5
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8 10	1
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	10 14	1
	'97	15	-	-	-	-	-	-	-	-	15	-	-	-	300	13 22	15
	'02	23	-	1	4	-	-	-	-	-	28	-	-	-	560	11 18	28
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'02	4	-	-	-	-	-	-	-	-	1	-	-	3	80		4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+ 0%						
'89		00%			00%			00%			+78%						
'97		00%			00%			00%			+59%						
'02		00%			03%			08%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%		
												'89	66		0%		
												'97	300		0%		
												'02	740		11%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	15	-	-	-	-	-	-	-	-	15	-	-	-	300		15	
	02	5	-	-	-	-	-	-	-	-	4	1	-	-	100		5	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	11	19	1
	89	9	-	-	-	-	-	-	-	-	9	-	-	-	600	8	6	9
	97	25	-	-	-	-	-	-	-	-	25	-	-	-	500	7	7	25
	02	72	-	-	-	-	-	-	-	-	69	3	-	-	1440	6	11	72
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
	02	11	-	-	1	-	-	-	-	-	11	-	-	1	240		12	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+92%							
'89		00%			00%			00%			- 3%							
'97		00%			00%			05%			+53%							
'02		00%			00%			01%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%			
												'89	866		8%			
												'97	840		5%			
												'02	1780		13%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Purshia tridentata</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	40			2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	1	-	-	-	-	-	-	-	-	-	-	20			1	
	02	-	1	1	-	-	-	-	-	-	-	-	-	40			2	
M	83	-	-	6	-	-	-	-	-	-	-	-	-	400	44	38	6	
	89	-	3	1	-	-	-	-	-	-	-	-	-	266	38	44	4	
	97	4	3	14	-	-	3	-	-	-	-	-	-	480	38	54	24	
	02	-	-	4	-	-	4	-	1	6	-	-	-	300	41	48	15	
D	83	-	-	2	-	-	-	-	-	-	-	-	-	133			2	
	89	-	-	2	-	-	-	-	-	-	-	-	-	133			2	
	97	-	-	1	-	-	1	-	-	-	-	-	-	40			2	
	02	-	-	1	-	-	5	-	-	1	-	-	-	140			7	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	80			4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	140			7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			88%			-25%							
'89		50%			50%			00%			+26%							
'97		15%			70%			11%			-11%							
'02		04%			92%			04%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	25%			
												'89	399		33%			
												'97	540		7%			
												'02	480		29%			
<b>Tetradymia canescens</b>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	2	-	-	-	-	-	-	-	-	-	-	-	133			2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	1	-	-	1	-	-	-	-	-	-	-	-	40			2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	4	-	-	-	-	-	-	-	-	-	-	-	80	14	11	4	
	02	10	-	1	-	-	-	-	-	-	-	-	-	220	11	16	11	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			-40%							
'97		00%			00%			00%			+69%							
'02		00%			08%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	133		-			
												'97	80		-			
												'02	260		-			

Trend Study 16A-7-02

Study site name: Willow Creek.

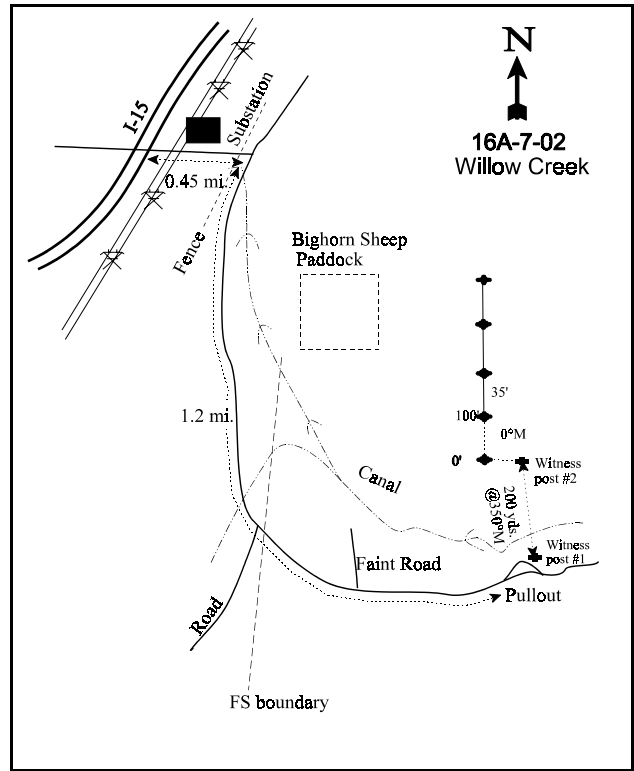
Vegetation type: Stansbury Cliffrose.

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

Beginning at the east side of the underpass where Cemetery Road passes over I-15 southeast of Mona, proceed east for 0.45 miles to an intersection. Take the right fork and proceed 1.2 miles to the witness post staying on the main road. From this point, walk 200 yards at 350 degrees magnetic to the witness post (you will need to cross the irrigation canal). The 0-foot baseline stake is 3 paces west of the witness post. It is a green fencepost with a red browse tag, number 3958, attached. The baseline runs at an azimuth of 0 degrees magnetic.



Map Name: Mona

Diagrammatic Sketch

Township 12S, Range 1E, Section 3

GPS: NAD 27, UTM 12S 4405388 N 430445 E



## DISCUSSION

### Willow Creek - Trend Study No. 16A-7

The Willow Creek study is located on a very steep (45%-50%) south facing slope at the mouth of Willow Creek Canyon, an area considered critical deer and elk winter range. The study area is within the Uinta National Forest. However, unfenced private land lies immediately to the west. This study samples a Stansbury cliffrose community at an elevation of approximately 5,900 feet. Quadrat frequency of elk pellet groups was moderately high at 32% with deer somewhat lower at 11% in 1997. Quadrat frequency numbers were high for deer at 30% and lower for elk at 19% in 2002. Data from a pellet group transect read along the study site baseline in 2002 estimated 88 deer and 36 elk days use/acre (217 ddu/ha and 89 edu/ha). Most of the deer pellet groups appeared to be from winter use while much of the elk was late winter to early spring.

Soils on the site are very rocky and loose, and are derived from limestone parent material. The soil surface appeared highly eroded with abundant bare ground (21%) and pavement (12%) in 1983 when the study was established. Cover of bare ground was 18% in 2002, slightly below 1983 estimates, with pavement estimated at 17%. Effective rooting depth is estimated at approximately 17 inches. Soil texture is a sandy loam with a neutral pH of 7.0. Organic matter is limited at only 1.8%. Phosphorus is also low at only 6.4 ppm. Values less than 10 ppm may be limiting to plant growth and development. Soil pedestalling is common, but erosion appears localized and there is protective ground cover mainly from annual cheatgrass. The erosion condition classification was determined as slight in 2002.

Stansbury cliffrose is the key browse species with a density estimated at 880 plants/acre in 2002. It currently provides 85% of the total browse cover. The population is mature and relatively tall, averaging over 5 feet in height. Recruitment is poor and currently 98% of the population consists of mature and decadent plants. Percent decadency is moderate at 23%. However, this species is long lived making recruitment not as critical as it would be for sagebrush. Use is heavy on available plants. Annual leader growth was measured at 1.1 inches on cliffrose in 2002.

Other preferred shrubs found on the site include small numbers of mountain big sagebrush, fourwing saltbush, white rubber rabbitbrush, and bitterbrush. Broom snakeweed, an undesirable increaser, was abundant and appeared to be expanding in 1997. However, drought conditions have caused the population to decline from 1,780 plants/acre in 1997 to 520 in 2002. Nearly half of the plants sampled in 2002 were classified as decadent.

The herbaceous understory is dominated by cheatgrass which accounted for 62% of the total herbaceous cover in 1997 and 56% in 2002. A wildfire in this plant community would cause the loss of the cliffrose, the key browse for the site. In fact, a wildfire did burn about ½ mile to the south in 2001. The only common perennial grass is bluebunch wheatgrass which provided 15% of the total herbaceous cover in 1997, increasing to 22% in 2002. Bulbous bluegrass, a low value short-lived perennial is also fairly abundant. The forb composition is poor and dominated by pale alyssum and storksbill. Perennial forbs are rare.

### 1983 APPARENT TREND ASSESSMENT

Soil condition is poor. The relatively high rate of erosion is a fundamental problem on this site. Vegetative trend appears stable, at least for the short term. However, if cliffrose is unable to reproduce satisfactorily, a slow decline in density could occur. Herbaceous composition and density are poor. Cheatgrass is overabundant and constitutes a potential fire hazard. Bluebunch wheatgrass production could be considerably better.

## 1989 TREND ASSESSMENT

Ground cover data indicates an increase in the percentage of basal vegetative cover and less bare soil in 1989. However, litter cover declined and pavement cover increased to 30%. Trend is considered stable, yet condition is poor with a high erosion hazard due to the steep, rocky slope. While broom snakeweed was the most abundant browse species, the key forage species is cliffrose which increased slightly in number on the density plots. However, more of the shrubs were classified as decadent in 1989 and there were actually fewer mature cliffrose per acre estimated. The cliffrose show moderate to heavy use, yet they have good vigor. Ten percent of the population was classified as young. Populations of the other, less common, browse species are stable. There were no significant changes in the composition or frequency of the herbaceous understory. A few different species of grasses and forbs were identified in 1989, but the major species remain bluebunch wheatgrass, low fleabane, and scarlet globemallow.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

Trend for soil is stable with a slight increase in percent bare ground (to only 12%) and a decline in pavement cover. Some erosion is still occurring. Trend for cliffrose is stable. The decline in density from 1,033 plants/acre in 1989 to 580 in 1997 is due to the larger sample used that year which gives better estimates for shrubs that have discontinuous distributions. Use is moderate to heavy, while vigor is normal and percent decadence low at only 3%. The undesirable broom snakeweed appears to be increasing. Trend for the herbaceous understory is down slightly due to a decline in the nested frequency of bluebunch wheatgrass which is the most numerous preferred perennial grass found on the site. Perennial forbs are rare. Annuals dominate the herbaceous understory with cheatgrass providing 62% of the total herbaceous ground cover.

### TREND ASSESSMENT

soil - stable, but poor condition (3)

browse - stable for cliffrose (3)

herbaceous understory - down slightly and in poor condition (2)

## 2002 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in cover of bare ground and a decline in litter cover. There is some localized erosion occurring but due to abundant herbaceous cover mainly from cheatgrass, it is not severe. The erosion condition classification was determined to be slight in 2002. Trend for the key browse species, cliffrose, is stable. Use continues to be heavy on available plants but vigor remains good on most plants. Other palatable shrubs occur only in small numbers. The undesirable increaser, broom snakeweed, has declined 3-fold from 1,780 plants/acre in 1997 to 520 plants/acre in 2002. Nearly half (46%) of the remaining population is decadent. Trend for the herbaceous understory is stable with similar sum of nested frequency values for perennial grasses. Sum of nested frequency of perennial forbs has declined slightly but they are still rare. Condition of the understory is poor and dominated by cheatgrass which provides 56% of the total herbaceous cover. This causes a high amount of fine fuels which leaves the entire area susceptible to fire. A fire burned just south of this site in 2001. A fire would eliminate the fire intolerant cliffrose.

### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Herd unit 16A, Study no: 7

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	<sub>b</sub> 198	<sub>b</sub> 191	<sub>a</sub> 132	<sub>a</sub> 121	71	76	54	56	4.17	5.55
G	<i>Bromus japonicus</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 19	-	-	-	6	-	.39
G	<i>Bromus tectorum</i> (a)	-	-	354	336	-	-	98	96	17.42	14.48
G	<i>Festuca myuros</i> (a)	-	-	6	-	-	-	2	-	.03	-
G	<i>Poa bulbosa</i>	<sub>a</sub> -	<sub>b</sub> 10	<sub>b</sub> 32	<sub>c</sub> 58	-	5	11	18	1.23	1.50
G	<i>Poa secunda</i>	<sub>a</sub> -	<sub>b</sub> 12	<sub>b</sub> 27	<sub>b</sub> 17	-	5	11	8	.13	.11
Total for Annual Grasses		0	0	360	355	0	0	100	102	17.45	14.87
Total for Perennial Grasses		198	213	191	196	71	86	76	82	5.53	7.17
Total for Grasses		198	213	551	551	71	86	176	184	22.99	22.04
F	<i>Agoseris glauca</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Alyssum alyssoides</i> (a)	-	-	<sub>b</sub> 291	<sub>a</sub> 212	-	-	90	75	3.07	.82
F	<i>Artemisia ludoviciana</i>	5	6	6	3	2	3	2	1	.06	.03
F	<i>Asclepias</i> spp.	-	-	-	5	-	-	-	2	-	.18
F	<i>Astragalus utahensis</i>	<sub>ab</sub> 2	<sub>ab</sub> 5	<sub>b</sub> 11	<sub>a</sub> -	2	5	5	-	.24	.00
F	<i>Camelina microcarpa</i> (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Calochortus nuttallii</i>	1	-	-	-	1	-	-	-	-	-
F	<i>Cerastium</i> spp.	-	3	-	-	-	1	-	-	-	-
F	<i>Cirsium vulgare</i>	1	6	-	-	1	3	-	-	-	-
F	<i>Cryptantha</i> spp.	4	2	-	-	2	1	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	8	2	-	-	5	2	.03	.01
F	<i>Eriogonum brevicaulis</i>	3	4	7	-	1	2	3	-	.06	-
F	<i>Erodium cicutarium</i> (a)	-	-	<sub>a</sub> 35	<sub>b</sub> 93	-	-	21	38	.18	1.67
F	<i>Erigeron pumilus</i>	<sub>b</sub> 34	<sub>b</sub> 47	<sub>a</sub> -	<sub>a</sub> -	16	19	-	-	-	-
F	<i>Galium aparine</i> (a)	-	-	8	-	-	-	3	-	.01	-
F	<i>Hackelia patens</i>	-	-	6	-	-	-	4	-	.02	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	3	-	-	-	1	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	-	1	-	-	-	1	-	.00
F	<i>Lactuca serriola</i>	-	-	1	2	-	-	1	1	.00	.00
F	<i>Leucelene ericoides</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 14	<sub>b</sub> 18	-	-	8	8	.26	.19
F	<i>Lygodesmia grandiflora</i>	9	-	-	-	4	-	-	-	-	-
F	<i>Oenothera</i> spp.	-	-	1	-	-	-	1	-	.03	-
F	<i>Penstemon</i> spp.	-	-	-	1	-	-	-	1	-	.03
F	<i>Phlox longifolia</i>	-	4	3	3	-	3	2	1	.01	.15
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 8	<sub>a</sub> 14	<sub>ab</sub> 26	<sub>b</sub> 31	3	5	9	12	.98	.59
F	<i>Taraxacum officinale</i>	-	-	3	-	-	-	1	-	.00	-
Total for Annual Forbs		0	0	345	311	0	0	120	117	3.30	2.51
Total for Perennial Forbs		67	91	78	64	32	42	36	27	1.68	1.19
Total for Forbs		67	91	423	375	32	42	156	144	4.98	3.70

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Artemisia tridentata vaseyana</i>	2	2	.53	.91
B	<i>Atriplex canescens</i>	0	1	-	-
B	<i>Chrysothamnus nauseosus albicaulis</i>	13	3	1.04	.53
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	0	-	-
B	<i>Cowania mexicana stansburiana</i>	21	33	14.32	14.97
B	<i>Gutierrezia sarothrae</i>	27	16	.39	1.25
B	<i>Purshia tridentata</i>	0	1	-	-
Total for Browse		63	56	16.29	17.66

CANOPY COVER --  
Herd unit 16A, Study no: 7

Species	Percent Cover	
	'97	'02
<i>Cowania mexicana stansburiana</i>	-	4

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 7

Species	Average leader growth (in)
	'02
<i>Cowania mexicana stansburiana</i>	1.1

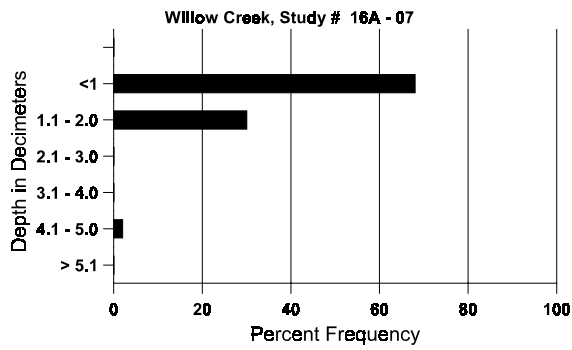
BASIC COVER --  
Herd unit 16A, Study no: 7

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	378	363	1.25	8.75	40.62	40.11
Rock	240	262	4.00	8.00	7.40	7.74
Pavement	293	316	11.50	29.75	15.57	16.68
Litter	389	366	62.25	44.75	40.29	36.85
Cryptogams	15	-	0	0	.14	0
Bare Ground	218	243	21.00	8.75	12.06	18.06

SOIL ANALYSIS DATA --  
 Herd Unit 16A, Study no: 07, Willow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.4	54.8 (14.6)	7.0	58.4	25.1	16.6	1.8	6.4	38.4	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 16A, Study no: 7

Type	Quadrat Frequency	
	'97	'02
Elk	32	19
Deer	11	30

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
470	36 (89)
1140	88 (217)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 7

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Artemisia tridentata vaseyana</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	40	28	50	2
	02	-	-	-	1	-	-	-	20	32	54	1
D	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	-	-	20			1
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	480			24
	02	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'97		50%		00%		00%		+ 0%				
'02		00%		50%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	0	Dec:	0%		
							'89	0		0%		
							'97	40		0%		
							'02	40		50%		
<i>Atriplex canescens</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	33	43	39	1
	97	-	-	-	-	-	-	-	0	59	46	0
	02	-	-	1	-	-	-	-	20	48	69	1
D	83	1	-	-	-	-	-	-	33			1
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		100%		+ 0%				
'89		00%		00%		00%						
'97		00%		00%		00%						
'02		00%		100%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	33	Dec:	100%		
							'89	33		0%		
							'97	0		0%		
							'02	20		0%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
Brickellia spp.												
Y	83	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	100		3	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	17	-	-	-	-	-	-	566	6	5	17
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'97		00%		00%		00%						
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	666		-			
						'97	0		-			
						'02	0		-			
Chrysothamnus nauseosus albicaulis												
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	2	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	0		0	
M	83	2	-	-	-	-	-	-	66	31	51	2
	89	1	-	-	-	-	-	-	33	41	31	1
	97	4	3	5	-	-	2	-	280	29	51	14
	02	-	-	-	-	-	-	-	0	24	38	0
D	83	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	33		1	
	97	-	-	-	-	-	-	-	0		0	
	02	1	2	-	-	-	-	-	60		3	
X	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+ 0%				
'89		00%		00%		00%		+79%				
'97		31%		44%		00%		-81%				
'02		67%		00%		33%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	66	Dec:	0%			
						'89	66		50%			
						'97	320		0%			
						'02	60		100%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	17	1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			
<i>Cowania mexicana stansburiana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
M	83	8	6	10	-	-	-	-	2	-	26	-	-	-	866	52	53	26
	89	1	6	7	2	-	-	-	-	-	16	-	-	-	533	81	84	16
	97	-	2	19	-	-	7	-	-	-	28	-	-	-	560	56	66	28
	02	-	-	15	-	-	18	-	-	-	31	2	-	-	660	64	67	33
D	83	1	-	-	-	-	-	-	1	-	1	-	1	-	66			2
	89	2	6	3	1	-	-	-	-	-	12	-	-	-	400			12
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	6	-	-	2	1	1	-	3	-	-	7	200			10
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		21%			38%			03%			+ 7%							
'89		39%			32%			00%			-44%							
'97		07%			93%			00%			+34%							
'02		00%			95%			16%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	965	Dec:	7%			
												'89	1033		39%			
												'97	580		3%			
												'02	880		23%			



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<b>Gutierrezia sarothrae</b>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	0		0
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	44	-	-	-	-	-	-	880		44
	02	1	-	-	-	-	-	-	20		1
M	83	8	-	-	-	-	-	-	266	13 14	8
	89	16	-	-	-	-	-	-	533	8 10	16
	97	44	-	-	-	-	-	-	880	11 11	44
	02	13	-	-	-	-	-	-	260	7 10	13
D	83	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	33		1
	97	1	-	-	-	-	-	-	20		1
	02	12	-	-	-	-	-	-	240		12
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	320		16
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'83		00%	00%	00%	+53%						
'89		00%	00%	12%	+68%						
'97		00%	00%	00%	-71%						
'02		00%	00%	38%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	266	Dec:	0%			
					'89	566		6%			
					'97	1780		1%			
					'02	520		46%			
<b>Purshia tridentata</b>											
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	20		1
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	0	78 194	0
	02	-	-	-	-	-	-	-	0	- -	0
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'83		00%	00%	00%							
'89		00%	00%	00%							
'97		00%	00%	00%							
'02		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	0	Dec:	-			
					'89	0		-			
					'97	0		-			
					'02	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	45	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	72	57	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			
Rhus trilobata																		
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66	24	24	2
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	28	30	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	53	114	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	-	-	3	-	100			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-20%							
'89		00%			00%			75%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	0%			
												'89	133		75%			
												'97	0		0%			
												'02	0		0%			

Trend Study 16A-8-02

Study site name: Gardner Canyon.

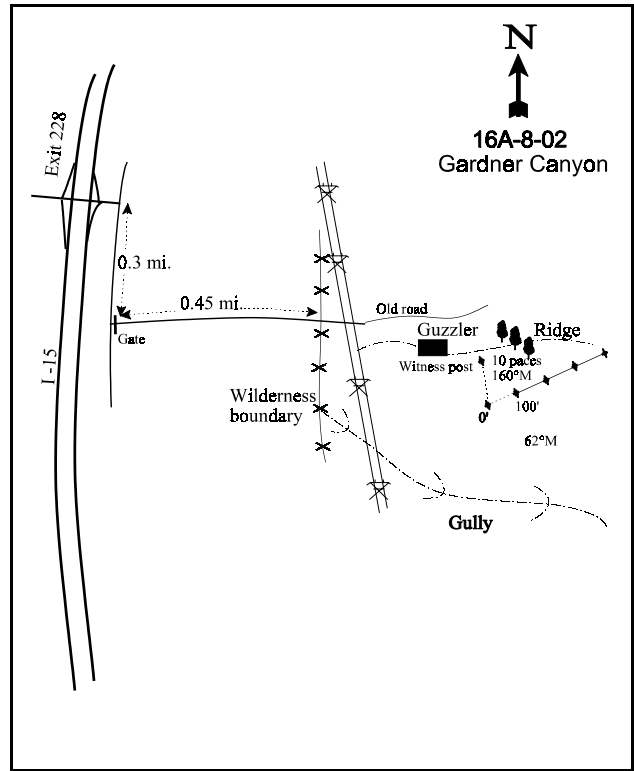
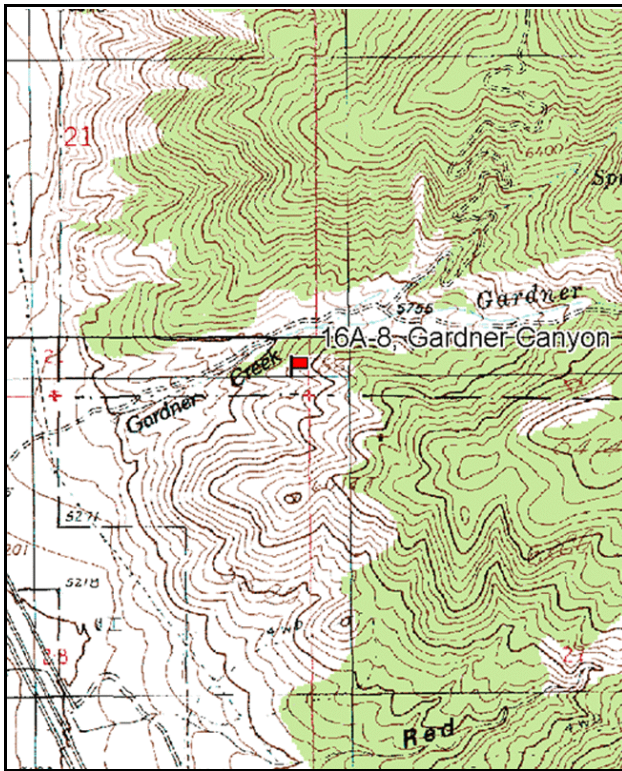
Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 62 degrees magnetic.

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

LOCATION DESCRIPTION

From exit #228 off of I-15, turn south on the frontage road and drive 0.3 miles to an intersection with a gate. Turn left at the intersection and drive 0.45 miles to the wilderness boundary fence. Walk up the old road under some powerlines. To the south, and perpendicular to the road, is a steep slope characterized by Gambel oak and cliffrose. Walk up the slope to a guzzler on the ridgetop. The witness post lies 75 yards up the ridge from the guzzler. From the witness post, the 0-foot stake is 10 paces at an azimuth of 160 degrees magnetic. The study is marked by green steel "T" fenceposts 12 to 13 inches in height. The 0-foot stake has a red browse tag, number 3964, attached.



Map Name: Nephi

Diagrammatic Sketch

Township 12S, Range 1E, Section 28

GPS: NAD 27, UTM 12S 4399995 N 429818 E

## DISCUSSION

### Gardner Canyon - Trend Study No. 16A-8

The Gardner Canyon study is located on critical winter range along the west Nebo face. This narrow band of habitat lying between Interstate 15 and the 6,000 foot elevational contour is critically important. The study is on Division land near the guzzler in Gardner Canyon. The study samples a very steep (45%-50%), west facing slope. The foothills between the site and I-15 are heavily used by deer and elk and many deer carcasses were found in the area during the 1989 reading. Deer and elk pellet groups were moderately abundant in 1997 with similar quadrat frequencies of 21% and 20% respectively. Data from a pellet group transect read along the study site baseline in 2002 estimated 70 deer and 24 elk days use/acre (172 ddu/ha and 60 edu/ha).

Soil at the site is exceptionally rocky and well-drained. Parent material is limestone with an abundance of large and small rock on the surface. Effective rooting depth is estimated at only 10 inches. Texture is a loam with a neutral pH of 7.0. Organic matter is limited at only 1.6% and phosphorus, like site #7, is also low at only 4.4 ppm. Values less than 10 ppm may be limiting to plant growth and development. Cover of bare ground is high and some erosion is occurring due to the steepness of the slope. Rock and pavement cover is also abundant. Although erosion is localized and soil pedestalling evident, erosion does not appear to be serious due to the abundant rock and annual grass cover. The erosion condition classification was determined to be slight in 2002.

The dominant browse on the site consist of large Stansbury cliffrose and true mountain mahogany. Cliffrose produced 54% of the browse cover in 1997 and 44% in 2002. Density was moderate at 600 and 500 plants/acre in 1997 and 2002 respectively. The decline in density from 966 plants/acre in 1989 is partly due to the larger sample size used in 1997. Average height of mature plants is currently just under 4 feet, making most plants still available for wildlife use. Use has been consistently heavy since 1983. Approximately 80% of the plants sampled in 1997 and 2002 were heavily hedged. Most plants display normal vigor with percent decadence estimated at 20% in 2002. Annual leader growth averaged 1 ½ inches on cliffrose in 2002.

True mountain mahogany occurs in small numbers with an estimated density of 300 plants/acre in 2002. Mature plants are tall averaging over 5 feet in height. Available portions are heavily hedged but vigor is good. Recruitment is poor and most of the population consists of mature plants. Decadency has remained low since 1983, but increased in 2002 due to drought conditions. Annual leader growth averaged 1.6 inches on mahogany in 2002. Other preferred browse are limited. Undesirable shrubs include narrowleaf low rabbitbrush and broom snakeweed.

Grass and forb composition is dominated by annuals, biennials, and low-value perennials. Cheatgrass produced 60% of the grass cover in 1997 and 52% in 2002. It is still abundant enough to constitute a severe fire hazard to the key browse species, especially cliffrose which do not re-sprout after fire. The only common perennial grass is bluebunch wheatgrass. Perennial forbs are rare with the exception of scarlet globemallow which is fairly abundant. Annual forbs are common but do not produce much cover.

### 1983 APPARENT TREND ASSESSMENT

Soil condition, as elsewhere on the Nebo face, is a definite limiting factor. The ongoing erosion and competition with the annual herbaceous species makes shrub seedling establishment of desirable plants very difficult. Vegetative condition is poor. The key browse species, Stansbury cliffrose, does not appear to be adequately reproducing, nor are the important secondary shrubs. Broom snakeweed, cheatgrass brome, and annual forbs comprise far too great a proportion of the total vegetative composition. Wildlife use continues to be heavy with little prospect for range improvements in the future.

## 1989 TREND ASSESSMENT

Differences in the percentages of vegetation and litter cover are largely related to changes in the prevalence of cheatgrass between years. It was much less abundant in the dry season of 1983. The ground cover data shows significantly more pavement and rock cover in 1989, indicating a possible continued loss of surface soil. Soil trend is considered stable, but in poor condition. The density of the key browse species, cliffrose, is unchanged. However, there were some changes in the age class structure of the population. A few young cliffrose were classified in 1989, but 52% of the population was considered decadent compared to 21% in 1983. The majority of the cliffrose remain severely hedged and generally vigor is only fair. The true mountain mahogany are also heavily hedged. Most of the junipers on the site have an obvious high-line. The few sagebrush sampled are decadent and in poor vigor. The drop in total browse density is due mainly to a decline of broom snakeweed. Browse trend is considered down slightly. There is a low frequency of perennial grasses and forbs. The only perennial grass species encountered in 1989 was bluebunch wheatgrass. The only perennial forbs with any significance are scarlet globemallow and low fleabane. Fewer species were identified in 1989. Trend for the herbaceous understory is stable, but in poor condition.

### TREND ASSESSMENT

soil - stable and continued poor condition (3)

browse - down slightly (2)

herbaceous understory - stable, but in poor condition (3)

## 1997 TREND ASSESSMENT

Soil conditions are still poor on the site, however, protective ground cover has increased since 1989. Trend is considered slightly up for soils. Trend for the key browse species, cliffrose and mahogany, is stable. Cliffrose is heavily hedged, although vigor has improved and percent decadency has declined from 52% in 1989 to 23%. Mahogany is also heavily utilized, but vigor is normal and decadency low at only 8%. Trend for the herbaceous understory is stable yet depleted because of the large proportion of annual weeds in the understory. The understory of annuals is a severe fire hazard to the non-sprouting browse species.

### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable, but depleted (3)

## 2002 TREND ASSESSMENT

Soil trend is down slightly since 1997. Percent bare ground has increased and the ratio of protective ground cover to bare ground has declined. There is some erosion occurring but it is not severe and the erosion condition classification was determined as slight in 2002. Trend for the key browse species, Stansbury cliffrose and true mountain mahogany are stable. Cliffrose is heavily utilized but vigor remains good and percent decadence is stable at 20%. Recruitment remains poor. Annual leader growth is also poor averaging only about 1 ½ inches. Mahogany density is stable but like cliffrose, recruitment is poor with no seedlings or young sampled in 2002. Use is also heavy on available plants but vigor is good. The number of decadent plants has increased from 8% to 33%. Annual leader growth is poor averaging only 1.6 inches. Trend for the herbaceous understory is down slightly due to a significant decline in the nested frequency of bluebunch wheatgrass which provides most of the perennial grass cover. Perennial forbs are uncommon except for scarlet globemallow which is moderately abundant. Nested frequency of cheatgrass declined significantly but it is still abundant and provides a majority of the total grass cover.

### TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 8

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	<sub>ab</sub> 234	<sub>b</sub> 231	<sub>b</sub> 227	<sub>a</sub> 187	93	85	80	79	7.66	7.83
G	<i>Bromus tectorum</i> (a)	-	-	<sub>b</sub> 344	<sub>a</sub> 296	-	-	99	91	11.33	9.32
G	<i>Festuca myuros</i> (a)	-	-	3	6	-	-	1	2	.00	.18
G	<i>Poa bulbosa</i>	-	-	1	5	-	-	1	3	.00	.64
G	<i>Poa pratensis</i>	2	-	-	-	1	-	-	-	-	-
G	<i>Poa secunda</i>	1	-	-	6	1	-	-	3	-	.04
Total for Annual Grasses		0	0	347	302	0	0	100	93	11.34	9.50
Total for Perennial Grasses		237	231	228	198	95	85	81	85	7.67	8.51
Total for Grasses		237	231	575	500	95	85	181	178	19.01	18.02
F	<i>Alyssum alyssoides</i> (a)	-	-	<sub>b</sub> 350	<sub>a</sub> 303	-	-	98	96	5.48	1.82
F	<i>Asclepias</i> spp.	-	-	-	-	-	-	-	-	-	.03
F	<i>Astragalus</i> spp.	-	2	-	-	-	1	-	-	-	-
F	<i>Calochortus nuttallii</i>	3	-	6	-	2	-	3	-	.01	-
F	<i>Cirsium</i> spp.	1	-	-	-	1	-	-	-	-	-
F	<i>Comandra pallida</i>	3	-	-	-	1	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	6	-	-	-	3	-	.01	-
F	<i>Eriogonum brevicaulis</i>	3	-	-	-	1	-	-	-	-	-
F	<i>Erodium cicutarium</i> (a)	-	-	<sub>a</sub> 12	<sub>b</sub> 86	-	-	5	32	.05	1.31
F	<i>Erigeron pumilus</i>	<sub>b</sub> 14	<sub>b</sub> 21	<sub>a</sub> -	<sub>a</sub> -	5	9	-	-	-	-
F	<i>Galium aparine</i> (a)	-	-	2	-	-	-	1	-	.03	-
F	<i>Hackelia patens</i>	-	-	4	-	-	-	1	-	.00	-
F	<i>Helianthus annuus</i> (a)	-	-	-	3	-	-	-	2	-	.01
F	<i>Hedysarum boreale</i>	<sub>b</sub> 17	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	9	-	-	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 16	-	-	-	7	-	.18
F	<i>Leucelene ericoides</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 15	<sub>ab</sub> 8	-	-	6	3	.27	.21
F	<i>Lygodesmia grandiflora</i>	12	3	5	16	5	1	2	7	.03	.14
F	<i>Sphaeralcea coccinea</i>	<sub>ab</sub> 90	<sub>b</sub> 117	<sub>ab</sub> 80	<sub>a</sub> 80	38	47	35	36	.50	1.77
F	<i>Streptanthus cordatus</i>	8	3	7	-	3	2	3	-	.04	-
F	<i>Tragopogon dubius</i>	4	-	4	-	2	-	2	-	.01	-
F	<i>Trifolium</i> spp.	-	-	1	-	-	-	1	-	.00	-
Total for Annual Forbs		0	0	370	408	0	0	107	137	5.57	3.32
Total for Perennial Forbs		155	146	122	104	67	60	53	46	0.88	2.16
Total for Forbs		155	146	492	512	67	60	160	183	6.46	5.48

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	1	0	-	-
B	Cercocarpus montanus	11	13	2.78	3.31
B	Chrysothamnus nauseosus albicaulis	1	1	.38	.30
B	Chrysothamnus viscidiflorus stenophyllus	15	13	.21	.46
B	Cowania mexicana stansburiana	22	21	4.65	5.33
B	Gutierrezia sarothrae	26	45	.50	2.07
B	Rhus trilobata	0	0	-	.76
Total for Browse		76	93	8.54	12.25

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 8

Species	Average leader growth (in) '02
Cercocarpus montanus	1.6
Cowania mexicana stansburiana	1.5

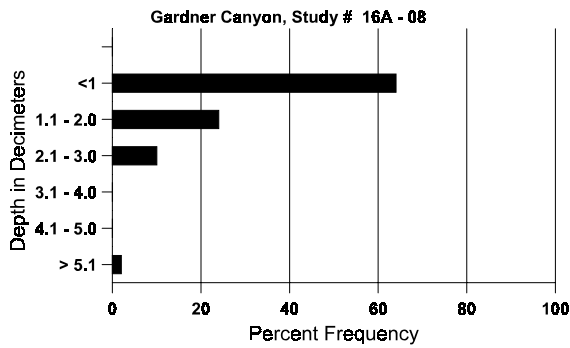
BASIC COVER --  
Herd unit 16A, Study no: 8

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	380	346	0	10.25	33.54	33.40
Rock	317	327	17.00	20.00	18.29	18.00
Pavement	303	320	2.00	12.75	7.86	5.28
Litter	385	365	50.50	31.00	30.88	30.60
Cryptogams	44	35	.25	0	.99	.75
Bare Ground	274	337	30.25	26.00	17.82	26.45

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 08, Gardner Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.1	55.4 (13.8)	7.0	38.7	40.7	20.6	1.6	4.4	57.6	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 8

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	5	2	-	-
Elk	20	20	313	24 (60)
Deer	21	26	905	70 (172)

## BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 8

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total			
		1	2	3	4						
Amelanchier alnifolia											
M	83	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	0	21	37	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
	'83	00%		00%		00%					
	'89	00%		00%		00%					
	'97	00%		00%		00%					
	'02	00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:			
						'89	0				
						'97	0				
						'02	0				



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
<i>Artemisia tridentata vaseyana</i>																
M	83	-	1	1	-	-	-	-	-	2	-	-	66	25	19	2
	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	0	21	35	0
	02	-	-	-	-	-	-	-	-	-	-	-	0	22	37	0
D	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	1	1	-	-	-	-	-	1	-	-	66			2
	97	-	2	-	-	-	-	-	-	-	-	2	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		50%		50%		00%		+ 0%								
'89		50%		50%		50%		-39%								
'97		100%		00%		100%										
'02		00%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	0%			
										'89	66		100%			
										'97	40		100%			
										'02	0		0%			
<i>Cercocarpus montanus</i>																
Y	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	2	1	-	-	-	-	-	3	-	-	100			3
	97	-	-	1	-	-	-	-	-	1	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	7	3	-	-	-	-	-	10	-	-	333	52	55	10
	89	-	3	7	-	-	1	-	-	11	-	-	366	62	51	11
	97	-	2	6	-	1	1	-	-	10	-	-	200	63	79	10
	02	1	4	1	-	-	4	-	-	7	3	-	200	67	75	10
D	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	1	-	-	-	-	-	1	-	-	20			1
	02	-	-	-	-	-	5	-	-	4	-	-	100			5
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		70%		30%		00%		+29%								
'89		36%		64%		00%		-48%								
'97		25%		75%		00%		+20%								
'02		27%		67%		07%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	333	Dec:	0%			
										'89	466		0%			
										'97	240		8%			
										'02	300		33%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																												
	1	2	3	4	5	6	7	8	9	1	2	3	4																																
<b>Chrysothamnus nauseosus albicaulis</b>																																													
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																												
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																												
	97	-	1	-	-	-	-	-	-	-	-	-	-	20	28	71	1																												
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	25	51	0																												
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1																												
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'97</td> <td>100%</td> <td>00%</td> <td>00%</td> <td>+ 0%</td> </tr> <tr> <td>'02</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%		'89	00%	00%	00%		'97	100%	00%	00%	+ 0%	'02	00%	00%	00%				
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																									
'83	00%	00%	00%																																										
'89	00%	00%	00%																																										
'97	100%	00%	00%	+ 0%																																									
'02	00%	00%	00%																																										
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead &amp; Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>0</td> <td>Dec:</td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>0</td> <td></td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>20</td> <td></td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'02</td> <td>20</td> <td></td> <td>100%</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)			'83	0	Dec:	0%				'89	0		0%				'97	20		0%				'02	20		100%
Total Plants/Acre (excluding Dead & Seedlings)			'83	0	Dec:	0%																																							
			'89	0		0%																																							
			'97	20		0%																																							
			'02	20		100%																																							
<b>Chrysothamnus viscidiflorus stenophyllus</b>																																													
Y	83	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1																												
	89	8	-	-	-	-	-	-	-	-	-	-	8	-	-	-	8																												
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0																												
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0																												
M	83	18	-	-	-	-	-	-	-	-	-	-	18	-	-	-	18																												
	89	7	6	-	1	-	-	-	-	-	-	-	13	-	-	1	14																												
	97	20	-	-	-	-	-	-	-	-	-	-	20	-	-	-	20																												
	02	13	1	-	-	-	-	-	-	-	-	-	14	-	-	-	14																												
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	89	1	1	-	-	-	-	-	-	-	-	-	1	-	-	1	2																												
	97	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2																												
	02	4	-	-	-	-	-	-	-	-	-	-	4	-	-	-	4																												
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																												
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1																												
	02	-	-	-	-	-	-	-	-	-	-	-	-	40			2																												
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+21%</td> </tr> <tr> <td>'89</td> <td>29%</td> <td>00%</td> <td>08%</td> <td>-45%</td> </tr> <tr> <td>'97</td> <td>00%</td> <td>00%</td> <td>05%</td> <td>-18%</td> </tr> <tr> <td>'02</td> <td>06%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%	+21%	'89	29%	00%	08%	-45%	'97	00%	00%	05%	-18%	'02	06%	00%	00%				
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																									
'83	00%	00%	00%	+21%																																									
'89	29%	00%	08%	-45%																																									
'97	00%	00%	05%	-18%																																									
'02	06%	00%	00%																																										
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead &amp; Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>633</td> <td>Dec:</td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>798</td> <td></td> <td>8%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>440</td> <td></td> <td>9%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'02</td> <td>360</td> <td></td> <td>22%</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)			'83	633	Dec:	0%				'89	798		8%				'97	440		9%				'02	360		22%
Total Plants/Acre (excluding Dead & Seedlings)			'83	633	Dec:	0%																																							
			'89	798		8%																																							
			'97	440		9%																																							
			'02	360		22%																																							

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Cowania mexicana stansburiana																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	3	-	-	2	2	-	-	-	7	-	-	-	233		7
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1
M	83	-	11	12	-	-	-	-	-	-	23	-	-	-	766	32 30	23
	89	-	2	5	-	-	-	-	-	-	7	-	-	-	233	25 29	7
	97	1	1	15	-	-	3	-	-	-	20	-	-	-	400	46 48	20
	02	-	-	8	-	-	6	-	5	-	19	-	-	-	380	38 43	19
D	83	-	-	6	-	-	-	-	-	-	6	-	-	-	200		6
	89	-	2	13	-	-	-	-	-	-	8	-	-	7	500		15
	97	-	-	4	-	-	2	1	-	-	5	-	-	2	140		7
	02	-	-	2	-	-	3	-	-	-	3	-	-	2	100		5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	120		6
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		38%			62%			00%			+ 0%						
'89		31%			69%			24%			-38%						
'97		03%			80%			07%			-17%						
'02		00%			80%			08%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	966	Dec:	21%			
											'89	966		52%			
											'97	600		23%			
											'02	500		20%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
<i>Gutierrezia sarothrae</i>																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	3	-	-	-	-	-	-	-	2	-	-	1	60		3			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1			
	97	29	-	-	-	-	-	-	-	29	-	-	-	580		29			
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1			
M	83	58	-	-	-	-	-	-	-	58	-	-	-	1933	11	9	58		
	89	8	-	-	-	-	-	-	-	8	-	-	-	266	9	8	8		
	97	33	-	-	-	-	-	-	-	33	-	-	-	660	7	10	33		
	02	96	-	-	-	-	-	-	-	96	-	-	-	1920	7	12	96		
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	16	-	-	-	-	-	-	-	8	-	1	7	533		16			
	97	2	-	-	-	-	-	-	-	1	-	-	1	40		2			
	02	17	-	-	-	-	-	-	-	11	-	-	6	340		17			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	40		2			
	02	-	-	-	-	-	-	-	-	-	-	-	-	300		15			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		-57%											
'89		00%		00%		32%		+35%											
'97		00%		00%		02%		+44%											
'02		00%		00%		05%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	1933	Dec:	0%						
										'89	832		64%						
										'97	1280		3%						
										'02	2280		15%						
<i>Quercus gambelii</i>																			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	78	81	0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	36	26	0		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%													
'89		00%		00%		00%													
'97		00%		00%		00%													
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-						
										'89	0		-						
										'97	0		-						
										'02	0		-						

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rhus trilobata																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	57	188	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			

Trend Study 16A-9-02

Study site name: Birch Creek.

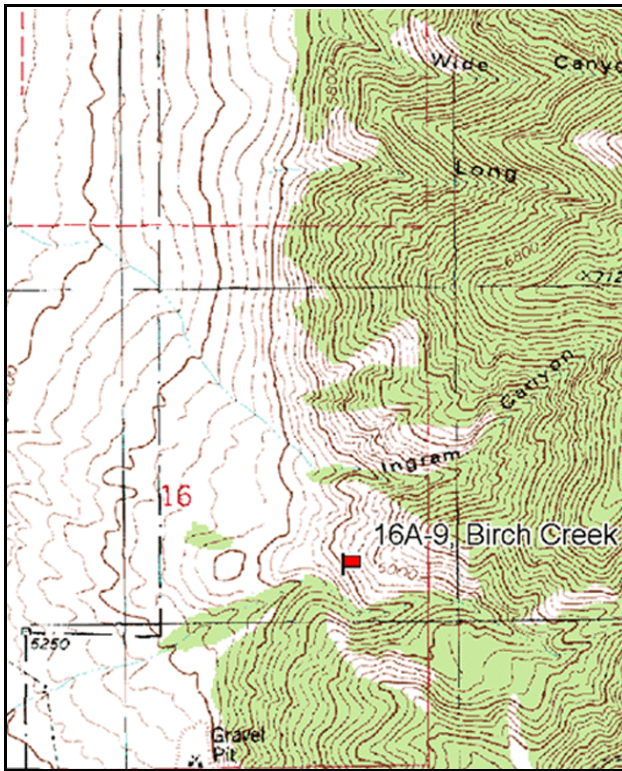
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 20 degrees magnetic (line 2 @ 50°M, line 3-4 @ 53°M).

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

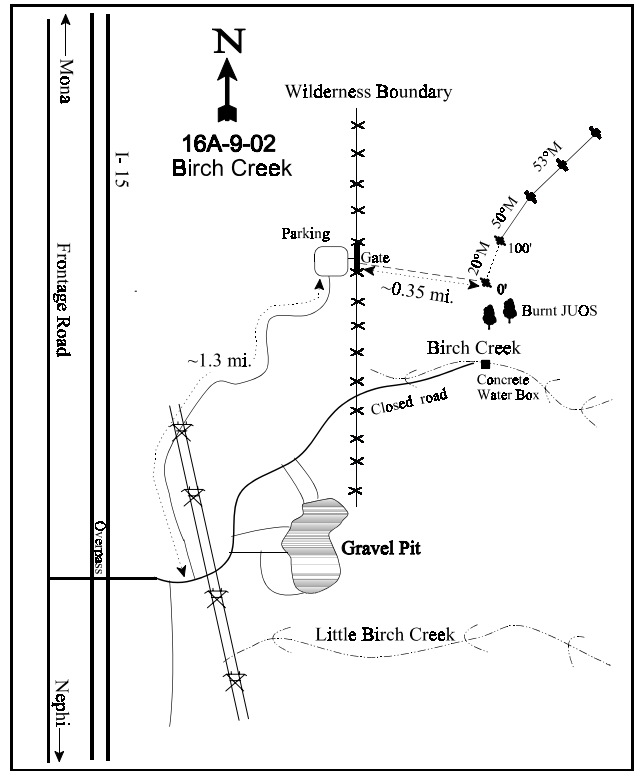
LOCATION DESCRIPTION

Beginning at the overpass where the road to Little Birch Canyon passes over I-15 (north of the northernmost Nephi exit), take the first left just before the powerlines cross the road. Proceed about 1.3 miles east-northeast to a parking lot. From the wilderness boundary, walk east for about 0.35 miles to the 0-foot stake. The 0-foot baseline stake is near a cliffrose bush on a small trail running parallel along the bench. Browse tag #3961 marks the 0-foot baseline stake.



Map Name: Mona

Township 12S, Range 1E, Section 16



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4402134 N 429657 E

## DISCUSSION

### Birch Creek - Trend Study No. 16A-9

The Birch Creek study is located on a very steep (70%), south facing slope at the mouth of Little Birch Creek. Elevation is approximately 5,680 feet. The original baseline sampled a more level bench with a slope of about 30%. The lengthened baseline extends up a steeper slope with the same aspect and vegetation type. Range type is a sparse mixture of mountain brush that is seriously depleted of ground cover and forage. Water is available in Birch Creek about 150 yards down slope from the baseline. The area is considered critical deer and elk winter range. Deer and elk pellet groups were common on the site in 1997 with a quadrat frequency of 30% for elk and 15% for deer. A fire burned the entire area in 2001, the same fire which burned near the Willow Creek site. The fire did not burn particularly hot on the study site and the end of the baseline was unburned leaving some healthy browse intact. Wildlife still utilize the area, and data from a pellet group transect read along the study site baseline in 2002 estimated 44 deer and 20 elk days use/acre (109 ddu/ha and 50 edu/ha).

The area possesses a shallow and extremely rocky soil which is eroded to the point where little bare soil remains. Parent material is limestone with numerous rock outcrops on the site. The site is terraced and some steeper areas have a complete cover of rock talus. Even with the rockiness of the soil, effective rooting depth is estimated at nearly 14 inches. Texture is a sandy loam with a neutral pH of 7.1. Percent organic matter in the soil is much higher at 3.1% than nearby study site #7 and #8 (1.8% and 1.6% respectively). Some erosion is occurring due to the steepness of the slope. The erosion condition classification was determined as slight in 2002.

The site supports three key browse species, mountain big sagebrush, serviceberry, and Stansbury cliffrose. Sagebrush occurred in small numbers in 1997 with an estimated density of only 360 plants/acre. Utilization of the sagebrush was moderate to heavy but vigor was normal on all plants and there were no decadent plants. After the burn, most of the sagebrush have been eliminated. In 2002, only 80 sagebrush plants/acre were estimated, most of which were decadent. Serviceberry is the most numerous shrub on the site with an estimated density of 640 plants/acre in 1997. Most of the serviceberry on the site burned, but most had resprouted in 2002. Resprouted plants were all classified as young plants numbering 1,240 plants/acre in 2002.

Cliffrose made up 28% of the browse cover with a small population of only 180 plants/acre in 1997. Nearly 80% of the population consisted of large mature plants which averaged over 5 feet in height. The height of these taller plants resulted in many of them being unavailable to browsing. After the fire, only a few (60 plants/acre) cliffrose up slope at the end of the baseline were left unburned. Utilization of cliffrose has been consistently heavy with mostly moderate use in 1989. Recruitment is poor and percent decadence is currently 33%.

Other preferred browse include black sagebrush, fourwing saltbush, and true mountain mahogany. These species occur in very limited numbers after the fire. The increasers, narrowleaf low rabbitbrush and broom snakeweed are found on the site in small numbers as well.

The herbaceous understory is depleted with grasses and forbs combining to produce less than 20% cover. Cheatgrass is abundant and accounted for 46% of the grass cover in 1997, increasing to 63% in 2002 after the fire. Bluebunch wheatgrass is the only abundant perennial grass. It made up just over half of the grass cover (53%) in 1997, declining to 24% in 2002. Perennial forbs are lacking. The only common perennial species include shortstem wild buckwheat and northern sweetvetch. Annual forbs are abundant and dominate the forb component of the herbaceous understory. The most common species include pale alyssum and storksbill.

### 1983 APPARENT TREND ASSESSMENT

A fundamental problem on this site is accelerated erosion and the resultant loss of topsoil. Soil condition is very poor and unlikely to improve without some kind of direct manipulation. Vegetative trend appears to be headed toward a relatively barren site populated principally by annual grasses, forbs, and perennial weeds. The most desirable browse plants are heavily utilized and not adequately reproducing.

### 1989 TREND ASSESSMENT

Ground cover values indicate no significant changes, although the soil remains unstable with extensive erosion pavement. As with other winter ranges in the area, the site is limited by poor soil conditions on steep slopes and by heavy browse utilization. On the density plots, mountain big sagebrush makes up 1/3 of the browse composition. It decreased 36% in density with half as many mature sagebrush counted in 1989. They have a moderately to heavily hedged growth form from recent use. The current age class structure indicates a stable population for sagebrush. The density data suggests a decline of serviceberry. However, this species is often difficult to count. Comparing other factors, the decline does not appear to be significant. Density data for other browse species on the site show that sumac increased while cliffrose and juniper are unchanged. While the diversity of grasses and forbs remains low, bluebunch wheatgrass increased significantly in nested frequency. Utah sweetvetch remains the most frequent perennial forb.

#### TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - stable for key species (3)

herbaceous understory - up, but poor (5)

### 1997 TREND ASSESSMENT

Trend for soil is stable. Cover of bare ground increased slightly and litter cover declined. Rock and pavement cover also increased from 45% to 57%. Some of these differences are likely due to the lengthened baseline which samples a steeper slope. There is some erosion occurring due to the steep slope. However, there is still abundant protective ground cover to prevent serious erosion. Trend for browse appears stable for the key species, serviceberry, mountain big sagebrush, and cliffrose. Utilization is heavier, but percent decadence is lower than that found in 1989. Density of these preferred shrubs is still low and recruitment is poor. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses and forbs. Annual grasses and forbs currently provide 52% of the herbaceous cover. Bluebunch wheatgrass and Sandberg bluegrass declined in their sum of nested frequency values.

#### TREND ASSESSMENT

soil - stable but poor (3)

browse - stable (3)

herbaceous understory - slightly down (2)



2002 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in cover of bare ground and a decline in litter and vegetation cover due to fire. However, due to the abundant rock and pavement cover (60%), there is not a lot of unprotected bare ground exposed (13%), and the erosion condition classification was determined as slight in 2002. Trend for the key browse is also down due to the fire which burned the site in 2001. Most of the shrubs were burned on the site with the exception of shrubs on the steeper part of the slope. Only 60 cliffrose per acre remain. These are all heavily browsed, in good vigor, with 1/3 decadent. Most of the mountain big sagebrush population was eliminated by the fire. Serviceberry has resprouted with a density of 1,240 young plants per acre. Trend for the herbaceous understory is also down slightly due to a significant decline in bluebunch wheatgrass which remains the most abundant perennial species. The annual, cheatgrass, remains the dominant herbaceous species. It provides 63% of the total grass cover and 49% of the total herbaceous cover. Perennial forbs are still lacking.

TREND ASSESSMENT

soil - down slightly (2)

browse - down due to fire (1)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 9

Type	Species	Nestled Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	<sub>b</sub> 188	<sub>c</sub> 259	<sub>bc</sub> 215	<sub>a</sub> 141	71	90	84	58	7.00	4.89
G	Bromus japonicus (a)	-	-	<sub>a</sub> -	<sub>b</sub> 45	-	-	-	17	-	.15
G	Bromus tectorum (a)	-	-	292	276	-	-	93	88	6.13	9.72
G	Poa secunda	<sub>a</sub> 4	<sub>c</sub> 75	<sub>b</sub> 23	<sub>bc</sub> 54	2	31	13	23	.14	.63
Total for Annual Grasses		0	0	292	321	0	0	93	105	6.13	9.88
Total for Perennial Grasses		192	334	238	195	73	121	97	81	7.14	5.53
Total for Grasses		192	334	530	516	73	121	190	186	13.27	15.42
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 237	<sub>a</sub> 190	-	-	79	68	2.66	1.20
F	Allium spp.	-	-	-	3	-	-	-	1	-	.03
F	Arabis spp.	-	-	1	-	-	-	1	-	.00	-
F	Artemisia ludoviciana	2	-	3	3	1	-	1	1	.03	.03
F	Castilleja linariaefolia	-	-	3	-	-	-	1	-	.00	-
F	Camelina microcarpa (a)	-	-	-	3	-	-	-	1	-	.00
F	Calochortus nuttallii	3	-	2	1	1	-	1	1	.00	.00
F	Cirsium spp.	-	-	6	-	-	-	2	-	.01	-
F	Comandra pallida	-	7	-	-	-	2	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	3	-	-	-	1	-	.00
F	Descurainia pinnata (a)	-	-	9	20	-	-	5	11	.02	.10
F	Epilobium brachycarpum (a)	-	-	-	1	-	-	-	1	-	.00
F	Eriogonum brevicale	-	2	8	10	-	2	5	4	.73	.48
F	Erodium cicutarium (a)	-	-	<sub>a</sub> 23	<sub>b</sub> 42	-	-	8	17	.09	1.39
F	Galium aparine (a)	-	-	57	57	-	-	26	25	.83	.22

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Gilia</i> spp. (a)	-	-	<sub>a</sub> 9	<sub>b</sub> 19	-	-	3	9	.01	.11
F	<i>Hackelia patens</i>	2	6	-	-	1	2	-	-	-	-
F	<i>Hedysarum boreale</i>	<sub>b</sub> 27	<sub>b</sub> 31	<sub>b</sub> 21	<sub>a</sub> 2	13	17	10	1	.77	.18
F	<i>Holosteum umbellatum</i> (a)	-	-	-	9	-	-	-	5	-	.02
F	<i>Lappula occidentalis</i> (a)	-	-	6	7	-	-	2	4	.01	.04
F	<i>Lactuca serriola</i>	-	-	-	2	-	-	-	1	-	.03
F	<i>Lygodesmia grandiflora</i>	<sub>ab</sub> 7	<sub>b</sub> 18	<sub>a</sub> -	<sub>a</sub> -	3	6	-	-	-	-
F	<i>Machaeranthera canescens</i>	-	9	10	-	-	4	4	-	.04	-
F	<i>Phacelia linearis</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 68	-	-	-	30	-	.52
F	<i>Phlox longifolia</i>	-	11	2	5	-	6	1	3	.00	.06
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	5	-	-	-	2	-	.01
F	<i>Streptanthus cordatus</i>	-	-	5	1	-	-	2	1	.15	.00
F	<i>Tragopogon dubius</i>	2	-	1	-	1	-	1	-	.00	-
F	Unknown forb-annual (a)	-	-	<sub>b</sub> 33	<sub>a</sub> -	-	-	17	-	.08	-
Total for Annual Forbs		0	0	374	356	0	0	140	144	3.73	3.14
Total for Perennial Forbs		43	84	62	95	20	39	29	43	1.78	1.35
Total for Forbs		43	84	436	451	20	39	169	187	5.51	4.49

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 9

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Amelanchier alnifolia</i>	16	16	1.91	1.05
B	<i>Artemisia nova</i>	5	0	-	-
B	<i>Artemisia tridentata vaseyana</i>	15	4	.89	.03
B	<i>Atriplex canescens</i>	1	0	-	-
B	<i>Brickellia californica</i>	2	0	.85	-
B	<i>Cercocarpus montanus</i>	2	1	1.00	.15
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	3	3	.00	.03
B	<i>Cowania mexicana stansburiana</i>	8	3	3.01	1.06
B	<i>Gutierrezia sarothrae</i>	7	2	-	-
B	<i>Juniperus osteosperma</i>	2	0	2.89	-
B	<i>Rhus trilobata</i>	0	2	-	-
Total for Browse		61	31	10.57	2.32

CANOPY COVER --  
Herd unit 16A, Study no: 9

Species	Percent Cover	
	'97	'02
Amelanchier alnifolia	1.8	-
Cowania mexicana stansburiana	1.0	-
Juniperus osteosperma	5	-

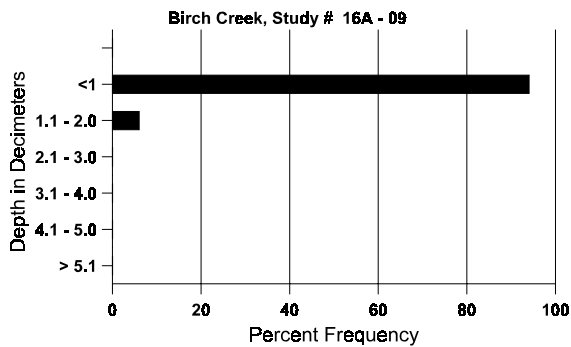
BASIC COVER --  
Herd unit 16A, Study no: 9

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	333	318	2.00	8.50	26.68	22.07
Rock	357	381	26.25	41.25	48.14	51.06
Pavement	200	291	25.50	3.25	9.28	9.39
Litter	361	352	44.50	42.25	26.36	19.13
Cryptogams	31	2	.25	1.50	.88	.00
Bare Ground	154	212	1.50	3.25	7.58	13.19

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 09, Birch Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.8	55.5 (12.9)	7.1	54.4	30.1	15.6	3.1	9.7	80.0	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 9

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	-	-	02	02
Elk	30	12	-	-
Deer	15	25	261	20 (50)
			574	44 (109)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 9

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Amelanchier alnifolia																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	8	-	-	-	-	-	-	-	-	8	-	-	-	160		8	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	4	2	-	-	-	-	-	-	-	6	-	-	-	200		6	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'97	2	8	-	3	-	-	-	-	-	13	-	-	-	260		13	
	'02	60	-	-	-	-	-	2	-	-	62	-	-	-	1240		62	
M	'83	-	14	-	-	1	-	-	-	-	13	-	2	-	500	34 37	15	
	'89	1	4	-	-	-	-	-	-	-	5	-	-	-	166	46 31	5	
	'97	-	8	10	-	-	-	-	-	-	18	-	-	-	360	52 62	18	
	'02	-	-	2	-	-	-	-	-	-	2	-	-	-	40	42 53	2	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	1	1	-	-	-	-	-	-	2	-	-	-	66		2	
	'97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	'02	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	660		33	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		81%			00%			10%			-62%							
'89		63%			13%			00%			+59%							
'97		50%			34%			00%			+51%							
'02		00%			05%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	700	Dec:	0%			
												'89	265		25%			
												'97	640		3%			
												'02	1300		2%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia nova</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	3	-	-	-	-	-	-	-	5	-	-	-	100	15	27	5
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	28	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	1	-	-	-	-	-	-	1	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		50%			17%			17%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	0		0%				
											'97	120		17%				
											'02	0		0%				
<i>Artemisia tridentata vaseyana</i>																		
Y	83	2	-	-	-	-	-	-	-	-	1	1	-	-	66			2
	89	3	1	-	-	-	-	-	-	-	4	-	-	-	133			4
	97	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	7	5	-	-	-	-	-	-	-	10	2	-	-	400	22	25	12
	89	2	3	1	-	-	-	-	-	-	5	-	1	-	200	17	29	6
	97	-	8	6	-	1	-	-	-	-	15	-	-	-	300	27	47	15
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	19	30	1
D	83	-	8	-	-	-	-	-	-	-	5	1	2	-	266			8
	89	1	3	-	-	-	-	-	-	-	3	-	-	1	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	1	1	-	-	-	-	-	1	-	-	2	60			3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		59%			00%			09%			-36%							
'89		50%			07%			14%			-23%							
'97		50%			33%			00%			-78%							
'02		00%			50%			50%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	732	Dec:	36%				
											'89	466		29%				
											'97	360		0%				
											'02	80		75%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Atriplex canescens</i>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	22	37	1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			100%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
												'02	0		-			
<i>Brickellia californica</i>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	5	-	-	-	-	-	5	-	-	-	100	21	28	5
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	100		-			
												'02	0		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Cercocarpus montanus</b>																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	1	-	-	1	-	-	-	2	-	-	-	40	55	50	2
	'02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	71	56	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			100%			00%			-50%							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	40		-			
												'02	20		-			
<b>Chrysothamnus nauseosus albicaulis</b>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	60	94	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Chrysothamnus viscidiflorus stenophyllus																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	4	-	-	-	-	-	-	-	4	-	-	-	133	19 33	4
	89	5	-	-	-	-	-	-	-	5	-	-	-	166	15 27	5
	97	3	-	-	-	-	-	-	-	3	-	-	-	60	16 33	3
	02	1	-	-	-	-	-	-	-	1	-	-	-	20	11 18	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	1	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%			+33%					
'89		00%			00%			00%			-70%					
'97		00%			00%			00%			+ 0%					
'02		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	133	Dec:	0%			
										'89	199		17%			
										'97	60		0%			
										'02	60		33%			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cowania mexicana stansburiana																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	1	1	-	-	-	1	-	1	-	66	67	69	2
	89	-	2	-	-	-	-	-	-	-	2	-	-	-	66	75	45	2
	97	-	1	3	-	2	-	-	1	-	7	-	-	-	140	65	77	7
	02	-	-	1	-	-	1	-	-	-	2	-	-	-	40	44	64	2
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	1	1	-	-	-	1	-	-	1	40		2	
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	50%			50%			50%			+33%							
	'89	100%			00%			00%			+45%							
	'97	44%			44%			11%			-67%							
	'02	00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%			
												'89	99		33%			
												'97	180		22%			
												'02	60		33%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
<b>Gutierrezia sarothrae</b>																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	3	-	-	-	-	-	-	-	3	-	-	-	60		3			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
M	83	2	-	-	-	-	-	-	-	2	-	-	-	66	11	10	2		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	5	-	-	-	-	-	-	-	5	-	-	-	100	8	12	5		
	02	2	-	-	-	-	-	-	-	2	-	-	-	40	6	10	2		
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1			
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1			
	02	-	-	-	-	-	-	-	-	-	-	-	-	40		2			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		-50%											
'89		00%		00%		00%		+79%											
'97		00%		00%		00%		-63%											
'02		00%		00%		33%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	0%						
										'89	33		100%						
										'97	160		0%						
										'02	60		33%						
<b>Juniperus osteosperma</b>																			
M	83	-	-	-	1	-	-	-	-	1	-	-	-	33	67	81	1		
	89	1	-	-	-	-	-	-	-	1	-	-	-	33	108	79	1		
	97	-	-	-	-	-	-	2	-	2	-	-	-	40	-	-	2		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	02	-	-	-	-	-	-	-	-	-	-	-	-	40		2			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		+ 0%											
'89		00%		00%		00%		+18%											
'97		00%		00%		00%													
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	33	Dec:	-						
										'89	33		-						
										'97	40		-						
										'02	0		-						

A Y G R E	Form Class (No. of Plants)	Vigor Class									Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4	5	6	7	8	9		1	2		3	4	
<b>Rhus glabra cismontana</b>																	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	89	6	3	-	-	-	-	-	-	-	9	-	-	-	300	39	35
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	17
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+89%						
'89		33%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	-			
											'89	300		-			
											'97	0		-			
											'02	0		-			
<b>Rhus trilobata</b>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	0		-			
											'02	40		-			

Trend Study 16A-10-02

Study site name: North Canyon.

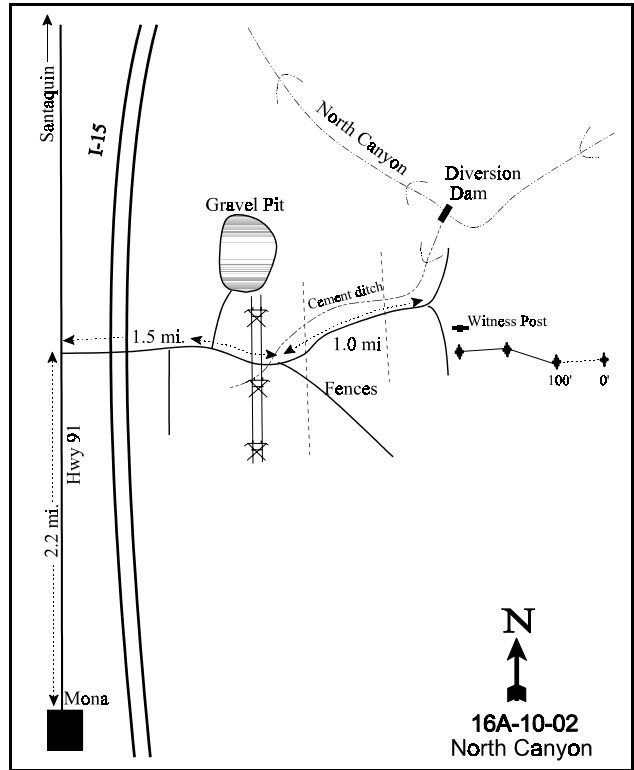
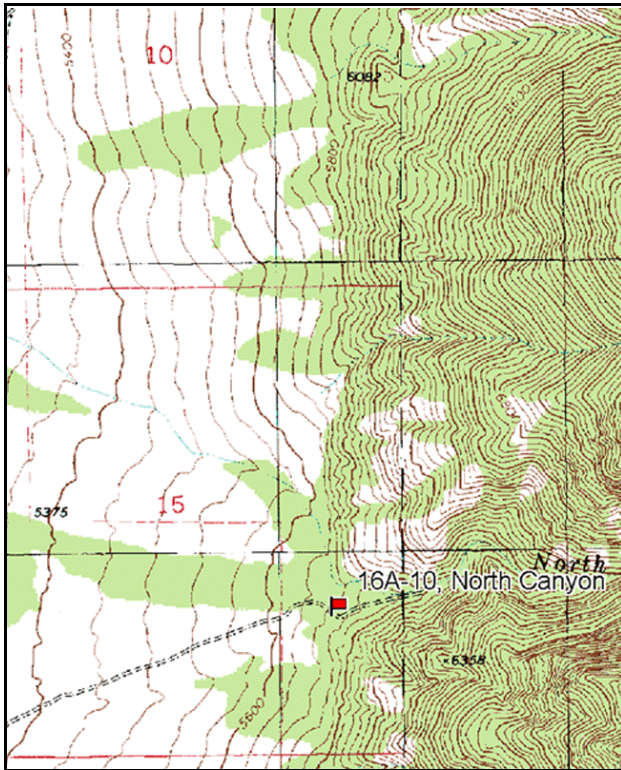
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 267 degrees magnetic (line 2 @ 277°M).

Frequency belt placement: line 1 (11 & 71ft), line 2 (41ft), line 3 (34 ft centered on 40, & 95ft). Rebar: belt 4 on 2 ft, belt 2 on 1 ft.

LOCATION DESCRIPTION

Beginning at the intersection of 200 North and Main Street in Mona, go north on Main Street for 2.2 miles to an improved gravel road on the east side. Take this road east for 1.5 miles (passing beneath the freeway) to where the road forks after crossing the irrigation ditch. Stay left at this fork and continue another mile to where the road faintly forks again. From here, walk down the right fork for 22 paces. At this point, the witness post is on the left, next to the 300-foot stake. A red browse tag, number 3957, is attached to the 0-foot baseline stake.



Map Name: Mona

Diagrammatic Sketch

Township 11S, Range 1E, Section 15

GPS: NAD 27, UTM 12S 4411768 N 431183 E

## DISCUSSION

### North Canyon - Trend Study No. 16A-10

This trend study is located on Division land near the mouth of North Canyon on an alluvial fan dissected by gullies. The site has a moderate slope (15%), west aspect, and an elevation of about 5,700 feet. The site supports a big sagebrush-grass community interrupted by an occasional Gambel oak and skunkbush sumac clones. Water can be found in the nearby creek. The principal wildlife value for the area is deer winter range. Elk use appears negligible. Few deer pellet groups were found on the site in 1997. A pellet group transect read along the study site baseline in 2002 estimated 21 deer days use/acre (53 ddu/ha). No elk pellet groups were encountered.

Soil is alluvially deposited from sedimentary limestone and quartzite parent material. The soil is moderately deep, but very rocky and well drained. Effective rooting depth is estimated at just over 10 inches. Soil texture is a sandy loam with a neutral pH of 7.1. Phosphorus and potassium may be limiting to vegetation development with only 8.2 ppm (minimum 10 ppm) and 51.2 ppm (minimum 70 ppm) found in the soil respectively. Much of the ground surface is occupied by rocks, some of which are boulder size or even larger. Cobble size rocks and pavement are concentrated on the surface in many areas. The distribution of vegetation and litter cover is uneven. Where adequate cover is found, it is effective at preventing runoff. However, the large areas occupied by rock and erosion pavement result in considerable overland water flow with relatively little soil movement. Deposition of soil from higher slopes is probably more common than is soil loss. The area to the immediate north and west, which is the active flood plain or out wash area from North Creek, appears to be heavily impacted by spring runoff. There is little unprotected bare ground on the study site itself (1%), and the soil erosion condition classification was determined to be stable in 2002.

The key browse species is mountain big sagebrush which accounted for 80% of the browse cover in 1997 and 74% in 2002. Population density has shown a steady decline since 1983 when a very high 6,333 plants/acre were estimated. Density was estimated at 3,880 plants/acre in 1997. Use was light to moderate, vigor good, and only 11% of the population was considered decadent. In 2002, density of sagebrush declined 11% to 3,460 plants/acre. Use was mostly light but due to drought conditions, the proportion of plants displaying poor vigor increased from 5% in 1997 to 21% in 2002. The number of decadent plants also increased from 11% to 42% of the population. In addition, 47% of the decadent sagebrush sampled in 2002 were classified as dying (>50% of crown dead). Recruitment is poor. No seedlings have been sampled on the site since 1983 with the exception of 2 seedlings found in 1997. The number of young plants have declined with every reading. The number of dead plants doubled between 1997 and 2002.

The only other common browse species is broom snakeweed which had a density of 2,020 plants/acre in 1997 declining to 1,700 by 2002. A few scattered curleaf mountain mahogany, white rubber rabbitbrush, and Gambel oak occur scattered over the site.

The herbaceous understory is diverse but not very productive. Species composition includes native and exotic species, with the latter presumably the result from a nearby range seeding. Annual cheatgrass is the most abundant species, accounting for 57% of the total grass cover in 1997 declining to 29% in 2002. The only common perennial species consists of Sandberg bluegrass. Forbs are much less abundant than grasses and include several annuals and biennials with a few perennials. Forb composition is dominated by redroot eriogonum which accounted for 55% of the forb cover in 1997. Most other perennial species occur rarely.

## 1983 APPARENT TREND ASSESSMENT

Soil trend seems stable even though some disturbance is noticeable. The combination of rock, erosion pavement, vegetation, litter cover, and gentle slope limit the degree of soil erosion. Soil deposition rates probably exceed soil loss. Vegetative trend amongst the browse population also appears stable but could change quickly if disturbed. Herbaceous composition, especially forbs, is somewhat depleted but not showing any obvious further deterioration.

## 1989 TREND ASSESSMENT

Frequency data comparisons on this site reveal a stable condition. Classifications on the density portion of the study indicate some changes in the population of the key species, mountain big sagebrush. Sagebrush density declined in the young and mature age classes. The study found a higher percentage of shrubs with a heavily hedged growth form in 1989 (40% compared to 24%). Still, the density of mature sagebrush remains satisfactory at close to 3,000 plants per acre and an average cover of 24%. Increases in grass frequency and density were recorded, and the herbaceous component, although depleted, is stable and also possibly slightly improving. There is an extensive rock and pavement cover, but the soil condition appears stable.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly, but depleted (4)

## 1997 TREND ASSESSMENT

Soil trend appears stable with similar ground cover characteristics compared to 1989. Trend for mountain big sagebrush also appears relatively stable, after self-thinning. The number of mature plants has remained similar while the number of young and decadent plants has declined. Utilization remains moderate to heavy, but vigor is normal and percent decadency low at 11%. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Forbs are still lacking however.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

Soil trend has improved slightly. There is excellent protective ground cover leaving very little (1%) unprotected bare ground. Herbaceous vegetation cover has increased from 14% to 23%, likely due to a slight decline in sagebrush. Trend for the key browse species, mountain big sagebrush, is down slightly. Density has declined 11%, recruitment is poor, more plants display poor vigor (5% vs 21%), and decadence has increased from 11% of the population to 42%. In addition, 47% of the decadent sagebrush sampled were classified as dying (>50% crown death). Still, there is a good amount of healthy sagebrush left on the site and the reduction in sagebrush density and cover appears to have improved the herbaceous understory. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses. Cover of perennial grasses increased from 4% in 1997 to 14% in 2002. Part of the improvement in perennial grasses comes from a significant increase in the nested frequency of the low value perennial, bulbous bluegrass. Frequency and cover of the annual, cheatgrass, has remained stable. Frequency of perennial forbs has declined slightly but forbs never were very productive on this site.

### TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - up slightly (4)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 10

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	8	22	7	6	4	8	3	3	.04	.57
G	Agropyron intermedium	40	48	24	25	16	18	9	12	.61	2.76
G	Aristida purpurea	8	7	18	20	3	4	8	9	.80	.76
G	Bromus carinatus	-	-	-	6	-	-	-	3	-	.68
G	Bromus japonicus (a)	-	-	-	3	-	-	-	1	-	.03
G	Bromus marginatus	1	-	-	-	1	-	-	-	-	-
G	Bromus tectorum (a)	-	-	274	284	-	-	87	86	5.69	5.55
G	Festuca myuros (a)	-	-	<sub>b</sub> 29	<sub>a</sub> 4	-	-	11	2	.30	.01
G	Festuca ovina	<sub>a</sub> -	<sub>a</sub> -	<sub>ab</sub> 6	<sub>b</sub> 18	-	-	2	7	.53	1.01
G	Poa bulbosa	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 15	<sub>c</sub> 60	-	-	5	19	.24	2.91
G	Poa pratensis	-	-	-	2	-	-	-	1	-	.03
G	Poa secunda	<sub>a</sub> 75	<sub>b</sub> 114	<sub>b</sub> 166	<sub>c</sub> 165	38	46	59	62	1.37	4.28
G	Sitanion hystrix	-	-	7	2	-	-	2	2	.01	.06
G	Sporobolus cryptandrus	<sub>b</sub> 15	<sub>a</sub> -	<sub>b</sub> 24	<sub>b</sub> 23	6	-	9	11	.41	.46
G	Vulpia octoflora (a)	-	-	-	7	-	-	-	3	-	.04
Total for Annual Grasses		0	0	303	298	0	0	98	92	5.99	5.63
Total for Perennial Grasses		147	191	267	327	68	76	97	129	4.03	13.56
Total for Grasses		147	191	570	625	68	76	195	221	10.02	19.20
F	Alyssum alyssoides (a)	-	-	<sub>a</sub> 86	<sub>b</sub> 178	-	-	34	61	.27	.43
F	Allium spp.	-	-	8	-	-	-	3	-	.01	-
F	Antennaria rosea	-	-	-	4	-	-	-	1	-	.03
F	Astragalus eurekaensis	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 14	-	-	-	5	-	.15
F	Astragalus utahensis	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 27	<sub>a</sub> 8	-	-	12	3	.33	.09
F	Castilleja linariaefolia	-	-	-	2	-	-	-	1	-	.03
F	Calochortus nuttallii	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 18	<sub>b</sub> 25	-	-	9	10	.04	.08
F	Cirsium vulgare	<sub>ab</sub> 3	<sub>a</sub> -	<sub>b</sub> 7	<sub>a</sub> -	1	-	4	-	.02	.00
F	Collinsia parviflora (a)	-	-	<sub>a</sub> 19	<sub>b</sub> 78	-	-	7	29	.06	.27
F	Cruciferae	-	2	-	-	-	2	-	-	-	-
F	Cryptantha spp.	-	-	4	-	-	-	2	-	.03	-
F	Cynoglossum officinale	-	2	3	-	-	1	1	-	.00	-
F	Draba spp. (a)	-	-	-	14	-	-	-	4	-	.04
F	Epilobium brachycarpum (a)	-	-	10	6	-	-	5	4	.02	.02
F	Erigeron pumilus	5	2	8	1	2	1	4	1	.09	.00
F	Eriogonum racemosum	43	52	73	47	24	24	29	28	2.09	.80
F	Galium aparine (a)	-	-	100	79	-	-	34	31	.42	.62
F	Helianthus annuus (a)	4	15	-	8	3	9	-	3	-	.01
F	Holosteum umbellatum (a)	-	-	<sub>a</sub> 29	<sub>b</sub> 82	-	-	11	29	.05	.19

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Leucelene ericoides	a-	a-	a6	b14	-	-	2	5	.03	.36
F	Lithospermum incisum	-	-	4	6	-	-	2	4	.03	.04
F	Machaeranthera canescens	6	3	8	-	2	1	3	-	.04	-
F	Medicago sativa	1	3	2	-	1	1	1	-	.03	-
F	Microsteris gracilis (a)	-	-	a-	b13	-	-	-	6	-	.03
F	Oenothera pallida	-	-	-	3	-	-	-	1	-	.03
F	Phlox longifolia	-	-	a3	b9	-	-	1	4	.00	.02
F	Ranunculus testiculatus (a)	-	-	74	93	-	-	27	36	.18	.55
F	Tragopogon dubius	-	-	-	1	-	-	-	1	-	.00
F	Unknown forb-annual (a)	-	-	2	-	-	-	2	-	.01	-
F	Unknown forb-perennial	3	-	-	-	2	-	-	-	-	-
F	Zigadenus paniculatus	-	-	4	2	-	-	2	1	.01	.03
Total for Annual Forbs		4	15	320	551	3	9	120	203	1.02	2.18
Total for Perennial Forbs		61	64	175	136	32	30	75	65	2.80	1.69
Total for Forbs		65	79	495	687	35	39	195	268	3.82	3.88

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 10

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	88	74	19.99	18.17
B	Cercocarpus ledifolius	1	1	.00	-
B	Chrysothamnus nauseosus albicaulis	2	6	1.39	3.15
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	.38	-
B	Gutierrezia sarothrae	24	31	2.14	.36
B	Opuntia spp.	3	0	.00	-
B	Pediocactus simpsonii	0	1	-	.00
B	Quercus gambelii	7	9	1.06	2.40
B	Rhus trilobata	0	0	-	.38
Total for Browse		126	122	24.98	24.47

#### Key Browse Annual Leader Growth

Herd unit 16A, Study no: 10

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.1



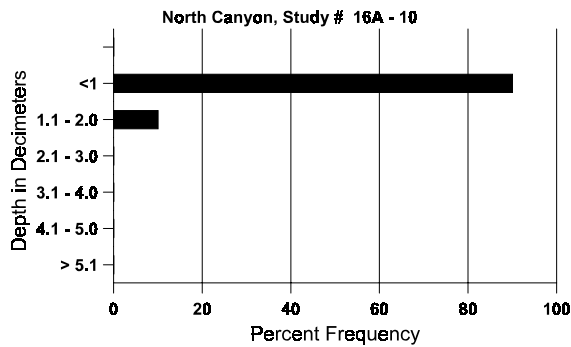
BASIC COVER --  
Herd unit 16A, Study no: 10

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	368	371	1.00	3.75	34.09	48.70
Rock	279	289	20.50	25.25	18.35	20.88
Pavement	225	234	7.00	10.00	15.76	16.25
Litter	385	369	66.75	56.75	43.20	43.88
Cryptogams	118	72	0	0	1.19	1.19
Bare Ground	134	94	4.75	4.25	4.25	.91

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 10, North Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.3	55.5 (14.3)	7.1	56.4	28.1	15.6	3.2	8.2	51.2	.8

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 10

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	-	4	-	-
Elk	-	1	-	-
Deer	6	16	278	21 (53)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 10

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata vaseyana																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	20	-	-	-	-	-	-	-	-	20	-	-	-	1333		20	
	'89	3	5	1	1	-	-	-	-	-	10	-	-	-	666		10	
	'97	18	1	-	-	-	-	-	-	-	19	-	-	-	380		19	
	'02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	'83	35	16	6	-	-	-	-	-	-	56	-	1	-	3800	21 24	57	
	'89	4	23	15	-	-	2	-	-	-	44	-	-	-	2933	19 28	44	
	'97	35	80	22	8	8	-	-	-	-	153	-	-	-	3060	24 40	153	
	'02	74	16	1	4	-	-	-	-	-	95	-	-	-	1900	23 33	95	
D	'83	1	-	17	-	-	-	-	-	-	-	-	18	-	1200		18	
	'89	-	8	11	-	-	-	-	-	-	14	-	3	2	1266		19	
	'97	5	6	11	-	-	-	-	-	-	12	-	-	10	440		22	
	'02	60	8	-	5	-	-	-	-	-	36	-	3	34	1460		73	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	880		44	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	1660		83	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		17%			24%			20%			-23%							
'89		49%			40%			07%			-20%							
'97		49%			17%			05%			-11%							
'02		14%			.57%			21%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6333	Dec:	19%			
												'89	4865		26%			
												'97	3880		11%			
												'02	3460		42%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		5	6		7	8	9	1	2	3	4	
<b>Cercocarpus ledifolius</b>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	3	4	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%											
'89		00%		00%		00%											
'97		00%		00%		00%		+ 0%									
'02		00%		100%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	0		0%				
										'97	20		0%				
										'02	20		100%				
<b>Chrysothamnus nauseosus albicaulis</b>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	2	-	-	-	40	32	33	2
	02	1	-	-	-	-	-	-	-	1	-	-	-	20	37	31	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	9	1	-	-	-	-	-	-	10	-	-	-	200		10	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%											
'89		00%		00%		00%											
'97		50%		00%		00%		+82%									
'02		09%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	0		0%				
										'97	40		0%				
										'02	220		91%				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	34	38	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
												'02	0		-			
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	89	11	-	-	-	-	-	-	-	-	11	-	-	-	733		11	
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	83	10	-	-	-	-	-	-	-	-	10	-	-	-	666	9	8	10
	89	4	-	-	-	-	2	-	-	-	6	-	-	-	400	8	5	6
	97	71	-	-	-	-	-	-	-	-	71	-	-	-	1420	7	8	71
	02	69	-	-	4	-	-	-	-	-	73	-	-	-	1500	6	6	75
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	9	-	-	-	-	-	-	-	-	8	-	-	1	600		9	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	6	-	-	-	-	-	-	-	-	-	-	-	6	120		6	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+38%							
'89		00%			00%			04%			+14%							
'97		00%			00%			00%			-16%							
'02		00%			00%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1066	Dec:	0%			
												'89	1733		35%			
												'97	2020		2%			
												'02	1700		7%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
Opuntia spp.									
M	83	-	-	-	-	-	-	0	
	89	-	-	-	-	-	-	0	
	97	4	-	-	-	-	-	80	
	02	-	-	-	-	-	-	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
	'83	00%		00%		00%			
	'89	00%		00%		00%			
	'97	00%		00%		00%			
	'02	00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-
						'89	0		-
						'97	80		-
						'02	0		-
Pediocactus simpsonii									
M	83	-	-	-	-	-	-	0	
	89	-	-	-	-	-	-	0	
	97	-	-	-	-	-	-	0	
	02	2	-	-	-	-	-	40	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
	'83	00%		00%		00%			
	'89	00%		00%		00%			
	'97	00%		00%		00%			
	'02	00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-
						'89	0		-
						'97	0		-
						'02	40		-
Prunus virginiana									
M	83	-	-	-	-	-	-	0	
	89	-	-	-	-	-	-	0	
	97	-	-	-	-	-	-	0	
	02	-	-	-	-	-	-	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
	'83	00%		00%		00%			
	'89	00%		00%		00%			
	'97	00%		00%		00%			
	'02	00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-
						'89	0		-
						'97	0		-
						'02	0		-

A Y G R E		Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	89	-	2	-	-	1	-	-	-	-	3	-	-	-	200			3
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
	02	7	-	-	1	-	-	-	-	-	8	-	-	-	160			8
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	20	31	1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	4	-	-	-	-	-	-	-	4	-	-	-	80	65	48	4
	02	6	-	-	7	-	-	-	-	-	5	-	8	-	260	48	35	13
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 1%							
'89		100%			00%			00%			-30%							
'97		57%			00%			00%			+67%							
'02		00%			00%			38%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	199	Dec:	-				
											'89	200		-				
											'97	140		-				
											'02	420		-				
Rhus trilobata																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	62	113	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				
											'02	0		-				

Trend Study 16A-11-02

Study site name: Rees Flat.

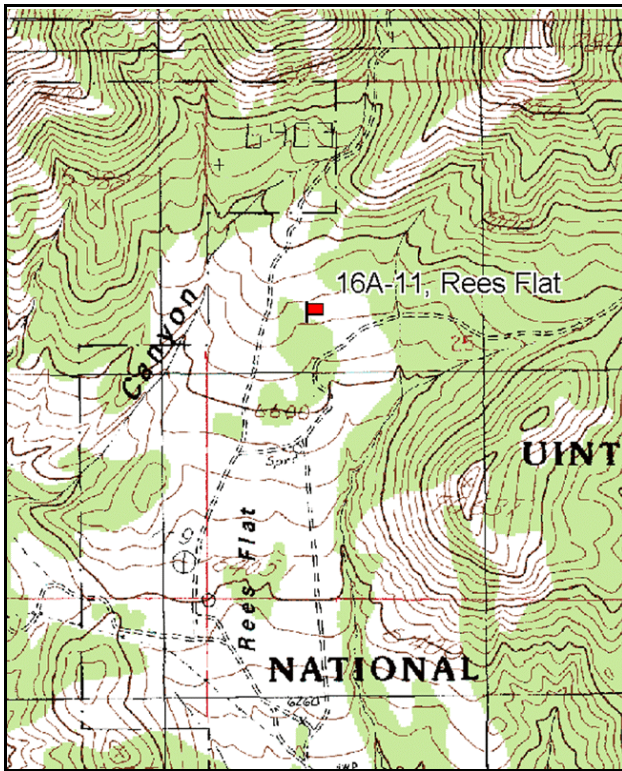
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 344 degrees magnetic (lines 2-4 @ 333°M).

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

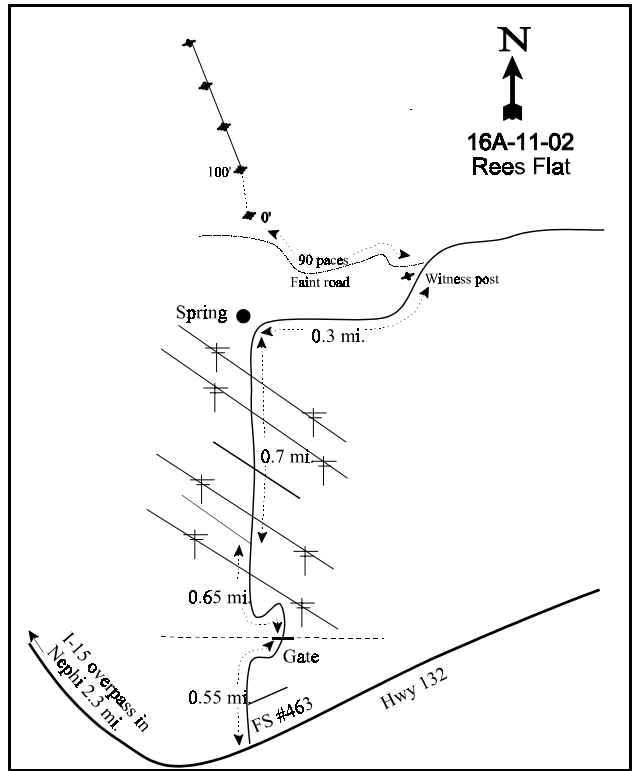
LOCATION DESCRIPTION

Beginning at the overpass where Highway 132 crosses beneath I-15 in Nephi, take Highway 132 east for 2.3 miles. Turn north onto Forest Service Road #463 and go 0.2 miles to a fork in the road. Stay left and go another 0.35 miles to a gate. From the gate, go 0.65 miles to another fork. Stay right on the main road for 0.7 miles passing through a 4-way intersection beneath the powerlines until you come to a spring on the left. Continue 0.3 miles farther along to a 3-foot tall witness post 6 paces northwest of the road near some oak brush. Stop here and walk 90 paces west on a faint road. The 0-foot baseline stake is 9 paces north of the faint road. It is a 12 inch high red post marked by browse tag #3956.



Map Name: Nephi

Township 12S, Range 1E, Section 25



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4399151 N 433453 E

## DISCUSSION

### Rees Flat - Trend Study No. 16A-11

The Rees Flat study is located on a burned and seeded, mixed Gambel oak and mountain big sagebrush type. The site has a gentle (10%) south aspect and an elevation of approximately 6,500 feet. This area is considered a rather high elevation for deer winter range, but elk tend to use it fairly consistently. A moderate number of deer and elk pellet groups, as well as two deer antler drops, were encountered in 1983 when the site was established. In 1997, pellet group quadrat frequency was moderately high for elk and deer at 38% and 26% respectively. Cattle and horses also graze the area in the summer. A pellet group transect read along the study baseline in 2002 estimated 56 deer and 27 elk days use/acre (137 ddu/ha and 66 edu/ha). Cattle use was estimated at 9 days use/acre. Nearly all of the deer pellet groups appear to have been from winter use, while about one-half of the elk pellet groups were from spring use.

Soil on the site is fairly deep with an effective rooting depth estimated at just over 15 inches. Soil texture is a clay loam with a moderately acidic pH of 5.9. The extent of rock in the profile varies along the baseline with the highest amount of rock near the surface along the original 100 feet of the baseline, with noticeably less further down the extended baseline. Litter buildup since the fire has been minimal except within the oak clones. Vegetation cover is much thinner in the openings and consists mostly of low growing bulbous bluegrass. There is little exposed bare ground and erosion is minimal due to the gentle slope. An erosion condition classification assessment was determined as stable in 2002.

The principal browse species are Gambel oak, mountain big sagebrush, and antelope bitterbrush. Gambel oak provided 40% of the browse cover in 1997 with an estimated density of 1,740 stems/acre. It occurs in scattered clones of various sizes. The average height of oak in 1997 was just over 7 feet. Density was similar between 1983 and 1989, but much lower in 1997 and 2002 due to the lengthened baseline and larger sample size. Utilization of the oak has been light, vigor good, and decadence low. Density of oak was estimated at 2,480 stems/acre in 2002. Many of the oak sampled in 2002 displayed poor vigor due to a late spring frost.

The larger sample used in 1997 also picked up more mountain big sagebrush which increased from a density of 499 plants/acre in 1983 along the original baseline to 1,900 plants/acre along the lengthened baseline. Age class composition in 1997 indicated an expanding population. In fact, the sagebrush population had increased by 45% to 3,460 plants/acre in 2002. Utilization continues to be mostly light, vigor good, with low numbers of decadent plants. Mature plants are vigorous with good annual leader growth averaging nearly 3 inches in 2002. Recruitment has been excellent with large numbers of seedlings and young sampled in 1997 and 2002, suggesting further increases in density in the future.

Antelope bitterbrush occurs in small numbers and is more heavily utilized. Density was estimated at 420 plants/acre in 2002. Mature plants average just over 2 feet in height with a crown diameter of 6 feet. Utilization was mostly moderate from 1983-1997, but very heavy in 2002. Annual leader growth of bitterbrush was poor in 2002 averaging only 1.4 inches. Vigor has remained normal and no decadent plants have been sampled during any reading. With this in mind, reproduction appears adequate to maintain a slightly increasing population. The only other common shrub found on the site is broom snakeweed which had a density of 1,500 plants/acre in 1997, increasing to 2,600 by 2002. The population has remained relatively stable since 1983.

Grasses provide a relatively uniform and moderately dense cover within openings, but are rare within the oak clones. Smooth brome is the only species that is shade tolerant. In 1983, livestock grazing apparently depressed the vigor, height, and production of almost all grass species. Grasses are abundant, but composition is dominated by the less desirable bulbous bluegrass which provided 72% of the total grass cover



in 1997, increasing to 77% in 2002. Smooth brome and crested wheatgrass are also fairly abundant. Cheatgrass was found in relatively small numbers in 1997 (6% of grass cover), but due to drought conditions, it was not sampled in 2002. Forbs are diverse yet combined to produce less than 2% total cover in 1997 declining to less than 1% in 2002. The most common species include longleaf phlox and milkvetch.

#### 1983 APPARENT TREND ASSESSMENT

This area is still recovering from fire and long term trend is difficult to determine. Soil trend appears stable, but rapid improvement is being handicapped by intense livestock use. From a vegetative standpoint, Gambel oak is currently at an optimum level of availability and abundance. Openings within the oak contain very little browse except for an increasing population of broom snakeweed. Grasses are abundant but have rather poor vigor. Forb composition and density are at less than optimum levels.

#### 1989 TREND ASSESSMENT

There was some increase in the percentage of vegetative basal cover and rock cover, but an abundant amount (23%) of bare soil still remains. Overall, erosion on the site is minimal and trend appears stable. The population of the dominant Gambel oak is relatively stable. Density of mature plants has declined possibly due to observer differences in classification. There is an abundance of young sprouts. The vigorous and moderately hedged bitterbrush exhibits an improving trend. Twenty-two percent of the population are young plants and biotic potential (# of seedlings) is also good at 22%. Although the mountain big sagebrush appears vigorous and productive, the density of mature plants declined to only 100 per acre. Broom snakeweed declined in density, but there are still 1,600 plants/acre. However, they only contribute 5% of the browse cover. Seeded grass species, namely crested wheatgrass and smooth brome, are found on the site, but bulbous bluegrass dominates the site. Bulbous bluegrass has increased significantly since 1983. Nested frequency of crested wheatgrass shows a decline. Some of the increase in frequency of bulbous bluegrass appears to be due to an identification problem between Sandberg bluegrass and bulbous bluegrass in 1983. Forb composition is similar between years, however they remain of limited forage value.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable overall, slightly down for sagebrush (3)

herbaceous understory - stable (3)

#### 1997 TREND ASSESSMENT

Trend for soil is up slightly. Percent bare ground declined from 23% to 8%, but litter cover declined as well. Some of these changes are due to the larger sample used which sampled less oak and more sagebrush openings. The browse trend is up. More sagebrush was picked up in the larger sample, and 72% of the sagebrush encountered consisted of young plants. This would demonstrate an expanding population. Bitterbrush and Gambel oak appear to have stable populations. Trend for the herbaceous understory is up slightly, but still dominated by the low value increaser bulbous bluegrass. Crested wheatgrass continued to decline in its sum of nested frequency value (not shade tolerant) while smooth brome (shade tolerant) continued to increase.

##### TREND ASSESSMENT

soil - up slightly (4)

browse - up for sagebrush (5)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

Trend for soil is stable. There was a small increase in cover of bare ground but protective ground cover is abundant and there is no significant erosion occurring. Trend for browse is up. Mountain big sagebrush is now the most abundant shrub on the site. It has increased 45% in density from 1,900 plants/acre in 1997 to 3,560 plants/acre in 2002. Use is mostly light, vigor good, decadence low, and recruitment excellent. It appears that the heavy livestock grazing in this area has benefitted shrubs. Bitterbrush numbers only about 400 plants/acre but it contributes 21% of the total browse cover. These plants average just over 2 feet in height but have a large crown diameter which averages 6 feet. They displayed heavy use in 2002, but vigor continues to be normal and no decadent plants were sampled. Recruitment also remains good and the population appears to be slowly expanding. Gambel oak appears to be relatively stable with a similar cover and strip frequency compared to 1997. Trend for the herbaceous understory is stable but still dominated by the low value perennial, bulbous bluegrass. Crested wheatgrass declined significantly in nested frequency while smooth brome increased significantly. Nested frequency of bulbous bluegrass remained stable. Perennial forbs continue to be rare.

### TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 16A, Study no: 11

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	<i>Agropyron cristatum</i>	<sub>c</sub> 159	<sub>b</sub> 117	<sub>b</sub> 94	<sub>a</sub> 33	62	44	38	14	2.14	.42
G	<i>Agropyron spicatum</i>	<sub>b</sub> 24	<sub>ab</sub> 11	<sub>a</sub> -	<sub>a</sub> 4	10	5	-	1	-	.03
G	<i>Bromus inermis</i>	<sub>a</sub> 88	<sub>a</sub> 118	<sub>b</sub> 170	<sub>c</sub> 245	32	40	55	81	5.09	8.34
G	<i>Bromus tectorum</i> (a)	-	-	<sub>b</sub> 48	<sub>a</sub> -	-	-	17	-	2.26	-
G	<i>Dactylis glomerata</i>	6	2	-	-	2	1	-	-	-	-
G	<i>Poa bulbosa</i>	<sub>a</sub> 3	<sub>b</sub> 282	<sub>c</sub> 352	<sub>c</sub> 335	1	85	93	89	26.80	31.76
G	<i>Poa fendleriana</i>	-	3	-	-	-	1	-	-	-	-
G	<i>Poa pratensis</i>	14	14	-	3	4	5	-	1	-	.38
G	<i>Poa secunda</i>	<sub>b</sub> 290	<sub>a</sub> 18	<sub>a</sub> 25	<sub>a</sub> 29	88	6	11	13	.37	.51
Total for Annual Grasses		0	0	48	0	0	0	17	0	2.26	0
Total for Perennial Grasses		584	565	641	649	199	187	197	199	34.42	41.44
Total for Grasses		584	565	689	649	199	187	214	199	36.69	41.44
F	<i>Agoseris glauca</i>	3	-	7	1	1	-	4	1	.19	.03
F	<i>Artemisia ludoviciana</i>	4	3	-	-	2	1	-	-	-	-
F	<i>Astragalus beckwithii</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 14	-	-	-	7	-	.16
F	<i>Aster chilensis</i>	-	10	-	-	-	4	-	-	-	-
F	<i>Astragalus convallarius</i>	-	-	2	-	-	-	1	-	.03	-
F	<i>Astragalus</i> spp.	-	-	15	-	-	-	7	-	.43	-
F	<i>Calochortus nuttallii</i>	3	-	7	-	2	-	4	-	.02	-
F	<i>Cirsium</i> spp.	5	6	4	5	3	4	2	3	.04	.18

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Collomia spp. (a)	-	-	1	-	-	-	1	-	.00	-
F	Comandra pallida	<sub>bc</sub> 23	<sub>c</sub> 29	<sub>ab</sub> 10	<sub>a</sub> 5	10	11	4	2	.48	.03
F	Cymopterus longipes	<sub>b</sub> 10	<sub>a</sub> -	<sub>ab</sub> 5	<sub>ab</sub> 6	7	-	3	3	.04	.04
F	Epilobium brachycarpum (a)	-	-	<sub>b</sub> 19	<sub>a</sub> 3	-	-	8	1	.04	.00
F	Erigeron divergens	-	-	2	-	-	-	1	-	.15	-
F	Lathyrus brachycalyx	2	-	-	-	1	-	-	-	-	-
F	Lactuca serriola	-	-	1	-	-	-	1	-	.00	-
F	Lomatium spp.	-	3	9	-	-	1	5	-	.05	-
F	Machaeranthera canescens	-	9	2	-	-	4	1	-	.00	-
F	Phlox longifolia	16	15	26	11	7	6	11	5	.05	.40
F	Polygonum douglasii (a)	-	-	-	3	-	-	-	1	-	.00
F	Solidago sparsiflora	2	-	-	-	2	-	-	-	-	-
F	Stellaria spp.	5	-	-	-	3	-	-	-	-	-
F	Tragopogon dubius	<sub>b</sub> 14	<sub>ab</sub> 6	<sub>ab</sub> 6	<sub>a</sub> 3	9	3	3	1	.01	.00
F	Unknown forb-annual (a)	-	-	2	-	-	-	1	-	.00	-
F	Viguiera multiflora	<sub>b</sub> 9	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-	-	-
F	Zigadenus paniculatus	-	-	3	1	-	-	1	1	.03	.03
Total for Annual Forbs		0	0	22	6	0	0	10	2	0.04	0.00
Total for Perennial Forbs		96	81	99	46	52	34	48	23	1.54	0.89
Total for Forbs		96	81	121	52	52	34	58	25	1.59	0.90

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 11

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	45	55	4.21	9.89
B	Chrysothamnus nauseosus albicaulis	1	1	.15	.03
B	Chrysothamnus viscidiflorus viscidiflorus	0	2	-	-
B	Gutierrezia sarothrae	18	37	.52	1.52
B	Purshia tridentata	7	15	1.54	4.21
B	Quercus gambelii	14	16	4.35	4.57
Total for Browse		85	126	10.79	20.23

CANOPY COVER --  
Herd unit 16A, Study no: 11

Species	Percent Cover	
	'97	'02
Quercus gambelii	-	1

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 11

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.6
Purshia tridentata	1.4

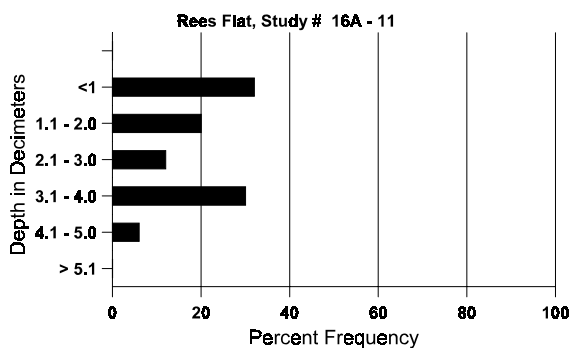
BASIC COVER --  
Herd unit 16A, Study no: 11

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	382	376	.25	8.25	50.06	57.61
Rock	95	72	7.50	7.75	2.80	3.06
Pavement	208	176	3.50	8.25	5.17	2.70
Litter	391	378	54.50	50.00	33.86	38.47
Cryptogams	201	144	.50	3.00	8.60	4.12
Bare Ground	190	189	33.75	22.75	7.52	11.90

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 11, Rees Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.4	48.0 (17.0)	5.9	40.4	33.1	26.6	2.4	29.8	179.2	.4

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 11

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	02	02
Rabbit	2	3	-	-
Elk	38	13	348	27 (66)
Deer	26	29	722	56 (137)
Cattle	2	4	113	9 (23)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 11

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	28	-	-	-	-	-	-	-	-	-	-	-	-	560		28	
	02	18	-	-	-	-	-	-	-	-	-	-	-	-	360		18	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	-	-	-	-	66		2	
	97	68	-	-	-	-	-	-	-	-	-	-	-	-	1360		68	
	02	79	2	2	-	-	-	-	-	-	-	-	-	-	1660		83	
M	83	12	2	-	-	-	-	-	-	-	-	-	-	-	466	18	26	14
	89	2	-	1	-	-	-	-	-	-	-	-	-	-	100	17	13	3
	97	15	6	3	-	-	-	-	-	-	-	-	-	-	480	24	44	24
	02	45	29	5	-	-	-	-	-	-	-	-	-	-	1580	18	36	79
D	83	1	-	-	-	-	-	-	-	-	-	-	-	-	33		1	
	89	-	1	-	-	-	-	-	-	-	-	-	-	-	33		1	
	97	2	-	1	-	-	-	-	-	-	-	-	-	-	60		3	
	02	9	1	1	-	-	-	-	-	-	-	-	-	-	220		11	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		13%			00%			00%			-60%							
'89		17%			17%			17%			+90%							
'97		06%			04%			03%			+45%							
'02		18%			05%			06%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	499	Dec:	7%			
												'89	199		17%			
												'97	1900		3%			
												'02	3460		6%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Chrysothamnus nauseosus albicaulis													
M	83	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	1	-	-	-	-	-	20	9	13	1	
	02	-	-	-	-	-	-	-	0	19	37	0	
D	83	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	0			0	
	02	-	1	-	-	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>		
'83		00%			00%			00%					
'89		00%			00%			00%					
'97		100%			00%			00%			+ 0%		
'02		100%			00%			100%					
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%
										'89	0		0%
										'97	20		0%
										'02	20		100%
Chrysothamnus viscidiflorus viscidiflorus													
Y	83	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	0			0	
	02	1	-	-	-	-	-	-	20			1	
M	83	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	0	10	28	0	
	02	1	-	-	-	-	-	-	20	9	22	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>		
'83		00%			00%			00%					
'89		00%			00%			00%					
'97		00%			00%			00%					
'02		00%			00%			00%					
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-
										'89	0		-
										'97	0		-
										'02	40		-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	'83	22	-	-	-	-	-	-	-	-	22	-	-	-	733		22	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	19	-	-	-	-	-	-	-	-	19	-	-	-	380		19	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	44	-	-	-	-	-	-	-	-	44	-	-	-	1466		44	
	'89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	'97	25	-	-	-	-	-	-	-	-	25	-	-	-	500		25	
	'02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	'83	21	-	-	-	-	-	-	-	-	21	-	-	-	700	8	6	21
	'89	39	-	-	-	-	-	-	-	-	39	-	-	-	1300	9	7	39
	'97	45	-	-	-	-	-	-	-	-	45	-	-	-	900	5	8	45
	'02	91	-	-	-	-	-	3	-	-	94	-	-	-	1880	4	7	94
D	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	'97	5	-	-	-	-	-	-	-	-	-	-	5	100		5		
	'02	30	-	-	-	-	-	-	-	-	19	-	-	11	600		30	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
	'02	-	-	-	-	-	-	-	-	-	-	-	-	200		10		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-27%							
'89		00%			00%			00%			- 6%							
'97		00%			00%			07%			+42%							
'02		00%			00%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2199	Dec:	2%			
												'89	1600		13%			
												'97	1500		7%			
												'02	2600		23%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	2	-	-	2	-	-	-	66		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	1	-	-	-	-	-	-	2	-	-	-	66		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	2	1	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	1	4	-	-	-	-	-	-	-	5	-	-	-	166	16	28	5
	89	-	7	-	-	-	-	-	-	-	7	-	-	-	233	23	39	7
	97	1	6	1	-	-	-	-	-	-	8	-	-	-	160	27	81	8
	02	-	1	17	-	-	-	-	-	-	18	-	-	-	360	27	72	18
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		80%			00%			00%			+44%							
'89		78%			11%			00%			-33%							
'97		60%			10%			00%			+52%							
'02		10%			81%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	-			
												'89	299		-			
												'97	200		-			
												'02	420		-			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	'83	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	'89	18	-	-	11	-	-	2	-	-	31	-	-	-	1033		31	
	'97	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	'89	29	-	-	8	-	-	-	-	-	36	-	-	1	1233		37	
	'97	33	-	-	-	-	-	-	-	-	33	-	-	-	660		33	
	'02	5	-	-	-	-	-	-	-	-	3	-	2	-	100		5	
M	'83	141	-	-	-	-	-	-	-	-	141	-	-	-	4700	46 24	141	
	'89	27	-	-	13	-	-	21	-	-	59	1	-	1	2033	77 36	61	
	'97	40	1	-	13	-	-	-	-	-	54	-	-	-	1080	86 76	54	
	'02	94	-	17	-	-	-	-	-	-	77	-	34	-	2220	62 32	111	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	20	1	-	-	-	-	-	-	-	20	-	-	1	700		21	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	6	-	-	-	-	-	2	-	-	6	-	-	2	160		8	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	120		6	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	300		15	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-19%							
'89		.84%			00%			03%			-56%							
'97		01%			00%			00%			+30%							
'02		00%			14%			31%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4900	Dec:	0%			
												'89	3966		18%			
												'97	1740		0%			
												'02	2480		6%			

Trend Study 16A-12-02

Study site name: Tithing Mountain.

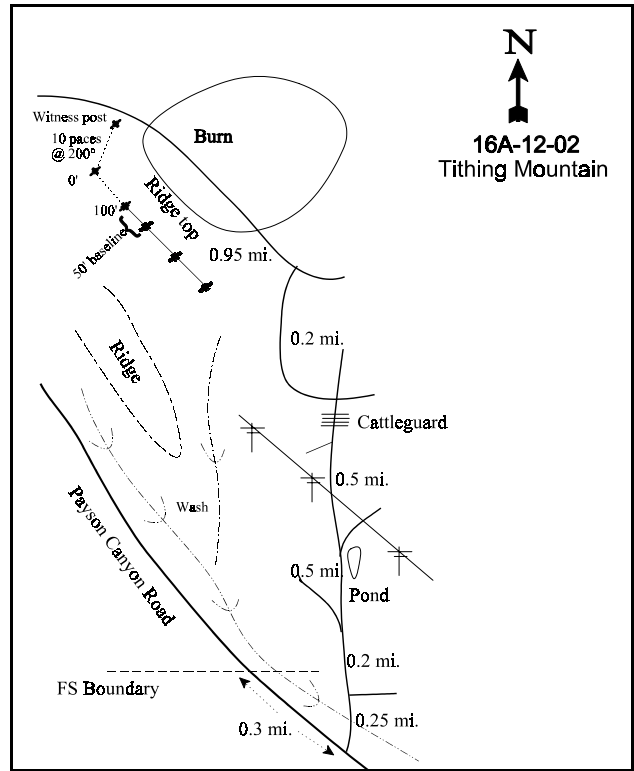
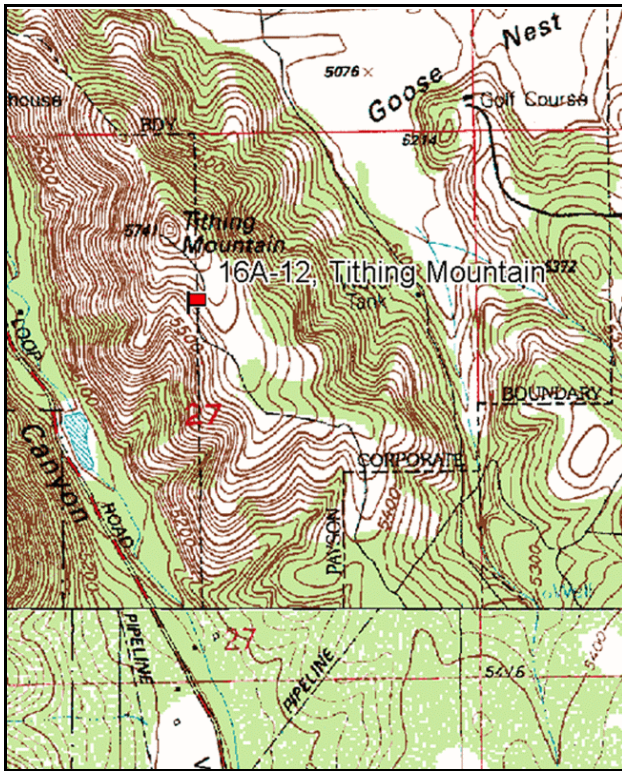
Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 136 degrees magnetic.

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

LOCATION DESCRIPTION

From the old Peteeetneet school at 100 North and 600 East in Payson, head south on 600 East which turns into the Payson Canyon Road. Go 2.9 miles to a flood control basin and a wide spot in the road. Either park here, cross the creek, follow the pipeline south to the first draw, then walk approximately 1/2 mile northwest up this draw to the burn, the road and the transect; **OR** continue driving up the Payson Canyon Road another 1.6 miles to the Forest Service boundary. Go another 0.3 miles and take a rough dirt road on the left (north). Go another 0.25 miles to a side road. Stay straight (left) 0.1 miles further until you cross a cattle guard. Go 0.1 miles beyond the cattle guard until you come to an intersection. At the intersection, go straight for 0.5 miles passing a pond (where you stay left) and crossing beneath the powerlines to another fork in the road. Go straight (north) for another 0.5 miles to a 4-way intersection. Stay left (west) and go 0.2 miles to a 3-way intersection where you will turn right (west). Go 0.95 miles to a witness post/rock pile on the left side of the road. From here, the 0-foot baseline stake (marked by browse tag #9083) is 10 paces away at 200 degrees magnetic.



Map Name: Spanish Fork

Diagrammatic Sketch

Township 9S, Range 2E, Section 27

GPS: NAD 27, UTM 12S 4428846 N 440144 E

## DISCUSSION

### Tithing Mountain - Trend Study No. 16A-12

The Tithing Mountain study was established in 1989 on private land to monitor critical big game winter range in an area southeast of Payson, Utah. The ridge is occupied by a stand of cliffrose with an association of mountain big sagebrush and Gambel oak. Exposure at the site is to the southeast on a 14% slope at an elevation of 5,700 feet. There is no water available on the ridge, however there has been sign in the past of significant winter use by deer and elk. It appears that domestic sheep trail through the area. In 1997, there was only sign of light deer use on the area with a pellet group frequency of only 7%. This increased considerably in 2002 to 21%. A pellet group transect read along the study site baseline in 2002 estimated 68 deer and 3 elk days use/acre (167 ddu/ha and 8 edu/ha). Most of the deer pellet groups were from winter use but a few deer appear to use the area in the spring as well.

The stony clay loam soil is well drained and moderately shallow with an effective rooting depth estimated at almost 10 inches. Soil texture is a clay loam with a slightly acidic pH of 6.3. Cobble sized rocks are common throughout the soil profile. Runoff and erosion are low and there is good protective ground cover providing protection to the soil. The soil erosion condition classification was determined to be stable in 2002.

The key browse on the site is Stansbury cliffrose which produced 76% of the browse cover in 1997, increasing to 91% in 2002. The dominant cliffrose was infrequently encountered, but a fair sample of the largely mature, partly unavailable cliffrose population was obtained on the density plots in 1989 (466 plants/acre). The population appeared stable with an equal number of young and decadent plants counted that year. The young shrubs averaged 2.5 feet in height. Older cliffrose got up to 8 feet in height and had large branches broken down, possibly due to heavy snow in the past and/or big game browsing. The tall shrubs tended to be moderately to heavily hedged on the available portions. Population density increased by 39% in 1997, mostly due to the larger, more representative sample used that year. No young plants were sampled. Utilization was heavier with 61% of the cliffrose sampled displaying heavy use. Vigor was good and there were few decadent plants. Use remained heavy on available cliffrose in 2002, but vigor was normal on most plants and the number of decadent plants remained stable. Mountain big sagebrush is the only other preferred browse species found on the site. It occurs in small numbers, shows moderate to heavy use, and displays good vigor.

The herbaceous understory is abundant but in poor condition. It is dominated by annuals and low value perennial weeds. Cheatgrass and Japanese brome comprised 92% of the grass cover in 1997 with a combined cover value of 29%. In 2002, no Japanese brome was encountered, but cheatgrass still dominates the site by providing 73% of the grass cover. These fine fuels pose a significant fire hazard to the future survival of the non-sprouting key browse species, sagebrush and cliffrose. There is a limited amount of perennial grass cover, most of which is made up from the low value perennial, bulbous bluegrass. Forbs are common, diverse, and provide more cover than grasses. However, composition is extremely poor with annuals such as storksbill, bedstraw, and bur buttercup making up 65% of the forb cover in 2002. The perennial forb composition is also poor and composed mostly of weedy species. The highly undesirable invader, whitetop, is common and has increased significantly in its sum of nested frequency value since 1989. Other common perennial forbs include weedy species such as prickly lettuce and dandelion, both somewhat valued as forage by wildlife.

### 1989 APPARENT TREND ASSESSMENT

The soil appears to be in a stable condition. There is no evidence of significant erosion at the study site, although steeper slopes are highly eroded. The browse stand currently appears stable. A wildfire has the highest potential of severely disturbing the site. Ubiquitous and undesirable invader herbaceous species take over this range type after a fire. The area provides a limited amount of winter range.

### 1997 TREND ASSESSMENT

Trend for soil appears stable. Litter cover has declined, but percent bare ground has also decreased. The browse trend is stable. Cliffrose shows moderate to heavy use, but vigor is normal and percent decadence is low at 13%. Mountain big sagebrush also appears to have a stable population. The herbaceous understory is abundant, but totally dominated by annuals, producing a very poor composition. Since annuals were not included in the previous reading, no comparisons can be made. Trend for perennial grasses is stable but they are lacking. Trend for perennial forbs is considered up slightly due to an increase in sum of nested frequency values. However, nested frequency of the noxious weed, whitetop, also increased significantly. The high density of annual grasses makes a wildfire a distinct possibility in the future.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly, but in poor condition (4)

### 2002 TREND ASSESSMENT

Trend for soil continues to be stable. Protective ground cover is abundant leaving little unprotected bare ground. Trend for the key browse species, Stansbury cliffrose, is also stable. It displays moderate to heavy use on available plants, but vigor is normal on most and the number of decadent plants has remained stable. Reproduction is non-existent. Mountain big sagebrush also shows moderate to heavy use, good vigor, and low decadence. Trend for the herbaceous understory is stable. Japanese brome which was abundant in 1997, was not encountered in 2002. Cheatgrass is still abundant, producing 73% of the grass cover with a cover value of 16%. Cover and frequency of perennial grasses have increased but the improvement is due to a significant increase in the low value perennial, bulbous bluegrass. The forb portion of the herbaceous understory continues to be dominated by annual and perennial weeds. The invasive weed, whitetop, has increased significantly in nested frequency since 1997. It now provides 22% of the total forb cover. The abundant and weedy understory causes intense competition to the establishment of shrub seedlings and provides fine fuels for wildfire. A fire on this site will destroy the value of this area as big game winter range.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 12

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron spicatum	10	3	-	3	1	-	.03	-
G	Bromus japonicus (a)	-	<sub>b</sub> 297	<sub>a</sub> -	-	86	-	15.63	-
G	Bromus tectorum (a)	-	300	267	-	91	82	12.92	15.48
G	Festuca myuros (a)	-	<sub>b</sub> 47	<sub>a</sub> -	-	16	-	.18	-
G	Poa bulbosa	<sub>a</sub> -	<sub>b</sub> 15	<sub>c</sub> 104	-	7	39	1.45	5.55
G	Poa pratensis	5	5	3	2	2	1	.03	.00
G	Poa secunda	<sub>ab</sub> 28	<sub>b</sub> 30	<sub>a</sub> 3	11	14	3	.74	.04
Total for Annual Grasses		0	644	267	0	193	82	28.74	15.48
Total for Perennial Grasses		43	53	110	16	24	43	2.26	5.59
Total for Grasses		43	697	377	16	217	125	31.01	21.08
F	Alyssum alyssoides (a)	-	<sub>b</sub> 98	<sub>a</sub> 16	-	37	6	.56	.05
F	Allium spp.	6	-	2	5	-	1	-	.00
F	Asclepias asperula	3	-	-	1	-	-	-	-
F	Cardaria draba	<sub>a</sub> 49	<sub>b</sub> 112	<sub>c</sub> 188	18	43	67	4.88	7.82
F	Camelina microcarpa (a)	-	9	9	-	3	4	.04	.02
F	Calochortus nuttallii	-	-	2	-	-	1	.00	.00
F	Collinsia parviflora (a)	-	61	70	-	22	30	.30	.49
F	Cymopterus longipes	7	15	15	3	8	10	.11	.10
F	Epilobium brachycarpum (a)	-	<sub>b</sub> 59	<sub>a</sub> 9	-	26	4	.91	.04
F	Eriogonum brevicaule	-	-	11	-	-	4	-	.02
F	Erodium cicutarium (a)	-	<sub>a</sub> 197	<sub>b</sub> 229	-	69	77	4.78	10.46
F	Erigeron divergens	-	-	3	-	-	1	-	.15
F	Eriogonum ovalifolium	-	-	2	-	-	1	-	.03
F	Galium aparine (a)	<sub>a</sub> 104	<sub>b</sub> 140	<sub>c</sub> 179	43	48	59	6.00	7.63
F	Helianthus annuus (a)	9	-	-	4	-	-	-	-
F	Holosteum umbellatum (a)	-	<sub>b</sub> 67	<sub>a</sub> 19	-	28	9	.28	.05
F	Lactuca serriola	<sub>b</sub> 148	<sub>c</sub> 204	<sub>a</sub> 89	64	80	39	5.83	.86
F	Lomatium spp.	-	-	6	-	-	2	-	.06
F	Medicago sativa	-	2	-	-	1	-	.00	-
F	Microsteris gracilis (a)	-	9	-	-	3	-	.01	-
F	Montia perfoliata (a)	-	<sub>a</sub> -	<sub>b</sub> 33	-	-	15	-	.22
F	Phlox longifolia	2	-	-	1	-	-	-	-
F	Polygonum douglasii (a)	-	3	5	-	1	2	.00	.01
F	Ranunculus spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 37	-	-	15	-	.41
F	Ranunculus testiculatus (a)	-	22	29	-	9	13	.09	.09
F	Taraxacum officinale	<sub>a</sub> 3	<sub>b</sub> 39	<sub>b</sub> 61	1	17	26	1.21	2.37
F	Tragopogon dubius	<sub>a</sub> 25	<sub>b</sub> 62	<sub>a</sub> 41	15	34	19	.62	.46

Type	Species	Nestled Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Unknown forb-annual (a)	-	<sub>a</sub> 19	<sub>b</sub> 56	-	8	21	.38	3.12
F	Unknown forb-perennial	-	4	-	-	1	-	.38	-
F	Veronica biloba (a)	-	37	46	-	12	15	.57	.66
F	Zigadenus paniculatus	1	3	3	1	1	1	.00	.00
Total for Annual Forbs		113	721	700	47	266	255	13.96	22.86
Total for Perennial Forbs		244	441	460	109	185	187	13.05	12.32
Total for Forbs		357	1162	1160	156	451	442	27.02	35.18

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 12

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	28	12	2.54	.66
B	Cowania mexicana stansburiana	32	26	13.96	14.17
B	Opuntia spp.	0	1	.03	.15
B	Purshia tridentata	1	0	-	-
B	Quercus gambelii	1	2	1.82	.53
Total for Browse		62	41	18.37	15.51

#### CANOPY COVER --

Herd unit 16A, Study no: 12

Species	Percent Cover	
	'97	'02
Artemisia tridentata vaseyana	-	.80
Cowania mexicana stansburiana	22	18
Quercus gambelii	1.2	-

#### Key Browse Annual Leader Growth

Herd unit 16A, Study no: 12

Species	Average leader growth (in)
	'02
Cowania mexicana stansburiana	0.8

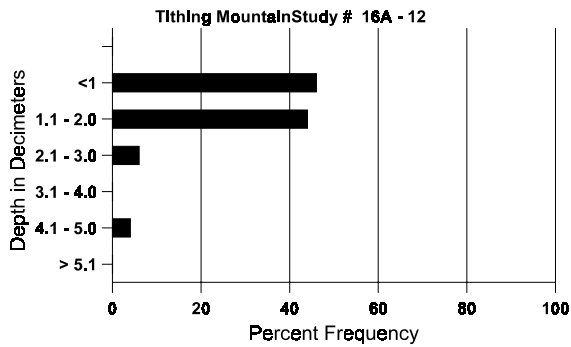
BASIC COVER --  
Herd unit 16A, Study no: 12

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	390	374	2.50	59.62	64.40
Rock	148	161	5.25	9.61	7.72
Pavement	108	77	.25	3.13	1.05
Litter	400	368	84.25	61.15	40.52
Cryptogams	6	-	.75	.06	0
Bare Ground	120	144	7.00	3.39	6.54

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 12, Tithing Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.4	53.6 (12.4)	6.3	38.4	29.1	32.6	3.4	22.0	92.8	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 12

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	-	2	0	-
Elk	-	-	44	3 (8)
Deer	7	21	879	68 (167)
Sheep	-	-	44	3 (8)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 12

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	8	-	-	-	-	-	-	-	-	8	-	-	-	266		8	
	97	9	-	-	-	-	-	-	-	9	-	-	-	180		9		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
M	89	-	3	3	-	-	-	-	-	6	-	-	-	200	20	38	6	
	97	11	1	1	3	-	2	-	-	18	-	-	-	360	24	37	18	
	02	6	3	1	-	-	-	-	-	10	-	-	-	200	24	31	10	
D	89	2	3	1	-	-	-	-	-	3	-	2	1	200		6		
	97	2	-	2	-	-	-	-	-	3	-	-	1	80		4		
	02	-	-	2	-	-	-	-	-	2	-	-	-	40		2		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	180		9		
	02	-	-	-	-	-	-	-	-	-	-	-	-	120		6		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		30%			20%			15%			- 7%							
'97		03%			16%			03%			-61%							
'02		25%			25%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	666	Dec:	30%				
											'97	620		13%				
											'02	240		17%				
<i>Cowania mexicana stansburiana</i>																		
Y	89	1	1	1	-	-	-	-	-	3	-	-	-	100		3		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
M	89	2	2	1	-	2	1	-	-	8	-	-	-	266	56	58	8	
	97	2	4	7	-	6	11	3	-	33	-	-	-	660	97	105	33	
	02	-	1	5	-	2	9	5	2	23	-	-	1	480	87	89	24	
D	89	-	1	1	-	1	-	-	-	3	-	-	-	100		3		
	97	-	-	4	-	-	1	-	-	2	-	-	3	100		5		
	02	-	-	-	-	-	-	4	1	2	-	-	3	100		5		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	80		4		
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			29%			00%			+39%							
'97		26%			61%			08%			-24%							
'02		10%			48%			14%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	466	Dec:	21%				
											'97	760		13%				
											'02	580		17%				



A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	7	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	20		-			
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	1	-	-	-	-	1	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		100%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			
Quercus gambelii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	3	-	-	3	-	-	-	-	-	6	-	-	-	120			6
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	37	39	4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	72	56	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+43%							
'02		00%			00%			14%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	80		0%			
												'02	140		14%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rosa woodsii																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	73	91	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16A-13-02

Study site name: Steele Ranch.

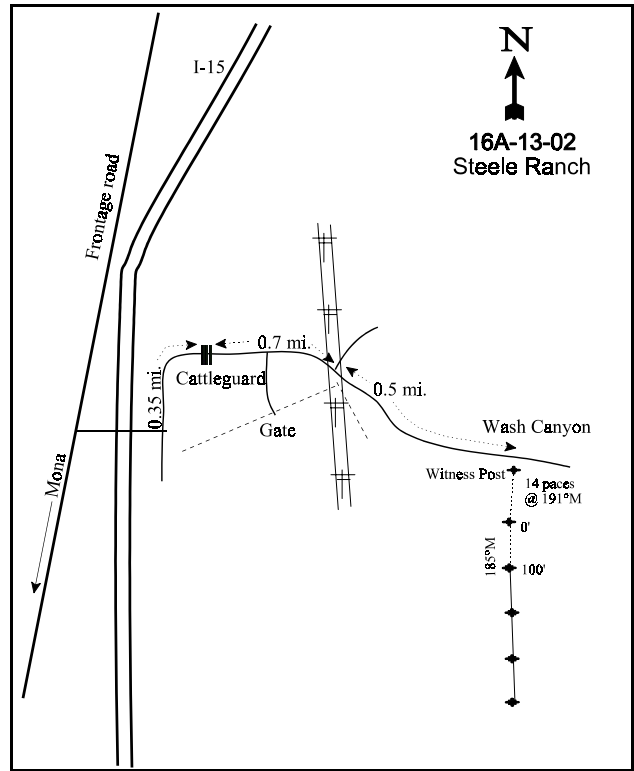
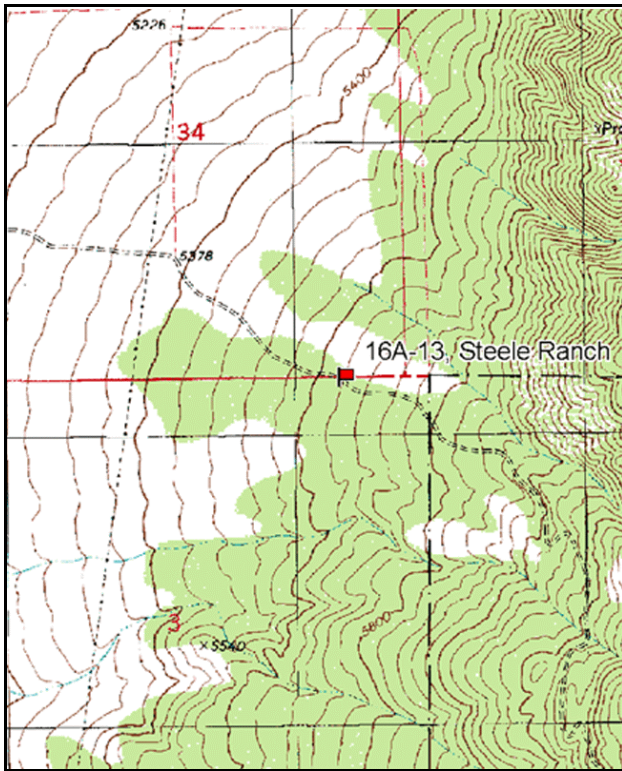
Vegetation type: Mixed Oak-Sage.

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

From 200 North Main Street in Mona, take the frontage road north towards Santaquin. Go 5.35 miles and turn east onto a gravel road that goes beneath the I-15 overpass. After passing beneath I-15, the road comes to a "T", go left 0.35 miles to a cattle guard. Continue up the road 0.7 miles to a fence corner and a fork in the road. Stay to the right (south) for 0.5 miles to the witness post on the south side of the road. From the witness post the 0-foot baseline stake is 14 paces away at 187 degrees magnetic. The 0-foot stake is marked with browse tag #182.



Map Name: Santaquin

Diagrammatic Sketch

Township 11S, Range 1E, Section 3

GPS: NAD 27, UTM 12S 4416158 N 431150 E

## DISCUSSION

### Steele Ranch - Trend Study No. 16A-13

The Steele Ranch study is on Division property and is typical of the mixed oak-big sagebrush type along the foothills of the Wasatch Front. Much of the type has been converted to agriculture or has been heavily grazed by domestic livestock. This site is representative of what remains of the native winter range along the mountain front. The site slopes (10-15%) to the west at an elevation of 5,620 feet. Depending on the severity of the winter, the site receives moderate to heavy use by deer and light use from elk. Pellet group data from 1997 estimated little deer use, with no elk sign noted. A pellet group transect read along the study baseline in 2002 estimated 62 deer days use/acre (154 ddu/ha).

Soil at the site is relatively deep with an effective rooting depth estimated at almost 11 inches. Soil texture is a loam with a neutral pH (7.2). Rocks are common on the surface and within the profile. Phosphorus in the soil is marginal at only 9.1 ppm. Values less than 10 ppm may be limiting to normal plant growth and development. Little bare soil is exposed, making the threat of erosion minimal on the site.

Mountain big sagebrush dominates much of the area, although site observations and data from 1989 suggested an expanding oak population. Sagebrush has maintained a stable density of around 3,000 plants/acre since 1989. Use was moderate in 1989, and moderate to heavy in 1997 and 2002. Due to drought conditions, poor vigor was expressed on 35% of the shrubs sampled in 2002 and 60% were decadent. In addition, 58% of the decadent sagebrush were classified as dying. Recruitment is marginal. While in some places sagebrush decadence may be caused by competition and shading with the oakbrush, this does not appear to be the case over the entire area.

The oakbrush is very patchy in its clonal distribution, yet produces as much cover as sagebrush. The height of oak is variable with some clones growing to 10 feet, while others are less than two feet. One of the old density plots contained 99% of the oak sampled in 1989. This small sample indicated that there was a stand of very dense young sprouts. In general, the age class structure was indicative of an increasing population. Twenty-two percent of the available oak had sustained moderate hedging in 1989. With the larger sample size used in 1997, the density of oak showed a slight increase to 10,320 stems/acre. Most of the plants were classified as mature (81%), but differentiating young oak from small mature plants is difficult. It is likely that many short mature plants were classified as young in 1989. The extended baseline samples a rocky area which supports some low growing mature oak. Young plants were common making up 16% of the population. Oakbrush increased to 15,940 stems/acre in 2002. Use was light on most plants but heavy on some of the low growing mature plants. Vigor was reduced on 25% of the plants sampled due to frost damage from the spring of 2002.

The herbaceous understory is functionally limited to Sandberg bluegrass which provided 88% of the grass cover in 1997 and 77% in 2002. It has a fairly high density, but produces little forage compared to other native bunchgrasses. Forbs are diverse but not abundant. Twenty-three species of annual and perennial forbs were sampled in 1997, and combined to produce only about 3% cover. The herbaceous species only contributed 17% of the total vegetative cover in 1997, increasing to 27% in 2002.

### 1989 APPARENT TREND ASSESSMENT

The soil appears stable. Little change would be expected to occur with the pavement dominated surface. There are two notable indicators of a downward trend presently apparent on the site: the expanding, highly competitive oakbrush and the high level of decadence in the mountain big sagebrush population. Vigor is good and utilization is sustainable on this key browse species. The herbaceous understory is depleted and basically nonproductive.

## 1997 TREND ASSESSMENT

The soil trend is currently stable. Ground cover characteristics have remained similar to the 1989 observations. The browse trend for sagebrush is stable. Some of the change in density may be due to the larger sample which gives more accurate estimates of shrub densities. However, it is apparent that some of the decadent plants sampled in 1989 have died. Currently, percent decadence has declined from 55% to only 19%. Use is moderate to heavy, but vigor is normal on most plants. Oak has a similar population density compared to 1989. The proportion of young plants has changed drastically, although some of the change may be due to classification errors and the larger sample size. The population appears to be increasing with the combination of good recruitment, low decadence, and good vigor. Overall browse trend is considered stable. The herbaceous understory is insufficient. Sum of nested frequency for grasses has remained similar to 1989, while sum of nested frequency for forbs has increased slightly. Trend overall is considered stable.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, but insufficient (3)

## 2002 TREND ASSESSMENT

Trend for soil remains stable. There is abundant protective ground cover leaving little exposed bare ground. Trend for the key browse species, mountain big sagebrush, is considered down slightly. Density has increased since 1997, but due to drought conditions for the past few years, the number of decadent plants has increased from 19% of the population to 60%. In addition, 58% of the decadent plants sampled were classified as dying (>50% crown death). Recruitment is marginal and not sufficient to maintain the current population, especially if drought conditions persist. Gambel oak continues to slowly increase in density. It is mostly lightly browsed, generally in good vigor, with low decadence. Trend for the herbaceous understory is stable but still depleted. Sum of nested frequency of perennial grasses has remained stable while frequency of perennial forbs has increased. However, total herbaceous cover is only 10%. The only abundant perennial species is Sandberg bluegrass which accounts for almost one-half of the total herbaceous cover. It has remained stable in nested frequency.

### TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - stable but depleted (3)

## HERBACEOUS TRENDS --

Herd unit 16A, Study no: 13

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron spicatum	-	-	8	-	-	3	-	.09
G	Bromus tectorum (a)	-	<sub>a</sub> 100	<sub>b</sub> 131	-	34	51	.29	.65
G	Festuca myuros (a)	-	<sub>b</sub> 30	<sub>a</sub> -	-	12	-	.06	-
G	Poa fendleriana	<sub>a</sub> 1	<sub>ab</sub> 16	<sub>b</sub> 26	1	5	11	.08	.61
G	Poa secunda	235	233	218	83	80	77	3.29	4.68
G	Sitanion hystrix	-	-	2	-	-	1	-	.03
Total for Annual Grasses		0	130	131	0	46	51	0.35	0.64
Total for Perennial Grasses		236	249	254	84	85	92	3.37	5.42
Total for Grasses		236	379	385	84	131	143	3.73	6.07

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Agoseris glauca</i>	-	8	5	-	4	3	.02	.04
F	<i>Alyssum alyssoides</i> (a)	-	<sub>b</sub> 234	<sub>a</sub> 163	-	68	52	.51	.83
F	<i>Allium</i> spp.	-	2	-	-	1	-	.00	-
F	<i>Antennaria rosea</i>	-	-	1	-	-	1	-	.00
F	<i>Arabis</i> spp.	5	1	2	2	1	1	.00	.00
F	<i>Astragalus beckwithii</i>	<sub>a</sub> 3	<sub>b</sub> 11	<sub>a</sub> -	1	6	-	.08	-
F	<i>Astragalus eurekaensis</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 30	-	-	13	-	.18
F	<i>Astragalus utahensis</i>	-	2	-	-	2	-	.03	-
F	<i>Castilleja linariaefolia</i>	-	6	6	-	3	2	.04	.06
F	<i>Calochortus nuttallii</i>	<sub>a</sub> 21	<sub>a</sub> 34	<sub>b</sub> 77	12	16	37	.08	.23
F	<i>Castilleja</i> spp.	6	3	-	4	2	-	.01	-
F	<i>Comandra pallida</i>	-	-	4	-	-	2	-	.03
F	<i>Collinsia parviflora</i> (a)	-	<sub>a</sub> 6	<sub>b</sub> 21	-	3	9	.01	.04
F	<i>Crepis acuminata</i>	-	-	5	-	-	3	-	.07
F	<i>Cryptantha</i> spp.	-	3	-	-	1	-	.00	-
F	<i>Draba</i> spp. (a)	-	-	1	-	-	1	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	12	6	-	6	4	.03	.02
F	<i>Erigeron pumilus</i>	-	-	-	-	-	-	-	.00
F	<i>Eriogonum racemosum</i>	3	2	-	1	1	-	.00	-
F	<i>Galium aparine</i> (a)	-	<sub>b</sub> 77	<sub>a</sub> 58	-	26	22	.96	.23
F	<i>Holosteum umbellatum</i> (a)	-	51	32	-	17	12	.13	.06
F	<i>Lactuca serriola</i>	-	-	3	-	-	1	-	.00
F	<i>Lomatium</i> spp.	<sub>a</sub> 5	<sub>b</sub> 33	<sub>b</sub> 23	4	14	13	.48	.36
F	<i>Microsteris gracilis</i> (a)	-	-	6	-	-	3	-	.01
F	<i>Petradoria pumila</i>	3	-	1	1	-	1	-	.00
F	<i>Phlox longifolia</i>	20	35	24	8	16	12	.10	.11
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>a</sub> 116	<sub>b</sub> 147	-	37	45	.47	1.95
F	<i>Tragopogon dubius</i>	3	4	1	1	2	1	.01	.01
F	Unknown forb-annual (a)	-	6	-	-	3	-	.01	-
F	<i>Veronica biloba</i> (a)	-	2	6	-	1	2	.00	.01
F	<i>Viola</i> spp.	-	3	5	-	2	3	.01	.01
F	<i>Zigadenus paniculatus</i>	-	-	1	-	-	1	.01	.01
Total for Annual Forbs		0	504	440	0	161	150	2.15	3.18
Total for Perennial Forbs		69	147	188	34	71	94	0.91	1.17
Total for Forbs		69	651	628	34	232	244	3.07	4.35

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	75	75	13.34	13.93
B	Gutierrezia sarothrae	2	5	.06	.19
B	Quercus gambelii	55	58	18.79	13.64
Total for Browse		132	138	32.20	27.76

CANOPY COVER --  
Herd unit 16A, Study no: 13

Species	Percent Cover	
	'97	'02
Quercus gambelii	14	17

Key Browse Annual Leader Growth  
Herd unit 16A , Study no: 13

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.8

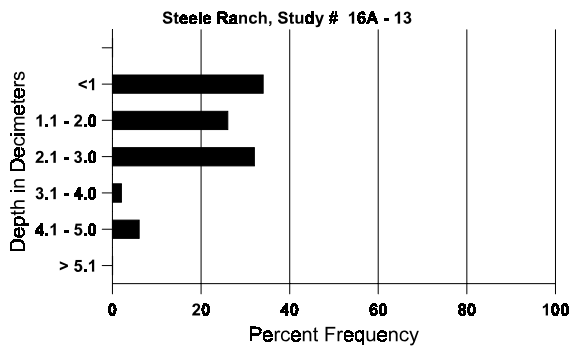
BASIC COVER --  
Herd unit 16A, Study no: 13

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	367	338	3.00	38.51	36.13
Rock	166	152	3.75	5.61	5.34
Pavement	172	167	26.75	9.78	8.90
Litter	397	388	56.75	58.58	60.54
Cryptogams	161	122	5.75	3.87	4.72
Bare Ground	150	153	4.00	4.83	6.14

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 13, Steele Ranch

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.6	47.6 (13.1)	7.2	37.1	41.1	21.8	4.0	9.1	86.4	.7

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 13

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	5	3	-	-
Deer	7	15	809	62 (154)

## BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 13

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Artemisia tridentata vaseyana</i>																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
Y	89	4	1	-	-	-	-	-	-	-	5	-	-	-	333		5
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	6	3	-	3	-	-	-	-	-	12	-	-	-	240		12
M	89	8	7	-	1	-	-	-	-	-	16	-	-	-	1066	22 23	16
	97	34	43	19	2	2	-	-	-	-	100	-	-	-	2000	26 40	100
	02	17	24	11	2	-	-	-	-	-	54	-	-	-	1080	25 36	54
D	89	8	18	-	-	-	-	-	-	-	22	-	4	-	1733		26
	97	5	10	8	-	-	-	-	-	-	14	-	-	9	460		23
	02	29	14	44	-	7	3	4	-	-	39	-	-	59	2020		101
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	460		23
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	820		41
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		55%			00%			09%			-21%						
'97		44%			22%			07%			+26%						
'02		29%			35%			35%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	3132	Dec:	55%			
											'97	2480		19%			
											'02	3340		60%			



A Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Gutierrezia sarothrae</b>																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	4	2	1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	6	9	4
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	4	5	5
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	1	-	-	-	-	-	-	-	-	-	1	-	20		1		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-85%							
'97		00%			00%			00%			+33%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	532	Dec:	12%				
											'97	80		0%				
											'02	120		17%				
<b>Quercus gambelii</b>																		
S	89	6	-	-	-	-	-	5	-	-	11	-	-	-	733		11	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
	02	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
Y	89	85	18	1	4	-	-	-	-	-	108	-	-	-	7200		108	
	97	85	-	-	-	-	-	-	-	-	85	-	-	-	1700		85	
	02	12	-	10	16	-	-	13	-	-	43	-	8	-	1020		51	
M	89	10	9	-	-	-	-	-	-	-	19	-	-	-	1266	33	24	19
	97	419	-	-	-	-	-	-	-	-	419	-	-	-	8380	54	40	419
	02	591	31	28	23	-	48	25	-	-	553	-	168	25	14920	44	27	746
D	89	12	4	-	-	-	-	-	-	-	15	-	1	-	1066		16	
	97	12	-	-	-	-	-	-	-	-	11	-	-	1	240		12	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	920		46		
	02	-	-	-	-	-	-	-	-	-	-	-	-	320		16		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		22%			.69%			.69%			+ 8%							
'97		00%			00%			.19%			+35%							
'02		04%			11%			25%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	9532	Dec:	11%				
											'97	10320		2%				
											'02	15940		0%				

Trend Study 16A-14-02

Study site name: Big Hollow.

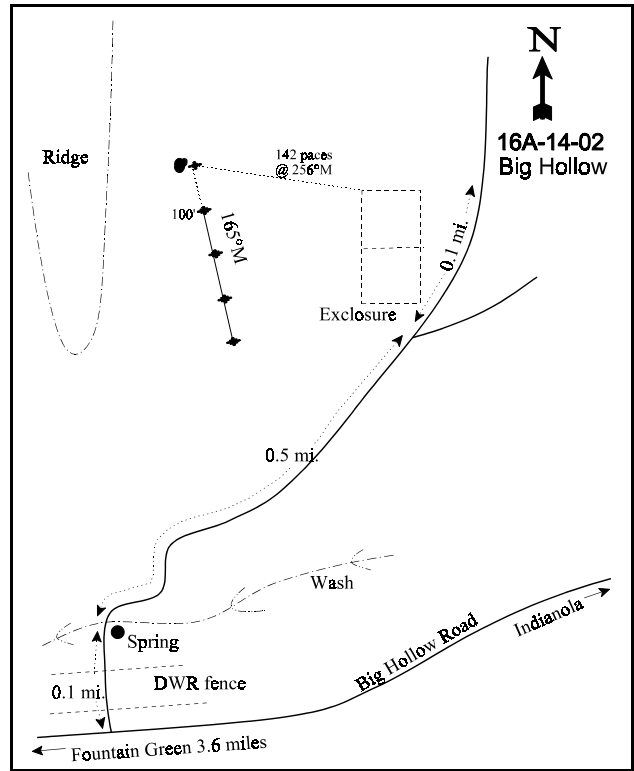
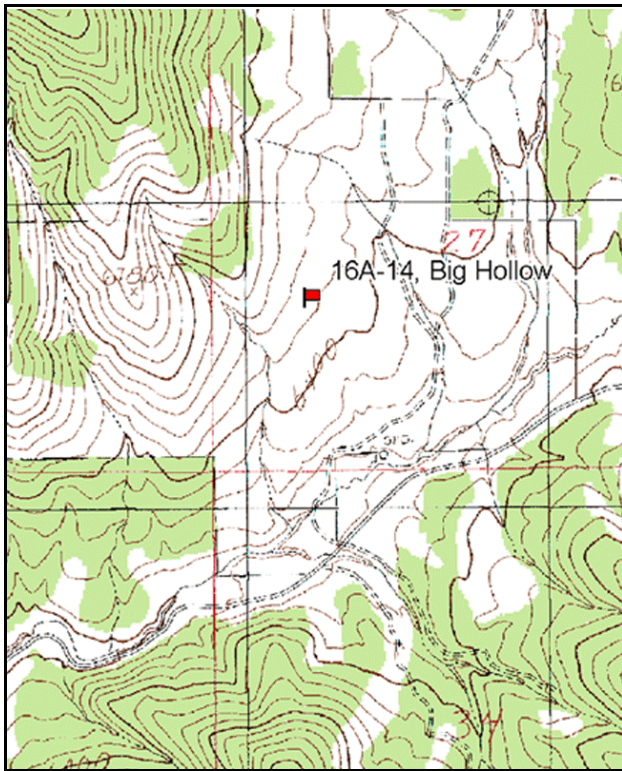
Vegetation type: Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: no rebar placed on site.

LOCATION DESCRIPTION

At the intersection of State Street and 100 North in Fountain Green, go east on 100 North for 0.3 miles to the old dump. Continue up Big Hollow for 3.3 miles to a gate parallel to the road onto DWR land. Turn left through the gates and go 0.1 miles to a spring in a wash. Continue on this road for 0.5 miles to a fork. Stay left and go 0.1 miles to the north end of an enclosure. Park here. From the northwest corner of the enclosure, walk 142 paces at a bearing of 256 degrees M to a tall fencepost in the sagebrush. This 4-foot tall green fencepost is the 0-foot baseline stake.



Map Name: Big Hollow

Diagrammatic Sketch

Township 13S, Range 3E, Section 27

GPS: NAD 27, UTM 12S 4389659 N 450200 E

## DISCUSSION

### Big Hollow - Trend Study No. 16A-14

The Big Hollow study is located on Division property east of Fountain Green on a large area that was chained in 1964. However, there is little evidence of the treatment on the site which is located near the bottom of a ridge. Trees appear to have never been very dense on the site, and no seeded species are present. Other areas of the chaining were apparently more heavily seeded. Point-quarter data from 2002 estimated only 24 scattered junipers trees/acre on the site, averaging 6-10 feet in height. Average diameter was about 6 inches. The dominant vegetation is basin big sagebrush with a smaller element of bitterbrush. There is a perennial spring 200 yards southeast of the study. Due to the availability of water during the dry year of 1989, deer were using the area during the summer. However, the majority of big game use occurs in winter and spring. One recent winter-killed fawn was found on the site in 1989. In 1997, rabbit pellet groups were relatively abundant with a quadrat frequency of 26%. A pellet group transect of 50, 100ft<sup>2</sup> circular plots was read in 1997 and estimated 31 deer days use/acre, 2 elk days use/acre, and 6 cattle days use/acre (77 ddu/ha, 5 edu/ha, and 15 cdu/ha). Pellet group transect data from 2002 estimated 62 deer, 1 elk, and 8 cow days use/acre (153 ddu/ha, 3 edu/ha, and 20 cdu/ha). Most of the deer pellet groups were from winter use. Rabbit pellets are very abundant and have increased in quadrat frequency from 26% in 1997 to 73% in 2002.

The soil is a moderately deep, sandy clay loam with an effective rooting depth of almost 12 inches. It contains a substantial amount of small rocks that are concentrated as erosion pavement on the soil surface. Rock and pavement cover together had a cover value of 30% in 1989, 23% in 1997, and 20% in 2002. Rock is concentrated in the upper 8 inches of the soil profile. As a result, soil temperature was relatively high, averaging 63°F at an average depth of 13 inches. Litter cover is moderately low due to the sparse herbaceous understory. Percent bare ground was 17% in 1989, increasing to 21% by 2002. Considering the amount of rock, pavement, and exposed soil, there is little erosion because of the level topography. In addition, the soil erosion condition classification was determined as stable in 2002.

As winter range, browse is the key forage component. Basin big sagebrush (*Artemisia tridentata tridentata*) made up 63% of the browse cover in 1997, increasing to 82% in 2002. It is characteristically tall and vigorous with mostly light utilization. Population density was originally estimated at 2,599 plants/acre in 1989. Recruitment was adequate, vigor good, but percent decadency was moderately high at 33%. Data from 1997 show a 32% decline in density to 1,780 plants/acre. The number of mature plants remained similar with the density of young and decadent plants decreasing. Some of the difference between years may be due to the larger sample used in 1997, but 42% of the difference can be explained by the number of dead plants on the site (340 plants/acre). Density and cover of sagebrush remained similar in 2002 at 1,880 plants/acre and a cover value of 15%. Reproduction remains adequate, vigor normal on most plants, with decadence still moderately high at 35%.

Bitterbrush numbered only 599 plants/acre in 1989. Vigor was good on the moderate to heavily hedged plants. They had relatively open crowns, average growth, and seed production. The taller shrubs exhibited good leader growth when the branches are out of reach from browsing. During the 1997 reading, density of bitterbrush was estimated at only 280 plants/acre. Since no dead plants were encountered, this density is considered a more accurate population estimate due to the larger sample size used in 1997. Bitterbrush in 1997 were classified as moderately to heavily hedged. Percent decadency was relatively low at 21%, but all decadent plants sampled displayed poor vigor and appeared to be dying. Young plants account for 29% of the population and were abundant enough to replace the decadent, dying individuals. Bitterbrush density was estimated at 320 plants/acre in 2002. Mature plants have continued to grow taller and now average nearly 6 feet in height. Some plants are becoming partly unavailable to browsing. Due to drought conditions for the past few years, the bitterbrush population has become increasingly decadent, increasing from 21% in 1997 to 63% in 2002. Use was also extremely heavy in 2002. Annual leader growth was poor averaging only ½ inch in 2002. Recruitment was nonexistent with no seedlings or young sampled in 2002.

Broom snakeweed, an undesirable invader/increaser, increased dramatically between 1989 and 1997. It increased from only 799 plants/acre to 22,560 plants/acre. Strip frequency indicated that it was widely distributed throughout the site with a frequency of 79%. The age distribution of the population indicated an expanding population. Due to drought conditions, broom snakeweed declined to only 160 plants/acre in 2002.

The herbaceous understory is diverse but not particularly productive. Annual cheatgrass was the most abundant grass in 1997 and 2002, providing 42% and 34% of the total grass cover respectively. Common perennial grasses include bluebunch wheatgrass, Carex, squirreltail, and needle-and-thread. No seeded grasses were encountered on the study site, although the nearby exclosure supports a much higher abundance of seeded grasses. The forb composition is composed mostly of small annual species. Perennial forbs are rare.

#### 1989 APPARENT TREND ASSESSMENT

The Big Hollow area provides quality big game winter range with an abundance of browse forage. The site sampled is less productive in terms of herbaceous vegetation for spring use, but other parts of the treated area have robust stands of seeded grasses. Trends for deer winter range values appear stable.

#### 1997 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare soil and an increase in nested frequency of perennial grasses. Browse trend for the preferred species, basin big sagebrush and bitterbrush appear stable. However, the large increase in broom snakeweed from 799 plants/acre to 22,560 plants/acre indicates a deteriorating trend. The herbaceous understory is sparse, but sum of nested frequency of perennial grasses and forbs increased slightly. The nearby exclosure supports a good stand of seeded and native grasses, illustrating the obviously heavy livestock use of the herbaceous vegetation outside of the fence.

##### TREND ASSESSMENT

soil - up slightly (4)

browse - stable for sagebrush (3)

herbaceous understory - up slightly (4)

#### 2002 TREND ASSESSMENT

Trend for soil is stable. Bare soil increased and litter cover slightly decreased. However, herbaceous cover increased as did sum of nested frequency of perennial grasses. There is still adequate protective ground cover to prevent most erosion and the erosion condition classification was determined as stable in 2002. Trend for the key browse species, basin big sagebrush, is stable. Density has remained similar to 1997 estimates but the number of decadent plants has increased. Use continues to be mostly light. The very abundant broom snakeweed sampled in 1997 has declined dramatically due to drought conditions. Density fell from 22,560 plants/acre in 1997 to only 160 plants/acre in 2002. Bitterbrush is also showing the effects of drought. Density has remained stable but use is very heavy and the number of decadent plants has risen from 21% of the population to 63%. Recruitment is currently poor but should rebound with a return to normal precipitation. Annual leader growth of bitterbrush was also poor averaging only ½ of an inch. Shrubs within the nearby exclosure visually display the same trends. The herbaceous trend is stable. Sum of nested frequency of perennial grasses has increased slightly while frequency of perennial forbs has declined slightly. Annual cheatgrass still provides the most grass cover (34%), but frequency and cover of bluebunch wheatgrass, Carex, and squirreltail all increased. Seeded perennial grasses were more abundant in both the total and livestock exclosures. Forbs are still rare and provide little forage.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable for sagebrush (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 14

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron dasystachyum</i>	-	-	5	-	-	3	-	.04
G	<i>Agropyron spicatum</i>	<sub>a</sub> 11	<sub>b</sub> 39	<sub>b</sub> 38	5	18	17	.70	2.45
G	<i>Bromus japonicus</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 21	-	-	9	-	.09
G	<i>Bromus tectorum</i> (a)	-	238	242	-	84	80	3.74	4.85
G	<i>Carex</i> spp.	<sub>a</sub> -	<sub>b</sub> 41	<sub>c</sub> 61	-	16	19	.74	2.33
G	<i>Oryzopsis hymenoides</i>	74	67	45	29	29	19	1.85	1.14
G	<i>Poa secunda</i>	-	3	-	-	1	-	.00	-
G	<i>Sitanion hystrix</i>	<sub>b</sub> 89	<sub>a</sub> 40	<sub>b</sub> 79	41	18	33	.86	2.18
G	<i>Stipa comata</i>	<sub>a</sub> 12	<sub>b</sub> 46	<sub>b</sub> 54	6	19	26	1.05	1.00
Total for Annual Grasses		0	238	263	0	84	89	3.74	4.95
Total for Perennial Grasses		186	236	282	81	101	117	5.21	9.17
Total for Grasses		186	474	545	81	185	206	8.96	14.12
F	<i>Alyssum alyssoides</i> (a)	-	<sub>a</sub> 148	<sub>b</sub> 241	-	58	78	1.02	2.07
F	<i>Astragalus</i> spp.	1	-	3	1	-	1	-	.00
F	<i>Calochortus nuttallii</i>	-	2	5	-	2	3	.01	.01
F	<i>Chaenactis douglasii</i>	<sub>a</sub> 12	<sub>b</sub> 21	<sub>a</sub> 5	5	11	4	.11	.02
F	<i>Chenopodium</i> spp. (a)	-	2	-	-	1	-	.00	-
F	<i>Cirsium</i> spp.	8	17	17	4	8	8	.04	.31
F	<i>Collinsia parviflora</i> (a)	-	-	4	-	-	1	-	.00
F	<i>Descurainia pinnata</i> (a)	-	-	1	-	-	1	-	.00
F	<i>Eriogonum cernuum</i> (a)	-	-	3	-	-	1	-	.00
F	<i>Erodium cicutarium</i> (a)	-	-	4	-	-	1	-	.00
F	<i>Eriogonum</i> spp.	1	2	-	1	1	-	.00	-
F	<i>Gilia</i> spp. (a)	-	1	-	-	1	-	.00	-
F	<i>Hackelia patens</i>	-	4	-	-	1	-	.03	-
F	<i>Lactuca serriola</i>	-	1	-	-	1	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 11	-	-	6	-	.03
F	<i>Orobanche fasciculata</i>	-	1	-	-	1	-	.00	-
F	<i>Penstemon</i> spp.	-	-	1	-	-	1	-	.00
F	<i>Polygonum douglasii</i> (a)	-	15	2	-	6	2	.05	.01
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 30	-	-	11	-	.08
F	<i>Sphaeralcea coccinea</i>	42	35	43	14	18	17	.47	.64
F	<i>Tragopogon dubius</i>	8	3	1	4	1	1	.01	.00
Total for Annual Forbs		0	166	296	0	66	101	1.09	2.21
Total for Perennial Forbs		72	86	75	29	44	35	0.69	1.01
Total for Forbs		72	252	371	29	110	136	1.78	3.22

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 14

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	61	57	14.77	14.69
B	Artemisia tridentata vaseyana	1	1	.30	.78
B	Gutierrezia sarothrae	79	8	5.73	.01
B	Juniperus osteosperma	0	1	-	.00
B	Opuntia spp.	5	2	.18	-
B	Purshia tridentata	12	13	2.27	2.38
Total for Browse		158	82	23.27	17.87

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 14

Species	Average leader growth (in) '02
Artemisia tridentata tridentata	1.7
Purshia tridentata	0.5

Point-Quarter Tree Data  
Herd unit 16A, Study no: 14

Species	Trees per Acre	Average diameter (in)
	'02	'02
Juniperus osteosperma	24	6.0

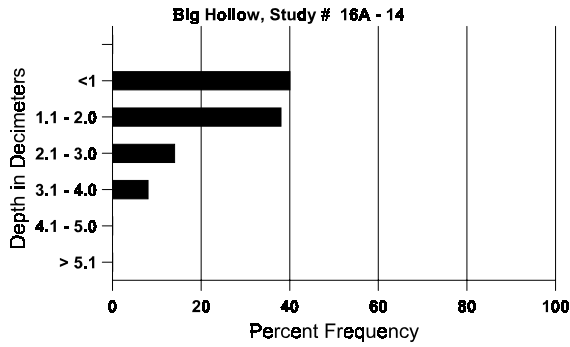
BASIC COVER --  
Herd unit 16A, Study no: 14

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	333	334	3.25	33.79	35.76
Rock	180	188	3.75	5.09	4.71
Pavement	292	271	26.25	17.61	15.09
Litter	384	371	49.00	44.18	38.18
Cryptogams	74	102	.50	1.59	5.34
Bare Ground	246	273	17.25	11.16	20.92

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 14, Big Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.7	63.4 (13.2)	6.8	48.0	27.1	24.9	2.9	13.3	166.4	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 14

Type	Quadrat Frequency		Pellet Transect			
	'97	'02	Pellet Groups per Acre		Days Use per Acre (ha)	
			'97	'02	'97	'02
Rabbit	26	73	-	-	-	-
Elk	2	1	26	9	2 (3)	1 (2)
Deer	32	14	409	809	31 (78)	62 (154)
Cattle	1	3	70	96	6 (14)	8 (20)

## BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 14

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total							
		1	2	3	4		Ht. Cr.									
Artemisia tridentata tridentata																
S	89	2	-	-	1	-	-	-	-	3	-	-	200		3	
	97	4	-	-	-	-	-	-	-	4	-	-	80		4	
	02	9	-	-	-	-	-	-	-	9	-	-	180		9	
Y	89	4	-	-	1	-	-	-	-	5	-	-	333		5	
	97	9	-	-	-	-	-	-	-	9	-	-	180		9	
	02	6	-	-	1	-	-	-	-	7	-	-	140		7	
M	89	15	6	-	-	-	-	-	-	19	2	-	1400	31	33	21
	97	54	1	-	1	-	-	-	-	56	-	-	1120	29	41	56
	02	40	9	4	-	-	1	-	-	54	-	-	1080	44	51	54
D	89	11	1	-	1	-	-	-	-	12	-	-	866		13	
	97	21	2	-	1	-	-	-	-	16	-	-	480		24	
	02	21	8	-	3	-	-	-	1	15	-	3	660		33	
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	340		17	
	02	-	-	-	-	-	-	-	-	-	-	-	560		28	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'89		18%		00%		03%		-32%								
'97		03%		00%		09%		+ 5%								
'02		18%		06%		19%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	2599	Dec:	33%			
										'97	1780		27%			
										'02	1880		35%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	-	-	1
	02	1	-	-	-	-	-	-	-	-	-	-	-	20	25	31	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%			+ 0%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	20		-		
												'02	20		-		
<i>Cowania mexicana stansburiana</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	65	94	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
												'02	0		-		
<i>Gutierrezia sarothrae</i>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1
Y	89	1	-	-	-	-	-	-	-	-	-	-	-	66			1
	97	327	5	-	2	-	-	-	-	-	-	-	-	6680			334
	02	8	-	-	-	-	-	-	-	-	-	-	-	160			8
M	89	11	-	-	-	-	-	-	-	-	-	-	-	733	6	4	11
	97	758	-	-	35	-	-	-	-	-	-	-	-	15860	9	13	793
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	180			9
	02	-	-	-	-	-	-	-	-	-	-	-	-	140			7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+96%						
'97		.44%			00%			.08%			-99%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	799	Dec:	0%		
												'97	22560		0%		
												'02	160		0%		



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	20		-			
Opuntia spp.																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	-	-	7
	02	-	2	-	-	-	-	-	-	-	2	-	-	-	40	5	10	2
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-63%							
'02		67%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	160		0%			
												'02	60		33%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	89	1	1	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	1	-	1	2	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	4	-	-	-	-	-	-	-	4	-	-	-	266	24	38	4
	97	-	4	1	1	1	-	-	-	-	7	-	-	-	140	46	76	7
	02	-	1	-	-	-	5	-	-	-	6	-	-	-	120	68	59	6
D	89	1	1	1	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	1	-	-	1	-	-	-	-	-	-	60		3		
	02	-	-	3	-	-	6	-	-	1	6	-	-	4	200		10	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		67%			11%			00%			-53%							
'97		36%			29%			21%			+13%							
'02		06%			94%			25%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	599	Dec:	33%				
											'97	280		21%				
											'02	320		63%				

Trend Study 16A-15-02

Study site name: Old Pinery.

Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 175 degrees magnetic.

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

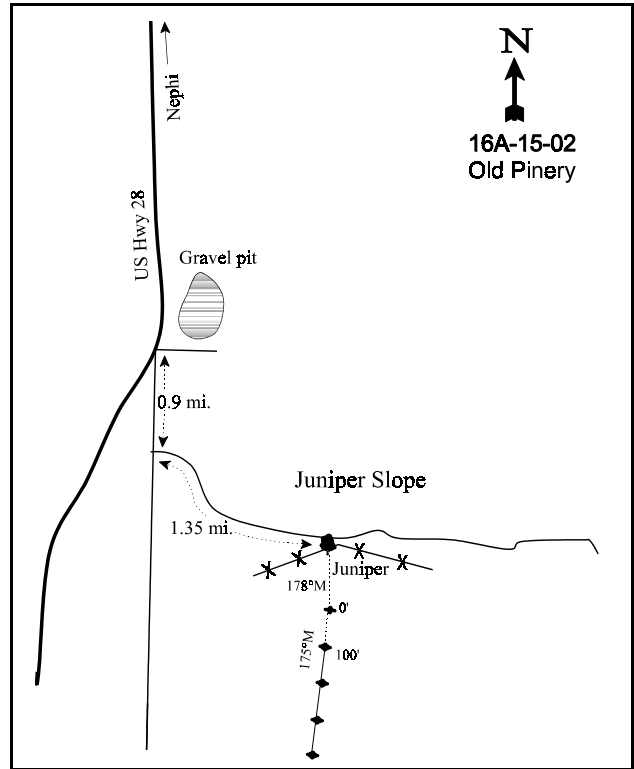
LOCATION DESCRIPTION

From Nephi, proceed south on U.S. 28 to a dirt road just past a gravel pit. Turn left on the dirt road, and proceed south 0.9 miles to another intersection. Turn left at the intersection and proceed southeast for 1.35 miles toward Old Pinery Canyon. Stop at the corner of the fenceline. From the easternmost of the two middle fenceposts, the 0-foot marker of the baseline is located 130 paces away at an azimuth of 178 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3960, is attached to the 0-foot baseline stake.



Map Name: Nephi

Township 13S, Range 1E, Section 33



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4388462 N 428889 E

## DISCUSSION

### Old Pinery - Trend Study No. 16A-15

The Old Pinery trend study is located on privately owned rangeland located south of Old Pinery Creek. Previously the area was dominated by juniper and pinyon, but has since been chained and seeded. Elevation is 5,700 feet with a gentle west facing slope of 3%. Tree removal was relatively successful with only 21 juniper trees/acre in the 8-10 foot class estimated on the site in 2002. A few of the trees sampled were tipped-over mature trees that were still growing. Animal use was very low in 1983 due to lack of cover and forage. However, deer pellet groups were common with a quadrat frequency of 41% in 1997. Old cattle sign was also noted that year with a quadrat frequency of 18%. There was no sign of elk use. A pellet group transect read along the study site baseline in 2002 estimated 94 deer days use/acre (233 ddu/ha) and 22 cow days use/acre (54 cdu/ha). All of the cattle use appears to be from the previous year (2001) but most deer pellet groups appear to be from winter use.

Soil at the site is a deep, alluvially deposited loam with an effective rooting depth estimated at 19 inches. Few rocks are found on the surface and in the profile. Soil reaction is slightly acidic (pH of 6.2). Erosion is not currently a problem due to the abundant vegetation and litter cover combined with the gentle terrain. The soil erosion condition classification was determined as stable in 2002.

The browse composition consists primarily of mountain big sagebrush which accounted for 86% of the browse cover in 2002. Total browse cover is low however, averaging only about 7% in 1997 and 12% in 2002. Data from 1983 estimated a population density of 1,332 sagebrush plants/acre. During this reading, there were no young plants or seedlings encountered and use was light. Density increased 71% to 4,532 plants/acre by 1989 due to a dramatic increase in the number of young plants (0 to 3,433 plants/acre). Seedlings were also abundant (8,166 plants/acre) which would indicate an expanding population. Use was mostly light and vigor good. With the larger sample used in 1997, density was estimated at 2,040 plants/acre. The lack of any dead plants would suggest that this significantly larger sample is a more accurate estimate of sagebrush density over the entire area, especially when the population is clumped or has a discontinuous distribution. The 1997 population was mostly young (69%), and seedlings were also abundant. Utilization was light to moderate on most plants with only a few individuals receiving heavy use. Seed heads from the 1996 growing season indicated excellent seed production. Density of sagebrush increased to 3,340 plants/acre by 2002. Use continues to be light to moderate with a few individuals displaying heavy use. Vigor remains good and decadence low. Annual leader growth of mature plants averaged nearly 3 inches in 2002 and seed heads were abundant. Young plants were still abundant and the population appears to be expanding.

The only other preferred browse found on the site consists of a few scattered, heavily hedged bitterbrush plants. Only 80 plants/acre were estimated in 2002. All plants sampled displayed a clubbed appearance. Broom snakeweed, an invader, has had a dynamic fluctuating population ranging from 633 plants/acre in 1983 to 8,565 in 1989, and 900 plants/acre in 2002.

The herbaceous understory was dominated by cheatgrass in 1983 and it appeared that the seeding was not successful. Seeded and native perennial grasses were rare and no perennial forbs were encountered that year. By 1989, sum of nested frequency for perennial grasses nearly tripled. A few perennial forbs were also encountered. During the 1997 reading, seeded and native grasses continued to increase. Cheatgrass was still present, but only accounted for 10% of the grass cover. Rattail fescue was also abundant in 1997 providing 24% of the total grass cover. Western wheatgrass and Sandberg bluegrass were also abundant. More perennial forbs were found in 1997. However, annual species were still dominant providing 86% of the forb cover. In 2002, nested frequency of perennial grasses continued to increase and cover doubled. Perennial forbs were still limited.

### 1983 APPARENT TREND ASSESSMENT

This study is an interesting management situation because it is illustrative of a poorly planned and executed seeding project. Poor value juniper-pinyon range has been converted to even less productive range. Current forage production from all classes of vegetation is probably less than 30 lbs/acre. If no further seeding is done, there will be a slow increase in sagebrush and perhaps a more rapid invasion of snakeweed. Perennial grasses will also improve but very slowly. The greatest threat to the area is from fire. A second attempt at seeding a mixture of desirable shrubs, forbs, and grasses could possibly improve conditions.

### 1989 TREND ASSESSMENT

The variability of seeding success after the juniper chaining remains obvious. Those areas not occupied by a dense stand of crested wheatgrass have an abundance of cheatgrass, annual forbs, and broom snakeweed. The site shows definite improvement over 1983, when the whole area appeared to be in an impoverished condition. In addition, the study is located in one of the poorer locations of the whole treatment. Ground cover characteristics have changed since 1983. Litter cover has declined from 75% to 63%, while bare ground increased from 18% to 27%. However, it appears from photos that this change is primarily the result in a change from mostly cheatgrass to a stand of perennial grasses. Trend is considered stable at this time. Trend for mountain big sagebrush is up. Density has increased from 1,332 plants/acre to 4,532. The sagebrush is vigorous and lightly hedged. There has been a definite increase in recruitment which would indicate an expanding population. Density of broom snakeweed has also increased dramatically. It appears to be expanding on areas without good perennial grass competition. Trend for the herbaceous understory is up. Quadrat frequency of crested wheatgrass increased from 14% to 48%. The natives, Sandberg bluegrass and western wheatgrass have increased significantly and are now common along the baseline. No perennial forbs were identified in 1983, but several species were identified in 1989. However, none are valuable as forage.

#### TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - up (5)

### 1997 TREND ASSESSMENT

Soil trend continues to be stable. Percent bare ground declined from 27% to 14% with litter cover also declining significantly from 63% to 36%. Erosion is currently not a problem due to the gentle terrain combined with excellent cover from herbaceous species. The browse trend appears to be improving despite the supposed decline in sagebrush density. It should be noted that no dead sagebrush were found on the site suggesting that the larger sample used this year is responsible for the change in sagebrush density. The larger sample and improved design gives significantly better population estimates for species with clumped or discontinuous distributions. Currently, the population is mostly young (69%) with a very high biotic potential (proportion of seedlings to the population) of 45%. This would indicate an expanding population. Another positive sign is the decline in broom snakeweed density. The herbaceous trend is also up with an increase in sum of nested frequency for perennial grasses and forbs. However, the forb composition is dominated by annuals which account for 86% of the forb cover.

#### TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - up (5)

2002 TREND ASSESSMENT

Trend for soil continues to be stable. There is abundant protective ground cover and erosion is minimal. Trend for sagebrush is also up. Density has increased by 39%, use is light to moderate, vigor good, and decadence low. Cover of sagebrush has increased from 6% to 10%. Recruitment continues to be excellent indicating a continued expanding population. Another positive change is the continued decline in density of broom snakeweed. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses. Frequency of cheatgrass remained stable. Composition has changed somewhat due to a dramatic increase in the nested frequency of the low value bulbous bluegrass which now makes up 43% of the total grass cover. Continued spring livestock grazing will further drive this area to be dominated by bulbous bluegrass. Perennial forbs are still rare.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - up slightly (4)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 15

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	a <sub>35</sub>	b <sub>121</sub>	b <sub>110</sub>	b <sub>107</sub>	14	48	48	43	5.19	6.10
G	Agropyron smithii	a <sub>23</sub>	b <sub>148</sub>	c <sub>163</sub>	bc <sub>144</sub>	10	52	54	50	3.49	3.78
G	Agropyron spicatum	ab <sub>23</sub>	a <sub>7</sub>	bc <sub>36</sub>	c <sub>60</sub>	12	3	18	25	1.39	3.37
G	Bromus japonicus (a)	-	-	-	18	-	-	-	9	-	.04
G	Bromus tectorum (a)	-	-	259	259	-	-	90	84	2.30	3.27
G	Festuca myuros (a)	-	-	b <sub>277</sub>	a <sub>81</sub>	-	-	80	36	5.50	.20
G	Poa bulbosa	a <sub>-</sub>	a <sub>-</sub>	b <sub>64</sub>	c <sub>246</sub>	-	-	25	75	.89	14.90
G	Poa pratensis	b <sub>55</sub>	a <sub>-</sub>	b <sub>-</sub>	c <sub>4</sub>	29	-	-	1	-	.15
G	Poa secunda	a <sub>4</sub>	b <sub>104</sub>	d <sub>190</sub>	c <sub>138</sub>	2	45	74	54	3.79	2.79
G	Sitanion hystrix	-	8	-	3	-	3	-	1	-	.03
Total for Annual Grasses		0	0	536	358	0	0	170	129	7.80	3.52
Total for Perennial Grasses		140	388	563	702	67	151	219	249	14.77	31.14
Total for Grasses		140	388	1099	1060	67	151	389	378	22.58	34.68
F	Agoseris glauca	-	-	7	4	-	-	2	2	.01	.01
F	Alyssum alyssoides (a)	-	-	b <sub>281</sub>	a <sub>127</sub>	-	-	88	43	.91	.31
F	Allium spp.	a <sub>-</sub>	b <sub>57</sub>	b <sub>47</sub>	a <sub>4</sub>	-	27	21	2	.13	.01
F	Astragalus spp.	a <sub>-</sub>	a <sub>-</sub>	b <sub>9</sub>	a <sub>4</sub>	-	-	5	2	.10	.03
F	Astragalus utahensis	-	-	2	3	-	-	1	1	.15	.00
F	Calochortus nuttallii	-	-	11	3	-	-	4	1	.02	.00
F	Cerastium spp.	a <sub>-</sub>	b <sub>16</sub>	a <sub>-</sub>	a <sub>-</sub>	-	6	-	-	-	-
F	Cirsium spp.	a <sub>-</sub>	a <sub>-</sub>	b <sub>9</sub>	a <sub>3</sub>	-	-	4	1	.05	.06
F	Convolvulus arvensis	-	-	2	-	-	-	1	-	.00	-
F	Collinsia parviflora (a)	-	-	b <sub>196</sub>	a <sub>103</sub>	-	-	68	40	.78	.57

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Cymopterus longipes</i>	a-	a3	b17	a7	-	3	8	3	.21	.06
F	<i>Descurainia pinnata</i> (a)	-	3	-	-	-	2	-	-	-	-
F	<i>Draba</i> spp. (a)	-	-	-	5	-	-	-	2	-	.01
F	<i>Epilobium brachycarpum</i> (a)	-	-	b75	a7	-	-	29	3	.14	.01
F	<i>Erodium cicutarium</i> (a)	-	-	b158	a31	-	-	55	11	1.72	.57
F	<i>Erigeron</i> spp.	-	-	2	-	-	-	1	-	.00	-
F	<i>Eriogonum racemosum</i>	-	-	6	5	-	-	3	2	.04	.01
F	<i>Grindelia squarrosa</i>	-	-	3	-	-	-	1	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	6	-	-	-	2	-	.01
F	<i>Lactuca serriola</i>	a-	c26	b11	a-	-	12	5	-	.02	-
F	<i>Microsteris gracilis</i> (a)	-	-	b58	a5	-	-	22	3	.16	.01
F	<i>Phlox longifolia</i>	a-	b9	c32	bc24	-	5	13	11	.09	.08
F	<i>Polygonum douglasii</i> (a)	-	-	b23	a1	-	-	10	1	.05	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	b287	a163	-	-	85	56	2.15	1.01
F	<i>Sphaeralcea coccinea</i>	-	3	-	-	-	1	-	-	-	-
F	<i>Tragopogon dubius</i>	a-	a3	b9	a-	-	1	6	-	.05	-
F	<i>Vicia americana</i>	-	-	9	9	-	-	3	4	.06	.12
Total for Annual Forbs		0	3	1078	448	0	2	357	161	5.93	2.52
Total for Perennial Forbs		0	117	176	66	0	55	78	29	0.96	0.39
Total for Forbs		0	120	1254	514	0	57	435	190	6.89	2.92

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

BROWSE TRENDS --

Herd unit 16A, Study no: 15

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Artemisia tridentata vaseyana</i>	46	66	5.53	10.01
B	<i>Gutierrezia sarothrae</i>	19	17	.53	.83
B	<i>Juniperus osteosperma</i>	1	1	.15	.76
B	<i>Purshia tridentata</i>	3	4	.42	.07
Total for Browse		69	88	6.63	11.67

CANOPY COVER --

Herd unit 16A, Study no: 15

Species	Percent Cover		Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02	'97	'02
<i>Juniperus osteosperma</i>	-	.6	12	21	3.2	6.8

Key Browse Annual Leader Growth  
Herd unit 16A , Study no: 15

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.8

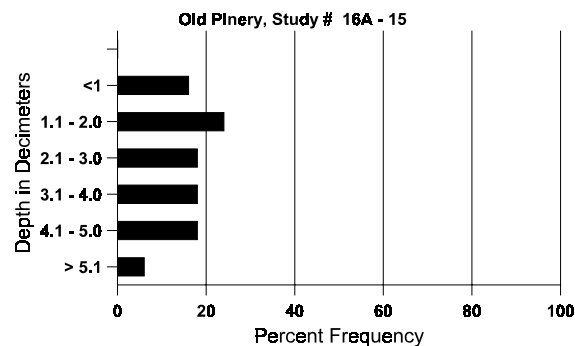
BASIC COVER --  
Herd unit 16A, Study no: 15

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	387	382	3.00	9.50	43.06	53.96
Rock	103	58	2.25	.25	4.32	1.16
Pavement	175	180	0	.50	.67	1.03
Litter	395	387	75.00	63.00	36.01	38.60
Cryptogams	262	64	1.50	0	5.95	1.58
Bare Ground	266	229	18.25	26.75	14.39	16.45

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 15, Old Pinery

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
19.1	44.8 (16.9)	6.2	37.4	39.7	22.8	1.8	19.2	208.0	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 15

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Rabbit	12	12	-	-
Elk	-	1	-	-
Deer	41	58	1228	94 (233)
Cattle	18	9	22	22 (54)
Horse	-	-	9	N/A



BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 15

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia tridentata vaseyana																	
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	162	-	-	16	-	-	67	-	-	245	-	-	-	8166		245
	'97	36	10	-	-	-	-	-	-	-	46	-	-	-	920		46
	'02	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	86	-	-	5	-	-	12	-	-	103	-	-	-	3433		103
	'97	62	-	8	-	-	-	-	-	-	70	-	-	-	1400		70
	'02	56	1	1	-	-	-	-	-	-	58	-	-	-	1160		58
M	'83	38	-	-	-	-	-	-	-	-	38	-	-	-	1266	13 13	38
	'89	27	1	-	-	-	-	-	-	-	28	-	-	-	933	15 16	28
	'97	18	11	2	-	-	-	-	-	-	31	-	-	-	620	22 41	31
	'02	58	34	8	-	-	-	-	-	-	100	-	-	-	2000	18 27	100
D	'83	2	-	-	-	-	-	-	-	-	1	-	1	-	66		2
	'89	4	1	-	-	-	-	-	-	-	4	-	-	1	166		5
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
	'02	1	3	4	-	1	-	-	-	-	7	-	-	2	180		9
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
		'83 00%			'83 00%			'83 03%			+71%						
		'89 01%			'89 00%			'89 .73%			-55%						
		'97 11%			'97 10%			'97 00%			+39%						
		'02 23%			'02 08%			'02 01%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	1332	Dec:	5%			
											'89	4532		4%			
											'97	2040		1%			
											'02	3340		5%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	119	-	-	-	-	-	-	-	-	119	-	-	-	3966		119	
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280		14	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	19	-	-	-	-	-	-	-	-	19	-	-	-	633	11	13	19
	89	123	-	-	1	-	-	-	-	-	124	-	-	-	4133	11	9	124
	97	64	-	-	-	-	-	-	-	-	64	-	-	-	1280	7	8	64
	02	34	-	-	-	-	-	-	-	-	34	-	-	-	680	7	8	34
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	14	-	-	-	-	-	-	-	-	14	-	-	-	466		14	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	11	-	-	-	-	-	-	-	-	9	-	-	2	220		11	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	200		10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+93%							
'89		00%			00%			00%			-82%							
'97		00%			00%			00%			-42%							
'02		00%			00%			04%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	633	Dec:	0%			
												'89	8565		5%			
												'97	1560		0%			
												'02	900		24%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Juniperus osteosperma													
Y	83	1	-	-	-	-	-	-	1	33		1	
	89	1	-	-	-	-	-	-	1	33		1	
	97	1	-	-	-	-	-	-	1	20		1	
	02	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	1	-	20	-	1	
X	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%		+ 0%					
'89		00%		00%		00%		-39%					
'97		00%		00%		00%		+ 0%					
'02		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	33	Dec:	-
										'89	33		-
										'97	20		-
										'02	20		-
Purshia tridentata													
M	83	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	2	-	-	1	-	-	60	11	43	
	02	-	-	2	-	-	2	-	-	80	16	49	
X	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%							
'89		00%		00%		00%							
'97		00%		100%		00%		+25%					
'02		00%		100%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-
										'89	0		-
										'97	60		-
										'02	80		-

Trend Study 16A-16-02

Study site name: Levan Farm Chaining.

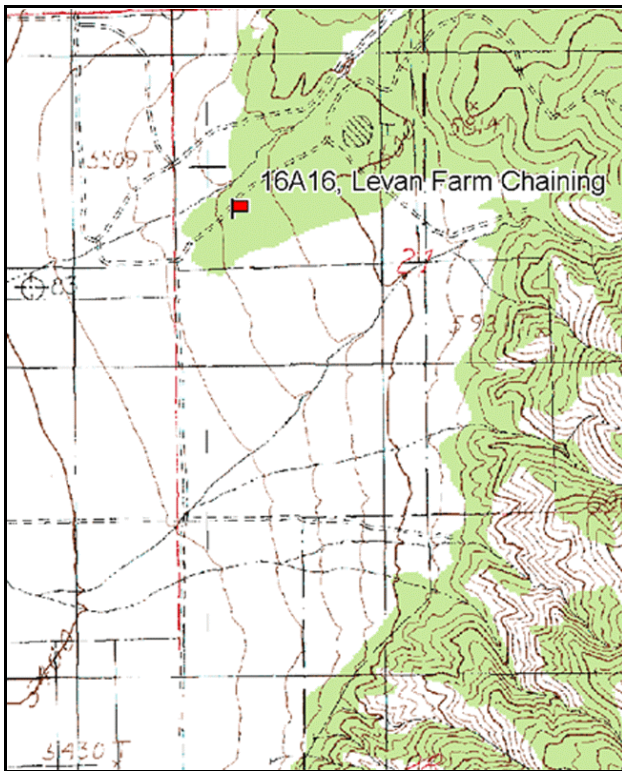
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 165 degrees magnetic.

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

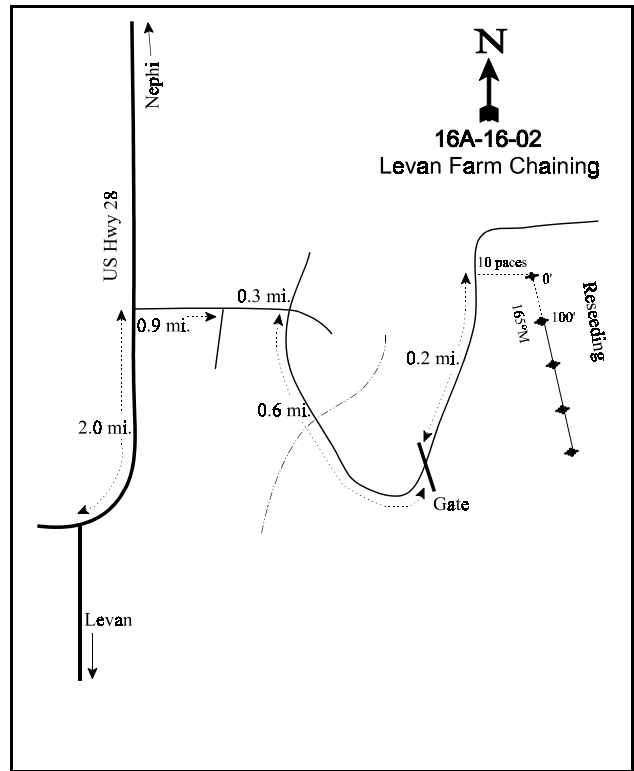
LOCATION DESCRIPTION

From the junction of Highway U.S. 78 and Highway 28 in Levan, proceed north towards Nephi for 2.0 miles to a dirt road to the east. Turn right and proceed east for 0.90 miles to a fork. Continue straight ahead for 0.30 miles to a 3-way fork. Take the right (southernmost) fork for 0.60 miles through a gate to another fork. Take the left fork for 0.20 miles to a chained-reseeded area, and stop. The baseline is located 10 paces to the east between two windrows of slash. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3965, is attached to the 0-foot stake of the baseline.



Map Name: Levan

Township 14S, Range 1E, Section 21



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4381466 N, 428517 E

## DISCUSSION

### Levan Farm Chaining - Trend Study No. 16A-16

The Levan Farm study is located on a chained juniper-pinyon site northeast of Levan. Utilized by deer and a few elk during severe winters, the area was purchased by the Division of Wildlife Resources shortly after the chaining was completed. This site closely resembled the previous study at Old Pinery. No serious seeding effort appears to have been made on this site. As a result, the area is nearly devoid of perennial plants. The only obvious difference from the Old Pinery chaining is that juniper slash had been windrowed. Slope on the site is nearly level with a slight west aspect and an elevation of about 5,520 feet. Wildlife use has been relatively light over the years due to the lack of forage. However, browse cover has increased and a pellet group transect read along the study site baseline in 2002 estimated 50 deer days use/acre (122 ddu/ha).

Soil conditions are similar to that of study #15, Old Pinery. Effective rooting depth is estimated at nearly 14 inches with few rocks on the surface. Soil texture is a clay loam with a neutral pH of 7.1. Phosphorus in the soil is low at 7.7 ppm. Values less than 10 ppm may limit normal plant growth and development. Erosion was reported to be occurring in 1983, but there does not appear to be any significant problems on the site due to the gentle terrain and improvements in protective cover. An erosion condition classification assessment was determined to be stable in 2002.

Valuable browse forage is limited and consists entirely of basin big sagebrush (*Artemisia tridentata tridentata*). Some basin big sagebrush was apparently transplanted after the chaining and 100 mature plants/acre were estimated in 1983. No sagebrush plants were sampled in 1989, but 660 sagebrush plants/acre were estimated in 1997. Recruitment was good with half of the population consisting of young plants. Utilization was light. Density continued to increase in 2002 to 1,540 plants/acre. Utilization remains mostly light, vigor good, and decadence low. Due in part to drought conditions, sagebrush recruitment was poor in 2002.

The only other common browse species on the site is broom snakeweed which has increased in density from 3,066 plants/acre in 1983 to an amazing 23,060 plants/acre in 1997. Seedlings and young were common in 1997 indicating a dynamic population which could further increase in density. However, due to drought conditions in this area in 2001 and 2002, snakeweed density has declined to 3,780 plants/acre. Most of the remaining plants are decadent and recruitment is nonexistent. A few juniper trees are scattered throughout this site. Point-quarter data from 2002 estimated 18 juniper trees/acre with an average diameter of 5.4 inches.

The herbaceous understory is very poor and dominated by annuals and biennial weeds. Cheatgrass dominates the site by providing 93% of the grass cover and 77% of the total herbaceous cover in 2002. Perennial grasses and forbs are lacking.

### 1983 APPARENT TREND ASSESSMENT

Soil condition is improving only because vegetative condition cannot be worse. The nearly level terrain has prevented serious soil erosion. Vegetative trend will also improve for essentially the same reason. Further seeding and/or transplanting is strongly recommended.

## 1989 TREND ASSESSMENT

The soil trend is stable. Litter is still provided mainly by cheatgrass. Significantly more pavement cover was estimated in 1989, along with less bare soil. There has been some soil loss, which will probably continue on areas with some slope. Some of the transplanted sagebrush survived and have grown to a height of 5 feet in the past ten years. They also display incredibly high amounts of seed production. However, the trend study did not get an adequate sample of the variable, sparse population and no sagebrush occurred within the density plots in 1989. However, sagebrush canopy cover averages 2% on the study site, ranging from 0 to 8%. The sagebrush observed and photographed are very vigorous. There is virtually no woody competition. The sagebrush are unutilized and surrounded by seedlings. Broom snakeweed occurs at similar densities, but seedlings are very abundant and density will likely increase. Trend for browse is considered down slightly. The herbaceous understory is very poor and dominated by annuals and biennial weeds. Besides sunflower and prickly lettuce, the list of forbs includes such undesirable species as bur buttercup, Russian thistle, and gumweed. Trend for the few perennial grasses and forbs is stable, but in very poor condition.

### TREND ASSESSMENT

soil - stable (3)

browse - down slightly and lacking (2)

herbaceous understory - stable, but in very poor condition (3)

## 1997 TREND ASSESSMENT

Soil trend continues to be stable yet it is in poor condition. Litter cover is relatively low at only 30%. Browse trend has improved. The larger sample used in 1997 estimates 660 sagebrush plants/acre, 52% of which are young. The sagebrush appears unutilized and in good vigor. On the negative side, broom snakeweed has continued to increase dramatically from 3,765 plants/acre to 23,060 plants/acre. It currently accounts for 70% of the browse cover on the site. Some of the increase may be due to the increased sample, but it is obvious that the population is increasing due to the large numbers of young and seedling plants. Strip frequency of snakeweed is high at 93%, indicating its abundance over the whole site. Trend for the herbaceous understory is stable, yet in very poor condition. Perennial grasses are still rare and valuable perennial forbs are lacking.

### TREND ASSESSMENT

soil - stable, but poor (3)

browse - up slightly for big sagebrush, but still dominated by broom snakeweed (4)

herbaceous understory - stable, but in very poor condition (3)

## 2002 TREND ASSESSMENT

Trend for soil continues to be stable. There is abundant ground cover made up mostly of cheatgrass. Cover of bare ground is moderately high at 22%, but due to the level terrain, erosion is not currently a problem. Trend for browse is up. Density of basin big sagebrush has increased from 660 plants/acre to 1,540 plants/acre. Use remains mostly light, vigor good, and decadence low. Another positive indicator is the dramatic decline in the previously dominant stand of broom snakeweed which was estimated at 23,060 plants/acre in 1997. Due to drought conditions for the past couple of years, density of snakeweed has declined to 3,780 plants/acre. Of the surviving plants, 61% are decadent and half of those were classified as dying (>50% crown death). This would indicate a continued decline in population for this undesirable invasive shrub. Trend for the herbaceous understory is stable but still in very poor condition. The herbaceous understory is still dominated by cheatgrass and annual weedy forbs. Perennial grasses and forbs are rare producing less than 2% total cover in 2002. Further seeding efforts will likely need to be done to improve this site.

### TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable but very poor (3)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 16

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron intermedium	-	4	2	4	-	1	1	1	.00	.00
G	Agropyron spicatum	a-	a-	b10	ab4	-	-	6	2	.22	.19
G	Bromus japonicus (a)	-	-	a-	b18	-	-	-	8	-	.06
G	Bromus tectorum (a)	-	-	a269	b346	-	-	90	96	4.20	14.61
G	Oryzopsis hymenoides	-	-	8	8	-	-	4	4	.36	.25
G	Poa secunda	6	9	17	8	2	5	7	4	.38	.09
G	Sitanion hystrix	a-	a3	a7	b39	-	2	3	20	.06	.55
Total for Annual Grasses		0	0	269	364	0	0	90	104	4.20	14.67
Total for Perennial Grasses		6	16	44	63	2	8	21	31	1.04	1.10
Total for Grasses		6	16	313	427	2	8	111	135	5.24	15.77
F	Agoseris glauca	-	-	6	-	-	-	2	-	.03	-
F	Alyssum alyssoides (a)	-	-	281	266	-	-	86	85	3.72	.94
F	Astragalus eurekensis	-	3	-	-	-	3	-	-	-	-
F	Asclepias speciosa	-	1	-	-	-	1	-	-	-	-
F	Astragalus spp.	-	-	-	2	-	-	-	1	-	.03
F	Camelina microcarpa (a)	-	-	9	-	-	-	4	-	.07	-
F	Calochortus nuttallii	3	-	4	-	1	-	2	-	.03	-
F	Chorispora tenella (a)	-	-	5	1	-	-	2	1	.03	.00
F	Cirsium spp.	a-	b14	a1	ab7	-	7	1	3	.03	.06
F	Convolvulus arvensis	a-	a-	b10	a-	-	-	5	-	.39	-
F	Comandra pallida	-	-	-	2	-	-	-	1	-	.00
F	Collinsia parviflora (a)	-	-	-	7	-	-	-	3	-	.04
F	Crepis acuminata	-	-	3	-	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	-	13	-	-	-	4	-	.07	-
F	Erodium cicutarium (a)	-	-	54	52	-	-	23	21	.41	.87
F	Gilia spp. (a)	-	-	1	3	-	-	1	1	.00	.00
F	Helianthus annuus (a)	a3	d240	c166	b56	1	88	68	27	.41	.13
F	Lactuca pulchella	c226	b13	b12	a-	85	8	6	-	.03	-
F	Leucelene ericoides	-	-	-	3	-	-	-	1	-	.00
F	Marrubium vulgare	1	-	-	-	1	-	-	-	-	-
F	Microsteris gracilis (a)	-	-	-	9	-	-	-	3	-	.01
F	Ranunculus testiculatus (a)	-	-	b264	a202	-	-	75	65	4.43	.95
F	Sisymbrium altissimum (a)	-	-	b7	a-	-	-	4	-	.04	.00
F	Sphaeralcea coccinea	-	3	2	-	-	1	1	-	.15	-
F	Streptanthus cordatus	-	4	3	1	-	2	2	1	.01	.03
F	Taraxacum officinale	-	-	4	-	-	-	2	-	.15	-
F	Tragopogon dubius	a-	ab5	b14	a-	-	3	6	-	.03	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
	Total for Annual Forbs	3	240	800	596	1	88	267	206	9.20	2.97
	Total for Perennial Forbs	230	43	59	15	87	25	28	7	0.87	0.14
	Total for Forbs	233	283	859	611	88	113	295	213	10.07	3.11

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 16

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	24	31	2.83	5.95
B	Chrysothamnus nauseosus albicaulis	0	1	.85	.00
B	Chrysothamnus viscidiflorus stenophyllus	0	1	-	.03
B	Gutierrezia sarothrae	93	62	9.29	2.20
B	Juniperus osteosperma	1	0	.38	-
	Total for Browse	118	95	13.35	8.19

#### CANOPY COVER --

Herd unit 16A, Study no: 16

#### Point-Quarter Tree Data

Species	Percent Cover		Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02	'97	'02
Juniperus osteosperma	-	.80	23	18	3.4	5.4

#### Key Browse Annual Leader Growth

Herd unit 16A, Study no: 16

Species	Average leader growth (in)
	'02
Artemisia tridentata tridentata	2.2

#### BASIC COVER --

Herd unit 16A, Study no: 16

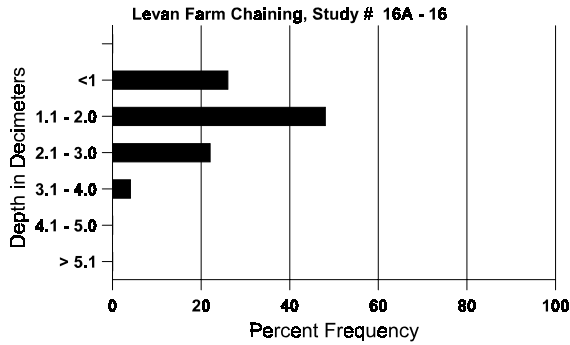
Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	375	373	0	1.75	31.58	28.32
Rock	145	127	3.00	3.00	2.70	2.68
Pavement	266	294	3.75	18.00	13.90	3.82
Litter	394	382	58.25	47.50	29.85	52.71
Cryptogams	160	176	0	0	2.36	6.25
Bare Ground	311	293	35.00	29.75	23.82	21.95



SOIL ANALYSIS DATA --  
 Herd Unit 16A, Study no: 16, Levan Farm Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.9	50.6 (16.9)	7.1	41.1	29.1	29.8	2.6	7.7	92.8	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 16A, Study no: 16

Type	Quadrat Frequency	
	'97	'02
Rabbit	7	22
Deer	16	25
Cattle	4	-

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
-	-
644	50 (122)
-	-

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 16

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	17	-	-	-	-	-	-	-	-	17	-	-	-	340		17	
	02	1	-	1	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100	16	24	3
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320	32	41	16
	02	48	17	-	2	-	-	-	-	-	66	-	1	-	1340	30	32	67
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	7	-	-	1	-	-	-	-	-	7	-	-	1	160		8	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%			+57%							
'02		22%			01%			03%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	100	Dec:	0%			
												'89	0		0%			
												'97	660		0%			
												'02	1540		10%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus nauseosus albicaulis</b>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	34	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			100%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	66		0%				
											'97	0		0%				
											'02	20		100%				
<b>Chrysothamnus viscidiflorus stenophyllus</b>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	2	-	-	-	-	-	-	-	2	-	-	-	40	3	7	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				
											'02	40		-				

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Gutierrezia sarothrae</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	302	-	-	-	-	-	-	-	-	-	-	-	10066			302	
	97	195	-	-	-	-	-	-	-	-	-	-	-	3900			195	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	83	3	-	-	-	-	-	-	-	-	-	-	-	100			3	
	89	11	-	-	-	-	-	-	-	-	-	-	-	366			11	
	97	265	-	-	-	-	-	-	-	-	-	-	-	5300			265	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	83	87	-	-	-	-	-	-	-	-	-	-	-	2900	9	9	87	
	89	86	-	-	-	-	-	-	-	-	-	-	-	2866	9	10	86	
	97	877	-	-	-	-	-	-	-	-	-	-	-	17540	7	9	877	
	02	73	-	-	-	-	-	-	-	-	-	-	-	1460	6	8	73	
D	83	2	-	-	-	-	-	-	-	-	-	-	-	66			2	
	89	16	-	-	-	-	-	-	-	-	-	-	2	533			16	
	97	11	-	-	-	-	-	-	-	-	-	-	5	220			11	
	02	111	1	-	-	-	-	4	-	-	-	-	60	2320			116	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	500			25	
	02	-	-	-	-	-	-	-	-	-	-	-	-	7880			394	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+19%							
'89		00%			00%			02%			+84%							
'97		00%			00%			.43%			-84%							
'02		.52%			00%			59%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	3066	Dec:	2%			
												'89	3765		14%			
												'97	23060		1%			
												'02	3780		61%			
<b>Juniperus osteosperma</b>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	40			2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		
												'02	0		-		
Rhus trilobata																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	71	148	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		
												'02	0		-		
Ribes spp.																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	4	12	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		
												'02	0		-		

Trend Study 16A-17-02

Study site name: Chicken Creek.

Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 280 degrees magnetic (line 2 @ 298°M, lines 3 and 4 @ 357°M).

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

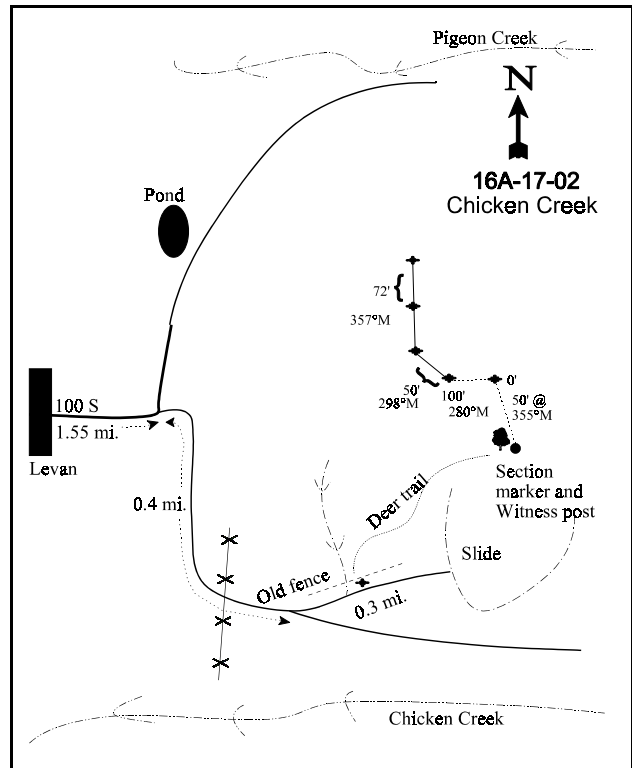
LOCATION DESCRIPTION

From the intersection of 100 South and Main Street in Levan, proceed east on 100 South for 1.55 miles to a fork. Turn right (south) and proceed 0.40 miles towards Chicken Creek to a road to the left. Turn left and proceed east for 0.30 miles to a green steel "T" fencepost on the north side of the road (fencepost may no longer exist). From the fencepost, walk up slope at an azimuth of 344 degrees true to the eastern most juniper on the ridge. There is a section marker and witness post next to the juniper. The 0-foot baseline stake is located 50 feet away at an azimuth 355 degrees magnetic. The study is marked by green, steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Levan

Township 14S, Range 1E, Section 33



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4378098 N 429135 E

## DISCUSSION

### Chicken Creek - Trend Study No. 16A-17

The Chicken Creek study is located on deer winter range near the mouth of Chicken Creek Canyon. The site samples a Stansbury cliffrose type with serviceberry, juniper, mountain big sagebrush, and Gambel oak intermixed. The study area sits on a narrow bench with shale covered slopes ranging from 10% to 60%. Elevation is about 5,700 feet. Pellet groups were abundant in 1983. Quadrat frequency of deer pellet groups was moderately high at 39% in 1997, with few elk pellet groups being sampled. A pellet group transect read along the study baseline in 2002 estimated 74 deer days use/acre (182 ddu/ha) and 2 elk days use/acre (5 edu/ha). Most of the deer pellet groups appeared to be from winter use.

Soil depth appears moderate, but badly eroded. The soil is actually deep in places with an effective rooting depth estimated at nearly 22 inches. Parent material is limestone with many gravel-sized fragments covering the surface. Larger rock outcrops are also found on the site. The soil has a clay loam texture with a neutral pH of 6.9. Soil pedestalling is common on the site and the area appears geologically unstable. Several large cracks in the ground surface were noted in 1983 and are indicative of a high potential for slippage or landslides. There is not a lot of exposed bare ground but the soil erosion condition classification was determined to be slight in 2002.

The key browse species are Stansbury cliffrose and serviceberry although both occur in low densities. Some other species are more abundant, but not nearly as preferred or productive. Cliffrose provides about one-half of the limited browse cover. Many of the mature plants are tall and partly unavailable to browsing. Population density was originally estimated at 399 plants/acre in 1983. Percent decadence was high at 83% and utilization was very heavy on available plants. Percent decadence remained at 83% in 1989 and use remained heavy on half of the cliffrose. By 1997, density was estimated at 240 plants/acre with the larger sample size. Dead plants, first counted in 1997, numbered 100 plants/acre. Recruitment was poor with one seedling encountered in 1997. Seedlings of cliffrose have difficulty competing and establishing within dense understories of annual weeds, but what is of more concern for the preferred browse is the potential for the loss of the community to wildfire. Density of cliffrose was estimated at 460 plants/acre in 2002. Use remained heavy on available plants. Due to drought conditions, vigor was poor on 22% of the plants sampled and 61% of the population was classified as decadent. Reproduction is nonexistent.

Serviceberry occurs only occasionally. All plants encountered in 1989 were heavily hedged. Currently ('02), the population density is low at only 60 plants/acre, with the entire population being classified as decadent. Other shrubs which provide some additional forage include a few mountain big sagebrush, true mountain mahogany, white-stemmed rubber rabbitbrush, chokecherry, and Gambel oak. All of these species, with the exception of oakbrush, occur sporadically. Oakbrush occurs in scattered clones. Mature plants are tall averaging more than 8 feet in height. It does not appear to have been utilized in 1997 and 2002.

The herbaceous understory is sparse and of poor quality. Cheatgrass provided over 40% of the grass cover in 1997 and 2002. However, it is not widespread over the site as it occurs mostly under the crowns of juniper trees. Bluebunch wheatgrass is the most abundant perennial grass on the site. It accounts for over half of the grass cover. The forb component is poor and contains several annuals.

### 1983 APPARENT TREND ASSESSMENT

Soil condition is poor. Rapid erosion has already removed much of the surface soil, leaving behind large areas of erosion pavement. Suitable seed beds for plant establishment are rare. Vegetative conditions appear to be declining. The most preferred browse species, cliffrose, serviceberry, and big sagebrush appear to be in a state of decline. Total browse density, forage production, and forage availability are very low. The herbaceous understory is depleted and what remains is of poor quality for deer. Management options are few due to the steep slope.

### 1989 TREND ASSESSMENT

Soil trend appears stable but in very poor condition. There is a very low percentage of litter cover, and pavement forms most of the ground cover, creating near-talus conditions. By the appearance of the hole and associated undercutting, the slope near density plot #1 will most likely experience another landslide. The juniper and cliffrose overstory dominate the site. Junipers are sparse, but evenly distributed over the whole hillside. There is a fair diversity of browse, but most of it is severely hedged to the point of unavailability and decadence. The density of cliffrose decreased to 199 plants/acre. The plants are largely decadent, heavily hedged and partly unavailable. There were fewer serviceberry and these are also in bad condition. Rubber rabbitbrush was the only browse to show an increase in density. The point-quarter method estimated there to be 10 junipers per acre. There are large stands of oakbrush on the slope below. Trend for the herbaceous understory is up slightly. There is a fair amount of bluebunch wheatgrass on the slope. Frequency increased slightly. There is a low frequency of forbs, and some species may have minor forage value.

#### TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - down (1)

herbaceous understory - up slightly, but poor (4)

### 1997 TREND ASSESSMENT

Trend for soil remains stable, but in poor condition. Trend for browse is stable. Density of cliffrose increased since 1989, but the change is likely due to the larger sample used in 1997. Dead plants are common and utilization continues to be heavy on available plants. On the positive side, vigor has improved and the number of decadent plants has declined from 83% to 33%. Recruitment remains poor. Gambel oak was picked up in the larger sample used this year. The population consists of tall vigorous plants which do not appear to be utilized. Trend for the herbaceous understory is down slightly due to a significant decline in the sum of nested frequency for bluebunch wheatgrass, the only common perennial grass. Composition of forbs is still very poor.

#### TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - stable (3)

herbaceous understory - slightly down and poor (2)



2002 TREND ASSESSMENT

Soil trend remains stable but condition is poor. There is little exposed bare ground due to the abundance of rock and pavement on the soil surface. The erosion condition classification was determined to be slight in 2002. Trend for the key browse species, cliffrose, is down slightly due to an increase in the number of decadent plants from 33% in 1997 to 61% in 2002. Utilization on available plants remains heavy and reproduction is nonexistent. Other desirable shrubs occur in very small numbers. Gambel oak is stable and unutilized with a density of 2,180 stems/acre. Trend for the herbaceous understory is stable and in very poor condition. Bluebunch wheatgrass is the only abundant perennial species. It currently provides 57% of the grass cover and 49% of the total herbaceous cover. It has declined slightly in nested frequency but not significantly. The only other perennial grass encountered included a limited number of Sandberg bluegrass. Cheatgrass is still abundant producing 42% of the grass cover. Perennial forbs are rare.

TREND ASSESSMENT

soil - stable but poor (3)

browse - down slightly for cliffrose (2)

herbaceous understory - stable but very poor (3)

HERBACEOUS TRENDS --

Herd unit 16A, Study no: 17

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	ab150	b185	a139	a121	55	74	56	53	12.44	11.67
G	Bromus japonicus (a)	-	-	-	7	-	-	-	4	-	.04
G	Bromus tectorum (a)	-	-	260	253	-	-	86	86	10.29	8.61
G	Poa secunda	a-	b25	b19	b15	-	13	8	6	.38	.13
Total for Annual Grasses		0	0	260	260	0	0	86	90	10.29	8.65
Total for Perennial Grasses		150	210	158	136	55	87	64	59	12.82	11.80
Total for Grasses		150	210	418	396	55	87	150	149	23.11	20.46
F	Allium spp.	-	-	-	1	-	-	-	1	-	.00
F	Camelina microcarpa (a)	-	-	23	12	-	-	12	5	.06	.07
F	Chorispora tenella (a)	-	-	a7	b14	-	-	3	9	.01	.07
F	Cirsium spp.	a-	a-	b17	a3	-	-	8	3	.53	.45
F	Collinsia parviflora (a)	-	-	-	2	-	-	-	1	-	.00
F	Cryptantha flavoculata	-	5	-	-	-	3	-	-	-	-
F	Cruciferae	-	-	12	-	-	-	4	-	.54	-
F	Cryptantha spp.	14	6	-	2	5	3	-	2	-	.01
F	Cymopterus spp.	-	-	-	1	-	-	-	1	-	.01
F	Descurainia pinnata (a)	-	-	21	7	-	-	10	4	.12	.02
F	Eriogonum brevicaula	9	14	11	5	4	5	7	3	.52	.09
F	Erodium cicutarium (a)	-	-	13	25	-	-	4	8	.07	.33
F	Galium aparine (a)	-	-	62	55	-	-	26	21	2.00	.94
F	Gilia spp. (a)	-	-	-	5	-	-	-	3	-	.04
F	Hackelia patens	a2	a-	b19	a3	1	-	8	3	.44	.42
F	Lathyrus brachycalyx	a2	a2	b25	a7	1	1	9	3	.31	.04

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Lappula occidentalis (a)	-	-	<sub>a</sub> 8	<sub>b</sub> 22	-	-	4	10	.02	.24
F	Lactuca serriola	<sub>b</sub> 27	<sub>a</sub> -	<sub>a</sub> 6	<sub>a</sub> 7	15	-	4	4	.02	.02
F	Lithospermum ruderales	-	-	-	4	-	-	-	2	-	.06
F	Machaeranthera canescens	4	-	1	-	2	-	1	-	.00	-
F	Phacelia spp.	-	-	-	9	-	-	-	4	-	.04
F	Physalis hederifolia	-	7	2	-	-	3	1	-	.00	-
F	Phlox longifolia	<sub>a</sub> -	<sub>a</sub> 3	<sub>b</sub> 21	<sub>a</sub> 6	-	1	10	3	.07	.04
F	Ranunculus testiculatus (a)	-	-	<sub>a</sub> 6	<sub>b</sub> 14	-	-	2	9	.01	.10
F	Sisymbrium altissimum (a)	-	-	<sub>b</sub> 35	<sub>a</sub> 12	-	-	16	5	.18	.12
F	Streptanthus cordatus	<sub>a</sub> 3	<sub>a</sub> 8	<sub>b</sub> 23	<sub>ab</sub> 18	3	3	13	8	.06	.06
F	Tragopogon dubius	2	-	-	-	1	-	-	-	.00	-
F	Unknown forb-annual (a)	-	-	5	-	-	-	2	-	.03	-
F	Veronica biloba (a)	-	-	-	5	-	-	-	2	-	.03
Total for Annual Forbs		0	0	180	173	0	0	79	77	2.52	1.99
Total for Perennial Forbs		63	45	137	66	32	19	65	37	2.53	1.27
Total for Forbs		63	45	317	239	32	19	144	114	5.05	3.27

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 17

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	3	1	.41	-
B	Cercocarpus montanus	1	1	-	.38
B	Chrysothamnus nauseosus albicaulis	6	5	.90	.71
B	Cowania mexicana stansburiana	12	13	3.00	3.21
B	Gutierrezia sarothrae	5	4	.01	.15
B	Juniperus osteosperma	0	1	-	1.00
B	Mahonia repens	20	21	.07	.31
B	Prunus virginiana	6	2	.00	-
B	Quercus gambelii	9	6	1.58	.83
B	Rhus glabra cismontana	0	0	.03	-
Total for Browse		62	54	6.03	6.60

CANOPY COVER --  
Herd unit 16A, Study no: 17

Species	Percent Cover	
	'97	'02
Cowania mexicana stansburiana	1	-
Juniperus osteosperma	2.4	3
Quercus gambelii	9.4	9

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 17

Species	Average leader growth (in)
	'02
Cowania mexicana stansburiana	3.8

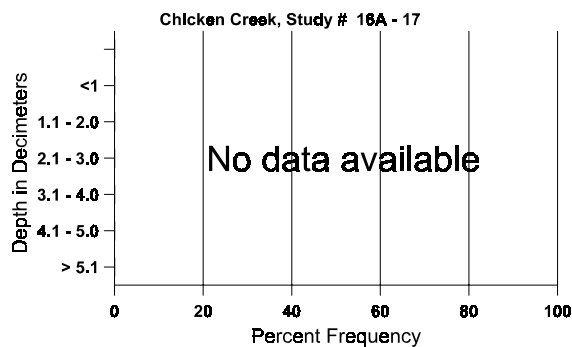
BASIC COVER --  
Herd unit 16A, Study no: 17

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	323	310	2.25	7.00	29.85	29.54
Rock	245	260	4.75	4.25	13.62	22.55
Pavement	290	271	52.00	57.25	26.51	26.07
Litter	378	359	33.50	29.75	27.93	30.74
Cryptogams	13	1	0	0	.26	.15
Bare Ground	179	165	7.50	1.75	8.96	5.48

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 17, Chicken Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.7	48.0 (13.0)	6.9	39.4	30.7	29.8	2.8	11.6	192.0	1.2

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 17

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Rabbit	-	2	-	-
Elk	2	-	26	2 (5)
Deer	39	36	957	74 (181)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 17

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Amelanchier alnifolia																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	3	-	-	-	-	-	-	-	3	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	1	-	-	-	-	-	-	-	1	-	-	-	33	18	8	1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	49	69	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	51	64	0
D	83	-	1	2	-	-	-	-	-	-	3	-	-	-	100			3
	89	-	-	1	-	-	1	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	3	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'83		40%			40%			00%						-60%				
'89		00%			100%			00%						+18%				
'97		75%			25%			00%						-25%				
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	166	Dec:	60%				
											'89	66		100%				
											'97	80		0%				
											'02	60		100%				

A Y G R E	Form Class (No. of Plants)	1				2				3				4				Plants Per Acre	Average (inches) Ht. Cr.		Total																							
		1	2	3	4	5	6	7	8	9	1	2	3	4	1	2																												
Artemisia tridentata vaseyana																																												
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																									
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																									
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	34	30	0																									
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	36	0																									
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0																									
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0																									
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1																									
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2																									
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'97</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'02</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>																				% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%		'89	00%	00%	00%		'97	00%	00%	00%		'02	00%	00%	00%	
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																								
'83	00%	00%	00%																																									
'89	00%	00%	00%																																									
'97	00%	00%	00%																																									
'02	00%	00%	00%																																									
Total Plants/Acre (excluding Dead & Seedlings)															'83	0	Dec:	-																										
															'89	0		-																										
															'97	0		-																										
															'02	0		-																										
Cercocarpus montanus																																												
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																									
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																									
	97	-	1	-	-	-	-	-	-	-	-	-	-	-	-	20	88	86	1																									
	02	-	-	-	-	-	1	-	-	-	-	-	-	-	-	20	61	82	1																									
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0																									
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0																									
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2																									
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0																									
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'97</td> <td>100%</td> <td>00%</td> <td>00%</td> <td>+ 0%</td> </tr> <tr> <td>'02</td> <td>00%</td> <td>100%</td> <td>00%</td> <td></td> </tr> </table>																				% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%		'89	00%	00%	00%		'97	100%	00%	00%	+ 0%	'02	00%	100%	00%	
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																								
'83	00%	00%	00%																																									
'89	00%	00%	00%																																									
'97	100%	00%	00%	+ 0%																																								
'02	00%	100%	00%																																									
Total Plants/Acre (excluding Dead & Seedlings)															'83	0	Dec:	-																										
															'89	0		-																										
															'97	20		-																										
															'02	20		-																										

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	20		-			
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100	27	33	3
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100	28	34	3
	97	1	2	-	-	-	-	-	-	-	3	-	-	-	60	26	40	3
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	34	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
	02	2	-	1	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+57%							
'89		00%			00%			00%			-48%							
'97		33%			00%			17%			-33%							
'02		00%			25%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	100	Dec:	0%			
												'89	233		0%			
												'97	120		33%			
												'02	80		75%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Cowania mexicana stansburiana																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	1	1	-	-	-	-	-	2	-	-	-	66	43 72	2
	89	-	-	-	-	-	1	-	-	1	-	-	-	33	114 126	1
	97	-	1	4	1	1	1	-	-	8	-	-	-	160	50 48	8
	02	3	-	4	-	1	1	-	-	9	-	-	-	180	55 60	9
D	83	-	2	8	-	-	-	-	-	5	-	5	-	333		10
	89	-	1	2	-	1	1	-	-	3	-	-	2	166		5
	97	1	1	1	1	-	-	-	-	2	-	-	2	80		4
	02	6	-	4	-	-	4	-	-	9	-	-	5	280		14
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	100		5
	02	-	-	-	-	-	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		25%			75%			42%			-50%					
'89		33%			50%			33%			+17%					
'97		25%			50%			17%			+48%					
'02		04%			57%			22%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	399	Dec:	83%			
										'89	199		83%			
										'97	240		33%			
										'02	460		61%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
<i>Gutierrezia sarothrae</i>																			
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	2	-	-	-	-	-	-	-	2	-	-	-	40		2			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	7	-	-	-	-	-	-	-	7	-	-	-	140	9	15	7		
	02	4	-	-	-	-	-	-	-	4	-	-	-	80	5	11	4		
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	02	3	-	-	-	-	-	-	-	2	-	-	1	60		3			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	40		2			
	02	-	-	-	-	-	-	-	-	-	-	-	-	40		2			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%													
'89		00%		00%		00%													
'97		00%		00%		00%		-22%											
'02		00%		00%		14%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%						
										'89	0		0%						
										'97	180		0%						
										'02	140		43%						
<i>Juniperus osteosperma</i>																			
M	83	1	-	-	-	-	-	-	-	1	-	-	-	33	67	118	1		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	116	145	0		
	02	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%													
'89		00%		00%		00%													
'97		00%		00%		00%													
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	33	Dec:	-						
										'89	0		-						
										'97	0		-						
										'02	20		-						



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Mahonia repens																		
Y	83	40	-	-	-	-	-	-	-	-	40	-	-	-	1333		40	
	89	87	-	-	-	-	-	-	-	-	87	-	-	-	2900		87	
	97	22	-	-	1	-	-	-	-	-	23	-	-	-	460		23	
	02	23	-	-	-	-	-	-	-	-	23	-	-	-	460		23	
M	83	108	-	-	-	-	-	-	-	-	108	-	-	-	3600	5	4	108
	89	18	13	-	7	-	-	-	-	-	38	-	-	-	1266	4	5	38
	97	93	-	-	21	-	-	-	-	-	114	-	-	-	2280	3	4	114
	02	206	-	-	5	-	-	-	-	-	194	17	-	-	4220	2	4	211
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	8	-	-	-	-	-	-	-	-	7	-	-	1	160		8	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-16%							
'89		10%			00%			00%			-34%							
'97		00%			00%			00%			+43%							
'02		00%			00%			.41%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4933	Dec:	0%			
												'89	4166		0%			
												'97	2740		0%			
												'02	4840		3%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Prunus virginiana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	7	3	-	-	-	1	-	-	-	11	-	-	-	220		11	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	15	15	
	02	-	1	-	-	-	-	-	-	-	1	-	-	-	20	6	8	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	1	-	-	-	-	-	-	-	-	-	1	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		20%			13%			00%			-87%							
'02		50%			50%			50%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	300		7%			
												'02	40		50%			

A Y G R E		Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	14	-	-	-	-	-	-	-	-	-	-	-	14			14	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	85	-	-	-	-	-	-	-	-	-	-	-	1700			85	
	02	14	-	-	89	-	-	-	1	-	-	-	-	2080			104	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	18	-	-	-	-	-	-	-	-	-	-	-	360	113	140	18	
	02	2	-	-	-	-	-	-	1	2	-	-	-	100	104	65	5	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	100			5	
	02	-	-	-	-	-	-	-	-	-	-	-	-	100			5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%			+ 6%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	2060		-			
												'02	2180		-			
Rhus glabra cismontana																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	88	128	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			

Trend Study 16A-18-02

Study site name: Deep Creek.

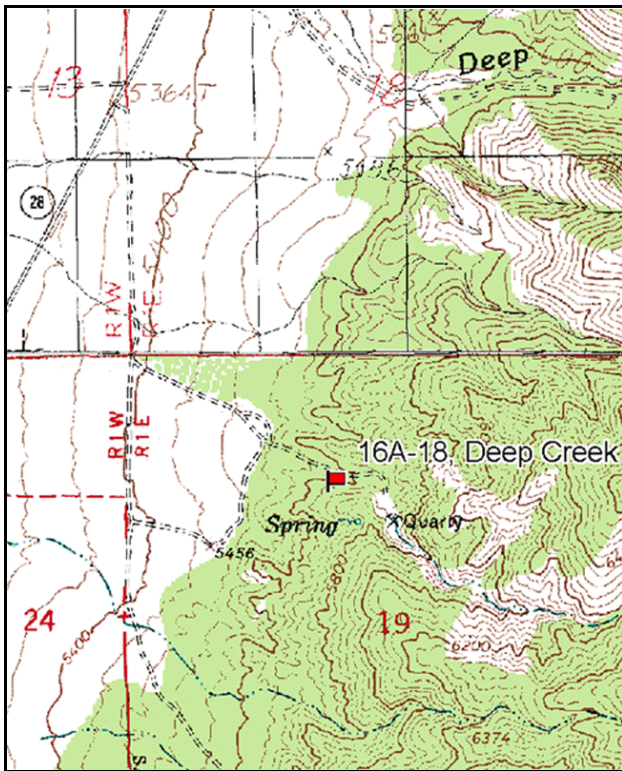
Vegetation type: True Mountain Mahogany.

Compass bearing: frequency baseline 235 degrees magnetic (line 3 @ 264°M, line 4 @ 249°M).

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

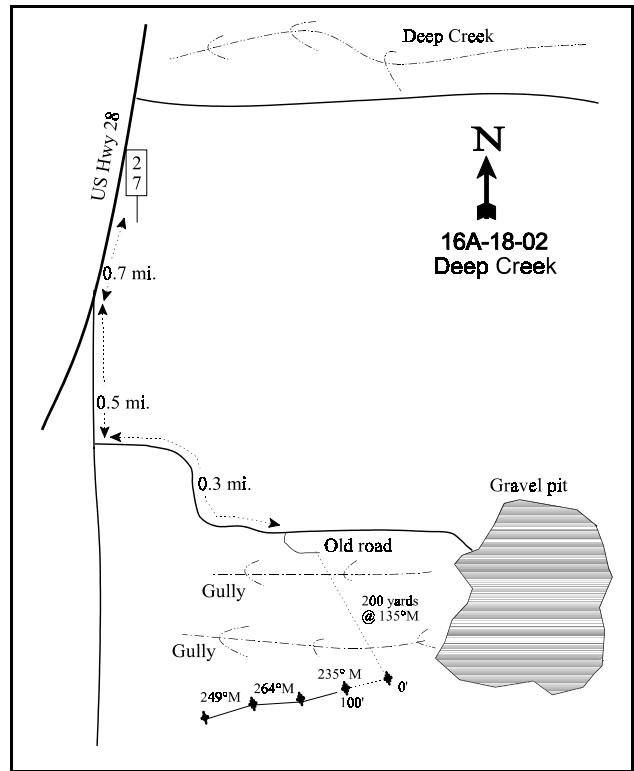
LOCATION DESCRIPTION

From the post office in Levan go south on U-28 for 3.8 miles. Turn left 0.7 miles past mile marker 27 (east then south) and go 0.5 miles to a fork in the road. Take a left (east) and go 0.3 miles to another fork. Take the old road to the right and park when it ends. From here, the 0-foot baseline stake is 200 yards at an azimuth of 135 degrees magnetic. There are some large boulders around the 100-foot baseline stake.



Map Name: Chriss Canyon

Township 15S, Range 1E, Section 19



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4371983 N 425754 E

## DISCUSSION

### Deep Creek - Trend Study No. 16A-18

This trend study monitors critical deer winter range located just south of Deep Creek. It is placed along a narrow ridge running east to west, sampling northwest and southeast facing slopes of 15% to 20%. The site supports a sparse pinyon-juniper stand associated with an understory mixture of browse species. Vegetative composition is typical of the west facing foothills from Levan south to the unit boundary. Herbaceous plants are usually very scattered and of little importance. Deer use of the area was reported moderate to heavy in 1983 and 1989. Several deer carcasses were found on the site in 1989. Pellet group quadrat frequency for deer was fairly low at 16% in 1997. A few elk pellet groups were also found at that time. Data from a pellet group transect read on site in 2002 estimated only 9 deer days use/acre (23 ddu/ha). Sheep had heavily utilized the site during the spring of 2002.

Soils are moderately deep in places with an average effective rooting depth of just over 18 inches along the baseline. Texture is a clay with a neutral pH of 7.2. The soil has poor structure with considerable erosion pavement on the surface. Pavement consists of small, flat and thin rock that cover a large portion of the exposed bare areas. Phosphorus is low at only 6.6 ppm. Values less than 10 ppm may be limiting to plant growth and development. In addition, percent organic matter is relatively low at only 1.2%. Permeability to water is likely poor and even moderate intensity storms can generate runoff from the barren shrub and tree interspaces. Erosion is apparent and unavoidable due to the poor protective ground cover. Protective cover is principally a function of aerial shrub and tree crowns, not herbaceous cover which is more effective at protecting the soil. With the lack of herbaceous species, the protection of the surface soil is minimal. Bare ground has been high in all years, especially in 2002 at 47%. The erosion condition classification was determined to be slight in 2002.

The site supports small populations of three preferred browse species: mountain big sagebrush, true mountain mahogany, and green ephedra. Mountain big sagebrush numbered around 500 plants/acre in 1983 and 1989. The population has become increasingly decadent with heavy use through 1989. Since 1989, sagebrush numbers have steadily declined to only 240 moderately hedged plants/acre in 2002. Vigor is normal on most plants but half are decadent. Dead plants, first included in the 1997 sample, total more than the number of live plants (360 plants/acre), indicating a definite declining population. Recruitment is also poor with no young or seedlings sampled in 2002.

True mountain mahogany appeared to have a stable population with adequate reproduction, moderate to heavy use, and low decadence in 1983 and 1989. Mahogany density increased by 46% in 1997 likely due to the larger, more representative sample used. Density was estimated at 1,040 plants/acre in 2002. Use remains moderate to heavy with most use in 2002 due to spring sheep grazing. Annual leader growth averaged 2.5 inches in 2002 and leaders were difficult to find due to the heavy use on available plants. Decadence increased from 14% in 1997 to 35% in 2002.

Although green ephedra is less preferred, it produces additional winter forage. The population density was estimated at 700 plants/acre in 2002. Mature plants are large with an average height of 3 ½ feet and a crown diameter of over 4 feet. Use of these shrubs was light to moderate in 1997 and 2002.

The herbaceous understory is sparsely distributed and most shrub and tree interspaces lack vegetative cover. Even cheatgrass is infrequent and found mostly under juniper crowns. Perennial grasses occur most often in the more favorable microsites near the base of shrubs. The most common perennial species is bluebunch wheatgrass which grows in scattered patches. The only other fairly common perennial grass is Sandberg bluegrass. Forbs produce as much cover as grasses, but composition is poor. The most common species is the annual, bur buttercup. The only common perennial species include tapertip hawksbeard and hoods phlox.

### 1983 APPARENT TREND ASSESSMENT

Soil condition is poor with poor protective ground cover provided by herbaceous plants. The study area has poor fertility and has a long history of erosion which has depleted the site potential. Soil erosion will continue to be a problem unless some manipulative steps such as terracing or chaining and seeding are undertaken. Vegetative trend appears somewhat more stable, in spite of an apparent declining big sagebrush population. The other key species, true mountain mahogany, appears stable or perhaps even increasing. Herbaceous understory is depleted and will continue to be so.

### 1989 TREND ASSESSMENT

Soil trend is down slightly due to a significant increase in cover of pavement and a decline in litter cover. Percent bare ground declined, but it is apparent that the decline is the result of soil loss. Erosion is ongoing and there are active gullies around the site. Comparisons of the browse data indicate a stable browse component. The key browse species, namely true mountain mahogany and mountain big sagebrush, have maintained their moderate to heavily hedged growth form and normal vigor. About a third of the mahogany population consists of young plants. The sagebrush population is stable in terms of density, but percent decadence has increased. Trend for the herbaceous understory is up slightly. The frequency data show a significant increase in the nested frequency of bluebunch wheatgrass. In the forb category, frequency is moderate and composition is similar between years for this relatively unimportant forage source.

#### TREND ASSESSMENT

soil - down slightly and in poor condition (2)

browse - stable (3)

herbaceous understory - up slightly, but poor (4)

### 1997 TREND ASSESSMENT

The soil trend shows an increasing loss of soil with rock/pavement cover increasing from 26% to 29% and bare ground declining from 31% to 25%. Litter cover is low and has declined to 26%. Trend is considered stable but in very poor condition. The browse trend appears stable. Density of mountain big sagebrush has declined, but it is not known how much of the change is due to the larger sample taken in 1997. However, the large number of dead plants alone (340 plants/acre) can explain the decline in the population. The most important browse species, mountain mahogany, accounts for 38% of the browse cover. It displays a stable population with moderate to heavy use, good vigor, and low decadence. The increase in density between 1989 and 1997 is likely due to the larger sample used in 1997. Trend for the herbaceous understory is stable and in poor condition.

#### TREND ASSESSMENT

soil - Stable but in poor condition (3)

browse - stable (3)

herbaceous understory - stable but poor (3)

## 2002 TREND ASSESSMENT

Trend for soil is down and in poor condition. Cover of bare ground has increased from 25% to 47%. Grass and forb cover have also declined from 17% to 7%. Cover of pavement declined nearly 2-fold. Some of the increase in bare ground and decline in pavement cover is likely due to the large number of sheep which grazed the site this spring. However, erosion is ongoing and there is not enough protective ground cover on the soil surface. Trend for the key browse species, mountain mahogany, is up slightly. Density has increased 17% to 1,040 plants/acre, cover has increased slightly, and strip frequency has increased to 29%. Use remains moderate to heavy and vigor is normal on most plants. However, the number of decadent plants has doubled to 35% of the population. Recruitment is marginal but should rebound with a return to normal precipitation. Secondary browse species, mountain big sagebrush and green ephedra, both show similar levels of use compared to 1997, but decadence has also increased. The browse component has a stable trend overall. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses has remained stable but frequency of perennial forbs has declined. Total herbaceous cover has also declined from 17% in 1997 to only 7% in 2002. Grasses and forbs remain unevenly distributed and composition is poor.

### TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down slightly and poor (2)

### HERBACEOUS TRENDS --

Herd unit 16A, Study no: 18

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	<sub>a</sub> 79	<sub>b</sub> 141	<sub>b</sub> 127	<sub>b</sub> 120	33	59	50	51	6.26	3.11
G	Bromus tectorum (a)	-	-	<sub>b</sub> 105	<sub>a</sub> 33	-	-	36	12	1.05	.28
G	Oryzopsis hymenoides	2	-	-	-	1	-	-	-	-	-
G	Poa fendleriana	-	2	-	-	-	1	-	-	-	-
G	Poa secunda	<sub>a</sub> 25	<sub>ab</sub> 31	<sub>bc</sub> 62	<sub>c</sub> 66	11	15	25	26	1.37	.33
Total for Annual Grasses		0	0	105	33	0	0	36	12	1.05	0.28
Total for Perennial Grasses		106	174	189	186	45	75	75	77	7.64	3.44
Total for Grasses		106	174	294	219	45	75	111	89	8.69	3.72
F	Agoseris glauca	-	-	-	4	-	-	-	2	-	.01
F	Alyssum alyssoides (a)	-	-	5	-	-	-	2	-	.01	-
F	Arabis spp.	1	-	5	6	1	-	2	5	.01	.02
F	Astragalus spp.	-	-	-	1	-	-	-	1	-	.00
F	Calochortus nuttallii	9	3	10	7	4	1	4	5	.02	.02
F	Chaenactis douglasii	3	-	-	2	1	-	-	1	-	.00
F	Collinsia parviflora (a)	-	-	4	1	-	-	1	1	.00	.00
F	Crepis acuminata	<sub>a</sub> 14	<sub>a</sub> 17	<sub>b</sub> 53	<sub>a</sub> 16	6	9	20	7	2.03	.08
F	Cruciferae	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 43	<sub>a</sub> -	-	-	15	-	.12	-
F	Cryptantha spp.	<sub>b</sub> 78	<sub>a</sub> 30	<sub>a</sub> 27	<sub>a</sub> 11	37	17	14	5	.12	.02
F	Descurainia pinnata (a)	-	-	18	12	-	-	7	4	.03	.02
F	Eriogonum brevicaulle	3	7	7	7	1	3	3	3	.01	.04

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Erigeron spp.	<sub>b</sub> 19	<sub>a</sub> 3	<sub>a</sub> 2	<sub>a</sub> -	6	1	1	-	.00	-
F	Galium aparine (a)	-	-	16	5	-	-	6	2	.20	.01
F	Gilia spp. (a)	-	-	<sub>a</sub> 12	<sub>b</sub> 29	-	-	4	10	.02	.05
F	Haplopappus acaulis	-	-	4	-	-	-	1	-	.15	-
F	Hackelia patens	<sub>ab</sub> 5	<sub>b</sub> 9	<sub>a</sub> -	<sub>b</sub> 10	3	5	-	6	-	.03
F	Lactuca serriola	-	-	-	2	-	-	-	1	-	.00
F	Leucelene ericoides	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 16	<sub>b</sub> 11	-	-	5	4	.24	.04
F	Machaeranthera canescens	-	1	-	-	-	1	-	-	-	-
F	Penstemon spp.	-	-	6	-	-	-	2	-	.01	-
F	Physaria australis	4	-	-	-	2	-	-	-	-	-
F	Physalis hederifolia	-	-	1	-	-	-	1	-	.00	-
F	Phlox hoodii	<sub>a</sub> 112	<sub>b</sub> 155	<sub>a</sub> 89	<sub>a</sub> 102	47	60	38	42	1.88	2.34
F	Phlox longifolia	<sub>a</sub> 26	<sub>ab</sub> 30	<sub>b</sub> 56	<sub>ab</sub> 40	11	14	25	18	.20	.09
F	Ranunculus testiculatus (a)	-	-	<sub>b</sub> 275	<sub>a</sub> 139	-	-	82	48	3.50	.85
F	Stanleya pinnata	<sub>ab</sub> 7	<sub>b</sub> 17	<sub>a</sub> -	<sub>a</sub> -	3	6	-	-	-	-
F	Unknown forb-annual (a)	-	-	8	-	-	-	5	-	.10	-
F	Zigadenus paniculatus	-	1	1	-	-	1	1	-	.00	-
Total for Annual Forbs		0	0	338	186	0	0	107	65	3.87	0.93
Total for Perennial Forbs		281	273	320	219	122	118	132	100	4.82	2.73
Total for Forbs		281	273	658	405	122	118	239	165	8.70	3.67

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 18

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	13	10	.74	1.02
B	Cercocarpus montanus	26	29	4.73	5.89
B	Chrysothamnus viscidiflorus stenophyllus	5	8	.36	.21
B	Ephedra viridis	18	20	2.62	3.43
B	Juniperus osteosperma	3	2	3.95	2.48
B	Pinus edulis	0	2	-	.66
B	Quercus gambelii	0	0	-	.00
Total for Browse		65	71	12.42	13.70



CANOPY COVER --

Herd unit 16A , Study no: 18

Species	Percent Cover		Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02	'97	'02
Juniperus osteosperma	6.4	3	52	63	10.6	11.0
Pinus edulis	-	.40	-	-	-	-

Point-Quarter Tree Data

Key Browse Annual Leader Growth

Herd unit 16A , Study no: 18

Species	Average leader growth (in)
	'02
Cercocarpus montanus	2.5

BASIC COVER --

Herd unit 16A, Study no: 18

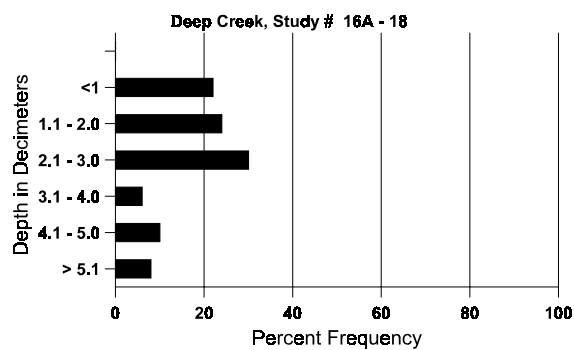
Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	358	270	2.50	9.75	27.87	23.49
Rock	211	240	2.25	5.25	8.19	7.31
Pavement	312	323	6.75	20.50	20.05	10.19
Litter	382	359	46.50	33.75	25.98	27.82
Cryptogams	35	30	2.00	0	.67	.88
Bare Ground	286	326	40.00	30.75	25.02	47.01

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 18, Deep Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
18.3	49.0 (17.0)	7.2	28.7	19.4	51.8	1.2	6.6	124.8	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 18

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	02	02
Sheep	-	12	722	56 (137)
Rabbit	9	15	-	-
Elk	2	1	-	-
Deer	16	1	122	9 (23)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 18

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total			
		1	2	3	4		Ht.	Cr.				
<i>Artemisia tridentata vaseyana</i>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	0		0	
M	83	2	6	1	-	-	-	-	300	28	34	9
	89	-	3	2	-	-	1	-	200	21	19	6
	97	8	1	-	-	-	-	-	180	26	30	9
	02	3	3	-	-	-	-	-	120	24	25	6
D	83	-	2	5	-	-	-	-	233			7
	89	-	4	4	-	-	1	-	300			9
	97	4	1	-	-	-	-	-	100			5
	02	2	4	-	-	-	-	-	120			6
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	340			17
	02	-	-	-	-	-	-	-	360			18
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		50%		38%		00%		- 6%				
'89		47%		40%		33%		-40%				
'97		13%		00%		13%		-20%				
'02		58%		00%		08%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	533	Dec:	44%			
						'89	500		60%			
						'97	300		33%			
						'02	240		50%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total					
		1	2	3	4		1	2						
<b>Cercocarpus montanus</b>														
Y	83	-	4	-	-	-	-	-	4	-	-	133		4
	89	-	4	-	-	-	-	-	4	-	-	133		4
	97	1	5	-	-	-	-	-	6	-	-	120		6
	02	1	-	-	-	1	-	-	2	-	-	40		2
M	83	1	6	2	-	-	-	-	9	-	-	300	35 36	9
	89	-	3	-	-	4	1	-	8	-	-	266	40 41	8
	97	-	17	14	-	-	-	-	31	-	-	620	39 48	31
	02	10	8	6	-	5	-	3	32	-	-	640	42 50	32
D	83	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	2	-	-	-	-	-	-	-	66		2
	97	-	5	1	-	-	-	-	5	-	-	120		6
	02	2	7	7	-	1	1	-	13	-	-	360		18
X	83	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>			
'83		77%			15%			00%			+ 7%			
'89		79%			21%			14%			+46%			
'97		63%			35%			02%			+17%			
'02		42%			27%			10%						
Total Plants/Acre (excluding Dead & Seedlings)										'83	433	Dec:	0%	
										'89	465		14%	
										'97	860		14%	
										'02	1040		35%	
<b>Chrysothamnus viscidiflorus stenophyllus</b>														
M	83	3	-	-	-	-	-	-	3	-	-	100	11 14	3
	89	3	1	-	-	-	-	-	4	-	-	133	10 13	4
	97	4	-	-	-	-	-	-	4	-	-	80	10 16	4
	02	5	1	1	-	-	-	-	7	-	-	140	10 20	7
D	83	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	1	-	-	20		1
	02	-	1	1	1	-	-	-	3	-	-	60		3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>			
'83		00%			00%			00%			+25%			
'89		25%			00%			00%			-25%			
'97		00%			00%			00%			+50%			
'02		20%			20%			00%						
Total Plants/Acre (excluding Dead & Seedlings)										'83	100	Dec:	0%	
										'89	133		0%	
										'97	100		20%	
										'02	200		30%	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Cowania mexicana stansburiana</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	2	-	-	-	-	-	-	-	-	-	-	66	26	35	2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	18	18	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		100%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	66		-			
												'97	0		-			
												'02	0		-			
<i>Ephedra viridis</i>																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	83	6	-	-	-	-	-	-	-	-	6	-	-	-	200	40	48	6
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133	35	24	4
	97	14	3	-	-	2	-	-	-	-	18	-	1	-	380	41	56	19
	02	18	4	-	1	-	-	-	-	-	23	-	-	-	460	42	53	23
D	83	1	1	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	97	2	1	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	7	-	-	-	1	-	2	-	-	8	-	-	2	200		10	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	120		6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		11%			00%			00%			+10%							
'89		00%			00%			00%			+24%							
'97		27%			00%			05%			+37%							
'02		14%			00%			06%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	299	Dec:	22%			
												'89	333		60%			
												'97	440		14%			
												'02	700		29%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4					
Juniperus osteosperma																			
M	'83	-	-	-	-	-	-	-	-	2	-	2	-	-	-	66	67	207	2
	'89	-	-	-	-	-	-	-	-	2	-	2	-	-	-	66	165	136	2
	'97	1	-	-	-	-	-	-	1	-	1	3	-	-	-	60	-	-	3
	'02	3	-	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
'83		00%			00%			00%			+ 0%								
'89		00%			00%			00%			- 9%								
'97		00%			33%			00%			+ 0%								
'02		00%			00%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-				
												'89	66		-				
												'97	60		-				
												'02	60		-				
Pinus edulis																			
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'02	1	-	-	1	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
'83		00%			00%			00%											
'89		00%			00%			00%											
'97		00%			00%			00%											
'02		00%			00%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-				
												'89	0		-				
												'97	0		-				
												'02	40		-				

Trend Study 16A-19-02

Study site name: Flat Canyon.

Vegetation type: Bitterbrush - Sagebrush.

Compass bearing: frequency baseline 204 degrees magnetic (line 2-4 @ 171°M).

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

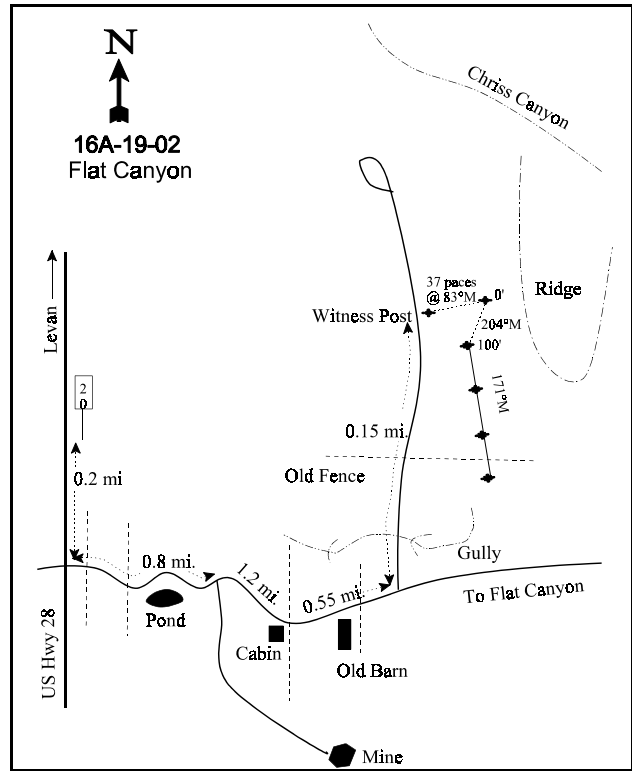
LOCATION DESCRIPTION

From Levan, go south on Highway 28 to 0.2 miles south of mile marker #20. Turn left here (east) and go 0.8 miles to a fork, keep left. Continue 1.2 miles to an old fence by an old cabin where the road makes a 90° turn to the east. Continue up the main road for 0.55 miles to a faint road which turns off to the left down into the sagebrush. Follow this road for 0.15 miles to a witness post on the right side of the road. From here walk up the hill about 37 paces bearing 83degrees magnetic to the 0 foot baseline stake which is marked with browse tag #9084.



Map Name: Skinner Peaks

Township 16S, Range 1W, Section 14



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4362948 N 423904 E

## DISCUSSION

### Flat Canyon - Trend Study No. 16A-19

The Flat Canyon trend study was established in 1989 on the critical and heavily used winter range in the hills around Flat and Chris Canyons, north of Gunnison. Much of the land around the area is inaccessible, posted private land. The trend study was located on a site typical of the slightly higher elevation range in the area, having a moderate density of juniper with a big sagebrush and bitterbrush understory. Juniper density was estimated at 45 mostly mature trees per acre in 2002. A few pinyon trees were also encountered. Big game use was reported heavy in 1989. Pellet group quadrat frequency of deer was moderately high at 28% in 1997 and 29% in 2002. Data from a pellet group transect read along the study baseline in 2002 estimated 44 deer days use/acre (109 ddu/ha). Most of the deer pellet groups appeared to be from late winter or early spring use. The few cattle pats encountered in 2002 were from the summer of 2001.

The study site is on a small ridge with a varying slope from 35% on the side of the ridge to only 3% to 5% on the ridge top. The original baseline sampled the steeper side of the ridge while the extended baseline from 1997 samples more of the ridge top. The elevation is 6,000 feet. Soil at the site is moderately deep with an estimated effective rooting depth of just over 17 inches. There appears to be a caliche layer in places that varies in depth. The soil penetrometer can apparently penetrate the layer. Rocks appear to be alluvially deposited and are rounded cobble. Large and small gravel sized rocks are common on the surface and throughout the profile. Rocks found at about 1 foot in depth have a calcium carbonate coating. The soil has a sandy loam texture with little structure and a neutral pH of 7.2. Organic matter is limited at only 1.6% and phosphorus may be limiting to plant growth at only 4.4 ppm. Levels below 10 ppm may be limiting to plant growth and development. Some erosion is occurring, but it does not appear to be severe on the site.

Key browse species include mountain big sagebrush and bitterbrush. Mountain big sagebrush had a moderate density of 2,532 plants/acre in 1989, declining to 1,220 plants/acre by 1997. Sagebrush canopy cover averaged 8% in 1989 and nearly 9% in 1997. Half of the sagebrush were classified as mature in 1989. These shrubs were large, moderately hedged with only fair vigor and rather depressed annual growth. Twenty-six percent of the population was decadent but there was an equal number of young and seedling plants. The population became increasingly more mature by 1997 with 72% of the stand consisting of mature plants. Some of the change in density may be the result of the larger sample used in 1997. However, the abundant number of dead plants (1,020 plants/acre), first counted in 1997, suggests a real decline. Density remained stable at about 1,200 plants/acre in 2002. Use was mostly light to moderate with heavy use on a few plants.

The bitterbrush is the interesting component on this site. Growth form varies from prostrate, layering shrubs to 8 foot tall, open tree-like forms. The low form of bitterbrush have been especially heavily hedged. The taller plants have also been heavily browsed with some forage unavailable due to height. A density of 533, all mature plants/acre was estimated in 1989. During the 1997 reading, 480 mature plants/acre were estimated along with 100 young plants/acre and 20 decadent. Use continued to be moderate to heavy with normal vigor. Density remained stable in 2002 at 620 plants/acre. Use was heavier but vigor remained normal on most plants and the number of decadent plants is still low. A small amount of ephedra, low rabbitbrush, and rubber rabbitbrush also occur on the site.

Perennial bunchgrasses are fairly common, but widely spaced. The prevalent species are bluebunch wheatgrass, Sandberg bluegrass, and needle-and-thread. They had been only lightly grazed in 1989 with no utilization apparent by late May of 1997 or 2002. Cheatgrass is also abundant. It provided 48% of the grass cover in 1997 and was found primarily under shrub and tree canopies. Drought conditions have caused a significant decline in cheatgrass frequency and cover in 2002. However, it is still abundant. Forbs are fairly diverse, but unproductive.

### 1989 APPARENT TREND ASSESSMENT

The slight erosion on the site does not appear to be any more serious than it ever has been. A further loss of understory vegetation would be detrimental to the soil condition, as seen in nearby stands of juniper. There are few young of the key browse species, mountain big sagebrush and bitterbrush, but the age class distribution is fairly stable. The heavy use and reduced vigor on the sagebrush and bitterbrush could cause a future downward trend. Overall, the vegetative trend appears stable.

### 1997 TREND ASSESSMENT

Soil trend appears stable. Erosion is still occurring yet it does not appear severe. Cover of bare soil has increased slightly, while percent litter cover declined from 42% to 32%. Some of the changes may be the result of the larger sample taken in 1997. Trend for browse is stable. Density of mountain big sagebrush has declined and dead plants are nearly as numerous as live ones. Some of the dead sagebrush appear to have died recently but not due to excessive use. Seedlings and young appear to be abundant enough to maintain the current population. Bitterbrush is moderately to heavily hedged, decadency is only 3%, vigor is good, and recruitment is adequate. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has declined slightly, while frequency of perennial forbs has increased.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, but poor composition (3)

### 2002 TREND ASSESSMENT

Trend for soil remains stable with similar ground cover characteristics compared to 1997. Trend for browse is stable for the key species, mountain big sagebrush and antelope bitterbrush. Use has increased somewhat compared to 1997, but densities have remained stable and vigor is normal on most plants. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses has increased slightly while frequency of perennial forbs has declined. However, perennial forbs are rare and provide little cover. Drought conditions in 2001 and 2002 have caused a significant decline in the nested frequency of cheatgrass, an annual. It is still abundant but it currently only provides 11% of the total grass cover, down from 48% in 1997.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)



HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 19

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron spicatum	<sub>b</sub> 171	<sub>a</sub> 122	<sub>ab</sub> 150	73	50	60	3.44	6.67
G	Bromus japonicus (a)	-	<sub>a</sub> -	<sub>b</sub> 20	-	-	8	-	.06
G	Bromus tectorum (a)	-	<sub>b</sub> 275	<sub>a</sub> 211	-	91	78	5.80	1.19
G	Oryzopsis hymenoides	<sub>b</sub> 27	<sub>ab</sub> 11	<sub>a</sub> -	11	5	-	.10	.01
G	Poa secunda	<sub>a</sub> 20	<sub>b</sub> 65	<sub>b</sub> 55	8	26	25	1.22	1.53
G	Sitanion hystrix	2	6	-	1	2	-	.15	-
G	Stipa comata	38	26	41	20	13	21	1.33	1.82
Total for Annual Grasses		0	275	231	0	91	86	5.80	1.26
Total for Perennial Grasses		258	230	246	113	96	106	6.25	10.05
Total for Grasses		258	505	477	113	187	192	12.05	11.31
F	Agoseris glauca	<sub>a</sub> -	<sub>b</sub> 20	<sub>b</sub> 11	-	9	5	.27	.05
F	Alyssum alyssoides (a)	-	<sub>a</sub> 1	<sub>b</sub> 25	-	1	9	.00	.04
F	Allium spp.	-	-	2	-	-	1	-	.00
F	Arabis spp.	-	-	1	-	-	1	-	.00
F	Astragalus agrestis	-	4	5	-	3	3	.07	.04
F	Astragalus eurekensis	-	-	6	-	-	3	-	.04
F	Castilleja linariaefolia	-	2	-	-	2	-	.06	-
F	Calochortus nuttallii	<sub>a</sub> -	<sub>c</sub> 41	<sub>b</sub> 15	-	18	5	.16	.05
F	Chaenactis douglasii	-	<sub>b</sub> 25	<sub>a</sub> 2	-	9	1	.69	.00
F	Chorispora tenella (a)	-	4	3	-	1	1	.03	.00
F	Cirsium spp.	-	5	-	-	2	-	.04	-
F	Collinsia parviflora (a)	-	-	3	-	-	1	-	.00
F	Crepis acuminata	-	-	-	-	-	-	-	.00
F	Cryptantha spp.	<sub>a</sub> 6	<sub>b</sub> 16	<sub>a</sub> -	3	8	-	.11	-
F	Descurainia pinnata (a)	-	-	7	-	-	3	-	.01
F	Epilobium brachycarpum (a)	-	3	7	-	1	4	.00	.02
F	Erodium cicutarium (a)	-	2	3	-	1	1	.00	.00
F	Eriogonum racemosum	-	-	2	-	-	1	-	.03
F	Galium aparine (a)	-	-	1	-	-	1	-	.00
F	Gilia spp. (a)	-	<sub>b</sub> 61	<sub>a</sub> 11	-	23	7	2.15	.03
F	Lactuca serriola	-	4	-	-	1	-	.00	-
F	Machaeranthera canescens	3	-	-	2	-	-	.00	-
F	Microsteris gracilis (a)	-	-	3	-	-	3	-	.01
F	Phlox austromontana	-	6	-	-	3	-	.18	-
F	Phlox longifolia	9	9	6	6	4	4	.04	.02
F	Polygonum douglasii (a)	-	3	-	-	1	-	.00	-
F	Streptanthus cordatus	3	5	1	1	3	1	.04	.00

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Tragopogon dubius	-	9	-	-	5	-	.10	-
F	Veronica biloba (a)	-	-	2	-	-	1	-	.00
F	Zigadenus paniculatus	-	-	3	-	-	1	-	.03
Total for Annual Forbs		0	74	65	0	28	31	2.20	0.15
Total for Perennial Forbs		21	146	54	12	67	26	1.80	0.28
Total for Forbs		21	220	119	12	95	57	4.00	0.43

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 19

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	43	44	8.83	10.96
B	Chrysothamnus viscidiflorus viscidiflorus	4	4	.15	.06
B	Ephedra viridis	0	0	-	.00
B	Gutierrezia sarothrae	7	4	.35	.30
B	Juniperus osteosperma	1	4	2.96	6.56
B	Opuntia spp.	3	0	.03	-
B	Purshia tridentata	14	18	3.04	4.09
B	Quercus gambelii	0	1	-	-
Total for Browse		72	75	15.37	21.99

#### CANOPY COVER --

Herd unit 16A, Study no: 19

Species	Percent Cover		Point-Quarter Tree Data	
	'97	'02	Trees per Acre	Average diameter (in)
Juniperus osteosperma	12	10	45	7.5
Pinus edulis	-	-	10	4.6

#### Key Browse Annual Leader Growth

Herd unit 16A, Study no: 19

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.1
Purshia tridentata	1.7

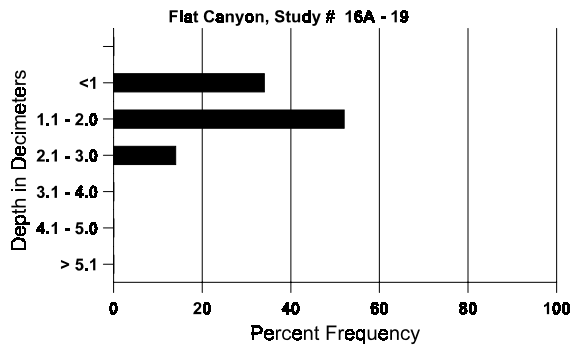
BASIC COVER --  
Herd unit 16A, Study no: 19

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	340	294	4.75	26.96	31.86
Rock	251	260	8.75	7.50	9.19
Pavement	313	306	21.00	15.75	11.90
Litter	379	365	42.25	32.46	35.46
Cryptogams	61	34	1.25	.92	.76
Bare Ground	294	298	22.00	28.46	30.32

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 19, Flat Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.2	50.8 (17.1)	7.2	70.4	15.8	13.8	1.6	4.4	153.6	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 19

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	2	23	02	02
Horse	-	1	-	-
Elk	1	-	-	-
Deer	28	29	574	44 (109)
Cattle	-	2	26	2 (5)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 19

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	-	-	1	-	-	66		1	
	97	6	-	-	-	-	-	-	-	-	-	6	-	-	120		6	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	9	-	-	-	-	-	-	-	-	8	1	-	-	600		9	
	97	7	-	-	1	-	-	-	-	-	8	-	-	-	160		8	
	02	3	-	-	1	-	-	-	-	-	4	-	-	-	80		4	
M	89	3	15	1	-	-	-	-	-	-	8	4	7	-	1266	20 24	19	
	97	37	6	-	1	-	-	-	-	-	44	-	-	-	880	22 35	44	
	02	30	11	1	3	1	-	-	-	-	46	-	-	-	920	19 29	46	
D	89	8	-	2	-	-	-	-	-	-	5	4	-	1	666		10	
	97	9	-	-	-	-	-	-	-	-	8	-	-	1	180		9	
	02	4	9	-	1	-	-	-	-	-	7	-	-	7	280		14	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	1020		51	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	580		29	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		39%			08%			21%			-52%							
'97		10%			00%			02%			+ 5%							
'02		33%			02%			11%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2532	Dec:	26%				
											'97	1220		15%				
											'02	1280		22%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	20 13	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28 33	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			50%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	-				
											'97	0		-				
											'02	0		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
Y	89	1	-	-	-	-	-	-	-	-	-	-	1	-	66		1	
	97	2	-	-	-	-	-	-	-	-	-	-	2	-	40		2	
	02	1	-	-	-	-	-	-	-	-	-	-	1	-	20		1	
M	89	3	1	1	-	-	-	-	-	-	-	-	5	-	333	12 13	5	
	97	5	-	-	-	-	-	-	-	-	-	-	5	-	100	13 19	5	
	02	1	-	-	2	-	-	-	-	-	-	-	3	-	60	11 15	3	
D	89	1	-	-	-	-	-	-	-	-	-	-	1	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	-	-	2	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		14%			14%			14%			-70%							
'97		00%			00%			00%			-14%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	465	Dec:	14%			
												'97	140		0%			
												'02	120		33%			
Ephedra viridis																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18 13	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16 13	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	58	-	-	-	-	-	-	-	-	58	-	-	-	1160			58
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	12	-	-	-	-	-	-	-	-	12	-	-	-	240	10	14	12
	02	4	-	-	1	-	-	-	-	-	5	-	-	-	100	4	6	5
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	14	-	-	-	-	-	1	-	-	-	-	-	15	300			15
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	300			15
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-71%							
'02		00%			00%			75%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	1400		0%			
												'02	400		75%			
<i>Juniperus osteosperma</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
	02	3	-	-	-	-	-	1	-	-	4	-	-	-	80	-	-	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+75%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	80		-			
<i>Opuntia spp.</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	3	10	4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total									
		1	2	3	4		5	6		7	8	9	1	2	3	4		
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	3	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	5	3	-	-	-	-	-	-	8	-	-	-	533	15	32	8
	97	-	17	6	-	-	1	-	-	-	24	-	-	-	480	57	46	24
	02	7	3	9	-	2	5	-	-	-	26	-	-	-	520	21	56	26
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	02	3	1	-	-	-	-	-	-	-	1	-	-	3	80		4	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		63%			38%			00%			+11%							
'97		67%			27%			00%			+ 3%							
'02		23%			45%			10%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	533	Dec:	0%					
										'97	600		3%					
										'02	620		13%					
Quercus gambelii																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-					
										'97	0		-					
										'02	20		-					

Trend Study 16A-20-02

Study site name: Triangle Ranch.

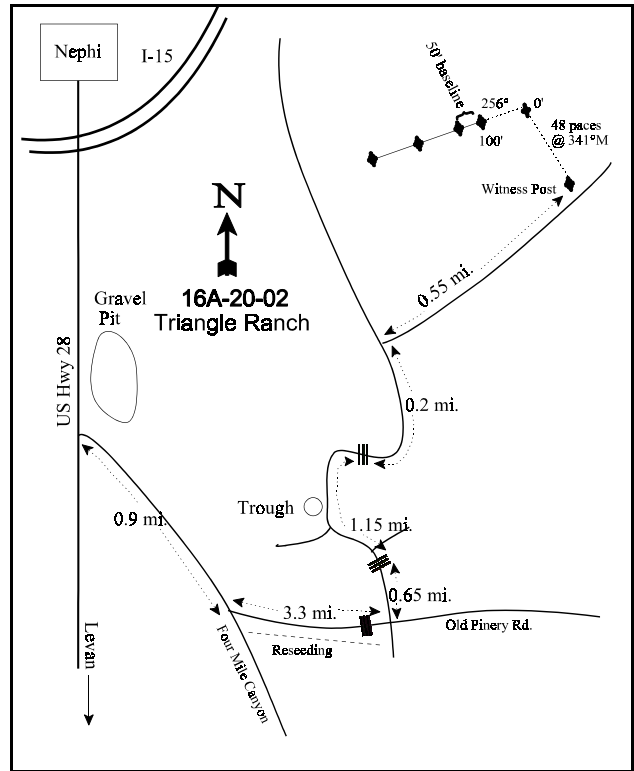
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 256 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft) 50' baseline, line 3 (59ft), line 4 (71ft). Rebar: belt 5 on 4ft.

LOCATION DESCRIPTION

Just south of Nephi on Highway 28, turn south past the gravel pit onto a graded road. Go 0.9 miles to a fork. Bear left on the Old Pinery Road. Go 3.0 miles to a cattle guard. Continue 0.3 miles to an intersection. Turn left here and go 0.65 miles to a cattle guard at the top of the hill, then drive through Little Valley 1.1 miles to a gate at the north end of the valley and 0.05 more to a cattle guard. Proceed up the jeep trail 0.2 miles to a fork and bear right. Go 0.55 miles to another fork in a chaining. Take the right fork 0.05 miles to the witness post. From the witness post, go 48 paces at 341 degrees magnetic to the 0-foot baseline stake.



Map Name: Nephi

Diagrammatic Sketch

Township 13S, Range 1E, Section 14

GPS: NAD 27, UTM 12S 4392838 N 432034 E



## DISCUSSION

### Triangle Ranch - Trend Study No. 16A-20

The Triangle Ranch study was established in 1989 within a chaining on the Division's Triangle Ranch property. The site is in a valley between the low hills south of Nephi. It has a slightly western aspect with a gentle slope of 10% and an elevation of 6,200 feet. The area provides a variety and abundance of browse and herbaceous forage. Gambel oak and juniper are reestablishing themselves after the treatment, but there is an excellent stand of big sagebrush and grass on the study site. In 1989, there was sign of moderate use by deer and elk, mainly in spring and fall as the area often receives significant snow cover. The area had also been grazed by cattle and horses. During the 1997 reading, no deer or elk pellet groups were encountered. Some old cattle pats were found. Data from a pellet group transect read on site in 2002 estimated 36 deer days use/acre (88 ddu/ha). Some old cattle pats were also encountered which appear to be from the summer of 2001. Most of the deer pellet groups appeared to be from winter use but about 20% were from early spring.

The soil is a moderately deep, clay loam with an effective rooting depth estimated at 21 inches. There are few rocks on the surface or in the soil profile. Organic matter is abundant on the surface, but percent organic matter in the top 6 to 8 inches of the soil is fairly low at only 1.9%. Erosion is limited due to the gentle slope and the abundant vegetation and litter cover. The erosion condition classification was determined to be stable in 2002.

Mountain big sagebrush is well established as the most frequent browse species. It provided 12% cover in 1997, increasing to 14% in 2002. Density has remained similar between readings at about 3,000 plants/acre since 1989. Utilization was moderate in 1989 with decadent plants common, making up 60% of the population. Since then, use has been mostly light and the number of decadent plants has declined. Annual leader growth averaged 1.5 inches in 2002. Bitterbrush and white-stemmed rubber rabbitbrush occur in small numbers and provide some additional forage. All bitterbrush plants encountered in 1997 were heavily hedged yet still had good vigor and none were classified as being decadent.

Some oak and juniper trees are reestablishing themselves on the site. Point-centered quarter data estimated 72 juniper/acre in 1989. Forty percent were young trees under 4 feet tall, 35% mature, and the rest were in the 4-8 foot class. Point quarter data from 2002 estimated 110 juniper trees/acre, most in the 10 to 15 foot height class. Average diameter was estimated at 4 inches.

The herbaceous understory is diverse and abundant with grasses producing a total of 30% ground cover in 2002 while forbs provided only 5% cover. The dominant perennial grasses are Kentucky bluegrass, intermediate wheatgrass, sheep fescue, and an increasing population of bulbous bluegrass. Other common grasses include western wheatgrass, smooth brome, orchard grass, and Sandberg bluegrass. Although forbs are diverse, they produce little forage. The only common perennial species is Beckwith milkvetch and false dandelion which accounted for over half of the meager forb cover in 2002.

### 1989 APPARENT TREND ASSESSMENT

The soil trend appears stable due to the abundant herbaceous ground cover. While the sagebrush population generally appears stable, the data may indicate a declining trend due to high decadence in the population. A rereading will be very interesting on this site. Grasses may still be increasing, and the increase of juniper will be slow but constant.

## 1997 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1989. Erosion is not currently a problem on the site. The browse trend is up slightly for the key browse species, mountain big sagebrush. Density has remained similar, but percent decadence has declined from 60% in 1989 to only 8% currently. It appears that due to the lack of dead plants (180 plants/acre), many of the decadent sagebrush encountered in 1989 have regained their vigor. Utilization continues to be mostly light and recruitment, in spite of the vigorous herbaceous understory, remains more than adequate to maintain the stand. Trend for the herbaceous understory is up due to an increase in the sum of nested frequency for perennial grasses and forbs. Some of the changes in frequency of grasses and forbs may be partly due to the larger sample taken in 1997, but it appears that western wheatgrass has declined significantly in its sum of nested frequency, while Kentucky bluegrass has increased significantly. With more precipitation associated with this higher elevation site, one would expect Kentucky bluegrass to be more competitive than western wheatgrass.

### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Trend for soil is stable. There was an increase in cover of bare ground and a decline in litter cover due to drought conditions in 2001 and 2002. However, herbaceous cover is abundant and it has increased slightly since 1997. There is no erosion occurring on site due to the abundant protective ground cover. Trend for mountain big sagebrush remains stable with a population of 2,900 plants/acre. Utilization is mostly light and vigor is normal on most plants. The number of decadent plants has increased but recruitment is adequate to maintain the population. One negative aspect is that juniper continues to increase in density and cover. However, it will be many years before it is abundant enough to negatively effect the sagebrush population. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses has declined slightly, while frequency of perennial forbs declined more sharply. Although, forbs provide only 14% of the total herbaceous cover. One negative aspect of the perennial grass component is the significant increase in the low value bulbous bluegrass and a significant decline in Kentucky bluegrass. Bulbous bluegrass provided only 9% of the grass cover in 1997, increasing to 27% in 2002. Cover increased from 2% to 8%. Kentucky bluegrass made up 31% of the grass cover in 1997 with a total cover value of 8%. It declined to a cover value of 4% in 2002 which made up 12% of the grass cover. There may also be some difficulty in identification of western wheatgrass. Data indicates a steady decline in nested frequency since 1989. Much of the intermediate wheatgrass on this chaining is strongly rhizomatous and may have been misidentified as western wheatgrass.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16A, Study no: 20

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>b</sub> 40	<sub>a</sub> 17	<sub>a</sub> 13	24	8	5	.78	.36
G	Agropyron intermedium	62	109	122	30	36	44	4.19	3.47
G	Agropyron smithii	<sub>c</sub> 330	<sub>b</sub> 140	<sub>a</sub> 71	97	50	28	1.06	.81
G	Agropyron spicatum	4	-	-	3	-	-	-	-
G	Bromus inermis	<sub>a</sub> 13	<sub>ab</sub> 37	<sub>b</sub> 47	6	12	17	1.17	2.71
G	Bromus tectorum (a)	-	71	51	-	25	20	.39	.12
G	Dactylis glomerata	<sub>a</sub> 28	<sub>b</sub> 83	<sub>b</sub> 60	14	31	26	2.34	3.06
G	Elymus cinereus	-	1	3	-	1	1	.00	.78
G	Elymus salina	-	5	-	-	2	-	.76	-
G	Festuca ovina	<sub>a</sub> 30	<sub>b</sub> 89	<sub>b</sub> 85	12	34	30	4.06	6.15
G	Poa bulbosa	<sub>a</sub> -	<sub>b</sub> 64	<sub>c</sub> 189	-	21	64	2.33	7.94
G	Poa fendleriana	-	1	-	-	1	-	.03	-
G	Poa pratensis	<sub>a</sub> 74	<sub>b</sub> 182	<sub>a</sub> 112	31	57	39	8.13	3.63
G	Poa secunda	82	59	47	30	22	21	1.19	.84
Total for Annual Grasses		0	71	51	0	25	20	0.39	0.12
Total for Perennial Grasses		663	787	749	247	275	275	26.09	29.79
Total for Grasses		663	858	800	247	300	295	26.48	29.92
F	Agoseris glauca	<sub>a</sub> 5	<sub>c</sub> 90	<sub>b</sub> 58	3	37	25	.80	.32
F	Alyssum alyssoides (a)	-	<sub>a</sub> 39	<sub>b</sub> 85	-	16	31	.08	.25
F	Antennaria rosea	-	6	-	-	2	-	.01	-
F	Arabis spp.	10	10	2	4	4	1	.02	.00
F	Astragalus beckwithii	<sub>a</sub> -	<sub>b</sub> 60	<sub>b</sub> 76	-	25	29	1.83	2.09
F	Aster chilensis	-	-	3	-	-	1	-	.15
F	Astragalus convallarius	<sub>b</sub> 25	<sub>a</sub> 6	<sub>a</sub> 2	13	3	2	.06	.18
F	Balsamorhiza sagittata	-	3	3	-	1	1	.00	.00
F	Calochortus nuttallii	<sub>a</sub> -	<sub>b</sub> 9	<sub>b</sub> 14	-	5	8	.02	.04
F	Cerastium spp.	4	-	-	2	-	-	-	-
F	Cirsium spp.	-	-	-	-	-	-	.03	-
F	Collomia linearis (a)	-	7	9	-	5	4	.05	.02
F	Collinsia parviflora (a)	-	198	165	-	72	55	.63	.64
F	Crepis acuminata	<sub>a</sub> 14	<sub>a</sub> 12	<sub>b</sub> 31	6	6	14	.13	.69
F	Cymopterus spp.	8	4	8	4	2	4	.03	.02
F	Draba spp. (a)	-	3	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	<sub>b</sub> 66	<sub>a</sub> 20	-	30	10	.17	.05
F	Eriogonum racemosum	5	3	1	3	1	1	.00	.00
F	Eriogonum umbellatum	6	6	6	2	2	2	.06	.03
F	Galium aparine (a)	-	<sub>b</sub> 25	<sub>a</sub> -	-	9	-	.50	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Lappula occidentalis (a)	-	<sub>b</sub> 12	<sub>a</sub> -	-	5	-	.02	-
F	Lactuca serriola	5	2	-	2	1	-	.00	-
F	Linum lewisii	<sub>ab</sub> 13	<sub>b</sub> 19	<sub>a</sub> 6	5	9	3	.15	.04
F	Microsteris gracilis (a)	-	<sub>a</sub> -	<sub>b</sub> 21	-	-	9	-	.04
F	Penstemon spp.	-	-	2	-	-	1	-	.00
F	Phlox longifolia	18	21	20	9	8	8	.04	.04
F	Polygonum douglasii (a)	-	8	3	-	3	1	.01	.00
F	Ranunculus testiculatus (a)	-	<sub>b</sub> 101	<sub>a</sub> 44	-	34	18	.26	.14
F	Sanguisorba minor	1	-	-	1	-	-	-	-
F	Sphaeralcea coccinea	<sub>b</sub> 12	<sub>ab</sub> 9	<sub>a</sub> 3	6	4	2	.02	.01
F	Taraxacum officinale	-	1	-	-	1	-	.00	-
F	Tragopogon dubius	<sub>b</sub> 45	<sub>b</sub> 53	<sub>a</sub> 12	24	21	7	.57	.08
F	Unknown forb-annual (a)	-	<sub>b</sub> 22	<sub>a</sub> -	-	10	-	.05	-
F	Viola spp.	-	<sub>B</sub> 5	<sub>a</sub> 1	-	4	1	.02	.00
F	Zigadenus paniculatus	1	6	7	1	3	5	.04	.07
Total for Annual Forbs		0	481	347	0	185	128	1.81	1.16
Total for Perennial Forbs		172	325	255	85	139	115	3.89	3.81
Total for Forbs		172	806	602	85	324	243	5.71	4.97

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

#### BROWSE TRENDS --

Herd unit 16A, Study no: 20

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	62	64	12.08	13.80
B	Chrysothamnus nauseosus albicaulis	6	6	.06	.68
B	Gutierrezia sarothrae	6	28	.02	.26
B	Juniperus osteosperma	2	8	1.14	3.04
B	Purshia tridentata	2	1	.15	-
B	Quercus gambelii	0	2	.63	.63
Total for Browse		78	109	14.09	18.43

#### CANOPY COVER --

Herd unit 16A, Study no: 20

Species	Percent Cover	
	'97	'02
Juniperus osteosperma	-	3
Quercus gambelii	-	2

#### Point-Quarter Tree Data

Trees per Acre		Average diameter (in)	
'97	'02	'97	'02
97	110	4.2	4.0
-	-	-	-

Key Browse Annual Leader Growth  
Herd unit 16A, Study no: 20

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.5

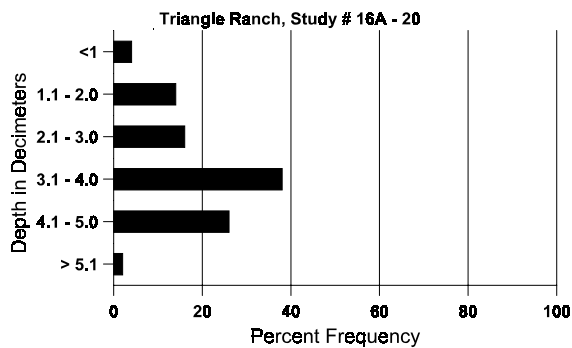
BASIC COVER --  
Herd unit 16A, Study no: 20

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	385	363	6.50	48.11	55.36
Rock	42	58	1.00	.22	.22
Pavement	154	119	.50	1.14	1.77
Litter	400	367	79.75	51.00	42.92
Cryptogams	25	4	1.25	.07	.15
Bare Ground	235	233	11.00	12.95	19.10

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 20, Triangle Ranch

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.3	43.8 (17.7)	6.2	42.0	31.4	26.6	1.9	17.7	185.6	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 20

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Rabbit	2	8	-	-
Deer	-	9	461	35 (88)
Cattle	7	5	52	4 (11)

BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 20

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32	30	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	44	42	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	5	1	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	43	1	-	-	-	-	-	-	-	44	-	-	-	880		44	
	02	13	1	-	-	-	-	-	-	-	14	-	-	-	280		14	
M	89	5	9	-	-	-	-	-	-	-	13	1	-	-	933	22	24	14
	97	75	23	5	-	-	-	-	-	-	103	-	-	-	2060	26	38	103
	02	62	27	-	-	-	-	-	-	-	89	-	-	-	1780	25	37	89
D	89	13	17	-	-	-	-	-	-	-	29	1	-	-	2000		30	
	97	11	1	-	-	-	-	-	-	-	4	-	1	7	240		12	
	02	32	9	-	-	1	-	-	-	-	26	-	1	15	840		42	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		54%			00%			00%			- 5%							
'97		16%			03%			05%			- 9%							
'02		26%			00%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	3333	Dec:	60%			
												'97	3180		8%			
												'02	2900		29%			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	34	29	4
	02	2	1	-	-	-	-	-	-	-	3	-	-	-	60	29	31	3
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	4	-	-	-	-	-	-	-	4	-	-	-	80			4
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			14%			+ 0%							
'02		71%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	140		14%				
											'02	140		57%				
Chrysothamnus viscidiflorus viscidiflorus																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	15	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	0		-				
											'02	0		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Gutierrezia sarothrae</i>											
S	89	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	0		0
Y	89	8	-	-	-	-	-	-	533		8
	97	5	-	-	-	-	-	-	100		5
	02	14	-	-	-	-	-	-	280		14
M	89	36	-	-	-	-	-	-	2400	7 8	36
	97	7	-	-	-	-	-	-	140	5 3	7
	02	47	-	-	1	-	-	-	960	4 7	48
D	89	4	-	-	-	-	-	-	266		4
	97	-	-	-	-	-	-	-	0		0
	02	4	-	-	-	-	-	-	80		4
X	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	40		2
	02	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'89		00%	00%	06%	-92%						
'97		00%	00%	00%	+82%						
'02		00%	00%	05%							
Total Plants/Acre (excluding Dead & Seedlings)					'89	3199	Dec:	8%			
					'97	240		0%			
					'02	1320		6%			
<i>Juniperus osteosperma</i>											
Y	89	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	40		2
	02	-	-	-	-	-	-	-	0		0
M	89	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	0	- -	0
	02	8	-	-	-	-	-	-	160	71 43	8
X	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	80		4
	02	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'89		00%	00%	00%							
'97		00%	00%	00%	+75%						
'02		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'89	0	Dec:	-			
					'97	40		-			
					'02	160		-			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Peraphyllum ramosissimum</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	51	64	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			00%			00%										
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Purshia tridentata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	2	-	-	-	-	-	-	2	-	-	-	40	23	32	2
	02	-	-	-	-	-	-	-	-	1	1	-	-	-	20	19	51	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			100%			00%			-50%							
	'02	00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
												'02	20		-			
<i>Quercus gambelii</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	7	8	-	-	-	-	-	-	-	15	-	-	-	300	64	36	15
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			00%			00%										
	'02	53%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	200	Dec:	-			
												'97	0		-			
												'02	300		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
M	'89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	40	34	1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	'89	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	50%			
												'97	0		0%			
												'02	0		0%			

## SUSPENDED STUDIES

Trend Study 16A-1-97

Study site name: Strawberry Highline Canal.

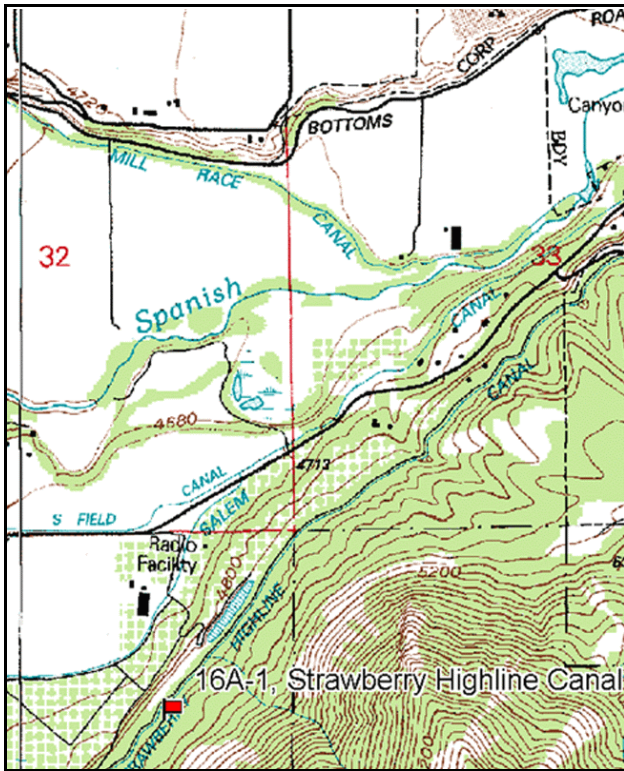
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 180 degrees magnetic.

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

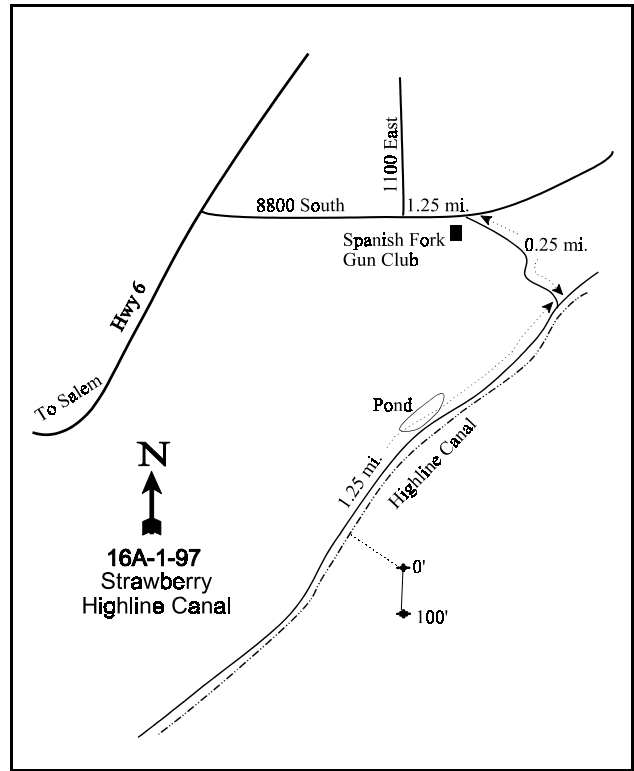
LOCATION DESCRIPTION

Beginning at the intersection of 8800 South and 1150 East (north of Salem), proceed east on 8800 South for 1.25 miles to an intersection. Turn right (i.e., south) at the intersection and proceed 0.25 miles to the High Line Canal Road. Turn right onto the High Line Canal Road and proceed southwest for 1.4 miles. From the road, walk 54 paces at an azimuth of 114 degrees true, to the 0-foot baseline stake. You must cross the canal at this point. This azimuth is from the northernmost tower in the orchard located immediately to the west. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Spanish Fork Peak

Township 9S, Range 3E, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4435113 N 447137 E

## DISCUSSION

### Strawberry Highline Canal - Trend Study No. 16A-1

**\*\*\*SUSPENDED** - This site was suspended in 2002. The area consists of small sagebrush openings surrounded by mature Gambel clones which are increasing in cover and density. The site narrative and data tables are included from the 1997 report.

The Strawberry Highline Canal study is located within critical deer winter range just above the canal, approximately 2½ miles southwest of Spanish Fork Canyon. The area sampled is a mixed Gambel oak and mountain big sagebrush community with a sparse grass-forb understory. The herbaceous understory makes up only 29% of the total vegetative cover. The site is located on the upper Lake Bonneville terrace at an elevation of approximately 5,000 feet. Slope is about 10% to 15%. Judging from the levels of use of the principle browse and the number of pellet groups observed in 1983 and 1989, the area received limited deer use. During the 1997 reading, only one deer pellet group was encountered and use of the sagebrush was light. Oak clones are becoming more dense and reducing the size of the sagebrush openings. Due to a lack of sagebrush openings to sample, all five belts were left on the original baseline instead of lengthening the baseline to 400 feet (see methods). This appears to be a poor site that will likely be dropped from the list in the future.

Soil at the site is deep and well drained with an effective rooting depth (see methods) estimated at 21 inches. It is derived from lacustrine deposits from Lake Bonneville. Small sized gravel pavement is common on the soil surface and throughout the profile. Soil has a loam texture with a neutral pH of 6.9. Although the slope is relatively gentle, the erosion hazard is severe. During the 1983 reading, there was abundant evidence of ongoing soil loss at the site. Soil pedestalling was common that year and erosion channels and gullies were present. Currently, soil erosion does not seem serious with little bare soil (8%). However, herbaceous cover is limited with grasses and forbs combining to produce only 12% cover.

Browse composition is dominated by Gambel oak, interspersed with numerous small mountain big sagebrush openings. Gambel oak dominates the site by providing 71% of the browse cover. It appears to be an expanding population with high numbers of sprouts and young plants. Its density has steadily increased from 3,299 stems/acre in 1983, to 4,432 in 1989, and 6,120 by 1996. Oak appears not to be utilized and in good vigor. Insect infestations reduced the vigor on 59% of the oak in 1983. The more preferred mountain big sagebrush has remained at a fairly constant density of around 2,000 plants/acre despite high numbers of seedling and young plants. Utilization is light and vigor normal on most plants. Percent decadency has declined from a high of 35% in 1989 to 17% in 1996. However, 76% of the decadent plants sampled in 1997, were classified as dying. Young plants are abundant enough to replace decadent, dying plants.

Broom snakeweed is also found on the site in moderate numbers. Density peaked in 1989 when the population was estimated at 5,332 plants/acre. It has since declined by 50% to 2,640 plants/acre. Age class analysis indicates a dynamic population with an extraordinary number of seedlings (5,840 seedlings/acre) and a high proportion of young plants (36%).

The herbaceous understory is somewhat depleted, especially in the sagebrush openings. These areas are dominated by bluebunch wheatgrass, Kentucky bluegrass and Beckwith milkvetch. Annual grasses are also fairly common. The understory plants associated with Gambel oak are generally of better quality and more numerous.

1983 APPARENT TREND ASSESSMENT

Soil is stable to declining. Ground cover is highly variable and noticeable erosion is occurring. This is especially evident in the big sagebrush openings where annual grasses are more prevalent. Indicators of vegetative trend suggest that Gambel oak is slowly thickening and probably encroaching into openings. This trend, if it continues, will gradually eliminate the mosaic-like nature of the area resulting in detrimental effects on big game habitat. Management objectives should encourage development and maintenance of healthy big sagebrush-grass forb communities in the oak openings.

1989 TREND ASSESSMENT

The soil trend appears stable with similar ground cover characteristics. There is little evidence of current soil erosion, although the erosion hazard is severe on this soil type. Trend for sagebrush is currently stable. Photo and data comparisons indicate improved production and recruitment in the big sagebrush component. However, population density remained similar with percent decadency increasing from 29% to 35%. Hedging remains light to moderate and canopy cover averages 8%. Gambel oak has increased 26%, while broom snakeweed increased 76%. The understory in the sagebrush openings remains in a depleted condition, but there was less cheatgrass and a few more perennial grasses and forbs observed in 1989 indicating a slightly improving trend.

TREND ASSESSMENT

soil - stable (3)

browse - stable, but density of broom snakeweed should be closely watched (3)

herbaceous understory - up slightly, but still poor (4)

1997 TREND ASSESSMENT

The soil trend appears stable with a slight decline in percent bare soil as well as a minor decline in percent litter cover. Erosion is limited by the gentle terrain and the thick oak clones. Trend for sagebrush is also stable with a similar population density compared to the 1989 estimate. Percent decadence declined from 35% to 17% with 76% of these appearing to be dying. Use remains light. Oak continues to increase, while the density of broom snakeweed declined by 50%. Trend for the herbaceous understory is stable. Annual grasses are common accounting for 31% of the grass cover.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, but still poor (3)

HERBACEOUS TRENDS --

Herd unit 16A, Study no: 1

T y p e	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'97	'83	'89	'97	Cover %
G	Agropyron spicatum	<sub>a</sub> 64	<sub>b</sub> 110	<sub>b</sub> 97	25	42	36	2.60
G	Bromus spp.	-	-	55	-	-	16	.62
G	Bromus tectorum (a)	-	-	91	-	-	27	.88
G	Festuca myuros (a)	-	-	29	-	-	13	.06
G	Koeleria cristata	-	-	3	-	-	1	.03
G	Poa bulbosa	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 15	-	-	8	.31
G	Poa pratensis	<sub>a</sub> 16	<sub>a</sub> 3	<sub>b</sub> 39	5	2	11	2.20

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
G	<i>Poa secunda</i>	<sub>b</sub> 66	<sub>b</sub> 59	<sub>a</sub> 31	27	24	13	.36
G	Unknown grass - annual (a)	-	-	118	-	-	38	.91
Total for Annual Grasses		0	0	238	0	0	78	1.86
Total for Perennial Grasses		146	172	240	57	68	85	6.13
Total for Grasses		146	172	478	57	68	163	8.00
F	<i>Agoseris glauca</i>	1	-	3	1	-	1	.00
F	<i>Alyssum alyssoides</i> (a)	-	-	79	-	-	29	.27
F	<i>Allium</i> spp.	2	-	-	2	-	-	-
F	<i>Arabis</i> spp.	1	1	2	1	1	1	.00
F	<i>Astragalus beckwithii</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 10	-	-	5	1.35
F	<i>Aster chilensis</i>	5	8	8	2	4	3	.44
F	<i>Balsamorhiza sagittata</i>	-	-	5	-	-	3	.43
F	<i>Calochortus nuttallii</i>	-	3	2	-	1	1	.00
F	<i>Comandra pallida</i>	3	-	-	1	-	-	-
F	<i>Draba</i> spp. (a)	-	-	8	-	-	3	.01
F	<i>Epilobium brachycarpum</i> (a)	-	-	54	-	-	19	.09
F	<i>Erigeron divergens</i>	1	-	-	1	-	-	-
F	<i>Eriogonum umbellatum</i>	18	30	21	8	13	9	.20
F	<i>Galium aparine</i> (a)	-	-	39	-	-	18	.23
F	<i>Gilia</i> spp. (a)	-	-	2	-	-	1	.00
F	<i>Hedysarum boreale</i>	<sub>ab</sub> 12	<sub>b</sub> 14	<sub>a</sub> 3	6	6	1	.15
F	<i>Lactuca serriola</i>	-	3	5	-	1	3	.01
F	<i>Lygodesmia grandiflora</i>	-	-	3	-	-	1	.03
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 20	<sub>b</sub> 30	-	10	12	.13
F	<i>Polygonum douglasii</i> (a)	-	-	12	-	-	5	.02
F	<i>Ranunculus testiculatus</i> (a)	-	-	32	-	-	11	.51
F	<i>Sphaeralcea coccinea</i>	13	18	24	5	6	10	.22
F	<i>Stephanomeria exigua</i>	1	-	-	1	-	-	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> 3	<sub>a</sub> -	<sub>b</sub> 8	1	-	6	.08
F	Unknown forb-perennial	-	1	3	-	1	1	.00
F	<i>Wyethia amplexicaulis</i>	<sub>a</sub> 3	<sub>b</sub> 11	<sub>a</sub> -	2	4	-	-
F	<i>Zigadenus paniculatus</i>	<sub>a</sub> -	<sub>b</sub> 8	<sub>b</sub> 16	-	4	7	.06
Total for Annual Forbs		0	0	226	0	0	86	1.16
Total for Perennial Forbs		63	117	143	31	51	64	3.14
Total for Forbs		63	117	369	31	51	150	4.31

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

BROWSE TRENDS --  
Herd unit 16A, Study no: 1

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Acer grandidentatum	3	.56
B	Artemisia tridentata vaseyana	48	5.82
B	Gutierrezia sarothrae	36	2.38
B	Quercus gambelii	54	21.22
Total for Browse		141	30.00

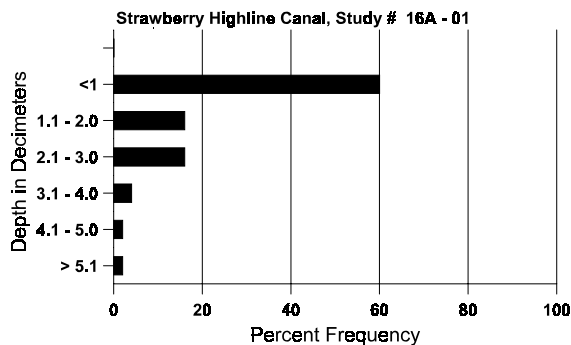
BASIC COVER --  
Herd unit 16A, Study no: 1

Cover Type	Nested Frequency	Average Cover %		
	'97	'83	'89	'97
Vegetation	328	1.75	4.50	40.80
Rock	98	2.50	1.75	2.99
Pavement	160	14.50	17.75	13.00
Litter	399	68.00	65.75	63.84
Cryptogams	22	3.50	0	.10
Bare Ground	145	9.75	10.25	7.99

SOIL ANALYSIS DATA --  
Herd Unit 16A, Study no: 01, Strawberry Highline Canal

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.0	51.5 (17.7)	6.9	48.4	29.1	22.6	1.5	11.4	105.6	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16A, Study no: 1

Type	Quadrat Frequency '97
Rabbit	1
Deer	1



BROWSE CHARACTERISTICS --  
Herd unit 16A, Study no: 1

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
<i>Acer grandidentatum</i>															
S	83	4	-	-	-	-	-	-	-	-	4		4		
	89	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	0		0		
Y	83	-	-	-	-	-	-	-	-	-	0		0		
	89	2	-	-	1	-	-	5	-	-	8		8		
	97	-	-	-	1	-	-	2	-	-	3		3		
M	83	-	-	-	-	-	-	-	-	-	0	-	0		
	89	-	-	-	-	-	-	-	-	-	0	-	0		
	97	-	-	-	1	-	-	-	-	-	20	87 63	1		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		00%		00%									
'89		00%		00%		00%		-70%							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-		
										'89	266		-		
										'97	80		-		
<i>Artemisia tridentata vaseyana</i>															
S	83	1	-	-	-	-	-	-	-	1	-	-	33		1
	89	122	-	-	25	-	-	15	-	-	162	-	-	5400	162
	97	7	-	-	-	-	-	-	-	-	7	-	-	140	7
Y	83	11	-	-	-	-	-	-	-	11	-	-	366		11
	89	14	-	-	1	-	-	1	-	16	-	-	533		16
	97	26	-	-	1	-	-	-	-	27	-	-	540		27
M	83	22	10	-	-	-	-	-	-	27	5	-	1066	14 25	32
	89	24	3	-	1	-	-	-	-	27	1	-	933	21 35	28
	97	51	5	-	-	-	-	-	-	56	-	-	1120	24 34	56
D	83	12	6	-	-	-	-	-	-	15	-	3	600		18
	89	16	2	-	3	-	-	3	-	20	1	-	800		24
	97	14	1	-	1	-	-	-	1	4	-	-	340		17
X	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	380		19
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		26%		00%		05%		+10%							
'89		07%		00%		04%		-12%							
'97		06%		00%		13%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	2032	Dec:	30%		
										'89	2266		35%		
										'97	2000		17%		

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Gutierrezia sarothrae</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	292	-	-	-	-	-	-	-	-	292	-	-	-	5840		292	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	37	-	-	2	-	-	2	-	-	41	-	-	-	1366		41	
	97	48	-	-	-	-	-	-	-	-	48	-	-	-	960		48	
M	83	36	-	-	-	-	-	-	-	-	36	-	-	-	1200	12 11	36	
	89	99	-	-	2	-	-	-	-	-	101	-	-	-	3366	9 10	101	
	97	83	-	-	-	-	-	-	-	-	83	-	-	-	1660	7 7	83	
D	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	17	1	-	-	-	-	-	-	-	18	-	-	-	600		18	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+76%							
'89		.62%			00%			00%			-50%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1266	Dec:	3%				
											'89	5332		11%				
											'97	2640		1%				
<b>Quercus gambelii</b>																		
S	83	11	-	-	-	-	-	-	-	-	6	5	-	-	366		11	
	89	-	-	-	4	-	-	-	-	-	4	-	-	-	133		4	
	97	7	-	-	3	-	-	-	-	-	10	-	-	-	200		10	
Y	83	32	-	-	-	-	-	-	-	-	7	25	-	-	1066		32	
	89	52	6	-	16	-	-	26	-	-	100	-	-	-	3333		100	
	97	74	-	-	3	-	-	-	7	-	84	-	-	-	1680		84	
M	83	45	-	-	18	-	-	-	-	-	32	31	-	-	2100	43 27	63	
	89	16	-	-	7	-	-	9	-	-	32	-	-	-	1066	71 41	32	
	97	206	-	-	12	-	-	3	-	-	221	-	-	-	4420	53 36	221	
D	83	4	-	-	-	-	-	-	-	-	-	4	-	-	133		4	
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33		1	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+26%							
'89		05%			00%			00%			+28%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3299	Dec:	4%				
											'89	4432		1%				
											'97	6120		0%				

## SUMMARY

### WILDLIFE MANAGEMENT UNIT - 16A - NEBO

Twenty trend studies occur within the unit. Fifteen trend studies were established in 1983. All sites were reread in 1989, and an additional 5 sites were established at that time. Nineteen sites were reread in 2002. One site, Strawberry Highline Canal, was suspended. It occurs in an area dominated by oak brush with shrinking sagebrush interspaces. The area receives little deer or elk use. All sites in the unit sample winter range. However, trend studies at Nebo Creek (#5), Rees Flat (#11), and Big Hollow (#14) occur in the upper reaches of the winter range and are unavailable during severe winters due to deep snow. Most of the trend studies on the unit sample the critical winter ranges on the Nebo unit between I-15 and the Wasatch Mountains.

Trends are down for soil, browse, and herbaceous understories for 3 sites at Santaquin Bench (#2), Nebo Creek (#5), and Birch Creek (#9), due to 3 separate wild fires which burned on Mount Nebo in 2001. All non-sprouting shrubs were completely eliminated. Soil trends were slightly down on 3 additional sites, Wash Canyon Canyon (#4), Willow Creek (#7), and Gardner Canyon (#8). Browse trends were slightly down at North Canyon (#10), Steele Ranch (#13), and Chicken Creek (#17). Herbaceous trends were stable to improving on most sites except for the 3 burned sites and Gardner Canyon (#8) and Deep Creek (#18). Wildfire continues to be a concern on several other sites in the unit due to abundance of winter annuals, primarily cheatgrass. Four sites on the Nebo Unit, Willow Creek (#7), Gardner Canyon (#8), Tithing Mountain (#12), and Levan Farm Chaining (#16), have not yet burned but contain an abundance of cheatgrass. Three of these sites support cliffrose and the other is sagebrush, none of which resprout after fire. Birch Creek burned in 2001, yet the site still supports enough cheatgrass to continue as a fire hazard. Most of the shrubs were burned on this site but serviceberry is resprouting.

Perennial grasses in the herbaceous understories on Unit 16A have, on average, remained relatively stable in sum of nested frequency and cover. Sum of nested frequency of forbs has declined but the average number of species sampled per site has remained similar. Even with drought conditions for the past few years, the annual cheatgrass has declined only slightly in cover and nested frequency since 1997. The poor value perennial, bulbous bluegrass, has increased significantly on several sites.

Broom snakeweed is abundant on many sites in the unit. It has declined dramatically on several sites due to drought conditions. In addition, the surviving plants show increased decadence.

Trend studies on the Nebo unit were established in 1983 during a period of above normal precipitation. The sites were reread during a drought period in 1989. Precipitation recorded at Nephi showed below normal annual precipitation between 1988 and 1991. The spring (April - June) of 1989 was extremely dry with only 58% of normal precipitation recorded. Spring precipitation was 143% of normal in 1997. Trend studies were read in late May and early June of that year. Annual precipitation in 2001 was only 77% of normal and the fall period (Sept - Nov) was extremely dry with only 34% of the normal precipitation recorded. Spring precipitation in 2002 was only 60% of normal. Trend studies were monitored in late May of 2002, and the trends are reflective of these dry conditions.

A trend summary of each study is listed below.

SUMMARY

	Category	1983	1989	1997	2002
16A-2 Santaquin Bench	soil	est	2	4	1
	browse	est	1	3	1
	herbaceous understory	est	5	4	1
16A-3 Santaquin Hill	soil	est	5	3	3
	browse	est	2	3	3
	herbaceous understory	est	5	2	3
16A-4 Wash Canyon	soil	est	3	5	2
	browse	est	3	2	3
	herbaceous understory	est	4	3	3
16A-5 Nebo Creek	soil	est	4	3	1
	browse	est	3	3	1
	herbaceous understory	est	5	3	1
16A-6 Hop Creek Browse	soil	est	4	3	3
	browse	est	3	3	4
	herbaceous understory	est	3	5	3
16A-7 Willow Creek	soil	est	3	3	2
	browse	est	3	3	3
	herbaceous understory	est	3	2	3
16A-8 Gardner Canyon	soil	est	3	4	2
	browse	est	2	3	3
	herbaceous understory	est	3	3	2
16A-9 Birch Creek	soil	est	3	3	2
	browse	est	3	3	1
	herbaceous understory	est	5	2	2

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

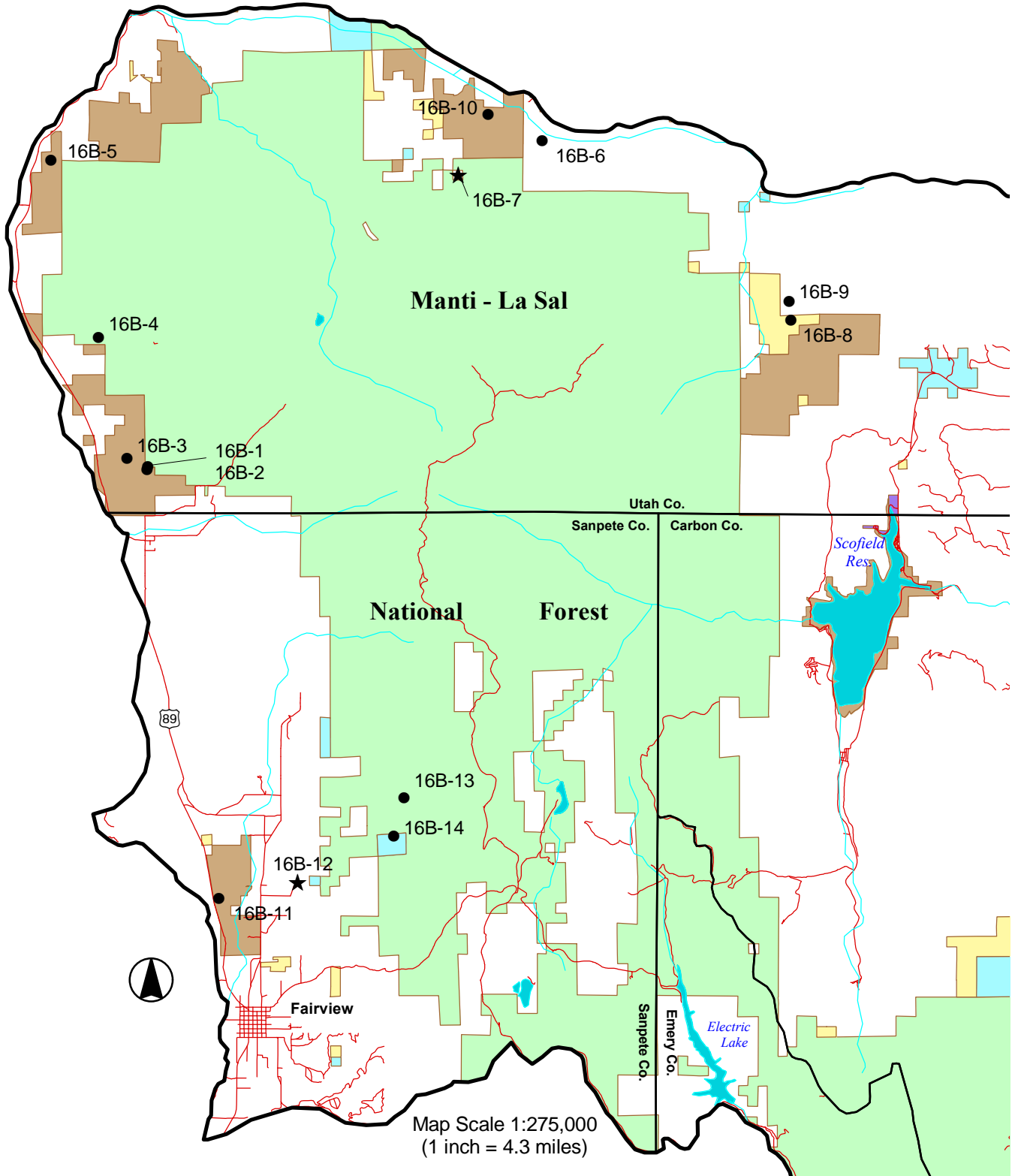
	Category	1983	1989	1997	2002
16A-10 North Canyon	soil	est	3	3	4
	browse	est	3	3	2
	herbaceous understory	est	4	4	4
16A-11 Rees Flat	soil	est	3	4	3
	browse	est	3	5	5
	herbaceous understory	est	3	4	3
16A-12 Tithing Mountain	soil		est	3	3
	browse		est	3	3
	herbaceous understory		est	4	3
16A-13 Steele Ranch	soil		est	3	3
	browse		est	3	2
	herbaceous understory		est	3	3
16A-14 Big Hollow	soil		est	4	3
	browse		est	3	3
	herbaceous understory		est	4	3
16A-15 Old Pinery	soil	est	3	3	3
	browse	est	5	5	5
	herbaceous understory	est	5	5	4
16A-16 Levan Farm Chaining	soil	est	3	3	3
	browse	est	2	4	5
	herbaceous understory	est	3	3	3
16A-17 Chicken Creek	soil	est	3	3	3
	browse	est	1	3	2
	herbaceous understory	est	4	2	3
16A-18 Deep Creek	soil	est	2	3	1
	browse	est	3	3	3
	herbaceous understory	est	4	3	2

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

	Category	1983	1989	1997	2002	
16A-19 Flat Canyon	soil		est	3	3	
	browse		est	3	3	
	herbaceous understory		est	3	3	
16A-20 Triangle Ranch	soil		est	3	3	
	browse		est	4	3	
	herbaceous understory		est	5	3	
SUSPENDED STUDIES						
16A-1 Strawberry Highline Canal	soil		est	3	3	susp
	browse		est	3	3	susp
	herbaceous understory		est	4	3	susp

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

# Management Unit 16B

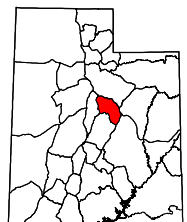


- Forest Service
- BLM
- State of Utah
- Private Land
- State Wildlife Reserve

- State Park/Recreation Area
- Water Body
- County Boundary
- Road
- Water Course

- Transect Location
- Suspended Site

Unit Location



## WILDLIFE MANAGEMENT UNIT 16 - MANTI-NEBO

### SUBUNIT 16B - MANTI-NEBO, MANTI NORTH

#### Boundary Description

**Utah, Sanpete, Emery and Carbon counties** - Boundary begins at Highway SR-10 and Highway SR-31 in Huntington; then north of 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 both the east and west slopes of the Wasatch Plateau that lie within the above listed unit boundaries. The western portion of this unit was monitored in 2002 which includes the area from Soldier Summit west to Highway 89, and then south to Fairview. The east side of this management unit is monitored as part of the Southeastern Region rotation that was last read in 1999, and will be reread in 2004. The range trend studies in management unit 16B were established in 1989 and reread in 1997 and 2002. These studies completed the establishment of permanently-marked range trend studies in the Division's Central Region. Sites were selected based on recommendations of local Interagency personnel with some being placed on old 1978 line-intercept (LI) studies. The majority of the studies monitor winter ranges along Highway 89 from Spanish Fork Canyon to Fairview. A few studies monitor transitional and summer ranges along Skyline Drive on top of the Wasatch Plateau. Elk are an increasingly important factor on these units. Several studies were established in consideration of the importance of monitoring critical elk habitat.

The availability of winter range and it's condition and productivity have always been an issue on these important deer herd units in central Utah. Due to location and access, a large number of hunters use these units and they continue to contribute an important portion of the yearly statewide deer harvest. The majority of the critical winter range in subunit 16B is found along highway corridors (U.S. 6 in Spanish Fork Canyon and Highway 89 from Spanish Fork Canyon to Fairview) and adjacent to agricultural areas. As a result, two issues facing wildlife managers in this unit are crop depredation and highway mortality. Nearly all of the Division owned lands (WMA's) in this unit were purchased to try to minimize the effects of these two factors on wildlife herds. Habitat management objectives for this unit include working with federal agencies, local governments, and private landowner's to achieve long term habitat protection and preservation.



## Trend Study 16B-1-02

Study site name: Long Ridge South.

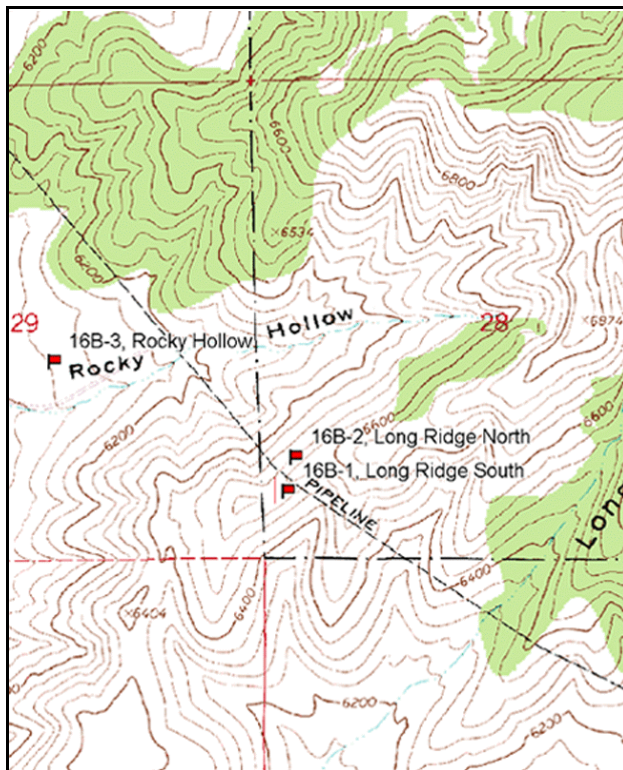
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 120 degrees magnetic (line 2-4 @ 200°M).

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

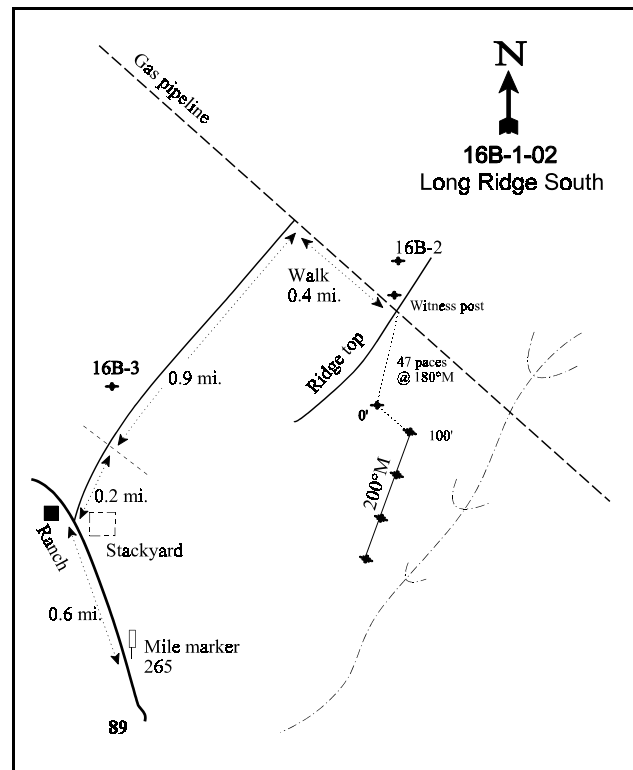
### LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard (0.6 miles north of mile marker 265). Turn right, go through a DWR gate into Lassen Draw Property. Go 0.2 miles to another gate/fence. Continue up the road, past transect 16B-3, for about 0.9 miles to a pipeline intersection at the upper end of the valley. Walk 0.4 miles up the steep hill following the pipeline to the top of the first ridge. Stop here at an intersection/witness post. From the southwest corner of the intersection, walk 47 paces at a bearing of 180 degrees magnetic to the 0-foot baseline stake, marked by browse tag #9090.



Map Name: Indianola

Township 11S, Range 4E, Section 28



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4408642 N 458276 E

## DISCUSSION

### Long Ridge South - Trend Study No. 16B-1

The Long Ridge South trend study, along with its companion study #16B-2, is located on Division property north of Indianola. The mountain brush covered hillsides are important wintering areas for deer and elk. The trend study is on a steep south facing slope (35% to 40%) at an elevation of 6,480 feet. Pellet group transect data taken in 2002 estimated high deer use at 106 days use/acre (261 ddu/ha). Elk use was much lower at an estimated 17 days use/acre (41 edu/ha).

The soil is relatively shallow and very rocky on the surface and throughout the profile. Effective rooting depth was estimated at just over 10 inches, but depth measurements are restricted due to the abundance of rock in the profile. Soil texture is a sandy clay loam with a slightly acidic pH (6.2). The soil is very well drained, but does have a moderate erosion hazard and moderate runoff. Because rock and pavement armor the soil surface, erosion is minimized. An erosion condition class assessment was determined as stable in 2002. Vegetation and litter cover are abundant and further guard the soil surface from erosion.

This site supports a fair diversity of preferred browse species which include serviceberry, mountain big sagebrush, and antelope bitterbrush. The dominant overstory is made up of serviceberry. Mature shrubs average 5 feet in height, resulting in a few serviceberry plants being classified as partially unavailable. Density was estimated at 432 plants/acre in 1989. Serviceberry was heavily hedged where available that year, but vigor was good and percent decadence low at 15%. During the 1997 and 2002 readings, the much larger and more accurate sample estimated serviceberry density at 340 and 260 plants/acre respectively. Heavy use declined to 65% in 1997, but again increased to 92% in 2002. Percent decadence was high in 1997 at 47%, however only 13% of the decadent plants were classified as dying. In 2002, decadency declined to the initial estimate of 15%. The steady decline in population is not surprising as reproductive potential (# of seedlings) and recruitment (# of young) have been low in all sampling years. No seedling or young plants were sampled in 2002. Reproduction has been difficult due to the abundance of cheatgrass in the understory, as well as drought conditions for several years prior to the 2002 sample. Annual growth for serviceberry averaged only 1.5 inches in 2002.

Big sagebrush found on the site was classified as mountain big sagebrush (*Artemisia tridentata vaseyana*). However, some plants exhibit characteristics of basin big sagebrush (*A. tridentata tridentata*). If both are present, they will hybridize. Density was estimated at just under 800 plants/acre in 1989, with the average height of mature plants at nearly three feet. Some sagebrush were noted as reaching 5 feet in height. The much larger sample size used in 1997 and 2002 estimated a stable population at about 700 plants/acre in both years. Use was mostly light to moderate in 1989 and 1997, with heavy use increasing to 38% of the population in 2002. The individuals displaying the heaviest use are those with the more characteristics of mountain big sagebrush. Vigor has been mostly normal in all sampling periods. Percent decadence has ranged from 25% in 1989 to 6% in 1997. Decadence was estimated at 15% in 2002, which is good considering the drought that was present prior to and during that sampling period. Recruitment by young sagebrush was good in 1997 at 29%, but declined to only 3% in 2002. Low reproduction is a result of both drought and severe competition from cheatgrass which dominates the understory. Annual growth on sagebrush averaged only 1.4 inches in 2002.

Bitterbrush is the other preferred browse found on the site. It makes up 20% of the browse cover and had an estimated density of 140 plants/acre in 2002. The current density estimate is a decline from 220 plants/acre in 1997. Mature plants exhibit a tall life-form averaging about 4½ feet in height in 2002. Utilization has been very heavy for both 1997 and 2002. Bitterbrush displaying poor vigor increased from 27% in 1997 to 43% in 2002. Percent decadence was relatively low at 27% in 1997, but increased to 86% in 2002. Increases in decadence and poor vigor often result with drought and should improve with better precipitation. Recruitment is poor with no seedlings or young sampled in any reading.

Low rabbitbrush provides about 40% of the total shrub cover on the site. It had an estimated density of 2,460 plants/acre in 1997, slightly decreasing to 2,240 plants/acre in 2002.

The herbaceous understory is abundant, but dominated by cheatgrass which makes up over 70% of the grass cover. Even with drought in 2002, cheatgrass increased in nested frequency. The fire hazard potential for this site is high with the abundance of cheatgrass in the understory. The only common perennial grass is bluebunch wheatgrass. Bluebunch wheatgrass significantly increased in nested frequency in 2002. Most of the bluebunch wheatgrass are found either growing underneath or in close proximity to shrubs. The forb composition is diverse yet the majority of the forb cover comes from annual species like pale alyssum, little pod false flax, and storksbill. The most common perennial species include: Louisiana sage, Beckwith milkvetch, spreading fleabane, and scarlet globemallow. Sum of nested frequency for perennial forbs declined by 53% in 2002 due to drought.

#### 1989 APPARENT TREND ASSESSMENT

The soil is somewhat limiting, but current erosion is slight. Soils appear to be stable. Vegetative trend appears to be stable to slightly down. There is a low frequency of forbs and desirable browse compared to other mountain brush sites. Production of the preferred browse, serviceberry, may become less available.

#### 1997 TREND ASSESSMENT

Trend for soil is up slightly with a decrease in percent bare soil from 9% to 3%. Trend for browse is down slightly. Mountain big sagebrush appears to be stable, but serviceberry is declining in density and increasing in decadence. Bitterbrush is very heavily utilized with reduced vigor on nearly one-third of the population and no reproduction is evident. Serviceberry and bitterbrush together contribute 42% of the browse cover, and 81% of the preferred browse species cover. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses and forbs. Cheatgrass still dominates the understory, while bluebunch wheatgrass increased significantly in its nested frequency value.

##### TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - up slightly (4)

#### 2002 TREND ASSESSMENT

Soils have a stable trend. Percent bare soil slightly increased, and litter cover declined in 2002. These changes are due to drought and will improve with normal precipitation. Vegetation and litter cover are still abundant and effectively limit erosion. Trend for browse is slightly down. The preferred species, serviceberry, bitterbrush, and mountain big sagebrush all show slight declines in density. The bitterbrush and mountain big sage populations also show increases in decadency and poor vigor. Recruitment is poor for all species which is not surprising with increased competition from cheatgrass as well as drought in 2002. Trend for the herbaceous understory is slightly down. Perennial grasses, specifically bluebunch wheatgrass, slightly increased in nested frequency, but cheatgrass also increased in nested frequency and remains the dominant understory species. Perennial forbs declined considerably in 2002 with drought. Forb diversity is fairly high, yet most species occur infrequently.

##### TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 1

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	<sub>a</sub> 138	<sub>b</sub> 197	<sub>b</sub> 226	55	71	81	5.51	8.96
G	<i>Bromus japonicus</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 62	-	-	25	-	.27
G	<i>Bromus tectorum</i> (a)	-	<sub>a</sub> 347	<sub>b</sub> 377	-	100	100	23.89	24.84
G	<i>Carex</i> spp.	4	-	-	1	-	-	-	-
G	<i>Poa fendleriana</i>	<sub>b</sub> 22	<sub>ab</sub> 6	<sub>a</sub> 1	9	4	1	.09	.00
G	<i>Poa secunda</i>	4	3	5	1	1	2	.03	.01
G	<i>Sitanion hystrix</i>	-	4	-	-	1	-	.00	-
G	<i>Sporobolus cryptandrus</i>	-	1	-	-	1	-	.03	-
G	<i>Stipa comata</i>	5	1	-	2	1	-	.03	-
Total for Annual Grasses		0	347	439	0	100	125	23.89	25.11
Total for Perennial Grasses		173	212	232	68	79	84	5.70	8.98
Total for Grasses		173	559	671	68	179	209	29.60	34.10
F	<i>Agoseris glauca</i>	<sub>a</sub> -	<sub>b</sub> 16	<sub>b</sub> 8	-	9	5	.12	.02
F	<i>Alyssum alyssoides</i> (a)	-	<sub>a</sub> 171	<sub>b</sub> 236	-	65	76	.88	1.32
F	<i>Artemisia ludoviciana</i>	<sub>b</sub> 74	<sub>a</sub> 34	<sub>a</sub> 44	34	14	18	.92	.36
F	<i>Astragalus beckwithii</i>	<sub>a</sub> -	<sub>b</sub> 24	<sub>b</sub> 9	-	11	6	.38	.08
F	<i>Astragalus utahensis</i>	-	5	-	-	3	-	.04	-
F	<i>Balsamorhiza sagittata</i>	<sub>b</sub> 15	<sub>a</sub> 4	<sub>ab</sub> 6	8	2	4	.04	.31
F	<i>Camelina microcarpa</i> (a)	-	52	42	-	21	20	1.78	.15
F	<i>Calochortus nuttallii</i>	5	1	1	3	1	1	.01	.00
F	<i>Cirsium</i> spp.	6	5	-	2	2	-	.06	-
F	<i>Collomia linearis</i> (a)	-	<sub>b</sub> 40	<sub>a</sub> 2	-	21	1	.26	.00
F	<i>Collinsia parviflora</i> (a)	-	8	6	-	4	2	.04	.01
F	<i>Crepis acuminata</i>	-	6	2	-	3	1	.02	.00
F	<i>Cryptantha</i> spp.	-	2	-	-	1	-	.03	-
F	<i>Cymopterus</i> spp.	-	2	-	-	1	-	.00	-
F	<i>Cynoglossum officinale</i>	-	2	-	-	1	-	.03	-
F	<i>Descurainia pinnata</i> (a)	-	7	2	-	2	1	.04	.00
F	<i>Epilobium brachycarpum</i> (a)	-	<sub>b</sub> 6	<sub>a</sub> -	-	5	-	.02	-
F	<i>Erodium cicutarium</i> (a)	-	<sub>b</sub> 146	<sub>a</sub> 76	-	55	31	1.39	1.03
F	<i>Erigeron divergens</i>	<sub>a</sub> -	<sub>b</sub> 75	<sub>a</sub> -	-	34	-	1.75	-
F	<i>Eriogonum racemosum</i>	10	6	4	4	2	2	.03	.01
F	<i>Haplopappus acaulis</i>	-	4	-	-	2	-	.30	-
F	<i>Lappula occidentalis</i> (a)	-	6	-	-	2	-	.01	-
F	<i>Lactuca serriola</i>	-	4	-	-	3	-	.02	-
F	<i>Lithospermum ruderales</i>	10	11	1	5	4	1	.22	.00
F	<i>Lomatium dissectum</i>	4	-	-	3	-	-	.00	-

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Microsteris gracilis (a)	-	1	6	-	1	2	.00	.01
F	Phlox longifolia	6	4	4	4	2	2	.01	.01
F	Polygonum douglasii (a)	-	3	-	-	2	-	.01	-
F	Ranunculus testiculatus (a)	-	3	-	-	1	-	.00	-
F	Sisymbrium altissimum (a)	-	1	-	-	1	-	.00	-
F	Sphaeralcea coccinea	<sub>a</sub> 14	<sub>b</sub> 42	<sub>b</sub> 38	7	17	16	.79	.25
F	Tragopogon dubius	-	2	-	-	1	-	.00	-
F	Viguiera multiflora	-	1	-	-	1	-	.01	-
Total for Annual Forbs		0	444	370	0	180	133	4.46	2.53
Total for Perennial Forbs		144	250	117	70	114	56	4.84	1.07
Total for Forbs		144	694	487	70	294	189	9.30	3.61

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

#### BROWSE TRENDS --

Herd unit 16B, Study no: 1

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	16	12	4.17	2.87
B	Artemisia tridentata vaseyana	27	23	1.82	2.09
B	Chrysothamnus nauseosus albicaulis	1	2	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	46	53	7.42	5.16
B	Gutierrezia sarothrae	12	2	.51	-
B	Opuntia spp.	16	16	1.27	.86
B	Purshia tridentata	11	7	3.71	2.17
B	Tetradymia canescens	4	4	.03	.31
Total for Browse		133	119	18.95	13.49

#### CANOPY COVER --

Herd unit 16B, Study no: 1

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	2

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 1

Species	Average leader growth (in) '02
Amelanchier alnifolia	1.5
Artemisia tridentata vaseyana	1.4

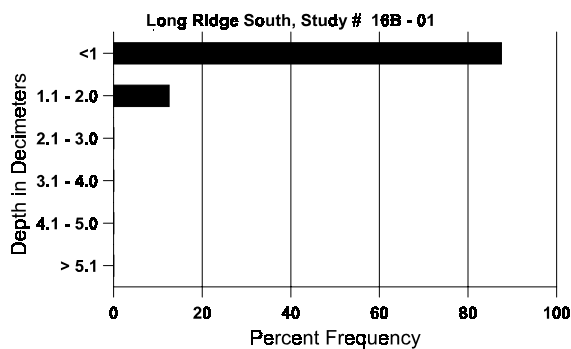
BASIC COVER --  
Herd unit 16B, Study no: 1

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	380	392	6.75	49.93	54.82
Rock	233	219	18.00	15.18	13.60
Pavement	147	165	14.50	2.49	3.69
Litter	385	384	52.00	52.19	40.37
Cryptogams	64	2	.25	.40	.03
Bare Ground	117	122	8.50	2.52	4.48

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 01, Long Ridge South

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.2	55.6 (13.1)	6.2	60.7	18.7	20.6	2.7	21.3	217.6	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 1

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Rabbit	-	3	-	-
Elk	19	1	218	17 (41)
Deer	46	30	1375	106 (261)

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 1

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Amelanchier alnifolia</i>											
S	89	-	-	-	-	2	-	-	66		2
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	0		0
Y	89	-	-	-	-	-	-	-	0		0
	97	-	-	1	-	-	1	-	20		1
	02	-	-	-	-	-	-	-	0		0
M	89	-	-	5	-	5	1	-	366	89 45	11
	97	-	-	-	1	6	1	-	160	52 46	8
	02	-	-	1	-	9	-	-	220	61 53	11
D	89	-	-	2	-	-	-	-	66		2
	97	-	-	1	-	3	4	-	160		8
	02	-	-	1	-	1	-	-	40		2
X	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	80		4
	02	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		00%		92%		08%		-21%			
'97		18%		65%		06%		-24%			
'02		08%		92%		08%					
Total Plants/Acre (excluding Dead & Seedlings)							'89	432	Dec:	15%	
							'97	340		47%	
							'02	260		15%	
<i>Artemisia tridentata vaseyana</i>											
S	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	5	-	-	-	-	-	-	100		5
Y	89	7	7	-	-	-	-	-	466		14
	97	10	-	-	-	-	-	-	200		10
	02	1	-	-	-	-	-	-	20		1
M	89	-	2	2	-	-	-	-	133	34 52	4
	97	10	6	1	1	4	1	-	460	24 31	23
	02	10	7	10	-	-	1	-	560	23 38	28
D	89	2	2	2	-	-	-	-	200		6
	97	-	-	2	-	-	-	-	40		2
	02	2	1	1	-	-	1	-	100		5
X	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	60		3
	02	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		46%		17%		04%		-12%			
'97		29%		11%		03%		- 3%			
'02		24%		38%		09%					
Total Plants/Acre (excluding Dead & Seedlings)							'89	799	Dec:	25%	
							'97	700		6%	
							'02	680		15%	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Chrysothamnus nauseosus albicaulis</b>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	22	19	1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	32	1
	02	-	1	-	-	-	-	-	-	-	-	1	-	-	20	24	24	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-39%							
'97		00%			00%			00%			+50%							
'02		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	0%			
												'97	20		0%			
												'02	40		50%			
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	31	-	-	-	-	-	-	-	-	6	-	25	-	1033	12	20	31
	97	108	-	1	-	1	-	-	-	-	110	-	-	-	2200	13	24	110
	02	95	-	-	-	-	-	-	-	-	95	-	-	-	1900	11	21	95
D	89	4	-	-	-	-	-	1	-	-	1	-	3	1	166			5
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	17	-	-	-	-	-	-	-	-	14	-	-	3	340			17
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			81%			+51%							
'97		.81%			.81%			00%			-9%							
'02		00%			00%			03%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1199	Dec:	14%			
												'97	2460		0%			
												'02	2240		15%			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Gutierrezia sarothrae</b>																		
M	89	56	-	-	-	-	-	-	-	-	56	-	-	-	1866	11	8	56
	97	23	-	-	1	-	-	-	-	-	24	-	-	-	480	10	11	24
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	7	1
D	89	6	-	-	-	-	-	-	-	-	5	-	-	1	200			6
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			02%			-77%							
'97		00%			00%			00%			-92%							
'02		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2066	Dec:	10%			
												'97	480		0%			
												'02	40		50%			
<b>Opuntia spp.</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	22	-	-	-	-	-	-	-	-	22	-	-	-	733	6	14	22
	97	19	-	-	2	-	-	-	-	-	21	-	-	-	420	7	18	21
	02	25	-	-	-	-	-	-	-	-	25	-	-	-	500	6	20	25
D	89	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			04%			-45%							
'97		00%			00%			00%			+15%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	799	Dec:	4%			
												'97	440		5%			
												'02	520		0%			
<b>Pediocactus simpsonii</b>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	6	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	13	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	15	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Purshia tridentata</b>																		
M	89	-	3	2	-	-	-	-	-	-	5	-	-	-	166	26	43	5
	97	-	-	3	-	1	4	-	-	-	8	-	-	-	160	42	63	8
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20	52	65	1
D	89	-	-	1	-	1	-	-	-	-	2	-	-	-	66			2
	97	-	-	1	-	-	2	-	-	-	-	-	-	3	60			3
	02	-	-	2	-	-	4	-	-	-	3	-	-	3	120			6
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		57%			43%			00%			- 5%							
'97		09%			91%			27%			-36%							
'02		00%			100%			43%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	232	Dec:	28%			
												'97	220		27%			
												'02	140		86%			
<b>Tetradymia canescens</b>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	1	-	-	-	-	-	-	-	3	-	-	-	60	12	24	3
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80	10	23	4
D	89	-	5	-	-	-	-	-	-	-	-	-	-	5	166			5
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			100%			-52%							
'97		50%			00%			00%			+33%							
'02		00%			00%			33%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	166	Dec:	100%			
												'97	80		0%			
												'02	120		33%			

## Trend Study 16B-2-02

Study site name: Long Ridge North.

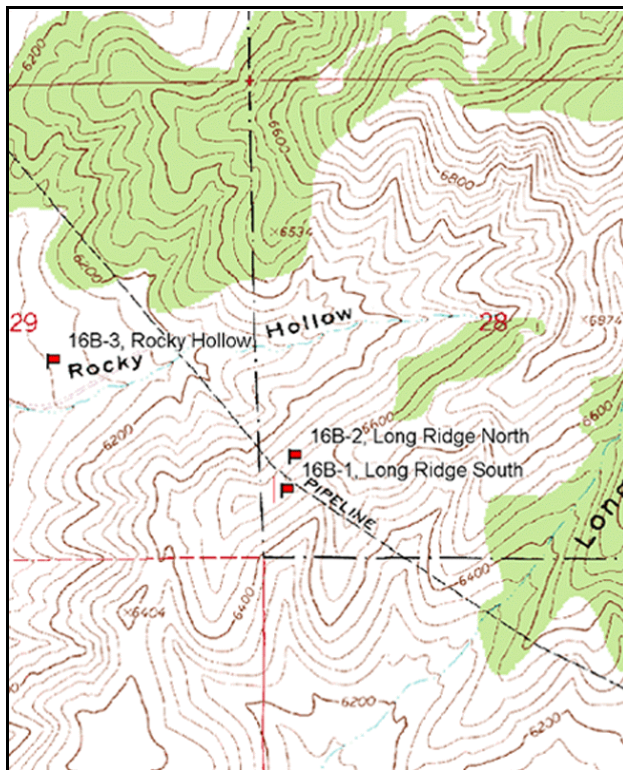
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 310 degrees magnetic (line 2 @ 440°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 2 ft, belt 5 on 10 ft, and belt 3 on 1 ft.

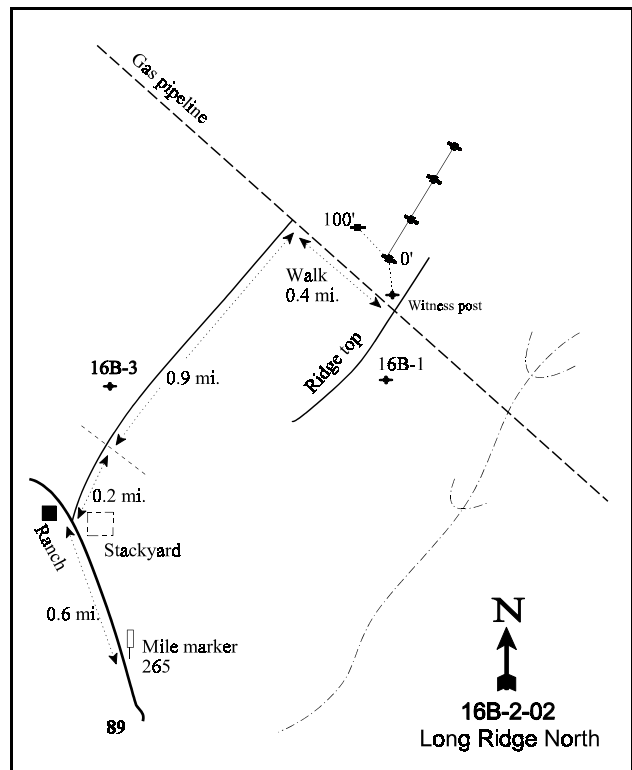
### LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard (0.6 miles north of mile marker 265). Turn right and go through a DWR gate into Lassen Draw property. Go 0.2 miles to another gate/fence. Continue up the road, past transect 16B-3, for about 0.9 miles to a pipeline intersection at the upper end of the valley. Walk 0.4 miles up the steep hill following the pipeline to the top of the first ridge. Stop here at an intersection/witness post. From the witness post, walk 21 paces at 5 degrees magnetic to the 0-foot baseline stake, marked by browse tag #173.



Map Name: Indianola

Township 11S, Range 4E, Section 28



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4408759 N 458304 E

## DISCUSSION

### Long Ridge North - Trend Study No. 16B-2

The Long Ridge North study is on the opposite side of the ridge from #16B-1. It is on a northwest facing slope above Rocky Hollow. This site is located in the sagebrush/grass type with a few scattered serviceberry. The site is located on Division land at 6,500 feet in elevation and is designated as key big game winter range. Both deer and elk use this site which is primarily winter range. However, two does were observed in the area during the 1997 reading. Pellet group quadrat frequency was moderately high for deer and elk in 1997. Pellet group transect data taken in 2002 estimated 80 deer days use/acre (197 ddu/ha) and 9 elk days use/acre (23 edu/ha) on the site.

Soils on this site are similar to those on nearby study #16B-1. Effective rooting depth is estimated at almost 14 inches. Rock and pavement are common on the surface and throughout the profile. Parent material is a mixture of igneous rock and sandstone. Texture is sandy clay loam and pH is neutral (6.9). Percent organic matter is moderate at 2.8%. There is some terracing and pedestalling present on the site. An erosion condition classification was determined to be slight in 2002. Ground cover characteristics in 2002 showed declines in litter and bare soil, and increases in rock and pavement cover. These changes are consistent with drought conditions as a decrease in litter cover results in more rock and pavement being exposed.

This side of the ridge supports the same key browse species that are found on site #16B-1, with serviceberry and mountain big sagebrush being the most common. Serviceberry density was estimated at 520 plants/acre in 1997, decreasing to 400 plants/acre in 2002. Mature plants are relatively small averaging only 15 inches in height. Utilization has been moderate to heavy since 1989, although vigor has improved since that initial reading when half of the shrubs displayed poor vigor and 70% were classified as decadent. Decadent plants made up only 10% of the population in 2002. Recruitment from young serviceberry plants was moderately high in both 1997 and 2002 estimated at 160 individuals/acre. Annual growth averaged 2.4 inches on serviceberry in 2002.

Mountain big sagebrush is much more abundant on this site than the Long Ridge South site at an estimated density of 2,220 plants/acre in 1997, increasing to 2,480 plants/acre in 2002. Twice as many plants were estimated in 1989, but due to the lack of large numbers of dead plants encountered in 1997 and 2002, the change in density is primarily due to the much larger, more representative sample currently used. Sagebrush has shown moderate to heavy use in all sampling years. Even with heavy use, the sagebrush population appears to be maintaining good health. Poor vigor was estimated at 15% or less in all years. Percent decadency has steadily declined from a high of 70% in 1989 to 31% in 2002. More importantly, the proportion of decadent plants classified as dying did increase between 1997 and 2002, currently estimated at 50% (380 plants/acre). Recruitment of young plants was poor in both 1989 and 1997, but did improve to 11% of the population in 2002. Annual growth on sagebrush averaged 1.9 inches in 2002.

The understory is moderately abundant and diverse. Perennial grasses have been the dominant understory component. Bluebunch wheatgrass, Sandberg bluegrass, and muttongrass are the most abundant species. With drought in 2002, bluebunch remained stable, but both Sandberg bluegrass and muttongrass significantly declined in nested frequency. Perennial grasses showed minimal seed head production in 2002. Use on perennial grasses has been light in all years. Cheatgrass, although present, produces less than 1% cover on this site. Forb diversity is high with several useful species present. The drought in 2002 caused a large decline in forb abundance. Sum of nested frequency for perennial forbs decreased by 57% between 1997 and 2002. Sum of nested frequency for perennial grasses and forbs combined declined by 44% between 1997 and 2002. Better precipitation in the future will help improve the abundance of perennial herbaceous species.

### 1989 APPARENT TREND ASSESSMENT

The rocky soil appears stable with adequate protection from abundant vegetation and litter cover. Heavy utilization is impacting the key browse species, mountain big sagebrush and serviceberry. Trend appears to be declining for these species. Otherwise, there is good diversity, a healthy understory, and relatively fewer increaser species compared to other sites.

### 1997 TREND ASSESSMENT

Trend for soil is stable. The increased percentage of bare ground cover is most likely the result of soil covering some of the surface rock as rock-pavement cover declined from 44% to 21%. Trend for browse is up slightly due to improved vigor and lower percent decadence for serviceberry and reduced heavy use and lower percent decadence for mountain big sagebrush. Trend for the herbaceous understory is relatively stable for perennial grasses and up for forbs. Sum of nested frequency for perennial grasses is similar between years with a decline in frequency for bluebunch wheatgrass, but an increase in the nested frequency for muttongrass and Sandberg bluegrass. Sum of nested frequency for perennial forbs increased markedly due to a significant increase in the nested frequency of sego lily (6 to 101). Overall trend for the herbaceous understory is considered up slightly.

#### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - up slightly (4)

### 2002 TREND ASSESSMENT

Soil trend is stable. Bare soil and litter cover both declined, resulting in increased exposure of rock and pavement. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil improved slightly. Erosion is currently slight, but not extreme for this moderately steep site. Trend for the key browse is stable. Mountain big sagebrush slightly increased in density while recruitment from young plants improved. Percent decadence in the sagebrush population also decreased. Serviceberry remains stable in percent decadence and vigor. The herbaceous understory shows a downward trend. Sum of nested frequency for perennial grasses declined by 32%, as forbs declined by 57%. The loss of herbaceous species is due to drought and should improve with normal precipitation in the future.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 2

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	295	270	281	99	92	85	7.18	17.81
G	<i>Bromus tectorum</i> (a)	-	57	61	-	21	24	.46	.17
G	<i>Poa fendleriana</i>	<sub>b</sub> 164	<sub>b</sub> 177	<sub>a</sub> 68	58	68	28	3.37	1.69
G	<i>Poa secunda</i>	<sub>b</sub> 140	<sub>c</sub> 192	<sub>a</sub> 104	52	71	44	3.75	1.10
G	<i>Sitanion hystrix</i>	-	3	-	-	1	-	.00	-
G	<i>Stipa comata</i>	<sub>c</sub> 49	<sub>b</sub> 29	<sub>a</sub> 5	24	12	2	.16	.06
Total for Annual Grasses		0	57	61	0	21	24	0.46	0.17
Total for Perennial Grasses		648	671	458	233	244	159	14.47	20.67
Total for Grasses		648	728	519	233	265	183	14.94	20.84
F	<i>Agoseris glauca</i>	<sub>a</sub> -	<sub>b</sub> 49	<sub>b</sub> 34	-	24	20	.15	.22
F	<i>Alyssum alyssoides</i> (a)	-	<sub>a</sub> 29	<sub>b</sub> 69	-	11	26	.05	.44
F	<i>Allium</i> spp.	-	3	-	-	2	-	.01	-
F	<i>Antennaria rosea</i>	<sub>a</sub> 20	<sub>b</sub> 55	<sub>a</sub> 23	8	23	12	.70	.59
F	<i>Arabis</i> spp.	<sub>b</sub> 51	<sub>a</sub> 6	<sub>a</sub> 1	25	3	1	.01	.00
F	<i>Artemisia ludoviciana</i>	<sub>a</sub> 3	<sub>a</sub> 3	<sub>b</sub> 13	1	1	6	.15	.34
F	<i>Astragalus beckwithii</i>	<sub>b</sub> 58	<sub>b</sub> 60	<sub>a</sub> 4	30	34	2	1.51	.03
F	<i>Astragalus utahensis</i>	<sub>a</sub> -	<sub>c</sub> 21	<sub>b</sub> 11	-	13	6	.51	.22
F	<i>Balsamorhiza sagittata</i>	5	10	1	2	4	1	.36	.15
F	<i>Castilleja chromosa</i>	<sub>b</sub> 31	<sub>a</sub> 8	<sub>a</sub> 5	14	5	3	.02	.04
F	<i>Calochortus nuttallii</i>	<sub>a</sub> 6	<sub>b</sub> 101	<sub>a</sub> 5	4	46	3	.22	.01
F	<i>Chaenactis douglasii</i>	2	-	-	1	-	-	-	-
F	<i>Cirsium</i> spp.	<sub>a</sub> 1	<sub>b</sub> 5	<sub>a</sub> -	1	3	-	.33	-
F	<i>Collomia linearis</i> (a)	-	46	26	-	21	13	.10	.06
F	<i>Collinsia parviflora</i> (a)	-	<sub>b</sub> 36	<sub>a</sub> 14	-	15	7	.27	.03
F	<i>Crepis acuminata</i>	20	24	11	12	10	7	.05	.28
F	<i>Cryptantha</i> spp.	<sub>b</sub> 47	<sub>ab</sub> 22	<sub>a</sub> 7	19	10	6	.22	.22
F	<i>Cymopterus longipes</i>	<sub>a</sub> 67	<sub>b</sub> 117	<sub>a</sub> 56	35	51	25	.75	.15
F	<i>Epilobium brachycarpum</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Eriogonum racemosum</i>	<sub>b</sub> 64	<sub>a</sub> 31	<sub>a</sub> 36	29	15	17	.23	.70
F	<i>Eriogonum umbellatum</i>	29	18	29	16	12	13	.09	.27
F	<i>Lappula occidentalis</i> (a)	-	5	-	-	2	-	.01	-
F	<i>Linum lewisii</i>	1	3	4	1	2	2	.01	.01
F	<i>Lithospermum ruderales</i>	8	17	9	5	7	5	.42	.26
F	<i>Lupinus argenteus</i>	<sub>b</sub> 40	<sub>b</sub> 47	<sub>a</sub> 12	24	23	6	2.43	.22
F	<i>Microsteris gracilis</i> (a)	-	12	7	-	5	4	.02	.02
F	<i>Phlox longifolia</i>	24	12	10	11	7	6	.03	.03
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>a</sub> 8	<sub>b</sub> 33	-	5	12	.02	.06

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Sphaeralcea coccinea</i>	13	9	7	6	3	3	.01	.04
F	<i>Taraxacum officinale</i>	3	-	-	2	-	-	-	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> -	<sub>b</sub> 20	<sub>a</sub> -	-	8	-	.04	-
Total for Annual Forbs		0	137	149	0	60	62	0.50	0.62
Total for Perennial Forbs		493	641	278	246	306	144	8.31	3.87
Total for Forbs		493	778	427	246	366	206	8.81	4.49

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Amelanchier alnifolia</i>	18	19	.63	.57
B	<i>Artemisia tridentata vaseyana</i>	76	69	9.75	9.54
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	41	40	2.69	1.49
B	<i>Gutierrezia sarothrae</i>	19	6	.07	.01
B	<i>Mahonia repens</i>	3	3	.06	.15
B	<i>Opuntia spp.</i>	15	19	.25	.41
B	<i>Purshia tridentata</i>	0	0	.00	-
B	<i>Rosa woodsii</i>	1	0	-	-
B	<i>Symphoricarpos oreophilus</i>	4	0	-	-
B	<i>Tetradymia canescens</i>	25	21	.52	.69
Total for Browse		202	177	13.99	12.87

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 2

Species	Average leader growth (in) '02
<i>Amelanchier alnifolia</i>	2.4
<i>Artemisia tridentata vaseyana</i>	1.9

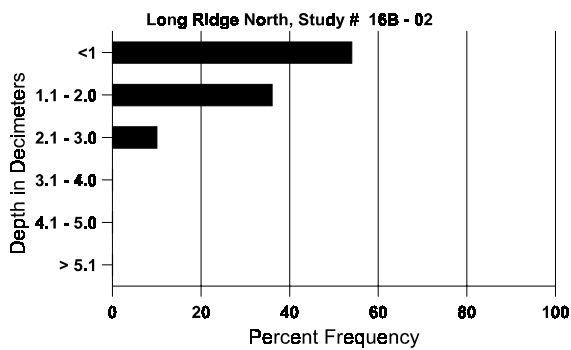
BASIC COVER --  
Herd unit 16B, Study no: 2

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	362	317	13.50	35.95	40.50
Rock	275	246	12.00	9.81	12.97
Pavement	323	292	31.75	10.85	17.20
Litter	394	324	35.75	33.23	26.77
Cryptogams	61	2	.50	.40	.06
Bare Ground	306	221	6.50	17.84	10.21

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 02, Long Ridge North

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.5	50.4 (14.0)	6.9	54.7	19.7	25.6	2.8	13.6	294.4	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 2

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	3	1	-	-
Elk	29	2	122	10 (23)
Deer	41	30	1035	80 (197)



BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 2

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	97	5	1	-	2	-	-	-	-	-	8	-	-	-	160			8
	02	5	2	-	1	-	-	-	-	-	8	-	-	-	160			8
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	6	1	7	1	-	-	-	-	-	15	-	-	-	300	15	22	15
	02	2	2	2	-	-	1	2	-	1	10	-	-	-	200	16	19	10
D	89	1	3	3	-	-	-	-	-	-	1	1	2	3	466			7
	97	1	-	1	1	-	-	-	-	-	2	-	-	1	60			3
	02	-	-	1	-	-	-	1	-	-	1	-	-	1	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		30%			30%			50%			-22%							
'97		08%			31%			04%			-23%							
'02		20%			25%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	666	Dec:	70%			
												'97	520		12%			
												'02	400		10%			
<i>Artemisia tridentata vaseyana</i>																		
S	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	97	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	12	1	1	-	-	-	-	-	-	14	-	-	-	280			14
M	89	6	8	5	-	-	-	-	-	-	17	2	-	-	1266	15	16	19
	97	14	36	15	-	-	-	-	-	-	65	-	-	-	1300	26	33	65
	02	6	27	39	-	-	-	-	-	-	72	-	-	-	1440	24	31	72
D	89	10	24	15	-	-	-	-	-	-	45	-	-	4	3266			49
	97	20	22	-	-	-	-	-	-	-	33	-	-	9	840			42
	02	4	5	26	-	1	1	1	-	-	19	-	-	19	760			38
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	580			29
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	440			22
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		46%			29%			06%			-52%							
'97		53%			14%			08%			+10%							
'02		27%			54%			15%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	4665	Dec:	70%			
												'97	2220		38%			
												'02	2480		31%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
Y	89	1	1	-	-	-	-	-	-	2	-	-	-	133		2	
	97	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	6	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	89	1	-	-	-	-	-	-	-	1	-	-	-	66	7	4	1
	97	68	-	-	-	-	-	-	-	68	-	-	-	1360	9	13	68
	02	66	-	-	-	-	-	-	-	66	-	-	-	1320	9	14	66
D	89	2	1	-	-	-	-	-	-	1	-	1	1	200		3	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	3	-	-	1	-	-	2	-	4	-	-	2	120		6	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		33%			00%			33%			+72%						
'97		00%			00%			00%			+ 9%						
'02		00%			00%			03%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	399	Dec:	50%				
										'97	1420		1%				
										'02	1560		8%				
<i>Gutierrezia sarothrae</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	10	-	-	-	-	-	-	-	10	-	-	-	666	10	6	10
	97	25	-	-	-	-	-	-	-	25	-	-	-	500	6	6	25
	02	2	-	-	-	-	-	-	-	2	-	-	-	40	6	4	2
D	89	1	-	-	-	-	-	-	-	-	-	-	1	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	3	-	-	-	-	-	-	-	2	-	-	1	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			09%			-32%						
'97		00%			00%			00%			-76%						
'02		00%			00%			17%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	732	Dec:	9%				
										'97	500		0%				
										'02	120		50%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Mahonia repens</b>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	25	-	-	-	-	-	-	-	-	-	-	-	500	4	4	25
	02	16	-	-	-	-	-	-	-	-	-	-	-	320	2	2	16
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-38%						
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	520		-		
												'02	320		-		
<b>Opuntia spp.</b>																	
S	89	3	-	-	-	-	-	-	-	-	-	-	-	200			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1
Y	89	1	-	-	-	-	-	-	-	-	-	-	-	66			1
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1
M	89	5	-	-	-	-	-	-	-	-	-	-	-	333	4	7	5
	97	17	-	-	-	-	-	-	-	-	-	-	-	340	4	8	17
	02	17	-	-	-	-	-	-	-	-	-	-	-	340	5	9	17
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	2	-	-	-	-	-	-	-	-	-	2	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			- 5%						
'97		00%			00%			00%			+ 5%						
'02		00%			00%			10%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	399	Dec:	0%		
												'97	380		5%		
												'02	400		10%		
<b>Purshia tridentata</b>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
												'02	0		-		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Rosa woodsii</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	7	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			
<b>Symphoricarpos oreophilus</b>																		
Y	89	-	1	-	-	-	-	-	-	-	-	-	1	-	66			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	1	-	-	-	-	-	-	-	3	-	-	-	60	3	8	3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			100%			+18%							
'97		25%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	80		-			
												'02	0		-			
<b>Tetradymia canescens</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	4	1
	97	29	-	-	-	-	-	-	-	-	29	-	-	-	580	9	16	29
	02	26	-	-	-	-	-	-	-	-	26	-	-	-	520	8	12	26
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+82%							
'97		00%			00%			00%			-14%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	0%			
												'97	740		11%			
												'02	640		6%			

Trend Study 16B-3-02

Study site name: Rocky Hollow.

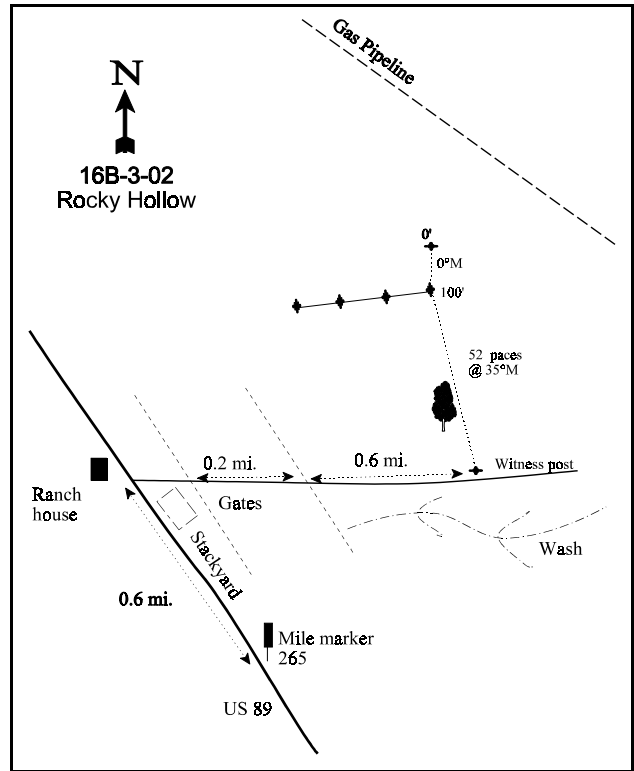
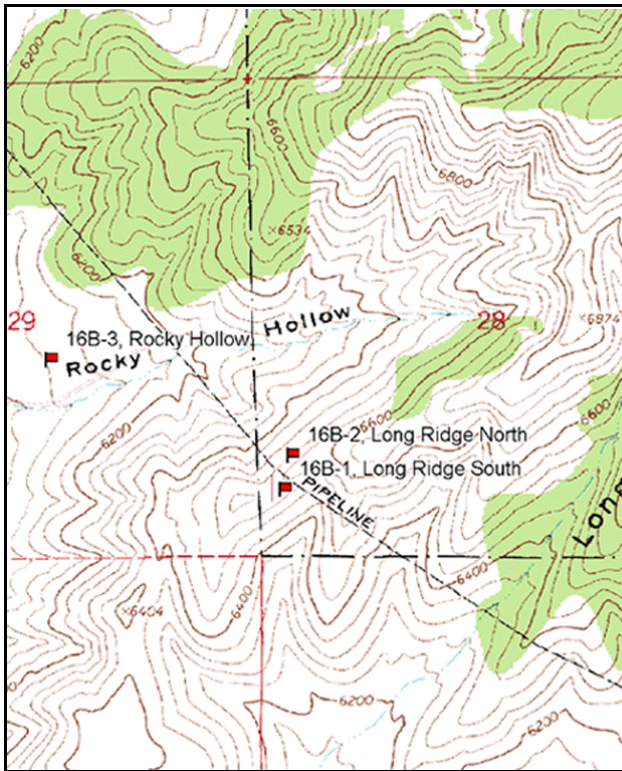
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic (lines 2-4 @ 260°M).

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

LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard (0.6 miles north of mile marker 265). Turn right, go through a DWR gate into Lassen Draw property. Go 0.2 miles to another gate/fence. Continue up road another 0.6 miles to a green and red witness post on the left ( north) just 3 paces off the road. From the witness post, walk 52 paces at 350 degrees magnetic to the 100-foot baseline stake. The 0-foot stake is marked by browse tag #180.



Map Name: Indianola

Diagrammatic Sketch

Township 11S, Range 4E, Section 29

GPS: NAD 27, UTM 12S 4409088 N 457476 E

## DISCUSSION

### Rocky Hollow - Trend Study No. 16B-3

The Rocky Hollow study samples the sagebrush type in the swales at the base of the foothills. It is on Division property and samples the same area as an old line-intercept transect. Elevation at the site is 6,050 feet with a gentle 5% slope and a western aspect. Big game use on the site has been relatively heavy during winters, especially by mule deer. Quadrat frequency of deer pellets has been high at 38% and 48% in 1997 and 2002 respectively. Elk use is much lighter with a quadrat frequency of 19% in 1997 and only 1% in 2002. Pellet group transect data taken in 2002 estimated 137 deer days use/acre (337 ddu/ha). No elk pellet groups were sampled in the transect. Cattle pats have been observed on the site in all sampling years but they are few in number, apparently from just a few trespass cattle.

Soils are moderately deep with an effective rooting depth estimated at almost 16 inches. Soil texture is a sandy clay loam with a slightly acidic pH (6.1). Large rocks are present on and just below the soil surface. The presence of rock on the surface and throughout the profile increases as one moves down the slope. Soils are stable as vegetation, litter, and cryptogams are abundant and appear to effectively limit erosion. An erosion condition classification determined the site to be stable in 2002.

The key browse species consists of a moderately dense stand of mountain big sagebrush (*Artemisia tridentata vaseyana*) which appears to be hybridizing with basin big sagebrush (*A. tridentata tridentata*). Density was estimated at 2,599 plants/acre in 1989. Utilization was light to moderate with normal vigor on most plants. Percent decadence was relatively high at 38% with poor recruitment as there were no seedlings and only 3% of the population were young plants. With the much larger sample used in 1997 and 2002, sagebrush density was estimated at a lower but more accurate level. In 1997, density was estimated at 1,700 plants/acre, slightly declining to 1,600 plants/acre in 2002. Nearly two-thirds of the sagebrush population is composed of mature plants, with the decadent class representing most of the remaining population. Seedlings and young were present in small numbers on the site. Seedlings increased in 2002 which is surprising due to the drought conditions. Dead plants number 660 plants/acre in both 1997 and 2002. Utilization has been moderate overall, with a few plants displaying heavy use in 2002. Vigor was normal on all but 14% of the population. Annual growth on sagebrush averaged 2 inches in 2002. Previous to the 2002 reading, it was reported that some of the decadency (partial crown death) and reduced vigor could be the result of winter injury.

Small numbers of serviceberry and bitterbrush offer additional forage. However, these species occur in very low densities. These species will likely remain in low densities in the future as reproduction is nearly absent for both. The most abundant shrub is stickyleaf low rabbitbrush which numbered almost 3,000 plants/acre in 2002. This is an increase from just over 2,000 plants/acre estimated in 1997. Age class distribution indicates a stable population with mostly mature plants. Prickly pear cactus is also relatively abundant providing 10% of the browse cover in 2002.

The herbaceous understory is dominated by annual species. Annual grasses, primarily cheatgrass, were sampled in nearly every quadrat in 1997 and 2002. Annual forbs consist mostly of very small species such as bur buttercup, pale alyssum, and little-flower collinsia. Both annual grasses and forbs increased in sum of nested frequency in 2002, even with drought. Perennial grasses and forbs are found almost exclusively under the protection of shrub canopies. Bluebunch wheatgrass and Sandberg bluegrass are the most abundant perennials, both increasing in nested frequency in 2002. Bottlebrush squirreltail, needle-and-thread grass, and Indian ricegrass are present but infrequent. As with other sites in this unit, perennial forbs were the vegetative class most effected by drought in 2002. Sum of nested frequency of perennial forbs declined by 39% between 1997 and 2002. Normal precipitation in the future should reverse this decline.

## 1989 APPARENT TREND ASSESSMENT

The condition of this site is rather poor. The preferred species, both forbs and browse, are depleted and increasers are common. Sagebrush appears to be stable to slightly declining with a mostly mature and decadent age structure and few young plants. Overall vegetative trend appears down on the untreated areas, and soils appear to be declining as well with a high amount of bare soil.

## 1997 TREND ASSESSMENT

The soil trend appears stable with similar amounts of protective ground cover as reported in 1989. Trend for mountain big sagebrush appears stable due to improved reproduction and slightly reduced decadence. Dead plants are common, suggesting that the decline in density can mostly be explained by the number of dead plants not the greatly increased sample size. The increaser, sticky leaf low rabbitbrush, also appears stable. Trend for the herbaceous understory is up slightly. Sum of nested frequency for perennial grasses has increased slightly, while frequency of perennial forbs has more than doubled since 1989.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

Soils have a stable trend. Ground cover characteristics remained stable between 1997 and 2002. Erosion is minimal at the present time. Trend for the key browse, mountain big sagebrush is stable. All of the key parameters show stable trends including density, reproduction, percent decadence, and vigor. The herbaceous understory has a slightly downward trend with a 24% decrease in sum of nested frequency for perennial species. There was an increase in both annual grasses and forbs.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

## HERBACEOUS TRENDS --

Herd unit 16B, Study no: 3

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron smithii	-	2	-	-	1	-	.03	-
G	Agropyron spicatum	ab80	a63	b101	32	28	45	3.84	4.05
G	Bromus japonicus (a)	-	a-	b86	-	-	32	-	.50
G	Bromus tectorum (a)	-	b328	a319	-	98	97	13.18	6.80
G	Oryzopsis hymenoides	b15	a3	a3	7	1	1	.38	.03
G	Poa secunda	a43	b104	b111	20	38	45	3.18	2.15
G	Sitanion hystrix	ab23	b39	a12	12	21	5	.89	.36
G	Stipa comata	a-	b9	ab3	-	5	2	.46	.18
Total for Annual Grasses		0	328	405	0	98	129	13.18	7.31
Total for Perennial Grasses		161	220	230	71	94	98	8.80	6.80
Total for Grasses		161	548	635	71	192	227	21.98	14.11

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Agoseris glauca</i>	a-	b15	ab9	-	8	4	.26	.16
F	<i>Alyssum alyssoides</i> (a)	-	a170	b317	-	62	95	.71	6.76
F	<i>Allium</i> spp.	a13	b61	c84	8	27	43	.20	.30
F	<i>Antennaria rosea</i>	-	3	-	-	1	-	.00	-
F	<i>Astragalus beckwithii</i>	a-	b21	b26	-	13	12	.58	.12
F	<i>Astragalus utahensis</i>	a-	b22	a-	-	11	-	.79	-
F	<i>Castilleja linariaefolia</i>	a-	b17	a4	-	8	1	.21	.00
F	<i>Camelina microcarpa</i> (a)	-	2	3	-	1	1	.00	.00
F	<i>Cirsium</i> spp.	-	3	-	-	1	-	.03	-
F	<i>Collomia linearis</i> (a)	-	b46	a15	-	22	7	.11	.03
F	<i>Comandra pallida</i>	3	-	-	1	-	-	-	-
F	<i>Collinsia parviflora</i> (a)	-	a313	b340	-	95	99	3.76	8.25
F	<i>Crepis acuminata</i>	4	1	3	3	1	1	.00	.00
F	<i>Cymopterus longipes</i>	a-	b39	a-	-	16	-	.08	-
F	<i>Erigeron pumilus</i>	2	-	-	1	-	-	-	-
F	<i>Eriogonum racemosum</i>	3	-	-	1	-	-	-	-
F	<i>Lithospermum ruderales</i>	3	15	10	3	6	4	.49	.19
F	<i>Lomatium triternatum</i>	b21	a3	a-	13	1	-	.00	-
F	<i>Lupinus argenteus</i>	6	6	-	4	4	-	.40	-
F	<i>Machaeranthera canescens</i>	4	-	-	1	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	a6	b26	-	3	12	.01	.06
F	<i>Phlox longifolia</i>	1	7	2	1	3	2	.01	.01
F	<i>Polygonum douglasii</i> (a)	-	b14	a1	-	7	1	.18	.00
F	<i>Ranunculus testiculatus</i> (a)	-	a72	b215	-	29	65	.54	4.22
F	<i>Sphaeralcea coccinea</i>	51	61	61	22	22	28	1.23	.99
F	<i>Tragopogon dubius</i>	-	5	-	-	4	-	.04	-
F	<i>Vicia americana</i>	a54	b137	a53	25	51	28	3.19	1.06
Total for Annual Forbs		0	623	917	0	219	280	5.32	19.35
Total for Perennial Forbs		165	416	252	83	177	123	7.54	2.85
Total for Forbs		165	1039	1169	83	396	403	12.87	22.21

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



BROWSE TRENDS --  
Herd unit 16B, Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	2	2	.03	.03
B	Artemisia tridentata vaseyana	61	58	11.59	14.92
B	Chrysothamnus viscidiflorus viscidiflorus	54	61	3.90	2.82
B	Gutierrezia sarothrae	0	1	-	-
B	Mahonia repens	0	1	-	-
B	Opuntia spp.	56	55	1.75	2.12
Total for Browse		173	178	17.27	19.90

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 3

Species	Average leader growth (in) '02
Amelanchier alnifolia	3.1
Artemisia tridentata vaseyana	2.0

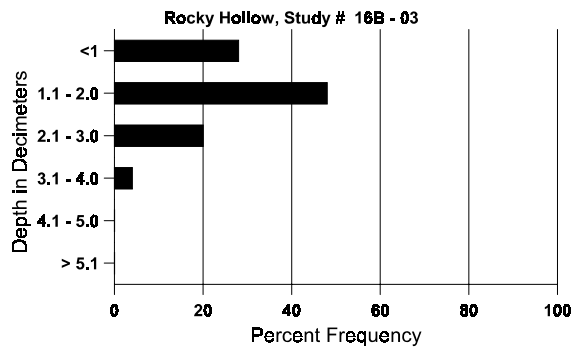
BASIC COVER --  
Herd unit 16B, Study no: 3

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	382	384	10.00	46.29	57.96
Rock	151	171	10.75	7.54	7.44
Pavement	64	156	6.00	.98	2.80
Litter	380	367	53.25	37.26	32.64
Cryptogams	185	104	1.75	3.27	4.30
Bare Ground	241	221	18.25	16.51	15.26

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 03, Rocky Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.5	50.4 (15.7)	6.1	54.7	24.7	20.6	1.5	22.8	316.8	.4

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 3

Type	Quadrat Frequency	
	'97	'02
Rabbit	5	24
Elk	19	1
Deer	38	48
Cattle	2	1
Sheep	-	-

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
-	-
-	-
1775	137 (337)
9	1 (2)
9	1 (2)

BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 3

A Y R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<i>Amelanchier alnifolia</i>													
S	89	-	-	-	-	1	-	-	1	-	1		
	97	-	-	-	-	-	-	-	0	-	0		
	02	-	-	-	-	-	-	-	0	-	0		
Y	89	-	-	-	-	1	-	-	66	-	1		
	97	-	-	-	-	-	-	-	0	-	0		
	02	-	-	-	-	-	-	-	0	-	0		
M	89	-	-	2	-	-	-	-	133	29	29	2	
	97	-	-	1	-	1	-	-	40	32	41	2	
	02	-	-	-	1	-	-	-	20	46	47	1	
D	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	0	-	-	0	
	02	-	-	-	1	-	-	-	20	-	-	1	
X	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	20	-	-	1	
	02	-	-	-	-	-	-	-	20	-	-	1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		67%		33%		-80%					
'97		00%		100%		00%		+ 0%					
'02		100%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	199	Dec:	0%
										'97	40		0%
										'02	40		50%
<i>Artemisia tridentata vaseyana</i>													
S	89	-	-	-	-	-	-	-	0	-	-	0	
	97	2	-	-	-	-	-	-	40	-	-	2	
	02	20	-	-	-	-	-	-	400	-	-	20	
Y	89	1	-	-	-	-	-	-	66	-	-	1	
	97	5	1	-	1	-	-	-	140	-	-	7	
	02	3	-	1	-	-	-	-	80	-	-	4	
M	89	13	10	-	-	-	-	-	1533	32	31	23	
	97	30	23	-	-	-	-	-	1060	35	51	53	
	02	23	20	8	1	-	-	-	1040	31	39	52	
D	89	7	8	-	-	-	-	-	1000	-	-	15	
	97	12	13	-	-	-	-	-	500	-	-	25	
	02	5	12	3	2	1	1	-	480	-	-	24	
X	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	660	-	-	33	
	02	-	-	-	-	-	-	-	660	-	-	33	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		46%		00%		05%		-35%					
'97		44%		00%		11%		- 6%					
'02		41%		16%		14%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	2599	Dec:	38%
										'97	1700		29%
										'02	1600		30%

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
S	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	20		1
Y	89	3	-	-	-	-	-	-	200		3
	97	2	-	-	-	-	-	-	40		2
	02	5	-	-	1	-	-	-	120		6
M	89	36	-	-	1	-	-	-	2466	13 13	37
	97	98	-	-	-	-	-	-	1960	12 17	98
	02	114	-	-	1	-	-	-	2300	10 16	115
D	89	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	40		2
	02	23	1	-	1	-	-	2	540		27
X	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		00%		00%		15%		-23%			
'97		00%		00%		02%		+31%			
'02		.67%		00%		03%					
Total Plants/Acre (excluding Dead & Seedlings)							'89	2666	Dec:	0%	
							'97	2040		2%	
							'02	2960		18%	
<i>Gutierrezia sarothrae</i>											
M	89	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	-	-	-	-	0	-	0
	02	3	-	-	-	-	-	-	60	-	3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		00%		00%		00%					
'97		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)							'89	0	Dec:	-	
							'97	0		-	
							'02	60		-	
<i>Mahonia repens</i>											
M	89	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	-	-	-	-	0	-	0
	02	1	-	-	-	-	-	-	20	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		00%		00%		00%					
'97		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)							'89	0	Dec:	-	
							'97	0		-	
							'02	20		-	

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
Opuntia spp.												
S	89	1	-	-	-	-	-	-	1	66		1
	97	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	0		0
Y	89	4	-	-	-	-	-	-	4	266		4
	97	-	-	1	-	-	-	-	1	20		1
	02	1	-	-	-	-	-	-	1	20		1
M	89	14	-	-	-	-	-	-	11	933	6 16	14
	97	111	-	-	4	-	-	-	115	2300	11 17	115
	02	71	-	-	-	-	-	-	70	1420	6 20	71
D	89	-	-	-	-	-	-	-	-	0		0
	97	4	-	-	-	-	-	-	3	80		4
	02	8	-	-	1	-	-	-	7	180		9
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		17%		+50%				
'97		00%		00%		.83%		-33%				
'02		00%		00%		02%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	1199	Dec:	0%
									'97	2400		3%
									'02	1620		11%
Purshia tridentata												
Y	89	1	-	-	-	-	-	-	1	66		1
	97	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%						
'97		00%		00%		00%						
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	66	Dec:	-
									'97	0		-
									'02	0		-

Trend Study 16B-4-02

Study site name: Dry Creek Chaining.

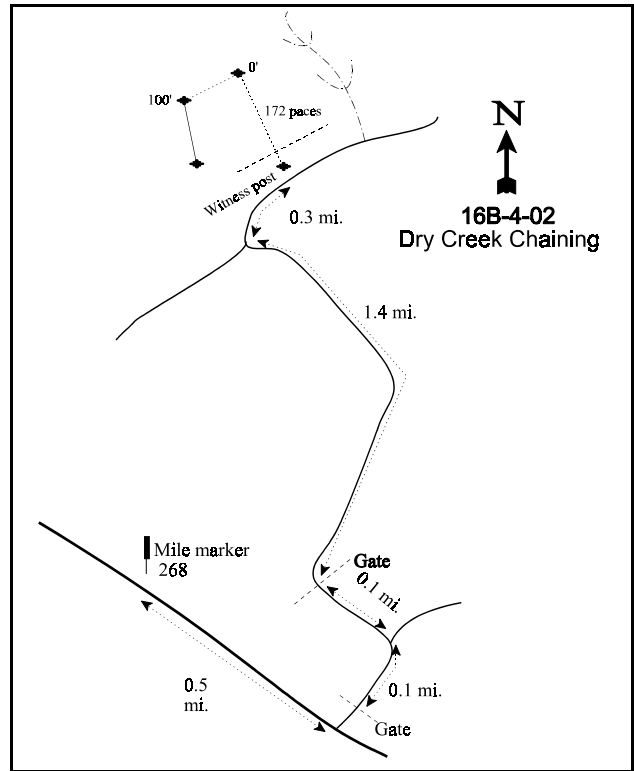
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 229 degrees magnetic (line 2 @ 162°M).

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

LOCATION DESCRIPTION

From mile marker 268 on U.S. 89, go 0.5 miles to a gate on the left. Go through this gate (east) 0.1 miles to a fork. Stay left and go 0.1 miles through another gate and veer right. Go 1.4 miles to a fork and turn right. Go 0.3 miles to a witness post at a gully on the left. From this post, walk 172 paces north going over a fence about 100 feet from the road to the 0-foot baseline stake marked by browse tag # 188.



Map Name: Spencer Canyon

Diagrammatic Sketch

Township 11S, Range 4E, Section 7

GPS: NAD 27, UTM 12S 4413970 N 456330 E

## DISCUSSION

### Dry Creek Chaining - Trend Study No. 16B-4

The Dry Creek Chaining study was established in 1989 on an old pinyon-juniper chaining on Forest Service lands. This study was established near the site of a 1978 line-intercept transect. The area has an overstory of pinyon, juniper, and Gambel oak. Big game use of the area has been moderately low on this site. Other than a moderately small stand of true mountain mahogany, very little preferred browse exists on the site resulting in limited carrying capacity for wintering big game. Pellet group transect data collected in 2002 estimated 34 elk days use/acre (84 edu/ha) and 11 deer days use/acre (28 ddu/ha). About half of the deer and elk pellet groups appear to be from spring use. Use of the site by rabbits has been more abundant in some years. There is not much livestock use of the site.

The site lies on a southwest facing, 20% slope at an elevation of 6,700 feet. Drainage is southerly towards the wash in Dry Canyon and takes the form of an active gully. Soils are shallow and rocky with an effective rooting depth estimated at just over 11 inches. Texture is a clay loam and soils are neutral in reactivity (pH of 7.3). Percent organic matter is relatively high at 3.2%. Pavement and rock cover are significant, accounting for about 22% of the ground cover during all sampling periods. Litter cover is good but discontinuous. Percent bare soil is moderately high 25% in 2002. There is evidence of some sheet erosion and sedimentation buildup in nearby gullies from past erosion events. However, the erosion condition classification was determined as stable in 2002.

In the openings, grasses dominate and provide good soil protection. Bare areas tend to be found in the more dense browse stands dominated by pinyon pine and Utah juniper. These two species are becoming increasingly abundant following the chaining treatment. Initial point-center quarter estimates in 1989 estimated 99 juniper/acre and 87 pinyon/acre for a total of 186 trees/acre. Most of these trees were in the 4-8 foot height class. Data from 2002 estimated 99 juniper/acre and 120 pinyon/acre. The increase in pinyon comes from an increase in young trees. Average diameter of pinyon was 3.2 inches in 2002, while juniper stems averaged 4.7 inches. Trees are also increasing in size which increases their competitive ability with other species on the site. There is a stand of large, unchained trees directly above the site on the ridge.

The most important browse species on the site is true mountain mahogany. Bitterbrush is also present, but occurs at one-half the density of mahogany. Gambel oak has a higher density than either mahogany or bitterbrush, but is less preferred and has less forage value. Mahogany density was estimated at 400 plants/acre in 2002. Mahogany use was light to moderate in 1989 and 1997, but increased in 2002. Annual leader growth averaged only 1.7 inches in 2002. Due to relatively light use by big game and minimal leader growth in 2002, utilization may have been overestimated. Percent decadence increased from 0% in 1997 to 50% in 2002, and poor vigor increased from 0% to 20%. These changes are due primarily to the drought in 2002 and should improve with better precipitation.

Bitterbrush had an estimated density of 240 plants/acre in 2002, a decrease from 360 plants/acre in 1997. Most of the decline is due to the loss of young plants, estimated at 80 plants/acre in 1997, but not sampled in 2002. Low reproduction often accompanies drought so this decline is not surprising. Gambel oak density was estimated at 4,300 stems/acre in 1989, most of which were classified as young. Oak forage was mostly unavailable on 34% of the trees and the remainder were only lightly used, if at all. During the 1997 and 2002 readings, a much larger, more representative sample was used which estimates oak density to be much lower. Currently ('02), oak density is estimated at 920 stems/acre. Use remains light, reproduction is low, and vigor mostly normal.

Snakeweed and pricklypear cactus were common along the more open areas near the baseline in 1997, although they were not encountered in the old density plots in 1989. In 2002, snakeweed density declined from 2,060 plants/acre to only 120 plants/acre. Snakeweed has been found to decline with extremely dry conditions so this decrease is expected with the drought experienced in 2002.

Perennial grasses are diverse but have steadily declined in frequency since the initial reading in 1989. This decline could be attributed, at least in part, to the increasing pinyon-juniper component in the community. The most common species are seeded types including intermediate and crested wheatgrass. Annual cheatgrass is moderately abundant, remaining stable in 2002 even with drought. Forbs species are diverse, but infrequent and are not a significant component on the site. Rock goldenrod is the most abundant forb contributing nearly half of all the forb cover in 2002.

#### 1989 APPARENT TREND ASSESSMENT

The soil shows some downward indicators, but could improve with increased vegetative cover. Grasses are vigorous. The available browse forage is only lightly utilized. There is evidence that less desirable species are increasing, indicating a slight downward trend making this area a candidate for re-treatment.

#### 1997 TREND ASSESSMENT

Trend for soil is slightly down. Percent bare ground increased from 11% to 15%, while litter cover declined from 58% to 41%. Nested frequency of perennial grasses also declined. Density estimates of many of the browse species have changed due to the much larger sample size used in 1997. The larger sample gives more accurate estimates for browse species that characteristically have distributions that are clumped or discontinuous. Trend for the key species appears stable with light use and low percent decadency. The increasing dominance of pinyon and juniper trees will eventually cause a decline in the understory shrub component. Trend for the herbaceous understory is down due to a 30% decline in the sum of nested frequency of perennial grasses. Frequency of perennial forbs increased slightly.

##### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - down (1)

#### 2002 TREND ASSESSMENT

Trend for soil is slightly down. Percent bare soil increased, and the decline in nested frequency of grasses leaves more opportunity for soil loss in the future. The ratio of protective cover (vegetation, litter, and cover) to bare soil declined as well. Trend for browse is also slightly down. True mountain mahogany and bitterbrush show increases in decadency and poor vigor, and decreased reproduction. The herbaceous understory has a downward trend as perennial species continue to decline in sum of nested frequency. It appears that two factors, drought and the increasing pinyon-juniper, are negatively impacting both the browse component as well as the herbaceous understory. This site needs to be retreated to decrease both the density and size of pinyon and juniper trees.

##### TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - down (1)



HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 4

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	50	51	59	20	22	22	.43	.90
G	Agropyron intermedium	<sub>c</sub> 171	<sub>b</sub> 121	<sub>a</sub> 66	57	42	28	4.38	1.51
G	Agropyron spicatum	45	21	31	18	10	13	.44	.48
G	Bromus inermis	<sub>b</sub> 71	<sub>a</sub> 21	<sub>a</sub> 19	31	11	9	.47	.21
G	Bromus japonicus (a)	-	-	2	-	-	1	-	.00
G	Bromus tectorum (a)	-	121	117	-	40	39	1.60	1.82
G	Carex spp.	<sub>b</sub> 19	<sub>ab</sub> 3	<sub>a</sub> -	8	1	-	.15	-
G	Oryzopsis hymenoides	<sub>b</sub> 19	<sub>b</sub> 17	<sub>a</sub> 3	8	8	1	.23	.03
G	Poa fendleriana	<sub>b</sub> 11	<sub>a</sub> -	<sub>b</sub> 8	6	-	6	-	.13
G	Poa secunda	<sub>a</sub> 6	<sub>b</sub> 45	<sub>b</sub> 25	4	22	15	.34	.15
G	Sitanion hystrix	11	4	-	5	2	-	.03	-
Total for Annual Grasses		0	121	119	0	40	40	1.60	1.83
Total for Perennial Grasses		403	283	211	157	118	94	6.49	3.44
Total for Grasses		403	404	330	157	158	134	8.09	5.27
F	Alyssum alyssoides (a)	-	<sub>a</sub> 25	<sub>b</sub> 138	-	12	43	.06	1.58
F	Aster spp.	-	-	1	-	-	1	-	.00
F	Balsamorhiza sagittata	2	3	4	1	2	2	.24	.60
F	Camelina microcarpa (a)	-	6	4	-	3	2	.04	.01
F	Calochortus nuttallii	-	6	-	-	3	-	.01	-
F	Chaenactis douglasii	-	3	-	-	1	-	.00	-
F	Cirsium spp.	<sub>b</sub> 12	<sub>b</sub> 13	<sub>a</sub> -	6	7	-	.18	-
F	Cryptantha spp.	<sub>ab</sub> 6	<sub>b</sub> 17	<sub>a</sub> -	3	10	-	.10	-
F	Cymopterus longipes	-	-	-	-	-	-	.00	-
F	Descurainia pinnata (a)	-	13	7	-	6	3	.03	.01
F	Draba spp. (a)	-	<sub>b</sub> 42	<sub>a</sub> -	-	16	-	.08	-
F	Epilobium brachycarpum (a)	-	1	-	-	1	-	.00	-
F	Erodium cicutarium (a)	-	2	1	-	1	1	.00	.00
F	Eriogonum umbellatum	1	-	5	1	-	3	-	.01
F	Gayophytum ramosissimum (a)	-	<sub>b</sub> 15	<sub>a</sub> -	-	6	-	.03	-
F	Holosteum umbellatum (a)	-	2	-	-	1	-	.00	-
F	Lappula occidentalis (a)	-	<sub>b</sub> 9	<sub>a</sub> -	-	5	-	.02	-
F	Lactuca serriola	3	-	2	1	-	1	-	.00
F	Medicago sativa	3	-	1	1	-	1	-	.00
F	Microsteris gracilis (a)	-	5	3	-	2	1	.01	.00
F	Penstemon humilis	7	6	2	3	3	1	.18	.03
F	Petroradia pumila	43	55	46	17	22	20	2.95	1.92
F	Phlox longifolia	5	16	8	2	6	3	.22	.01

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Polygonum douglasii</i> (a)	-	3	1	-	1	1	.00	.00
F	<i>Ranunculus testiculatus</i> (a)	-	20	50	-	9	17	.04	.18
F	<i>Streptanthus cordatus</i>	1	-	4	1	-	2	-	.01
F	Unknown forb-annual (a)	-	44	-	-	18	-	.09	-
Total for Annual Forbs		0	187	204	0	81	68	0.42	1.80
Total for Perennial Forbs		83	119	73	36	54	34	3.91	2.61
Total for Forbs		83	306	277	36	135	102	4.34	4.42

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

#### BROWSE TRENDS --

Herd unit 16B, Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Artemisia tridentata vaseyana</i>	1	1	-	.03
B	<i>Cercocarpus montanus</i>	17	16	5.50	4.05
B	<i>Chrysothamnus nauseosus albicaulis</i>	0	2	-	-
B	<i>Gutierrezia sarothrae</i>	32	3	.98	.00
B	<i>Juniperus osteosperma</i>	6	9	3.23	5.64
B	<i>Opuntia</i> spp.	6	12	.18	.30
B	<i>Pinus edulis</i>	3	6	3.64	5.24
B	<i>Purshia tridentata</i>	11	10	1.85	1.67
B	<i>Quercus gambelii</i>	10	13	2.11	2.78
B	<i>Symphoricarpos oreophilus</i>	5	7	.62	1.31
Total for Browse		91	79	18.13	21.03

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 16B, Study no: 4

Species	Percent Cover	
	'97	'02
<i>Artemisia tridentata vaseyana</i>	-	.07
<i>Cercocarpus montanus</i>	-	6.17
<i>Juniperus osteosperma</i>	3.4	12.5
<i>Opuntia</i> spp.	-	.05
<i>Pinus edulis</i>	5.4	6.58
<i>Purshia tridentata</i>	-	1.17
<i>Quercus gambelii</i>	3.4	3.58
<i>Symphoricarpos oreophilus</i>	-	2.75

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 4

Species	Average leader growth (in) '02
Cercocarpus montanus	1.8
Purshia tridentata	1.7

Point-Quarter Tree Data  
Herd unit 16B , Study no: 4

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	96	99	3.7	4.7
Pinus edulis	65	120	6.5	3.2

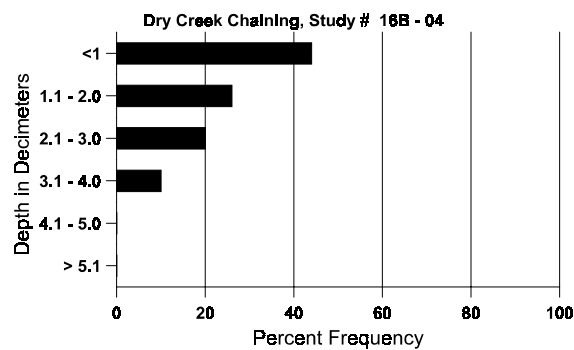
BASIC COVER --  
Herd unit 16B, Study no: 4

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	283	281	6.75	28.67	28.29
Rock	245	228	12.50	14.30	14.53
Pavement	244	256	10.25	7.50	7.72
Litter	385	370	57.50	41.10	45.35
Cryptogams	117	122	2.25	4.38	3.63
Bare Ground	244	284	10.75	14.62	25.72

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 04, Dry Creek Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.1	53.0 (15.6)	7.3	34.7	30.7	34.6	3.2	9.2	80.0	.6

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 4

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	20	21	-	-
Elk	13	13	444	34 (84)
Deer	9	5	148	11 (28)

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 4

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
M	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33	68	23	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	9	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	12	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	-	-	-	-	-	-	1	20				1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+ 0%							
'02		00%			100%			100%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	20		0%			
												'02	20		100%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<b>Cercocarpus montanus</b>															
Y	89	-	-	-	-	2	-	-	2	-	-	-	66		2
	97	1	-	-	1	-	-	-	2	-	-	-	40		2
	02	1	-	-	-	-	-	-	1	-	-	-	20		1
M	89	4	2	-	1	-	-	2	9	-	-	-	300	54 40	9
	97	7	3	-	6	-	-	-	16	-	-	-	320	47 49	16
	02	-	-	9	-	-	-	-	9	-	-	-	180	51 56	9
D	89	2	2	-	1	1	-	2	6	-	-	2	266		8
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	1	3	2	3	-	-	6	-	-	4	200		10
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		26%		00%		11%		-43%							
'97		17%		00%		00%		+10%							
'02		20%		60%		20%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	632	Dec:	42%		
										'97	360		0%		
										'02	400		50%		
<b>Chrysothamnus nauseosus albicaulis</b>															
Y	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	-	-	-	-	0	13 16	0
	02	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
D	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%									
'97		00%		00%		00%									
'02		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%		
										'97	0		0%		
										'02	40		50%		
<b>Chrysothamnus viscidiflorus viscidiflorus</b>															
D	89	1	-	-	-	-	-	-	-	-	-	1	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		100%									
'97		00%		00%		00%									
'02		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	33	Dec:	100%		
										'97	0		0%		
										'02	0		0%		

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180		9	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	92	-	-	-	-	-	-	-	-	92	-	-	-	1840	9	10	92
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60	5	4	3
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
	02	3	-	-	-	-	-	-	-	-	-	-	-	3	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			02%			-94%							
'02		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	2060		2%				
											'02	120		50%				
<i>Juniperus osteosperma</i>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	2	-	-	-	-	-	2	-	-	-	66	96	47	2
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120	72	61	6
	02	8	-	-	2	-	-	-	-	-	9	-	1	-	200	78	47	10
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		00%			00%			00%			+40%							
'02		00%			00%			10%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	-				
											'97	120		-				
											'02	200		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	5	10	
	02	22	-	-	1	-	-	-	-	-	23	-	-	-	460	5	9	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			22%			+64%							
'02		00%			00%			04%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	180		22%				
											'02	500		4%				
Pinus edulis																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
Y	89	-	-	-	1	-	-	1	-	-	2	-	-	-	66		2	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	
	02	3	-	-	2	-	-	-	-	-	5	-	-	-	100	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		00%			00%			00%			+57%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	60		-				
											'02	140		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	19	43	1
	97	3	6	5	-	-	-	-	-	-	14	-	-	-	280	19	39	14
	02	-	4	7	-	-	-	-	-	-	11	-	-	-	220	16	45	11
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+91%							
'97		33%			28%			00%			-33%							
'02		42%			58%			08%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	0%				
											'97	360		0%				
											'02	240		8%				
Quercus gambelii																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	41	-	-	16	-	-	22	-	-	79	-	-	-	2633		79	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	20	-	-	19	-	-	40	-	-	-	1333	73	30	40
	97	25	-	-	3	-	-	-	-	-	27	1	-	-	560	36	29	28
	02	36	-	-	7	-	-	-	-	-	43	-	-	-	860	37	23	43
D	89	4	1	-	2	-	-	3	-	-	9	-	1	-	333		10	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	3	-	-	-	-	-	-	-	-	1	-	-	2	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		.77%			00%			.77%			-86%							
'97		00%			00%			00%			+35%							
'02		00%			00%			04%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	4299	Dec:	8%				
											'97	600		7%				
											'02	920		7%				



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
Y	'89	-	-	-	-	-	-	1	-	-	1	-	-	-	33		1	
	'97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
	'02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	'97	5	-	-	5	-	-	-	-	-	10	-	-	-	200	22	28	
	'02	6	-	-	5	-	-	-	-	-	11	-	-	-	220	13	26	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+85%							
'97		00%			00%			00%			+15%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	220		-			
												'02	260		-			

Trend Study 16B-5-02

Study site name: Jackson Unit.

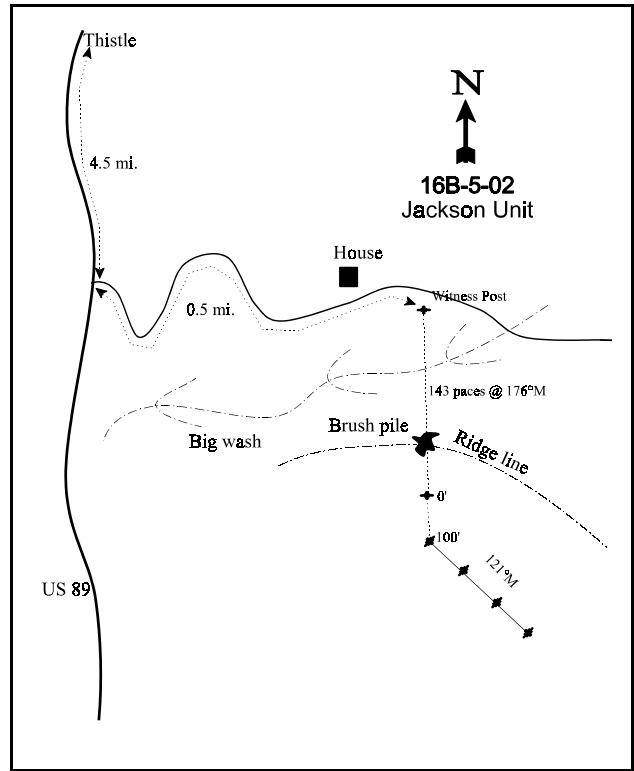
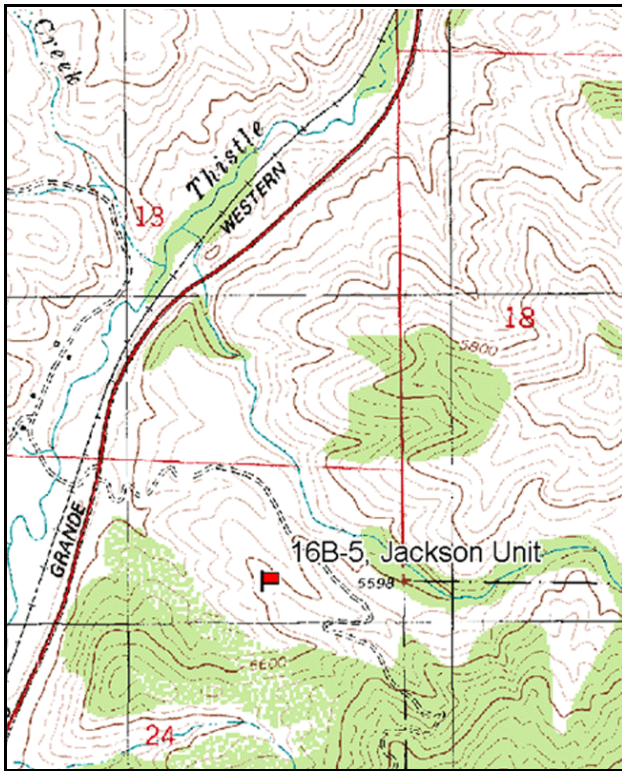
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 181 degrees magnetic (lines 2-4 @ 121°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (79ft), line 4 (34ft). Rebar: belt 3 on 1ft.

LOCATION DESCRIPTION

From Thistle bridge, proceed south on U.S. 89 for 4.5 miles. From here, take a side road east onto a DWR reseeding for 0.5 miles. Stop at a full high witness post. From this post, walk 143 paces at 176 degrees magnetic to the 0-foot baseline stake marked by browse tag #417.



Map Name: Birdseye

Diagrammatic Sketch

Township 10S, Range 3E, Section 24

GPS: NAD 27, UTM 12S 4421090 N 454416 E

## DISCUSSION

### Jackson Unit - Trend Study No. 16B-5

The 1972 Jackson Unit chaining was previously sampled by a permanently marked line-intercept transect. This study, which is on Division property, was established in 1989 to replace the line-intercept study. Aspect of the study is southwest, and slope is moderately steep at 28%. This is the lowest elevation study in the unit at 5,600 feet. Grass is abundant, but juniper release and/or reestablishment is becoming a limiting factor to the browse component. Elk appear to be using the area in moderate numbers in winter and spring. Quadrat frequency of elk pellet groups was moderately high at 36% in 1997, with markedly less sign of deer (quadrat frequency of 14%). Pellet group transect data taken in 2002 estimated 45 elk days use/acre (111 edu/ha) and 10 deer days use/acre (25 ddu/ha). The lack of palatable winter browse makes this site less important to deer.

The soil is fairly deep with an effective rooting depth of almost 15 inches. It is well-drained, has a sandy clay loam texture, and a neutral pH (7.2). Phosphorus is low at only 6.9 ppm and could be limiting to plant development as 10 ppm is thought necessary for normal plant growth and development. Natural vegetation on this soil type consists of juniper, pinyon pine, bitterbrush, big sagebrush, perennial grass, and rabbitbrush. Due to the slope and amount of bare soil on site, erosion hazard is moderate. A high amount of bare soil has been present during all readings, currently ('02) estimated at 25%. However, perennial grasses seem to limit erosion and gullies in the area appear stable with only slight soil movement. An erosion condition class assessment was determined to be stable in 2002. Rock and pavement cover combined are also high at 17% and 22% in 1997 and 2002 respectively.

Utah juniper is the dominant overstory vegetation on this study. Juniper density was estimated at 210 trees/acre using the point quarter method in 1997. Most of the trees were in the 4 to 8 height class. Juniper density increased slightly to 219 trees/acre in 2001 with trees increasing in height. Average diameter was estimated at about 6 inches. This area appears to have the need to be treated again to remove the juniper.

Very little palatable forage for browsing animals exists on the site. There are a few big sagebrush plants and small clumps of young Gambel oak scattered throughout the area. Recruitment of shrub populations will be difficult in the future with intense competition from juniper and seeded perennial grasses. Pricklypear cactus is common throughout the site.

Grasses are the prevalent vegetation both on the site and the surrounding slopes. The understory is composed of a mixture of seeded and native species including crested wheatgrass, intermediate wheatgrass, needle-and-thread grass, Indian ricegrass, and bluebunch wheatgrass. It was noted in past reports that grasses had increased and the prevalence of cheatgrass had decreased since 1978. This is one of the few reports that makes mention of the presence/abundance of cheatgrass in the line-intercept studies, especially since annuals were not included in the range trend studies until 1992. Sum of nested frequency of perennial grasses increased slightly between 1989 and 1997, but decreased by 20% between 1997 and 2002. As with the previous study, this is likely the result of drought coupled with competition from an increasing juniper component. The grasses receive some light grazing pressure from livestock and elk, as do the few palatable forbs which include seeded species such as Lewis flax and alfalfa. Vigor was good in 2002 despite drought conditions. Perennial forbs have been sparse and insignificant on this site in all years, but further declined in abundance in 2002 due to drought. Pale alyssum, an annual, was the most abundant species in 2002.

### 1989 APPARENT TREND ASSESSMENT

Soils appear to be stable at the present time. Soil condition has undoubtedly improved since treatment as ground cover characteristics (protective cover from herbaceous vegetation, litter, and cryptogams) have increased. Erosion is slight. The vegetative trend appears to be moving towards increasing juniper and oak, which is beneficial up to a point. Grasses remain in very good condition and vegetative trend appears to be improving.

### 1997 TREND ASSESSMENT

Soil trend is up slightly due to a decline in percent bare ground from 24% to 16%. Also, almost three-fourths of the vegetative cover is contributed by the herbaceous understory. Browse is limited on the site and provides little forage. Trend is considered slightly down due to a decline in sagebrush and a gradual increase in the dominance of junipers. Trend for the herbaceous understory is stable with similar nested frequency values for perennial grasses and forbs between years.

#### TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - stable (3)

### 2002 TREND ASSESSMENT

Soil trend is stable. Bare soil increased, but perennial grasses remain the dominant vegetation class and they are keeping soils stabilized at the present time. The increase in bare soil is a direct result of the drought the last few years. It should decline with increased vegetative growth from grasses and forbs in association with better precipitation in the future. Browse remains limited and virtually insignificant on this sight. The lack of palatable, abundant browse really limits the usefulness of this site as a critical big game wintering area, especially deer. Browse trend is stable but poor. The herbaceous understory is slightly down with a 20% decline in sum of nested frequency for perennial grasses. A return to normal precipitation patterns will likely reverse this trends as well as increase the abundance of forbs. Retreatment of the juniper component and seeding of preferred browse for big game should be considered in the future.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 5

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron cristatum</i>	136	133	126	53	54	52	3.98	4.24
G	<i>Agropyron intermedium</i>	<sub>b</sub> 91	<sub>b</sub> 97	<sub>a</sub> 65	37	33	25	1.54	.90
G	<i>Agropyron spicatum</i>	41	57	67	17	21	26	2.84	2.57
G	<i>Bromus inermis</i>	4	-	-	1	-	-	-	-
G	<i>Bromus tectorum</i> (a)	-	103	113	-	40	42	.76	.38
G	<i>Elymus junceus</i>	1	1	-	1	1	-	.00	-
G	<i>Festuca ovina</i>	<sub>a</sub> -	<sub>c</sub> 36	<sub>b</sub> 17	-	16	7	1.37	.89
G	<i>Oryzopsis hymenoides</i>	48	44	30	27	21	15	.95	1.43
G	<i>Poa secunda</i>	2	11	6	1	5	3	.07	.04
G	<i>Sitanion hystrix</i>	3	2	-	1	2	-	.06	-
G	<i>Stipa comata</i>	<sub>b</sub> 123	<sub>ab</sub> 94	<sub>a</sub> 70	51	40	28	3.73	4.02
Total for Annual Grasses		0	103	113	0	40	42	0.76	0.38
Total for Perennial Grasses		449	475	381	189	193	156	14.58	14.12
Total for Grasses		449	578	494	189	233	198	15.34	14.51
F	<i>Agoseris glauca</i>	-	2	-	-	1	-	.00	-
F	<i>Alyssum alyssoides</i> (a)	-	<sub>b</sub> 331	<sub>a</sub> 227	-	94	76	4.27	.78
F	<i>Allium</i> spp.	1	3	-	1	1	-	.15	-
F	<i>Astragalus</i> spp.	1	4	-	1	2	-	.06	-
F	<i>Astragalus utahensis</i>	<sub>a</sub> -	<sub>b</sub> 9	<sub>a</sub> 4	-	7	2	.55	.03
F	<i>Camelina microcarpa</i> (a)	-	2	-	-	1	-	.00	-
F	<i>Cirsium</i> spp.	1	1	1	1	1	1	.15	.00
F	<i>Descurainia pinnata</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Eriogonum</i> spp.	<sub>b</sub> 14	<sub>a</sub> -	<sub>a</sub> -	7	-	-	-	-
F	<i>Linum lewisii</i>	<sub>b</sub> 11	<sub>b</sub> 10	<sub>a</sub> -	7	5	-	.62	-
F	<i>Medicago sativa</i>	3	-	-	2	-	-	-	-
F	<i>Oxytropis</i> spp.	3	-	-	1	-	-	-	-
F	<i>Phlox longifolia</i>	-	5	-	-	3	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	5	-	-	3	-	.01
F	<i>Streptanthus cordatus</i>	10	4	4	5	2	2	.03	.01
F	<i>Tragopogon dubius</i>	3	8	-	2	4	-	.07	-
F	Unknown forb-perennial	-	3	-	-	1	-	.00	-
F	<i>Verbascum thapsus</i>	-	1	-	-	1	-	.00	-
Total for Annual Forbs		0	334	232	0	96	79	4.28	0.79
Total for Perennial Forbs		47	50	9	27	28	5	1.67	0.05
Total for Forbs		47	384	241	27	124	84	5.95	0.84

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	0	0	.15	-
B	Chrysothamnus nauseosus albicaulis	1	3	-	.18
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	-	.15
B	Gutierrezia sarothrae	7	1	.03	-
B	Juniperus osteosperma	8	15	6.07	8.62
B	Opuntia spp.	41	29	1.19	.61
B	Quercus gambelii	1	0	-	-
Total for Browse		59	49	7.45	9.56

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16B, Study no: 5

Species	Percent Cover	
	'97	'02
Chrysothamnus nauseosus hololeucus	-	.17
Chrysothamnus viscidiflorus viscidiflorus	-	.25
Juniperus osteosperma	5.8	10.67
Opuntia spp.	-	.17

Point-Quarter Tree Data  
Herd unit 16B, Study no: 5

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	210	219	5.6	5.3

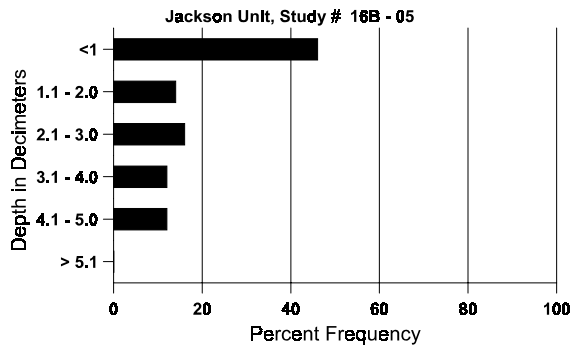
BASIC COVER --  
Herd unit 16B, Study no: 5

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	364	329	7.0	31.12	27.02
Rock	259	254	12.5	8.57	12.51
Pavement	308	305	12.8	8.26	9.68
Litter	385	382	43.5	29.96	37.19
Cryptogams	182	180	0	4.13	9.30
Bare Ground	269	288	24.3	16.14	24.74

SOIL ANALYSIS DATA --  
 Herd Unit 16B, Study no: 05, Jackson Unit

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.6	52.6 (21.7)	7.2	56.7	19.7	23.6	2.5	6.9	128.0	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 16B, Study no: 5

Type	Quadrat Frequency	
	'97	'02
Sheep	-	1
Rabbit	20	3
Horse	-	1
Elk	36	7
Deer	14	10
Cattle	-	1

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
-	-
-	-
61	N/A
583	45 (111)
131	10 (25)
17	1 (4)

BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 5

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata tridentata</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	29	21	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	62	65	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	61	26	0
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		33%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	67%				
											'97	0		0%				
											'02	0		0%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	31	37	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	44	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	3	-	-	-	-	-	-	-	-	2	-	-	1	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%						+67%				
'02		00%			00%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	20		0%				
											'02	60		100%				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	15	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	16	19	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%						+ 0%				
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
											'02	20		-				



A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	9	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	11	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-91%							
'02		00%			00%			100%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	220		0%				
											'02	20		100%				
<i>Juniperus osteosperma</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	102	55	
	97	5	-	-	-	-	3	-	-	-	8	-	-	-	160	-	-	
	02	14	-	-	-	-	-	2	-	-	15	-	-	1	320	-	-	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+63%							
'97		00%			00%			00%			+47%							
'02		00%			00%			06%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	180		-				
											'02	340		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
M	89	21	-	-	-	-	-	-	-	-	21	-	-	-	700	5	5	21
	97	84	-	-	-	-	-	-	-	-	84	-	-	-	1680	6	11	84
	02	63	-	-	-	-	-	-	-	-	63	-	-	-	1260	5	10	63
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	8	-	-	-	-	-	-	-	-	-	-	-	8	160		8	
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+53%							
'97		00%			00%			09%			-12%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	866	Dec:	4%				
											'97	1860		9%				
											'02	1640		7%				
Quercus gambelii																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	5	6	1	-	-	-	-	-	-	12	-	-	-	400		12	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	19	24	2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	8	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			08%			00%			-90%							
'97		100%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	400	Dec:	-				
											'97	40		-				
											'02	0		-				

Trend Study 16B-6-02

Study site name: Mill Fork.

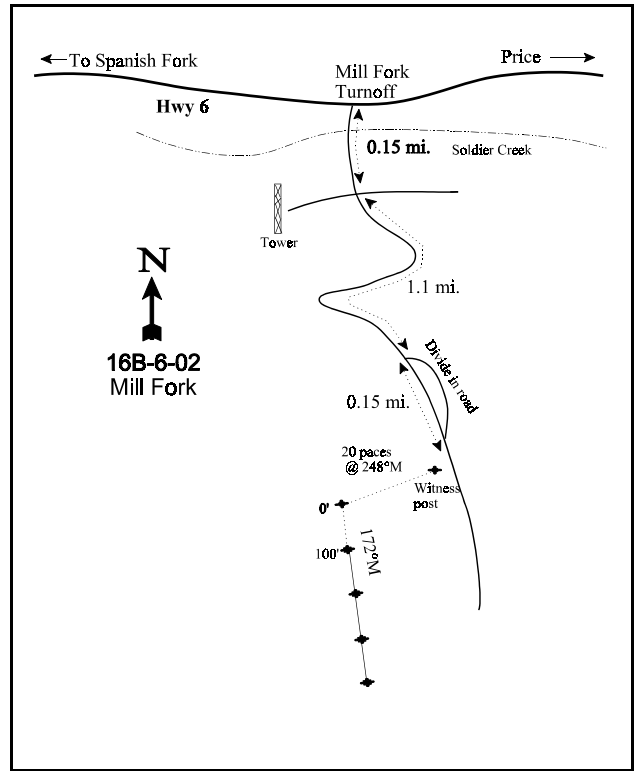
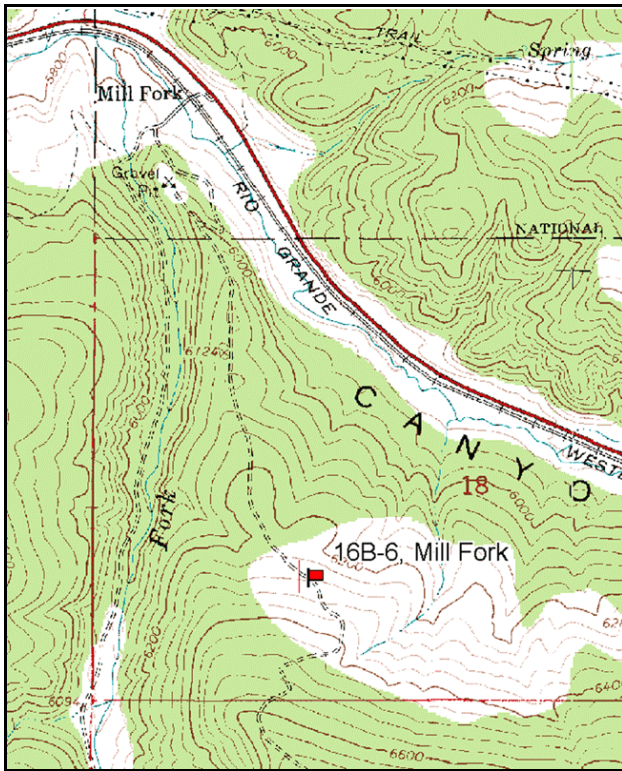
Vegetation type: Big Sagebrush.

Compass bearing: frequency baseline 172 degrees magnetic.

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

LOCATION DESCRIPTION

From the Sheep Creek Cafe and Sheep Creek Turnoff on Highway 6, travel east on Highway 6 (toward Price) for 1.9 miles to the Mill Fork turnoff on the south side of the highway. Take this road 0.15 miles through a gate and crossing the river to a fork. Stay left (east) and go up the hill 1.1 miles to a division in the road. Here the dense pinyon/juniper forest opens up into a sagebrush stand. Proceed another 0.15 miles to a witness post on the west side of the road. From the witness post the 0-foot baseline stake is 20 paces away at 248 degrees magnetic. It is marked by browse tag #9091.



Map Name: Mill Fork

Diagrammatic Sketch

Township 10S, Range 6E, Section 18

GPS: NAD 27, UTM 12S 4421861 N 474171 E

## DISCUSSION

### Mill Fork - Trend Study No. 16B-6

The Division's Mill Fork property is considered important winter range for deer and elk, although the area supports a depleted sagebrush range. Elevation at the site is 6,300 feet with a 10-15% slope on a north by northwest aspect. This same sagebrush community was originally sampled by a line-intercept transect in 1978. The 1978 report identified the sagebrush as basin big sagebrush (*Artemisia tridentata tridentata*), but in 1989 it was classified as mountain big sagebrush (*Artemisia tridentata vaseyana*). It is likely a hybrid between the 2 subspecies. The sagebrush population on the site is a relatively dense, old stand with low production. Wildlife use of the site has been light for elk and moderate for deer. Pellet group transect data collected in 2002 estimated 18 elk days use/acre (45 edu/ha) and 58 deer days use/acre (144 ddu/ha). Domestic sheep are trailed through the general area during spring and summer, but use by sheep on the site itself is minimal.

Soils have an effective rooting depth estimated at just under 14 inches. Soil texture is a clay and reactivity is neutral (pH of 7.3). Due to minimal understory vegetation and a high proportion of bare soil, erosion tends to be an increasingly negative factor on the site. Soils have little protection, especially in the barren shrub interspaces. An erosion condition class assessment was determined as slight in 2002. Pedestalling and active gullies throughout the site provide evidence that erosion is occurring. Bare soil is high accounting for about 27% of the ground surface during all sampling periods.

Mountain big sagebrush dominates the site, providing at least three-fourths of the total vegetative cover in 1997 and 2002. Sagebrush cover was estimated at 29% in 1997, increasing to 33% in 2002. Sagebrush density is high at about 5,100 plants/acre. Reproduction has steadily declined since the initial reading in 1989. No young plants were sampled in 2002. Decadence has varied between sampling periods. Decadence was high in both 1989 (78%) and 2002 (43%). Both of these readings occurred during periods of drought so these decadence levels are expected as sagebrush plants experience leaf drop and increased crown death during long periods of drought. In 1997, percent decadence was low at only 15%, which incidentally was a year of above normal precipitation throughout the region. Sagebrush vigor has steadily improved with each reading, and hedging has been generally moderate. Annual growth was low in 2002 averaging 1.4 inches. This site would be a good candidate for some type of treatment to reduce the density and canopy cover of sagebrush. This could help stimulate the reproduction of sagebrush and establishment of perennial herbaceous species.

The site supports a variety of other browse, although these species are in limited abundance. Stickyleaf low rabbitbrush had an estimated density of 1,660 plants/acre in 2002, a 23% decrease from 1997 (2,160 plants/acre). Serviceberry and snowberry are also present, providing some additional forage. Juniper has an estimated density of 140 trees/acre using the point-centered quarter method in 2002. This density estimate is somewhat higher than the 1997 estimate of 64 juniper trees/acre. Several young plants were sampled in 2002 increasing the density estimate.

The herbaceous component has become insignificant on the site. Grasses and forbs combine to provided less than 5% total cover in 1997 and 2002. Diversity has been fair in the past, suggesting a higher site potential. Five perennial grass species were encountered producing less than 1% cover in both 1997 and 2002. There is a moderate density of forbs, with none considered as being important. The most common species are longleaf phlox and low penstemon. The understory is being suppressed by an overabundant population of big sagebrush. This community would greatly benefit from some type of treatment to reduce sagebrush density and cover, and add variability to the sagebrush age structure which is represented by only mature and decadent individuals.

1989 APPARENT TREND ASSESSMENT

The vegetation component is best characterized as having a depleted understory, and an overly decadent and unproductive sagebrush population. Conditions are further impacted by poor soil conditions that have substantial erosion.

1997 TREND ASSESSMENT

The soil trend for this site is stable with similar ground cover characteristics compared to 1989. However, conditions are poor with little herbaceous ground cover and gradual erosion. The browse trend is up for the key species, mountain big sagebrush. This is due to a decline in percent decadency from 78% to 15% between 1989 and 1997. Vigor has improved but recruitment is still poor. Density of broom snakeweed declined by 89% since 1989, but stickyleaf low rabbitbrush density increased by 23%. Trend for the herbaceous understory is stable but depleted. Perennial grasses are nearly nonexistent.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Soil trend is stable, but soils remain in poor condition with a high proportion of bare soil (27%) and very low protective cover from herbaceous species. Erosion is slight. Browse trend is stable. Mountain big sagebrush has increased decadence and low reproduction, but vigor improved and use remains mostly moderate. The vegetation component would greatly benefit from a sagebrush thinning treatment. The herbaceous understory has a slightly downward trend. Grasses are nearly non-existent and sum of nested frequency for perennial forbs declined by nearly half in 2002. Drought coupled with an overly abundant sagebrush stand has severely depressed the understory on this site.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 16B, Study no: 6

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron spicatum	a-	b22	b29	-	10	12	.91	.85
G	Oryzopsis hymenoides	2	1	-	1	1	-	.00	-
G	Poa fendleriana	4	-	-	4	-	-	-	-
G	Sitanion hystrix	2	4	-	1	2	-	.03	-
G	Stipa lettermani	-	3	3	-	1	1	.03	.03
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		8	30	32	6	14	13	0.99	0.88
Total for Grasses		8	30	32	6	14	13	0.99	0.88

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Achillea millefolium</i>	-	4	4	-	1	1	.03	.03
F	<i>Astragalus beckwithii</i>	-	7	1	-	5	1	.10	.00
F	<i>Aster chilensis</i>	34	28	17	14	10	9	.51	.22
F	<i>Astragalus convallarius</i>	<sub>b</sub> 43	<sub>a</sub> 21	<sub>a</sub> 11	23	11	5	.18	.05
F	<i>Astragalus utahensis</i>	2	4	-	1	4	-	.10	-
F	<i>Calochortus nuttallii</i>	<sub>a</sub> 1	<sub>b</sub> 35	<sub>a</sub> -	1	21	-	.10	-
F	<i>Castilleja</i> spp.	-	2	-	-	2	-	.03	-
F	<i>Chaenactis douglasii</i>	<sub>b</sub> 17	<sub>b</sub> 28	<sub>a</sub> 2	10	12	1	.26	.01
F	<i>Cirsium</i> spp.	2	5	-	1	2	-	.01	-
F	<i>Collinsia parviflora</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Cymopterus</i> spp.	-	7	5	-	4	2	.02	.01
F	<i>Eriogonum brevicaulis</i>	1	1	3	1	1	1	.03	.15
F	<i>Erigeron eatonii</i>	-	-	3	-	-	1	-	.00
F	<i>Lomatium</i> spp.	-	7	-	-	4	-	.02	-
F	<i>Machaeranthera canescens</i>	<sub>b</sub> 24	<sub>ab</sub> 13	<sub>a</sub> 6	12	7	3	.03	.04
F	<i>Penstemon caespitosus</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 27	-	-	13	-	.80
F	<i>Penstemon humilis</i>	41	40	29	17	19	11	1.59	.85
F	<i>Phlox longifolia</i>	<sub>c</sub> 159	<sub>b</sub> 106	<sub>a</sub> 60	60	41	26	.57	.26
F	<i>Polygonum douglasii</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Taraxacum officinale</i>	3	2	-	1	1	-	.00	-
F	<i>Verbascum thapsus</i>	3	7	-	1	3	-	.04	-
F	<i>Vicia americana</i>	4	4	2	3	2	1	.03	.00
F	<i>Viola</i> spp.	-	4	-	-	2	-	.03	-
Total for Annual Forbs		0	4	0	0	2	0	0.00	0
Total for Perennial Forbs		334	325	170	145	152	75	3.73	2.44
Total for Forbs		334	329	170	145	154	75	3.74	2.44

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	7	5	.36	.03
B	Artemisia tridentata vaseyana	89	89	29.47	33.22
B	Chrysothamnus depressus	3	6	.18	.03
B	Chrysothamnus nauseosus hololeucus	2	5	.00	.09
B	Chrysothamnus viscidiflorus viscidiflorus	44	37	1.15	.49
B	Gutierrezia sarothrae	6	5	.15	.03
B	Juniperus osteosperma	6	4	2.67	3.29
B	Opuntia spp.	1	0	.00	-
B	Symphoricarpos oreophilus	13	17	.68	.21
B	Tetradymia canescens	7	6	.06	.15
Total for Browse		178	174	34.75	37.57

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16B, Study no: 6

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.17
Artemisia tridentata vaseyana	-	26.92
Chrysothamnus depressus	-	.07
Chrysothamnus nauseosus hololeucus	-	.33
Chrysothamnus viscidiflorus viscidiflorus	-	.33
Juniperus osteosperma	2.2	4.33
Symphoricarpos oreophilus	-	.50
Tetradymia canescens	-	.42

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 6

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	3.5

Point-Quarter Tree Data  
Herd unit 16B, Study no: 6

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	64	140	2.8	4.0

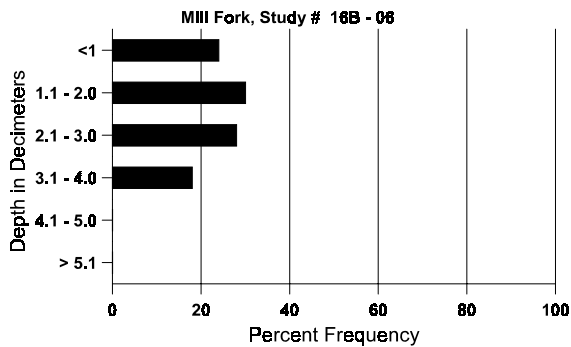
BASIC COVER --  
Herd unit 16B, Study no: 6

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	253	205	6.50	35.90	40.29
Rock	130	136	2.50	4.87	4.59
Pavement	243	244	15.25	6.28	5.86
Litter	390	379	47.25	42.78	38.99
Cryptogams	82	73	2.00	2.34	3.95
Bare Ground	272	268	26.50	27.07	27.53

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 06, Mill Fork

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.9	42.8 (15.0)	7.3	20.7	22.7	56.6	2.8	12.3	83.2	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 6

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	2	5	-	-
Elk	11	3	235	18 (45)
Deer	26	30	757	58 (144)



BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 6

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	89	-	-	2	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	4	2	-	1	-	-	-	-	-	7	-	-	-	140	23	25	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	17	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	3	1	-	-	-	-	1	-	1	-	-	4	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+ 5%							
'97		29%			00%			00%			-14%							
'02		50%			17%			67%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	133	Dec:	0%				
											'97	140		0%				
											'02	120		83%				
<i>Artemisia tridentata vaseyana</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	7	1	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	8	1	-	-	-	-	-	-	-	9	-	-	-	600	32	36	
	97	29	120	5	3	-	-	-	-	-	157	-	-	-	3140	34	56	
	02	77	46	23	-	-	-	-	-	-	146	-	-	-	2920	31	40	
D	89	11	45	4	-	-	-	-	-	-	39	-	-	21	4000		60	
	97	8	19	-	-	-	-	-	-	-	5	-	-	22	540		27	
	02	71	29	7	1	-	-	-	-	-	88	-	-	20	2160		108	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	580		29	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	1100		55	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		61%			05%			27%			-28%							
'97		75%			03%			12%			+27%							
'02		30%			12%			08%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	5133	Dec:	78%				
											'97	3700		15%				
											'02	5080		43%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus depressus																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80	11	11	4
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	3	9	5
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	4	-	-	-	-	-	1	-	-	1	-	-	4	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+60%							
'02		00%			00%			40%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	80		0%				
											'02	200		50%				
Chrysothamnus nauseosus hololeucus																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
	02	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	34	35	0
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80	10	12	4
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			50%			+75%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	40		50%				
											'02	160		13%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	14	-	-	2	-	-	1	-	-	17	-	-	-	1133		17	
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28	
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
M	89	6	-	-	3	-	-	2	-	-	11	-	-	-	733	13	14	11
	97	67	-	-	13	-	-	-	-	-	80	-	-	-	1600	22	13	80
	02	70	-	-	4	-	-	-	-	-	74	-	-	-	1480	8	10	74
D	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	7	-	-	-	-	-	-	-	-	6	-	-	1	140		7	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 5%							
'97		00%			00%			00%			-23%							
'02		00%			00%			01%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2266	Dec:	18%			
												'97	2160		0%			
												'02	1660		8%			
<i>Gutierrezia sarothrae</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	21	-	-	-	-	-	-	-	-	21	-	-	-	1400	10	13	21
	97	6	-	-	1	-	-	-	-	-	7	-	-	-	140	9	9	7
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	9	10	5
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-89%							
'97		00%			00%			00%			-13%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1466	Dec:	0%			
												'97	160		0%			
												'02	140		14%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Juniperus osteosperma</b>																		
S	89	1	-	-	-	-	-	1	-	-	2	-	-	-	133			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80	161	115	4
	02	2	-	-	-	-	-	1	-	-	3	-	-	-	60	-	-	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			14%			-43%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	140		-			
												'02	80		-			
<b>Mahonia repens</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	5	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<b>Opuntia spp.</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	1	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-85%							
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	50%			
												'97	20		0%			
												'02	0		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
Symphoricarpos oreophilus																		
Y	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	2	-	-	-	-	2	-	-	-	133	13	19	2
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320	16	26	16
	02	19	-	-	-	-	-	-	-	-	19	-	-	-	380	13	24	19
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		67%			00%			00%			+50%							
'97		00%			00%			00%			+13%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	0%			
												'97	400		0%			
												'02	460		17%			
Tetradymia canescens																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	4	1
	97	13	-	-	-	-	-	-	-	-	12	1	-	-	260	8	6	13
	02	9	-	-	-	-	-	-	-	-	9	-	-	-	180	8	8	9
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+79%							
'97		00%			00%			00%			-31%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	0%			
												'97	320		0%			
												'02	220		18%			

Trend Study 16B-8-02

Study site name: Starvation Mahogany.

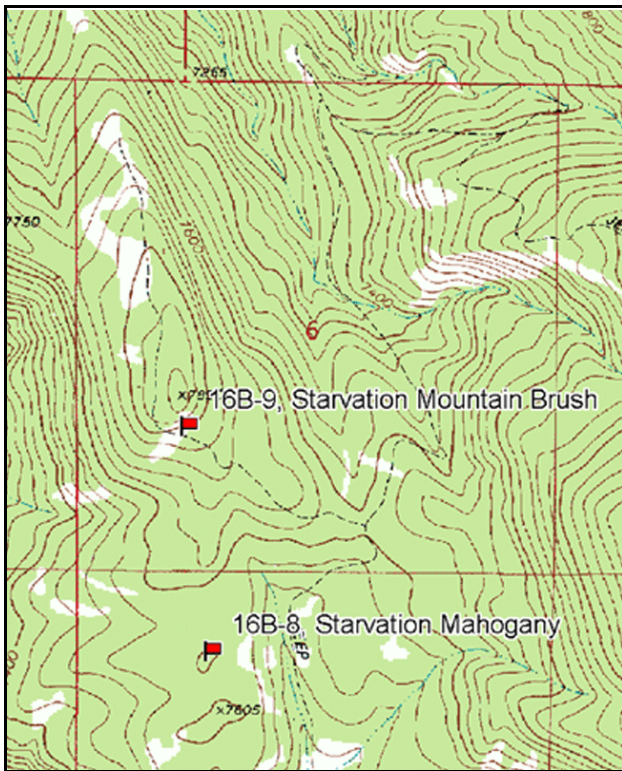
Vegetation type: Curleaf Mahogany.

Compass bearing: frequency baseline 160 degrees magnetic (line 2-4 @ 151°M).

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

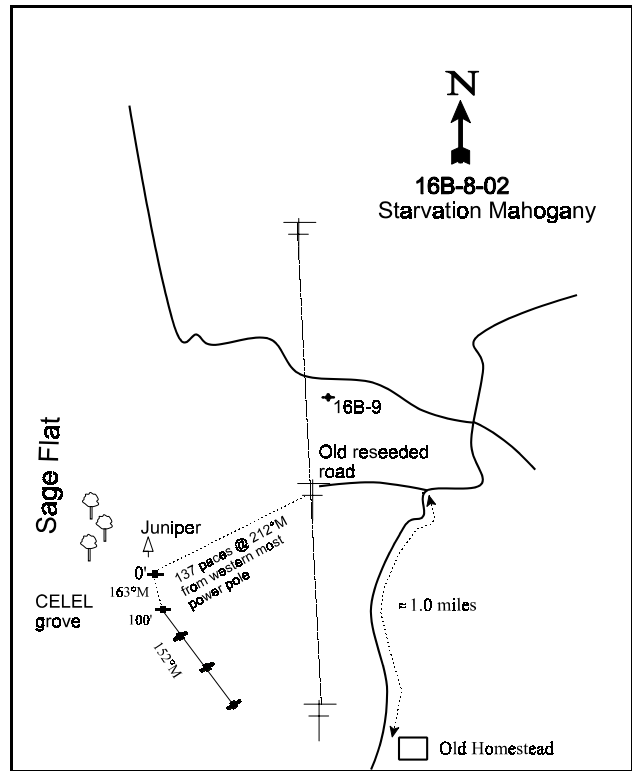
LOCATION DESCRIPTION

From Tucker rest area on Highway 6 in Spanish Fork Canyon, take the Starvation Canyon road 4.6 miles. Turn left and go 0.5 miles to another fork. Turn left and go up a small canyon on a rough road for 1.15 miles to a fork. Turn left, cross the creek, and go 0.3 miles to an old homestead site. Continue up the road about 1.0 miles to an old road on the left that has been seeded over. From here, walk east to the double powerlines on the hill. From the westernmost pole, walk 137 paces at 212 degrees magnetic to the 0-foot stake of the baseline. It is marked by browse tag #9047.



Map Name: Tucker

Township 11S, Range 7E, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4414648 N 484175 E

## DISCUSSION

### Starvation Mahogany - Trend Study No. 16B-8

This trend study is located on a curlleaf mahogany bench in the Starvation Creek drainage on DWR property. The site was established in 1989. It is considered important range for both mule deer and elk, with most use occurring in the winter. The site slopes gently to the southwest at an elevation of 7,600 feet. Pellet group transect data from 1999 estimated light to moderate wildlife use with 34 deer days use/acre (84 ddu/ha) and 34 elk days use/acre (84 edu/ha). Livestock use was very light with an estimated 4 cow days use/acre (9 cdu/ha). Pellet group transect data taken in 2002 estimated 58 deer days use/acre (144 ddu/ha) and 18 elk days use/acre (45 edu/ha). Livestock use remained light in 2002 at 7 cow days use/acre (16 cdu/ha). A large 4-point buck antler shed was found while hiking to the site in 1999.

The soil is a dark brown clay loam with a slightly alkaline pH (7.4). The soil has moderate depth with an estimated effective rooting depth of nearly 14 inches. There is very little rock or pavement on the surface. There is a clay layer at 10-12 inches below the surface that is about 6 inches in thickness. The stoniness index estimated by penetrometer readings is more a reflection of this clay horizon than from actual rock within the profile. Erosion is minimal with high vegetation and litter cover. Also, the majority of the roots from vegetation lie in the upper 12 inches of the profile helping to hold the soils in place. Organic matter is moderately high at 3.2%, while phosphorus levels are quite low (2.7 ppm). Phosphorus levels less than 10 ppm can be limiting to normal plant growth and development. An erosion condition class assessment was determined as slight in 2002.

The browse community at the site is diverse with 14 species being sampled. The key species include Utah serviceberry, mountain big sagebrush, true mountain mahogany, curlleaf mahogany, and bitterbrush. These key species accounted for only 27% of the total browse cover in 1997, increasing to 36% in 2002. Less preferred species such as snowberry, Gambel oak, and stickyleaf low rabbitbrush provide the majority of the browse cover. The baseline was extended in 1999 to better sample browse populations that have clumped and/or discontinuous distributions. The extension of the baseline and discontinuation of the relatively small density plots accounts for some of the big changes in population densities between sampling years for many of the shrub species. The population of serviceberry had an estimated density between 500 and 600 plants/acre in 1999 and 2002. Recruitment from young plants was high in 1999 at 52%, resulting in a slight increase in density in 2002. Reproduction remained good at 17% in 2002. Percent decadence has been low during all sampling periods, currently ('02) at 14%. Vigor improved in 2002 with only 7% of the population displaying poor vigor. Use was moderate in 1989 and 1999, increasing in 2002 to 55% heavy use.

Mountain big sagebrush numbered about 900 plants/acre in 1999 and 2002, with most individuals occurring in more open areas. Decadency has been high in all samples, but did decline in 2002 to 33%. Young recruitment is low at 2% in 1999 and 2002. Annual growth was minimal on sagebrush in 2002 averaging less than 2 inches.

True mountain mahogany and curlleaf mahogany are currently ('02) estimated at 740 and 300 plants/acre respectively. Curlleaf mahogany increased in density between 1999 and 2002, while true mountain mahogany remained stable. The curlleaf population consists of both tall, tree-like plants that are mostly unavailable to browsing ungulates, and smaller plants accessible to wildlife. Mature curlleaf trees are about 7 feet tall, with many being highlined. In 1999, both species had a high proportion of seedling and young plants in their populations. In 2002, no seedlings were sampled for either species, but young plants remain high for curlleaf (60%) and moderate for mountain mahogany (16%). The lack of mahogany seedlings is not surprising with the drought conditions experienced in 2002. Both species of mahogany showed heavy use in 2002, with use being more moderate in previous readings. Vigor was normal on most plants, and percent decadency low for both species in 2002.

The bitterbrush population is composed of mature, heavily utilized individuals. Density was estimated at 120 plants/acre in 1999 and 2002. Vigor was normal and decadence low. Annual growth averaged just over 1 inch for both bitterbrush and true mountain mahogany in 2002. The moderate to heavy use on mahogany and bitterbrush is expected as both have relatively low densities on this site.

The most numerous browse at the site are the less preferred species. Snowberry and Gambel oak both had densities of 2,420 plants/acre in 2002. Use has been light and vigor good for these species in the past, although Gambel oak had reduced vigor and increased decadence in 2002. A late spring frost in 2002 is the cause for these changes. Stickyleaf low rabbitbrush has the highest density with an estimated 6,300 plants/acre in 2002.

The herbaceous understory is diverse in both grasses and forbs. Fourteen species of grasses and 35 species of forbs have been sampled during the three readings. Annual species are present but occur in low frequencies. Three native species, bluebunch wheatgrass, western wheatgrass, and mutton bluegrass, are the most abundant grasses providing 70% of the grass cover in 2002. As a group, sum of nested frequency for perennial grasses remained stable between 1999 and 2002. The grasses had good size even with drought. Perennial grasses, under a light grazing regime, seem to weather drought conditions better than forbs and browse species. Hoods phlox is the most abundant forb. It occurred in over half of the sampling quadrats and provided 60% of the forb cover in 1999 and 2002. Sum of nested frequency for perennial forbs declined slightly in 2002, which is expected with drought. Annual forbs slightly increased in nested frequency in 2002, but remain insignificant.

#### 1989 APPARENT TREND ASSESSMENT

High vegetation diversity would indicate a stable community, and considering the reproduction of desirable species, trend appears to be stable to improving. Much of the curlleaf mountain mahogany is unavailable as forage, but provides good cover. Future overutilization of the browse component could result in higher decadence, unavailability of new production, and lower reproduction. Soils are adequately protected due to high vegetation and litter cover.

#### 1999 TREND ASSESSMENT

Trend for soil is stable. Protective ground cover provided by herbaceous vegetation and litter is high. Erosion is minimal with the gentle slope and the abundance of grasses and forbs. Trend for the key browse is stable overall. Seedling and young recruitment is high for Utah serviceberry, true mountain mahogany, and curlleaf mahogany. Percent decadence is also relatively low. These species all display evidence of moderate to heavy use. However, all these species are tolerant of higher levels of browsing and the current levels are not excessive. The main concern for the key browse on this site is the high decadency rate (43%) of mountain big sagebrush, and the number of dead plants (800 per acre). However, mountain big sagebrush only makes up about 14% of the preferred browse component (Utah serviceberry, true mountain mahogany, curlleaf mahogany, and bitterbrush). Herbaceous understory trend is stable. Sum of nested frequency for perennial grasses nearly doubled in 1999, while perennial forb sum of nested frequency decreased by 25%. Overall, the sum of nested frequency of all herbaceous perennial species remained nearly the same between 1989 and 1999.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)



## 2002 TREND ASSESSMENT

Soil trend is stable. Erosion is minimal, and ground cover characteristics remain similar to 1999 levels. Trend for browse is stable. Even with drought in 2002, the key species show improvements in important parameters compared to 1999. Density increased or remained stable with all of the key species. Reproduction declined for serviceberry and true mountain mahogany, but remained stable for curlleaf mahogany. Mountain big sagebrush and bitterbrush already had very low reproduction prior to 2002. All of the key species have stable or improving decadency rates and vigor, which is a positive sign during periods of drought. Utilization appears to have increased on most of the key browse species. This could be due to two things. First, utilization can be overestimated during years of minimal annual growth which was the case in 2002. Low annual growth results in plants having a heavily hedged appearance making ocular utilization estimates difficult to determine. Second, use may have increased as the key species occur in relatively low densities on this site, and animals may be bunching up on key areas due to drought conditions. Trend for the herbaceous understory is stable. Perennial grasses and forbs remained nearly stable in sum of nested frequency values compared to 1999. The understory remains diverse and nearly free of annual species.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 16B, Study no: 8

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'99	'02	'89	'99	'02	'99	'02
G	Agropyron cristatum	<sub>b</sub> 25	<sub>a</sub> 9	<sub>ab</sub> 13	11	3	5	.18	.39
G	Agropyron smithii	<sub>a</sub> 59	<sub>b</sub> 125	<sub>b</sub> 137	20	44	47	1.98	2.26
G	Agropyron spicatum	80	92	86	35	38	36	2.56	3.23
G	Agropyron trachycaulum	<sub>b</sub> 16	<sub>a</sub> -	<sub>a</sub> -	7	-	-	-	-
G	Bromus inermis	-	2	4	-	1	2	.03	.15
G	Carex spp.	9	6	17	4	3	7	.44	1.00
G	Koeleria cristata	<sub>ab</sub> 4	<sub>b</sub> 12	<sub>a</sub> -	2	6	-	.05	-
G	Oryzopsis hymenoides	11	2	13	7	2	7	.06	.30
G	Poa fendleriana	<sub>a</sub> 22	<sub>a</sub> 52	<sub>b</sub> 83	11	20	30	.69	2.42
G	Poa pratensis	<sub>a</sub> 4	<sub>b</sub> 49	<sub>a</sub> 16	1	16	6	.88	.42
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 11	<sub>c</sub> 25	-	6	12	.05	.16
G	Sitanion hystrix	<sub>ab</sub> 4	<sub>b</sub> 11	<sub>a</sub> -	2	5	-	.10	-
G	Stipa comata	-	2	8	-	1	3	.00	.33
G	Stipa lettermani	37	43	21	18	18	10	.79	.51
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		271	416	423	118	163	165	7.87	11.19
Total for Grasses		271	416	423	118	163	165	7.87	11.19

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'99	'02	'89	'99	'02	'99	'02
F	<i>Achillea millefolium</i>	6	3	-	2	1	-	.15	-
F	<i>Agoseris glauca</i>	-	-	6	-	-	4	-	.04
F	<i>Antennaria rosea</i>	a-	ab4	b14	-	1	6	.15	.39
F	<i>Arabis</i> spp.	1	3	2	1	1	2	.00	.01
F	<i>Aster chilensis</i>	b57	a16	b25	23	5	11	.12	.13
F	<i>Astragalus convallarius</i>	26	23	21	13	12	11	.19	.16
F	<i>Astragalus miser</i>	-	1	2	-	1	1	.03	.15
F	<i>Astragalus</i> spp.	9	9	10	6	3	5	.01	.07
F	<i>Calochortus nuttallii</i>	-	1	3	-	1	1	.00	.00
F	<i>Chaenactis douglasii</i>	9	2	1	6	2	1	.01	.00
F	<i>Cirsium</i> spp.	b30	a13	a12	15	6	6	.05	.07
F	<i>Comandra pallida</i>	b20	b15	a-	7	6	-	.10	-
F	<i>Collinsia parviflora</i> (a)	-	a-	b41	-	-	15	-	.10
F	<i>Draba</i> spp. (a)	-	3	-	-	2	-	.01	-
F	<i>Erigeron</i> spp.	-	-	3	-	-	1	-	.00
F	<i>Eriogonum racemosum</i>	-	-	-	-	-	-	-	.01
F	<i>Eriogonum umbellatum</i>	20	12	15	12	7	7	.08	.11
F	<i>Ipomopsis aggregata</i>	3	-	-	1	-	-	-	-
F	<i>Lomatium</i> spp.	3	5	4	1	2	2	.33	.21
F	<i>Machaeranthera canescens</i>	b95	a42	a27	45	18	13	.16	.19
F	<i>Microsteris gracilis</i> (a)	-	-	7	-	-	3	-	.01
F	<i>Orthocarpus</i> spp. (a)	-	6	2	-	3	2	.04	.01
F	<i>Penstemon caespitosus</i>	a-	c31	b21	-	15	9	.46	.41
F	<i>Penstemon cyananthus</i>	b69	a7	b51	31	3	27	.04	1.15
F	<i>Penstemon humilis</i>	b31	a3	a-	16	1	-	.00	-
F	<i>Penstemon</i> spp.	a-	b58	a-	-	28	-	1.00	-
F	<i>Phlox hoodii</i>	b154	ab129	a125	62	53	56	4.45	5.38
F	<i>Phlox longifolia</i>	4	6	9	2	2	5	.01	.05
F	<i>Polygonum douglasii</i> (a)	-	4	1	-	2	1	.01	.00
F	<i>Senecio multilobatus</i>	b8	a-	b10	5	-	6	-	.05
F	<i>Solidago</i> spp.	-	2	-	-	2	-	.03	-
F	<i>Taraxacum officinale</i>	a-	b17	ab4	-	6	2	.03	.01
F	<i>Tragopogon dubius</i>	-	-	2	-	-	1	-	.00
F	<i>Viguiera multiflora</i>	1	3	3	1	1	1	.00	.03
F	<i>Zigadenus paniculatus</i>	-	-	-	-	-	-	-	.00
Total for Annual Forbs		0	13	51	0	7	21	0.06	0.12
Total for Perennial Forbs		546	405	370	249	177	178	7.47	8.67
Total for Forbs		546	418	421	249	184	199	7.54	8.80

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'99	'02	'99	'02
B	Amelanchier utahensis	21	25	.77	1.20
B	Artemisia tridentata vaseyana	34	34	.98	2.24
B	Cercocarpus ledifolius	8	14	.79	1.70
B	Cercocarpus montanus	24	28	3.63	3.87
B	Chrysothamnus depressus	2	4	.53	.33
B	Chrysothamnus viscidiflorus viscidiflorus	62	74	3.77	5.45
B	Gutierrezia sarothrae	14	16	.45	1.14
B	Juniperus scopulorum	0	0	-	.00
B	Mahonia repens	33	31	2.75	2.49
B	Opuntia fragilis	4	3	-	.00
B	Purshia tridentata	6	6	1.23	1.61
B	Quercus gambelii	14	17	4.83	2.41
B	Symphoricarpos oreophilus	57	54	6.97	6.71
B	Tetradymia canescens	13	16	.33	.33
Total for Browse		292	322	27.06	29.51

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16B, Study no: 8

Species	Percent Cover	
	'99	'02
Amelanchier utahensis	-	1.00
Artemisia tridentata vaseyana	-	1.67
Cercocarpus ledifolius	8	4.83
Cercocarpus montanus	1	6.75
Chrysothamnus depressus	-	.17
Chrysothamnus viscidiflorus viscidiflorus	-	8.00
Gutierrezia sarothrae	-	1.33
Mahonia repens	-	2.00
Purshia tridentata	-	1.33
Quercus gambelii	7	5.58
Symphoricarpos oreophilus	-	14.08
Tetradymia canescens	-	.50

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 8

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.9
Cercocarpus montanus	1.3
Purshia tridentata	1.1

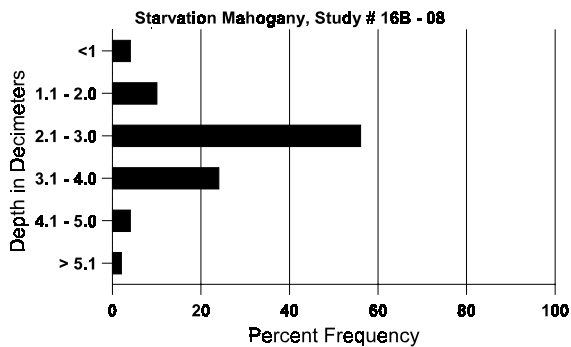
BASIC COVER --  
Herd unit 16B, Study no: 8

Cover Type	Nested Frequency		Average Cover %		
	'99	'02	'89	'99	'02
Vegetation	335	325	16.00	39.83	46.26
Rock	91	80	1.00	5.50	3.86
Pavement	109	109	.50	.72	1.46
Litter	369	371	64.75	50.79	46.75
Cryptogams	80	41	.75	3.12	1.64
Bare Ground	227	238	17.00	17.17	18.37

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study # 08, Starvation Mahogany

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.9	46.2 (15.1)	7.4	36.7	28.7	34.6	3.2	2.7	156.8	0.7

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 8

Type	Quadrat Frequency		Pellet Transect			
			Pellet Groups per Acre		Days Use per Acre (ha)	
	'99	'02	'99	'02	'99	'02
Rabbit	-	6	-	-	-	-
Elk	24	12	444	235	34 (84)	18 (45)
Deer	20	24	444	757	34 (84)	58 (144)
Cattle	2	2	48	78	4 (10)	7 (16)

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 8

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Amelanchier utahensis																		
S	89	2	-	-	1	-	-	-	-	-	3	-	-	-	200			3
	99	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	22	4	-	6	-	-	4	-	-	24	11	1	-	2400			36
	99	11	-	-	2	-	-	-	-	-	12	-	1	-	260			13
	02	2	1	1	-	-	-	1	-	-	5	-	-	-	100			5
M	89	-	-	-	-	-	-	2	-	-	2	-	-	-	133	31	18	2
	99	-	7	-	1	-	1	-	-	-	9	-	-	-	180	42	59	9
	02	-	3	12	5	-	-	-	-	-	20	-	-	-	400	25	29	20
D	89	1	1	-	1	-	-	-	-	-	1	1	1	-	200			3
	99	-	-	2	-	-	-	-	-	1	1	-	-	2	60			3
	02	-	-	3	-	-	-	-	1	-	2	-	1	1	80			4
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		12%			00%			05%			-82%							
'99		28%			16%			12%			+14%							
'02		14%			55%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2733	Dec:	7%			
												'99	500		12%			
												'02	580		14%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	4	2	-	-	-	-	-	-	-	6	-	-	-	400			6
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	18	22	1
	99	20	5	-	1	-	-	-	-	-	26	-	-	-	520	18	24	26
	02	19	7	3	-	-	-	-	-	-	28	1	-	-	580	17	24	29
D	89	1	4	-	-	-	-	-	-	-	5	-	-	-	333			5
	99	10	5	3	2	-	-	-	-	-	15	-	-	5	400			20
	02	14	1	-	-	-	-	-	-	-	10	-	-	5	300			15
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	800			40
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	360			18
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		58%			00%			00%			+15%							
'99		21%			06%			11%			- 4%							
'02		18%			07%			11%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	799	Dec:	42%				
											'99	940		43%				
											'02	900		33%				
<i>Cercocarpus ledifolius</i>																		
S	89	12	2	-	2	-	-	2	-	-	18	-	-	-	1200			18
	99	2	-	-	-	-	-	1	-	-	3	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	9	-	-	-	-	-	1	-	-	10	-	-	-	666			10
	99	4	1	-	-	-	-	1	-	-	6	-	-	-	120			6
	02	1	1	6	-	-	-	1	-	-	9	-	-	-	180			9
M	89	-	-	-	-	-	-	-	6	-	6	-	-	-	400	235	146	6
	99	-	-	1	-	-	-	-	1	-	2	-	-	-	40	140	152	2
	02	-	-	1	-	-	-	1	1	2	4	-	1	-	100	27	27	5
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	1	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	-	-	-	-	-	-	-	1	1	-	-	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-83%							
'99		11%			33%			11%			+40%							
'02		07%			80%			07%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1066	Dec:	0%				
											'99	180		11%				
											'02	300		7%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Ceanothus martinii</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	26	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'99	0		-			
												'02	0		-			
<b>Cercocarpus montanus</b>																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	99	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	14	8	1	5	-	-	4	-	-	24	8	-	-	2133			32
	99	11	4	1	2	3	-	-	-	-	21	-	-	-	420			21
	02	4	-	-	1	-	1	-	-	-	6	-	-	-	120			6
M	89	-	6	-	3	-	-	-	-	-	9	-	-	-	600	30	20	9
	99	2	2	3	1	2	3	3	-	-	16	-	-	-	320	38	40	16
	02	6	-	13	-	4	6	-	-	-	28	-	1	-	580	24	27	29
D	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	1	-	-	-	1	-	-	1	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		36%			02%			00%			-74%							
'99		30%			19%			00%			+ 0%							
'02		11%			59%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2799	Dec:	2%			
												'99	740		0%			
												'02	740		5%			
<b>Chrysothamnus depressus</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	11	-	-	-	-	-	-	-	-	11	-	-	-	220	-	-	11
	02	14	-	-	-	-	-	-	-	-	14	-	-	-	280	3	11	14
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%			+21%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'99	220		-			
												'02	280		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	60	-	-	-	-	-	-	-	-	60	-	-	-	4000		60	
	99	11	-	-	-	-	-	-	-	-	11	-	-	-	220		11	
	02	11	-	-	-	-	-	-	-	-	11	-	-	-	220		11	
M	89	18	-	-	-	-	-	-	-	-	18	-	-	-	1200	11	12	18
	99	220	-	-	2	-	-	-	-	-	222	-	-	-	4440	12	15	222
	02	292	-	-	1	-	-	1	-	-	290	4	-	-	5880	10	15	294
D	89	6	-	-	-	-	-	-	-	-	5	-	-	1	400		6	
	99	6	-	-	-	-	-	-	-	-	4	-	-	2	120		6	
	02	9	1	-	-	-	-	-	-	-	10	-	-	-	200		10	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			01%			-15%							
'99		00%			00%			.83%			+24%							
'02		.31%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	5600	Dec:	7%				
											'99	4780		3%				
											'02	6300		3%				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	99	12	-	-	-	-	-	-	-	-	12	-	-	-	240		12	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266	8	7	4
	99	37	2	-	-	-	-	-	-	-	39	-	-	-	780	6	12	39
	02	71	-	-	-	-	-	-	-	-	71	-	-	-	1420	3	8	71
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+61%							
'99		04%			00%			00%			+29%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	399	Dec:	-				
											'99	1020		-				
											'02	1440		-				
<i>Juniperus scopulorum</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'99	0		-				
											'02	0		-				



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Mahonia repens</b>																		
S	89	10	-	-	-	-	-	-	-	-	10	-	-	-	666		10	
	99	5	-	-	3	-	-	-	-	-	8	-	-	-	160		8	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	143	-	-	27	-	-	13	-	-	183	-	-	-	12200		183	
	99	193	-	-	13	-	-	8	-	-	214	-	-	-	4280		214	
	02	27	-	-	1	-	-	-	-	-	28	-	-	-	560		28	
M	89	27	-	-	-	-	-	-	-	-	27	-	-	-	1800	4	4	27
	99	225	-	-	15	-	-	41	-	-	276	5	-	-	5620	4	4	281
	02	328	-	-	44	-	-	-	-	-	348	24	-	-	7440	3	4	372
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-29%							
'99		00%			00%			00%			-18%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	14000	Dec:	0%				
											'99	9900		0%				
											'02	8100		1%				
<b>Opuntia fragilis</b>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	3	-	-	-	-	-	-	-	-	3	-	-	-	60	4	9	3
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	1	-	-	-	-	-	-	-	-	-	-	1	20		1		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			14%			-43%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'99	140		14%				
											'02	80		0%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Pinus edulis																		
Y	89	1	-	-	-	-	-	-	-	-	-	-	1	-	66		1	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			100%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'99	0		-			
												'02	0		-			
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	1	-	-	-	-	1	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	2	1	-	-	-	-	-	2	-	1	-	200	14 23	3	
	99	1	2	-	-	-	-	-	-	1	4	-	-	-	80	17 44	4	
	02	-	1	5	-	-	-	-	-	-	6	-	-	-	120	13 31	6	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			67%			33%			-40%							
'99		33%			50%			00%			+ 0%							
'02		17%			83%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	200	Dec:	0%			
												'99	120		17%			
												'02	120		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	1	-	-	1	-	-	-	-	-	-	2	-	-	133		2	
	99	7	-	-	9	-	-	9	-	-	25	-	-	-	500		25	
	02	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
Y	89	9	-	-	1	-	-	-	-	-	-	10	-	-	666		10	
	99	29	-	-	17	-	-	7	-	-	53	-	-	-	1060		53	
	02	25	-	-	2	-	-	-	-	-	27	-	-	-	540		27	
M	89	-	-	-	-	-	-	-	1	-	1	-	-	-	66	177	39	1
	99	32	-	-	5	-	-	-	7	-	37	7	-	-	880	86	38	44
	02	50	1	1	7	-	-	-	5	-	63	-	1	-	1280	46	20	64
D	89	6	-	-	-	-	-	-	-	-	-	6	-	-	400		6	
	99	-	-	-	1	1	-	-	-	-	-	2	-	-	40		2	
	02	26	-	-	-	-	-	-	4	-	10	-	-	20	600		30	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	220		11	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	240		12	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+43%							
'99		01%			00%			00%			+18%							
'02		.82%			.82%			17%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1132	Dec:	35%				
											'99	1980		2%				
											'02	2420		25%				
Symphoricarpos oreophilus																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	55	5	-	23	-	-	6	-	-	81	8	-	-	5933		89	
	99	37	-	-	3	-	-	-	-	-	40	-	-	-	800		40	
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	89	35	6	-	4	-	-	1	-	-	45	1	-	-	3066	17	20	46
	99	85	-	-	19	-	-	5	-	-	109	-	-	-	2180	17	38	109
	02	88	-	15	4	-	-	-	-	-	107	-	-	-	2140	13	32	107
D	89	15	5	-	4	-	-	-	-	-	23	-	-	1	1600		24	
	99	7	-	-	-	-	-	-	-	-	5	-	-	2	140		7	
	02	7	-	1	-	-	-	1	-	-	5	-	2	2	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		10%			00%			.62%			-71%							
'99		00%			00%			01%			-22%							
'02		00%			13%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	10599	Dec:	15%				
											'99	3120		4%				
											'02	2420		7%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
Y	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	'99	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133	16	12	2
	'99	10	-	-	-	-	-	-	-	-	10	-	-	-	200	12	15	10
	'02	13	1	-	2	-	-	-	-	-	16	-	-	-	320	10	14	16
D	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	'99	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
	'02	1	-	-	-	-	-	1	-	-	1	-	-	1	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-20%							
'99		00%			00%			00%			+16%							
'02		05%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	399	Dec:	33%				
											'99	320		19%				
											'02	380		11%				

Trend Study 16B-9-02

Study site name: Starvation Mountain Brush.

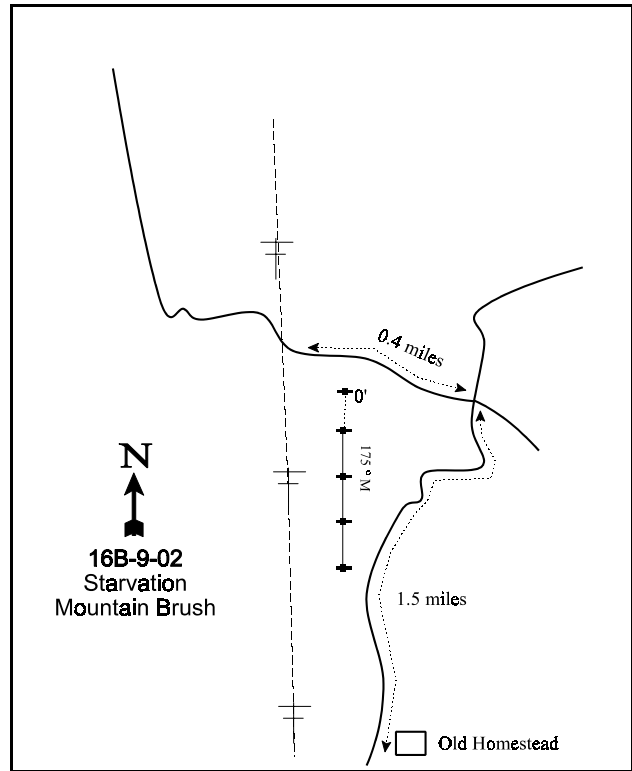
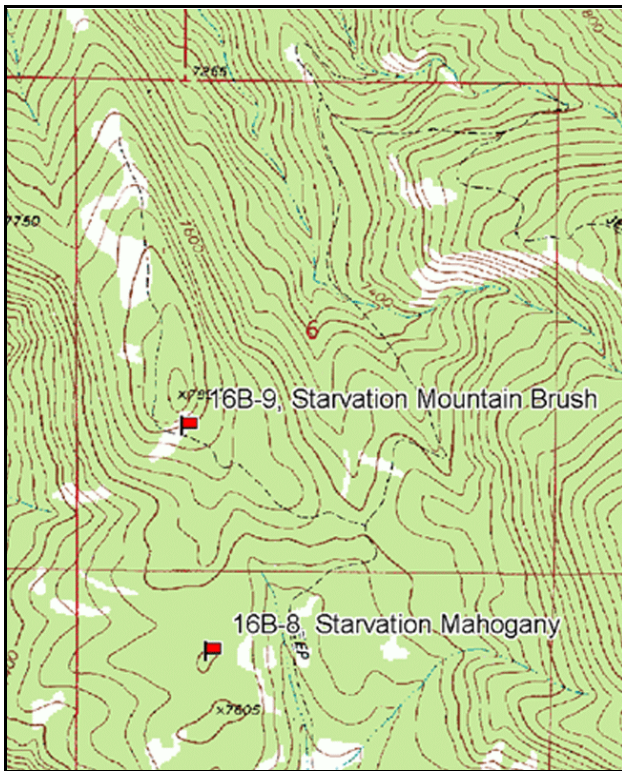
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 175 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 Tucker rest area on Highway 50/6 in Spanish Fork Canyon, take the Starvation Canyon road 4.6 miles. Turn left and go 0.5 miles to another fork. Turn left and go up a small canyon on a rough road for 1.15 miles to a fork. Turn left, cross the creek, and go 0.3 miles to an old homestead site. Continue on this road for 1.5 miles to a 4-way intersection. Turn left (west) and go 0.4 miles and park beneath the powerlines. The 0-foot stake of the baseline is 30 feet away from the road marked by browse tag #432.



Map Name: Tucker

Diagrammatic Sketch

Township 11S, Range 7E, Section 6

GPS: NAD 27, UTM 12S 4415397 N 484099 E

## DISCUSSION

### Starvation Mountain Brush - Trend Study No. 16B-9

The Starvation Mountain Brush trend study samples a mixed mountain brush community in the Starvation Creek drainage on DWR property. Slope of the site ranges from 25-35%. Aspect is to the south and elevation is 7,800 feet. This study lies above and north of the curlleaf mahogany bench sampled by trend study 16B-8. The site was established in 1989 to monitor use by wildlife. Use by big game has been moderate on the site. Pellet group transect data estimated 45 deer days use/acre (111 ddu/ha) and 64 elk days use/acre (159 edu/ha) in 1999. In 2002, deer use was estimated at 68 days use/acre (169 ddu/ha) and 19 elk days use/acre (48 edu/ha). The surrounding area provides excellent thermal and escape for wildlife with large curlleaf mahogany thickets scattered in all directions. Several perennial water sources exist in the nearby area with the Spanish Fork River within a few miles to the north, Starvation Creek one-half mile to the west, and a spring three-fourths mile to the south.

Soils have a clay loam texture and are slightly alkaline in reactivity (pH of 7.4). The profile is shallow and rocky with an estimated effective rooting depth of just over 12 inches. Organic matter is very high at 5.5%, while phosphorus levels (8.5 ppm) are lower than the minimum (10 ppm) thought necessary for normal plant development and growth. Most of the bare areas are covered with rock and pavement. When coupled with the steep terrain, these rocky slopes tend to increase run-off, significantly reducing the amount of effective precipitation. Erosion potential is moderate to severe, especially during severe thunderstorms with the formation of rills and the movement of litter downslope. Abundant pedestalling and terracing is occurring on the steeper areas. The erosion condition class assessment was determined as slight in 2002.

Browse at the site is diverse with many key species present. The most important species include Utah serviceberry, mountain big sagebrush, true mountain mahogany, and antelope bitterbrush. These key species provide about half of the total browse cover, and 40% of the total vegetation cover on the site. The sagebrush is classified as mountain big sagebrush (*Artemisia tridentata vaseyana*), but some of the population displays characteristics of basin big sagebrush (*Artemisia tridentata tridentata*). It is likely that a portion of the population is a hybrid of the two subspecies. Sagebrush density was estimated at 1,660 plants/acre in 1999, slightly increasing to 1,800 plants/acre in 2002. These estimates are lower than the initial estimate of 2,666 plants/acre in 1989. The extension of the baseline in 1999 accounts for most of the differences in sagebrush density. This much larger sample size better samples browse populations that have clumped and/or discontinuous distributions. The proportion of the population classified as decadent and in poor vigor increased in 2002, and young recruitment declined to only 1% of the population. These changes can be expected with the drought conditions experienced in 2002. However, the increases in decadence and poor vigor on sagebrush are not extreme, and should improve with better precipitation in the future. Utilization on sagebrush has been moderate to heavy in all readings. Annual growth on sagebrush averaged just under 2 inches in 2002.

Serviceberry had an estimated density of 1,060 plants/acre in 1999, increasing to 1,400 plants/acre in 2002. The serviceberry population is slightly increasing due to a high proportion of young plants being recruited into the population (25% in 1999, and 30% in 2002). In 1999, a high proportion of the decadent age class were classified as dying (77%), and it was noted as being a concern for a possible decrease in population density. In 2002, decadency slightly increased but the proportion of decadent plants classified as dying decreased. Currently ('02), recruitment from young plants is higher than the number of plants expected to die in the future. Utilization has remained moderate to heavy since site establishment in 1989. In 1999, most of the leader growth on serviceberry was good (3-5 inches), with most being restricted to those stems which are protected and/or unavailable to browsing animals. Leader growth averaged less than 2 inches in 2002. True mountain mahogany had an estimated density of 1,120 plants/acre in 1999 and 2002. Heavy use was high, ranging from 55% in 1999 to 93% in 2002. However, this species is tolerant to heavy browsing with most of the population displaying normal vigor. The decadent age class doubled between 1999 and 2002 to 300 plants/acre, but with drought, this increase is not extreme and should improve with better precipitation. Recruitment declined slightly in 2002, but remains adequate to maintain the population.

Bitterbrush has the lowest population density of all the key browse, estimated at just over 500 plants/acre. In 2002, percent decadence and plants displaying poor vigor increased, while recruitment from young plants decreased. All of these changes are consistent with drought conditions and should improve as precipitation patterns improve. Use was mostly moderate in 1989 and 1999, increasing to heavy in 2002.

The few juniper trees found on the site in 1999 were cut down in 2002, because part of the study site occurs under high tension power lines.

The herbaceous understory is dominated by perennial species. The presence of seeded grasses indicates that some seeding has been done in the area, probably to revegetate the power line corridor which runs directly through the area. Crested wheatgrass is the dominant species providing 71% of the grass cover in 1999 and 92% in 2002. Other perennial grasses include bluebunch wheatgrass, mutton bluegrass, Indian ricegrass, Kentucky bluegrass, and Intermediate wheatgrass. Forbs are diverse as well. Hoods phlox is the most abundant forb, which provides nearly half off the forb cover. All other species occur infrequently. Annuals are present but infrequent, and are not significant in the community at the present time. With drought in 2002, perennial grasses remained stable in sum of nested frequency, while perennial forbs declined.

#### 1989 APPARENT TREND ASSESSMENT

Soils appear to have a downward trend on this site with the presence of active gullies and evidence of soil movement. Trend for browse and the herbaceous understory appears to be stable at the present time. However, continued heavy use coupled with drought may reverse this trend in the future.

#### 1999 TREND ASSESSMENT

Trend for soil is slightly down with a decrease in litter cover, and an increase in bare ground. Soil movement is evident with pedestalling occurring around the base of most vegetation. The trend for the key browse is mixed. The most preferred species, serviceberry, true mountain mahogany, and bitterbrush, show good recruitment from young plants. Use is moderate to heavy on these species. However, all are tolerant of heavy browsing. Biotic potential and recruitment for big sagebrush is low. Big sagebrush (most likely a hybrid between mountain big sagebrush and basin big sagebrush) shows moderate to heavy use on nearly half of the population. Currently, 10% of the big sagebrush population displays poor vigor. Overall, browse trend is stable. The herbaceous understory trend is up slightly. Sum of nested frequency for perennials increased, while annuals are an insignificant influence on the site.

#### TREND ASSESSMENT

soil - slightly down (2)

browse - stable overall for the key species (3)

herbaceous understory - up slightly (4)

2002 TREND ASSESSMENT

Trend for soil is again slightly down. Litter cover decreased, and bare soil increased. Erosion remains a factor on the site, and the erosion condition class assessment was determined to be slight in 2002. Trend for browse is stable. The key browse species are showing some negative effects from the drought, but densities remain stable. Increases in percent decadence and poor vigor, and a decrease in reproduction are all changes consistent with dry conditions. These changes were not extreme for the three most abundant species, serviceberry, big sagebrush, and true mountain mahogany. All of these parameters should improve with better precipitation in the future. Utilization did increase on all of the key species. However, with the exception of sagebrush, the key browse are tolerant to heavy browsing. Trend for the herbaceous understory is stable. Perennial grasses remained stable in sum of nested frequency, while forbs declined. However, the decline in forb abundance is not enough to warrant a downward trend. Forbs are usually the first component in the vegetative community to decline with drought and they should rebound with better precipitation in the future, especially at this elevation.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Herd unit 16B, Study no: 9

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'99	'02	'89	'99	'02	'99	'02
G	Agropyron cristatum	<sub>a</sub> 78	<sub>b</sub> 168	<sub>b</sub> 180	32	58	61	4.31	9.44
G	Agropyron intermedium	6	8	6	2	4	3	.18	.07
G	Agropyron smithii	-	-	4	-	-	2	-	.15
G	Agropyron spicatum	<sub>b</sub> 55	<sub>ab</sub> 25	<sub>b</sub> 10	21	13	7	.62	.08
G	Bromus inermis	4	1	-	2	1	-	.00	-
G	Bromus tectorum (a)	-	<sub>b</sub> 23	<sub>a</sub> 4	-	9	2	.22	.03
G	Carex spp.	-	3	5	-	1	3	.00	.09
G	Oryzopsis hymenoides	-	3	8	-	1	3	.03	.06
G	Poa fendleriana	26	18	20	13	9	9	.36	.14
G	Poa pratensis	-	5	6	-	2	2	.30	.18
G	Sitanion hystrix	<sub>b</sub> 21	<sub>ab</sub> 4	<sub>a</sub> 1	7	4	1	.02	.03
G	Stipa lettermani	1	-	-	1	-	-	-	-
Total for Annual Grasses		0	23	4	0	9	2	0.21	0.03
Total for Perennial Grasses		191	235	240	78	93	91	5.85	10.26
Total for Grasses		191	258	244	78	102	93	6.07	10.29



Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'99	'02	'89	'99	'02	'99	'02
F	Agoseris glauca	-	-	2	-	-	1	-	.00
F	Arabis spp.	-	-	1	-	-	1	-	.00
F	Aster chilensis	-	-	4	-	-	2	-	.01
F	Astragalus convallarius	-	-	1	-	-	1	-	.00
F	Astragalus spp.	8	-	-	3	-	-	-	-
F	Calochortus nuttallii	-	-	2	-	-	1	-	.00
F	Chaenactis douglasii	14	19	4	6	8	2	.07	.01
F	Cirsium spp.	8	19	7	5	10	4	.08	.09
F	Collomia linearis (a)	-	-	3	-	-	1	-	.00
F	Cryptantha spp.	<sub>a</sub> -	<sub>b</sub> 16	<sub>a</sub> 7	-	6	3	.45	.18
F	Cynoglossum officinale	2	-	-	1	-	-	-	-
F	Eriogonum racemosum	1	1	-	1	1	-	.00	-
F	Eriogonum umbellatum	2	3	3	1	1	1	.03	.00
F	Machaeranthera canescens	<sub>b</sub> 91	<sub>a</sub> 21	<sub>a</sub> 20	40	11	9	.13	.23
F	Microsteris gracilis (a)	-	1	-	-	1	-	.00	-
F	Penstemon caespitosus	-	1	2	-	1	2	.00	.01
F	Penstemon cyananthus	30	31	21	17	17	12	.18	.53
F	Penstemon humilis	<sub>b</sub> 11	<sub>a</sub> -	<sub>ab</sub> 4	5	-	2	-	.01
F	Penstemon spp.	<sub>a</sub> 14	<sub>b</sub> 31	<sub>a</sub> 14	8	17	6	.85	.10
F	Phlox hoodii	<sub>a</sub> 16	<sub>b</sub> 81	<sub>b</sub> 59	7	36	28	1.89	1.14
F	Phlox longifolia	<sub>b</sub> 51	<sub>a</sub> 7	<sub>a</sub> 17	27	3	7	.01	.06
F	Ranunculus testiculatus (a)	-	-	3	-	-	2	-	.01
F	Streptanthus cordatus	4	4	3	2	2	1	.01	.00
F	Taraxacum officinale	1	7	-	1	3	-	.04	-
F	Tragopogon dubius	-	3	-	-	1	-	.00	-
F	Veronica biloba (a)	-	-	3	-	-	1	-	.00
F	Verbascum thapsus	1	-	-	1	-	-	-	-
F	Viguiera multiflora	-	5	5	-	2	2	.06	.06
Total for Annual Forbs		0	1	9	0	1	4	0.00	0.01
Total for Perennial Forbs		254	249	176	125	119	85	3.84	2.50
Total for Forbs		254	250	185	125	120	89	3.85	2.51

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'99	'02	'99	'02
B	Amelanchier utahensis	42	42	2.33	2.07
B	Artemisia tridentata vaseyana	50	54	7.06	9.42
B	Cercocarpus montanus	46	41	4.28	3.96
B	Chrysothamnus depressus	2	3	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	44	47	2.21	1.54
B	Juniperus osteosperma	0	0	1.23	.00
B	Mahonia repens	7	6	.51	.01
B	Opuntia spp.	1	2	.00	.01
B	Purshia tridentata	19	18	3.33	2.73
B	Quercus gambelii	0	0	.00	-
B	Symphoricarpos oreophilus	91	87	14.12	10.95
B	Tetradymia canescens	20	15	1.09	1.88
Total for Browse		322	315	36.20	32.61

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16B, Study no: 9

Species	Percent Cover	
	'99	'02
Amelanchier utahensis	.20	1.50
Artemisia tridentata vaseyana	.20	6.80
Cercocarpus montanus	-	4.00
Chrysothamnus depressus	-	.08
Chrysothamnus viscidiflorus viscidiflorus	-	2.83
Juniperus osteosperma	2	-
Purshia tridentata	-	3.17
Symphoricarpos oreophilus	-	13.42
Tetradymia canescens	-	1.58

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 9

Species	Average leader growth (in) '02
Amelanchier alnifolia	1.6
Artemisia tridentata vaseyana	1.9
Cercocarpus montanus	1.3
Purshia tridentata	3.8

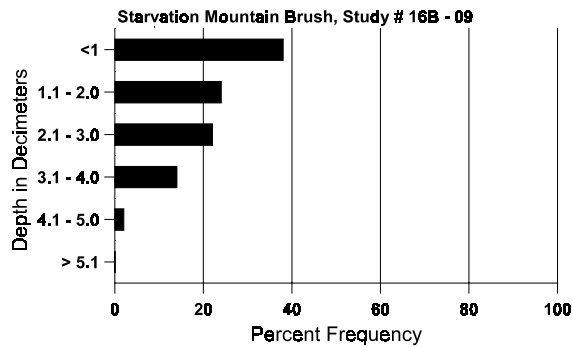
BASIC COVER --  
Herd unit 16B, Study no: 9

Cover Type	Nested Frequency		Average Cover %		
	'99	'02	'89	'99	'02
Vegetation	309	300	12.50	41.06	41.41
Rock	150	152	12.00	6.14	5.58
Pavement	202	193	11.50	3.91	3.01
Litter	377	382	54.25	50.65	40.02
Cryptogams	63	8	.50	2.03	.10
Bare Ground	246	289	4.00	18.73	26.22

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study # 09, Starvation Mountain Brush

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.5	51.0 (13.3)	7.4	36.7	22.7	40.6	5.5	8.5	121.6	0.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 9

Type	Quadrat Frequency		Pellet Transect			
	'99	'02	Pellet Groups per Acre		Days Use per Acre (ha)	
			'99	'02	'99	'02
Sheep	3	1	60	-	5 (11)	-
Rabbit	2	7	-	-	-	-
Elk	37	20	832	252	64 (158)	19 (48)
Deer	22	31	702	887	54 (111)	68 (168)

BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 9

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
S	89	9	-	-	-	-	1	1	-	-	11	-	-	-	733		11	
	99	5	-	-	-	-	-	-	-	5	-	-	-	100		5		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
Y	89	16	29	4	1	-	-	1	-	-	49	-	2	-	3400		51	
	99	5	3	-	3	2	-	-	-	11	-	2	-	260		13		
	02	3	-	4	9	-	3	2	-	21	-	-	-	420		21		
M	89	-	-	10	-	-	1	-	-	11	-	-	-	733	28	27	11	
	99	-	3	9	3	6	6	-	-	26	-	1	-	540	24	23	27	
	02	2	-	11	5	3	5	1	-	27	-	-	-	540	19	21	27	
D	89	-	-	9	-	-	-	-	-	9	-	-	-	600		9		
	99	1	1	2	2	1	2	4	-	3	-	-	10	260		13		
	02	1	-	16	-	2	3	-	-	12	-	-	10	440		22		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	99	-	-	-	-	-	-	-	-	-	-	-	-	180		9		
	02	-	-	-	-	-	-	-	-	-	-	-	-	60		3		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		41%			34%			03%			-78%							
'99		30%			36%			25%			+24%							
'02		07%			60%			14%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	4733	Dec:	13%				
											'99	1060		25%				
											'02	1400		31%				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	1	-	-	-	66		1		
	99	1	-	-	-	-	-	1	-	2	-	-	-	40		2		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
Y	89	8	-	1	-	-	-	-	-	9	-	-	-	600		9		
	99	5	-	-	-	-	-	-	-	5	-	-	-	100		5		
	02	-	1	-	-	-	-	-	-	1	-	-	-	20		1		
M	89	2	7	8	-	-	-	-	-	17	-	-	-	1133	21	22	17	
	99	28	27	6	-	-	-	1	-	62	-	-	-	1240	23	30	62	
	02	7	20	37	-	-	1	1	-	61	3	2	-	1320	21	27	66	
D	89	1	3	10	-	-	-	-	-	14	-	-	-	933		14		
	99	2	3	-	3	-	5	3	-	8	-	-	8	320		16		
	02	6	7	10	-	-	-	-	-	12	-	3	8	460		23		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	99	-	-	-	-	-	-	-	-	-	-	-	-	980		49		
	02	-	-	-	-	-	-	-	-	-	-	-	-	600		30		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		25%			48%			00%			-38%							
'99		36%			13%			10%			+ 8%							
'02		31%			53%			14%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2666	Dec:	35%				
											'99	1660		19%				
											'02	1800		26%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Cercocarpus montanus</b>																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	99	4	1	-	-	-	-	1	-	-	6	-	-	-	120		6
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	-	1	-	-	-	-	1	-	-	2	-	-	-	133		2
	99	4	1	-	1	1	-	1	-	-	8	-	-	-	160		8
	02	1	1	2	1	-	-	-	-	-	5	-	-	-	100		5
M	89	-	-	4	-	-	-	-	-	-	4	-	-	-	266	25 27	4
	99	-	5	5	-	9	22	-	-	-	34	5	2	-	820	32 33	41
	02	1	-	32	-	-	3	-	-	-	36	-	-	-	720	27 32	36
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	99	-	-	-	-	-	4	3	-	-	4	-	-	3	140		7
	02	-	-	12	-	-	3	-	-	-	9	-	-	6	300		15
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		17%			67%			00%			+64%						
'99		29%			55%			09%			+ 0%						
'02		02%			93%			11%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	399	Dec:	0%			
											'99	1120		13%			
											'02	1120		27%			
<b>Chrysothamnus depressus</b>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	99	7	-	-	-	-	-	-	-	-	7	-	-	-	140	- -	7
	02	3	8	-	-	-	-	-	-	-	3	-	-	-	220	6 11	11
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	99	-	-	1	-	-	-	-	-	-	-	-	1	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'99		00%			13%			13%			+27%						
'02		73%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%			
											'99	160		13%			
											'02	220		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	99	10	-	-	1	-	-	-	-	-	11	-	-	-	220			11
	02	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	89	51	-	-	-	-	-	-	-	-	50	-	1	-	3400	12	15	51
	99	98	11	-	11	-	-	-	-	-	120	-	-	-	2400	8	14	120
	02	102	-	-	2	-	-	-	-	-	104	-	-	-	2080	7	12	104
D	89	5	-	-	-	-	-	1	-	-	6	-	-	-	400			6
	99	7	-	-	-	-	-	1	-	-	2	-	-	6	160			8
	02	1	-	-	1	-	-	-	-	-	1	-	1	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			02%			-36%							
'99		08%			00%			04%			-17%							
'02		00%			00%			.86%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	4333	Dec:	9%			
												'99	2780		6%			
												'02	2300		2%			
<i>Cowania mexicana stansburiana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	44	48	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'99	0		-			
												'02	0		-			
<i>Juniperus osteosperma</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'99	0		-			
												'02	0		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Mahonia repens																		
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	99	21	-	-	-	-	-	-	-	-	21	-	-	-	420		21	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	81	-	-	-	-	-	-	-	-	81	-	-	-	1620	2	5	81
	02	57	-	-	-	-	-	-	-	-	57	-	-	-	1140	4	4	57
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+90%							
'99		00%			00%			00%			-44%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	200	Dec:	-			
												'99	2040		-			
												'02	1140		-			
Opuntia spp.																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	21	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	2	13	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%			+67%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'99	20		-			
												'02	60		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66		1	
	99	2	2	-	1	-	-	-	-	-	5	-	-	-	100		5	
	02	-	1	1	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	17	19	
	99	3	10	3	-	5	1	-	-	-	22	-	-	-	440	23	51	
	02	-	2	5	-	-	4	-	-	-	11	-	-	-	220	16	43	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	12	-	-	1	-	-	-	7	-	-	6	260		13	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			00%			00%			+76%							
'99		63%			15%			00%			- 4%							
'02		12%			88%			23%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	0%				
											'99	540		0%				
											'02	520		50%				
<i>Quercus gambelii</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'99	0		-				
											'02	0		-				



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Symphoricarpos oreophilus</b>																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	99	15	-	-	1	-	-	-	-	-	16	-	-	-	320		16	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	22	1	-	-	-	-	-	-	-	22	-	1	-	1533		23	
	99	66	-	-	3	-	-	1	-	-	69	-	1	-	1400		70	
	02	50	-	-	-	-	-	3	-	-	53	-	-	-	1060		53	
M	89	84	1	1	1	-	-	2	-	-	83	-	6	-	5933	16	21	89
	99	150	4	-	52	2	-	-	-	-	201	-	5	-	4160	19	33	208
	02	232	-	-	50	-	-	1	-	-	280	3	-	-	5660	11	17	283
D	89	10	3	-	-	-	-	-	-	-	7	-	3	3	866		13	
	99	7	-	-	4	-	-	1	-	-	4	-	-	8	240		12	
	02	12	-	-	1	-	-	-	-	-	6	-	2	5	260		13	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		04%			.80%			10%			-30%							
'99		02%			00%			05%			+17%							
'02		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	8332	Dec:	10%			
												'99	5800		4%			
												'02	6980		4%			
<b>Tetradymia canescens</b>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	11	-	-	-	-	-	-	-	-	11	-	-	-	220		11	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	27	1	-	1	-	-	1	-	-	30	-	-	-	600	13	20	30
	02	20	-	1	2	-	-	-	-	-	23	-	-	-	460	12	21	23
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	99	5	2	-	-	-	-	-	-	-	6	-	-	1	140		7	
	02	5	1	-	-	-	-	-	-	-	2	-	-	4	120		6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'99		06%			00%			02%			-38%							
'02		03%			03%			13%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'99	960		15%			
												'02	600		20%			

Trend Study 16B-10-02

Study site name: Dairy Fork Burn.

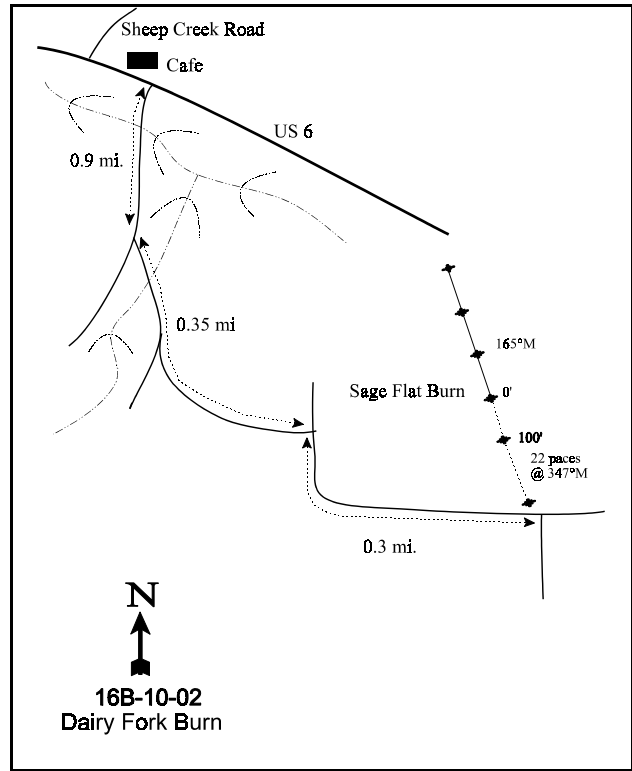
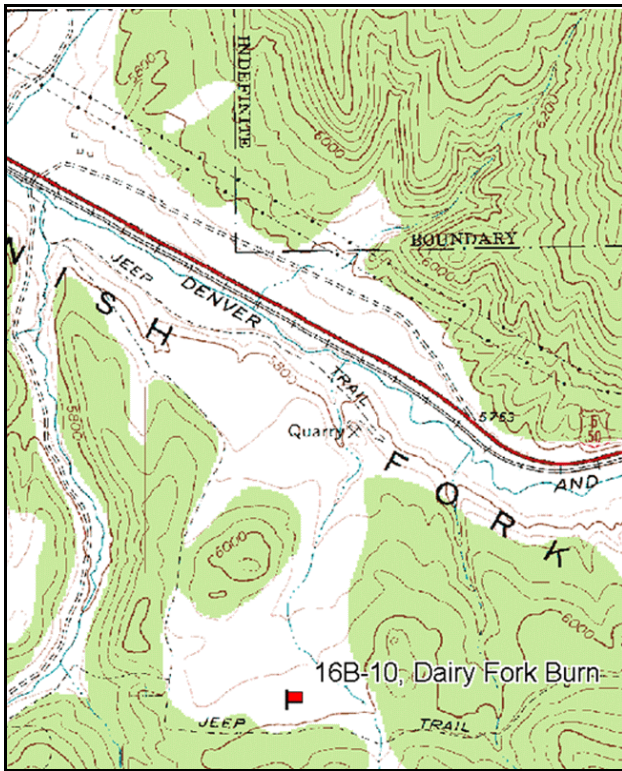
Vegetation type: Big Sagebrush-Burn.

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

Near the Sheep Creek cafe on Highway 6, take Dairy Fork Road on the south side of the highway 0.9 miles to a left hand fork. Take this fork, cross the creek and go 0.35 miles staying east (left) to a sagebrush flat/burn and a 3-way intersection. Turn right (south) and follow the road around upper edge of flat for 0.3 miles to a junction on the right and a witness post on the left. Stop here and walk north into the flat about 22 paces at an azimuth of 347 degrees magnetic to the 100-foot baseline stake.



Map Name: Mill Fork

Diagrammatic Sketch

Township 15S, Range 5E, Section 7

GPS: NAD 27, UTM 12S 4422921 N 471997 E

## DISCUSSION

### Dairy Fork Burn - Trend Study No. 16B-10

The Dairy Fork Burn study samples a burned sagebrush flat surrounded by juniper. The site has an elevation of 6,000 feet with a gentle 3% slope to the north. This Division property was burned and seeded in 1988, resulting in the big sagebrush population being largely eliminated within the flat. A 1978 line-intercept transect ran across the lower, north end of the flat where a disc-chain was used for preparing a seedbed. A trend study was established in 1989 to monitor recovery on this basin big sagebrush (*Artemisia tridentata tridentata*) site. Use of the site by big game is light by deer and moderate to heavy by elk. Quadrat frequency of pellet groups in 1997 was 33% for elk and 9% for deer. Quadrat frequency in 2002 increased to 46% for elk and 13% for deer. Pellet group transect data taken in 2002 estimated 116 elk days use/acre (288 edu/ha) and only 5 deer days use/acre (13 ddu/ha). About one-third of the elk pellet groups encountered appear to be from spring use. Domestic sheep had been trailed through the area just prior to the site being read in 2002. Sheep use was estimated at 34 days use/acre (84 sdu/ha).

Soils at the site have moderate depth and the effective rooting depth is estimated at nearly 14 inches. Soil texture is a clay and reactivity is slightly alkaline (pH of 7.4). The high clay content (dense compact soil) limited soil penetrometer readings. Phosphorus levels (8 ppm) are slightly lower than the 10 ppm determined as necessary for normal plant growth and development. There is a high amount of exposed bare soil (averages 41% between all readings) which translates into high erosion potential. However, due to the gentle slope, erosion is minimal on the study site. Other areas of the flat without herbaceous cover display significant soil movement. An erosion condition class assessment determined the probability of erosion to be slight in 2002.

When this study was established in 1989, no density plots were established to estimate sagebrush density. In 1997, sagebrush density was estimated at 300 plants/acre, increasing to 480 plants/acre in 2002. Recruitment from the young age class was high in 1997 at 40%, and moderately high in 2002 at 21%. Decadent plants were first sampled in 2002, with only 13% of the population being classified as such. Vigor is mostly normal throughout the limited big sagebrush population in all years. Big sagebrush increased in average cover and strip frequency in 2002, supporting the increased density estimate. It should be noted that the dead sagebrush plants listed in the browse characteristics table in 1997 and 2002 were plants that existed in the original population before the burn treatment. Use on sagebrush has been mostly light in all readings. Sagebrush annual growth was estimated at nearly 3 inches in 2002.

Musk thistle was the dominate herbaceous species in the treated area in 1989. However, this undesirable weed was infested with a weevil and there was little viable seed. Musk thistle has steadily declined to where none was sampled in 2002. Native and seeded perennial grasses were diverse but not abundant when the site was established in 1989. By 1997, sum of nested frequency of perennial grasses increased dramatically (95 to 569). With drought in 2002, sum of nested frequency for perennial grasses slightly decreased to 462. Crested wheatgrass is the dominate species on the site, contributing nearly three-fourths of the grass cover, and over 60% of the total vegetation cover on the site in 2002. Other grasses that occur in lower frequencies include intermediate wheatgrass, smooth brome, and bottlebrush squirreltail. With the exception of squirreltail, grasses had been moderate to heavily utilized by domestic sheep when the site was read in June 2002. Since site establishment, sum of nested frequency for forbs has steadily declined due to a significant reduction in the frequency of two weedy species, musk thistle and prickly lettuce. Drought in 2002 also likely played a role in decreased nested frequency of perennial forbs. Whitetop, a noxious weed, was sampled on the site in 2002. Two seeded forbs, small burnet and alfalfa, were sampled in 1997 in low frequency, but neither were present in 2002.

## 1989 APPARENT TREND ASSESSMENT

Vegetation condition is improving after the burn as herbaceous perennials and sagebrush reoccupy the treated flat. Soils will improve as the vegetative community becomes established, especially from perennial species. Soil erosion is not serious on the study site due to the gentle slope.

## 1997 TREND ASSESSMENT

The soil trend is considered stable. Percent bare ground increased slightly from 38% to 44% and litter cover declined. However, sum of nested frequency for perennial grasses increased sixfold. Erosion is not currently a problem on the site. Trend for sagebrush is up, but the population remains limited. Young plants make up 40% of the age class, use is light, and there are no decadent plants. Trend for the herbaceous understory is up. Sum of nested frequency for grasses increased sixfold, while nested frequency of forbs declined due to a reduction in musk thistle and other weedy forbs.

### TREND ASSESSMENT

soil - stable (3)

browse - up for big sagebrush (5)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Trend for soil is stable. Bare soil remains high, but slightly decreased in 2002. Litter cover improved over 1997 levels with minimal erosion occurring. Trend for big sagebrush is slightly up as density continues to slowly improve. Young plants make up 21% of the population which is very good especially during a drought year. Use remains light, and decadency is low at 13%. Trend for the herbaceous understory is slightly down. Sum of nested frequency for perennial grasses declined by 19%, and sum of nested frequency for perennial forbs declined by 81%. The decrease in frequency of perennial forbs came mostly from the decline in musk thistle, so this decline is not all negative.

### TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - slightly down (2)

## HERBACEOUS TRENDS --

Herd unit 16B, Study no: 10

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 11	<sub>b</sub> 209	<sub>c</sub> 285	6	70	92	8.24	15.97
G	Agropyron intermedium	<sub>a</sub> 1	<sub>b</sub> 108	<sub>b</sub> 85	1	38	32	5.00	4.20
G	Bromus inermis	<sub>a</sub> 1	<sub>b</sub> 86	<sub>b</sub> 50	1	32	22	2.21	.58
G	Bromus tectorum (a)	-	<sub>b</sub> 132	<sub>a</sub> 18	-	50	6	.88	.32
G	Dactylis glomerata	9	10	2	6	4	1	.09	.00
G	Oryzopsis hymenoides	<sub>a</sub> 1	<sub>ab</sub> 6	<sub>b</sub> 15	1	3	7	.56	.31
G	Poa fendleriana	1	-	-	1	-	-	-	-
G	Poa pratensis	<sub>a</sub> 2	<sub>b</sub> 27	<sub>a</sub> -	1	10	-	.53	-
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 5	<sub>a</sub> -	-	5	-	.12	-
G	Sitanion hystrix	<sub>b</sub> 69	<sub>c</sub> 118	<sub>a</sub> 25	33	52	10	2.71	.90

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
	Total for Annual Grasses	0	132	18	0	50	6	0.88	0.31
	Total for Perennial Grasses	95	569	462	50	214	164	19.49	21.97
	Total for Grasses	95	701	480	50	264	170	20.38	22.29
F	<i>Achillea millefolium</i>	3	4	5	1	1	2	.63	.03
F	<i>Alyssum alyssoides</i> (a)	-	6	6	-	3	2	.01	.03
F	<i>Astragalus cibarius</i>	3	-	-	2	-	-	-	-
F	<i>Astragalus convallarius</i>	<sub>c</sub> 113	<sub>b</sub> 62	<sub>a</sub> 3	53	26	1	.46	.00
F	<i>Astragalus tenellus</i>	<sub>b</sub> 9	<sub>ab</sub> 5	<sub>a</sub> -	5	3	-	.04	-
F	<i>Cardaria draba</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 16	-	-	7	-	.04
F	<i>Camelina microcarpa</i> (a)	-	<sub>b</sub> 42	<sub>a</sub> -	-	21	-	.13	-
F	<i>Carduus nutans</i> (a)	<sub>c</sub> 230	<sub>b</sub> 106	<sub>a</sub> -	91	46	-	3.23	-
F	<i>Chaenactis douglasii</i>	<sub>b</sub> 145	<sub>a</sub> 25	<sub>a</sub> 4	67	11	2	.05	.01
F	<i>Cirsium</i> spp.	-	3	-	-	1	-	.03	-
F	<i>Comandra pallida</i>	<sub>a</sub> -	<sub>b</sub> 36	<sub>a</sub> -	-	14	-	.56	-
F	<i>Collinsia parviflora</i> (a)	-	2	-	-	1	-	.00	-
F	<i>Descurainia pinnata</i> (a)	-	2	-	-	1	-	.00	-
F	<i>Epilobium brachycarpum</i> (a)	-	5	-	-	2	-	.01	-
F	<i>Grindelia squarrosa</i>	6	-	-	2	-	-	-	-
F	<i>Lactuca serriola</i>	<sub>c</sub> 217	<sub>b</sub> 32	<sub>a</sub> -	81	14	-	.14	-
F	<i>Machaeranthera canescens</i>	5	-	-	3	-	-	-	-
F	<i>Medicago sativa</i>	-	1	-	-	1	-	.03	-
F	<i>Microsteris gracilis</i> (a)	-	<sub>b</sub> 58	<sub>a</sub> 27	-	24	10	.36	.05
F	<i>Penstemon caespitosus</i>	7	13	14	3	5	5	.74	.22
F	<i>Phlox longifolia</i>	-	3	2	-	1	1	.00	.00
F	<i>Ranunculus testiculatus</i> (a)	-	4	-	-	1	-	.00	-
F	<i>Sanguisorba minor</i>	5	9	-	4	4	-	.16	-
F	<i>Sisymbrium altissimum</i> (a)	-	5	-	-	3	-	.01	-
F	<i>Taraxacum officinale</i>	11	8	-	3	4	-	.07	-
F	<i>Tragopogon dubius</i>	<sub>c</sub> 23	<sub>b</sub> 8	<sub>a</sub> -	13	6	-	.05	-
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>b</sub> 24	<sub>a</sub> -	-	9	-	.04	-
	Total for Annual Forbs	230	230	33	91	102	12	3.78	0.08
	Total for Perennial Forbs	547	233	44	237	100	18	3.03	0.31
	Total for Forbs	777	463	77	328	202	30	6.82	0.39

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 10

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	13	19	.41	1.86
B	Chrysothamnus nauseosus	0	1	-	-
B	Juniperus osteosperma	1	0	.15	.63
Total for Browse		14	20	0.56	2.50

Key Browse Annual Leader Growth  
Herd unit 16B , Study no: 10

Species	Average leader growth (in) '02
Artemisia tridentata tridentata	2.9

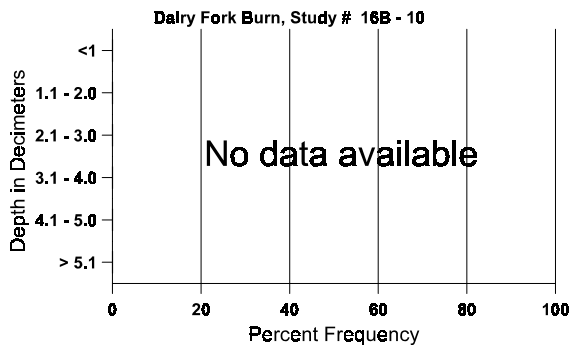
BASIC COVER --  
Herd unit 16B, Study no: 10

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	351	339	4.00	32.15	25.91
Rock	3	5	0	.00	.01
Pavement	92	30	0	.22	.06
Litter	379	387	58.25	24.80	49.02
Cryptogams	5	7	0	.16	.03
Bare Ground	350	321	37.75	43.81	41.40

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 10, Dairy Fork Burn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.7	59.0 (13.2)	7.5	25.4	26.8	47.8	2.2	8.0	217.6	.4

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 10

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Sheep	-	11	444	34 (84)
Rabbit	12	8	-	-
Elk	33	46	1514	116 (288)
Deer	9	13	70	5 (13)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 10

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Artemisia tridentata tridentata																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	9	-	-	-	-	-	-	-	-	8	-	1	-	180	49	43	9
	02	11	3	2	-	-	-	-	-	-	16	-	-	-	320	33	30	16
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	3	-	-	-	-	-	-	-	1	-	1	1	60			3
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	2360			118
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	1280			64
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			07%			+38%							
'02		25%			08%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	300		0%			
												'02	480		13%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20	24	27	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	20		-			
Juniperus osteosperma																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			



Trend Study 16B-11-02

Study site name: Hilltop.

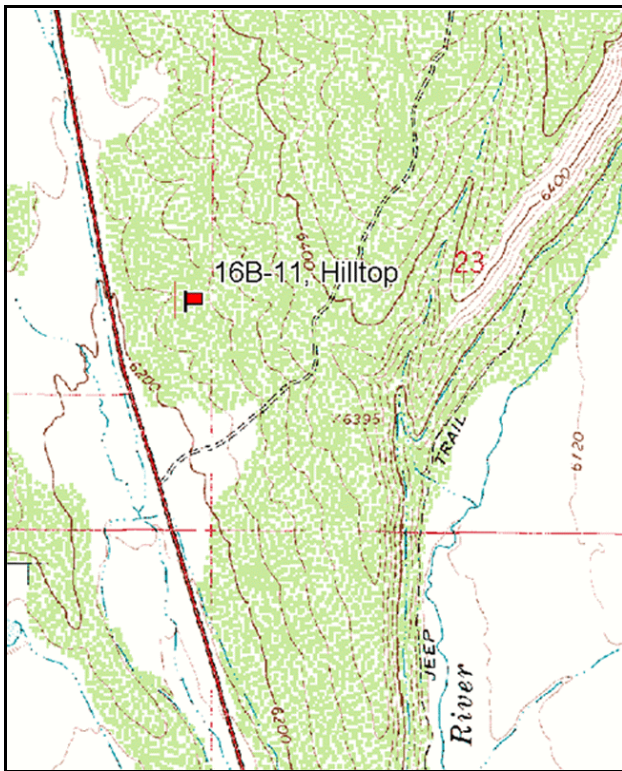
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 168 degrees magnetic.

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

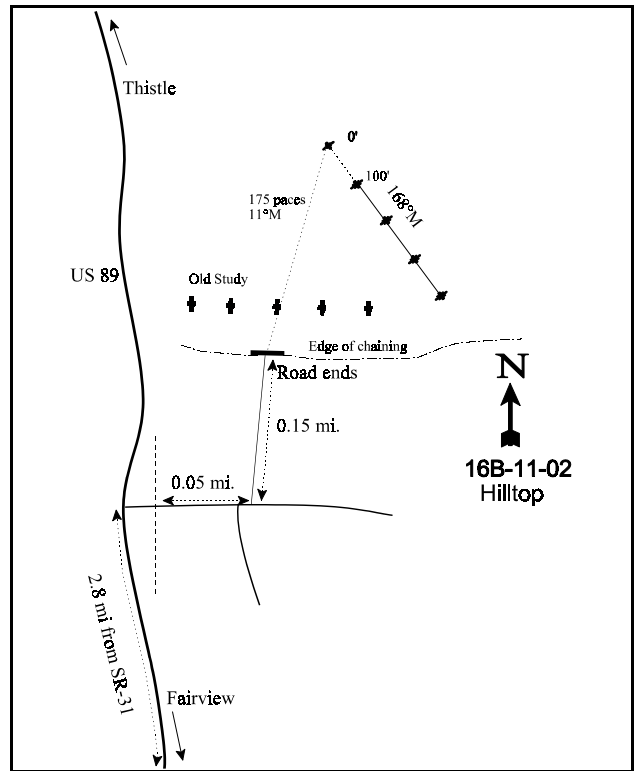
LOCATION DESCRIPTION

From the intersection of US-89 and SR-31 in Fairview, travel north on US-89 for 2.8 miles. Turn right (east) onto DWR property. Pass through a gate and go 0.05 miles to an intersection, turn left (north). Go 0.15 miles to the end of the road. The 0-foot baseline stake, marked by browse tag #439, is 175 paces at an azimuth of 11 degrees magnetic from the end of the road.



Map Name: Fairview

Township 13S, Range 4E, Section 22



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4391415 N 461172 E

## DISCUSSION

### Hilltop - Trend Study No. 16B-11

This study was established on land formerly owned by the Division of Wildlife Resources, north of Fairview and just east of Highway 89. The area where this study lies was part of a land swap between the Division and a private land owner for property to build the new fish hatchery near Fountain Green. A conservation easement was also part of the property swap which allows grazing for a short time in spring and fall. The study monitors a 250 acre pinyon-juniper chaining treatment that was completed in 1978. The trend study was established in the lower, southern end of the chaining. Slope on the site varies from 5-10% toward the west. Elevation at the study site is 6,200 feet. In 1997, quadrat frequency of deer pellets was 25%, while elk pellet groups were sampled in only one quadrat. In 2002, use by both deer and elk was light. Pellet group transect data collected in 2002 estimated 2 elk days use/acre (5 edu/ha) and 4 deer days use/acre (10 ddu/ha). The sight had been heavily utilized by both cows and sheep before the sight was read in June of 2002. Cattle use was estimated at 19 days use/acre (47 cdu/ha). While sheep use was estimated at 50 days use/acre (123 shu/ha). Livestock use was also noted on the site in 1997.

The soil is moderately deep with an effective rooting depth estimated at nearly 14 inches. Soil depth varies along the baseline with more shallow measurements along the first 200 feet of the baseline (almost 10 inches) and noticeably deeper measurements along the last 200 feet (about 20 inches). Soil texture is a clay loam with a slightly alkaline pH (7.4). Organic matter is relatively high for this unit at 3.9%, second highest measurement in the unit. Phosphorus may be a limiting factor to plant development at only 8.8 ppm, where 10 ppm is considered necessary for normal plant growth and development. There is considerable bare ground on the site (48% in 2002) where erosion is evident with pedestalled bunchgrasses. An erosion condition class assessment indicated that the probability of erosion was moderate in 2002. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare soil was low in 1997 and 2002 at just over 2:1.

Browse is limited which is probably a main factor why wildlife use is so low. Junipers in the chaining average 8 feet in height and have a density of about 50 trees/acre using point-center quarter data from 1997 and 2002. Average tree diameter is 5 inches. There are also scattered clumps of oak. Mountain big sagebrush is uncommon with an estimated density of 100 plants/acre in 1997, and 40 plants/acre in 2002. Utilization has been mostly light, even with the very low density. It appears that big sagebrush will likely not increase in the near future as no seedling or young plants were sampled in 2002. Establishment of seeded browse appeared to be poor. Mountain big sagebrush and four-wing saltbush were included in the aerial broadcast mix, while cliffrose and bitterbrush were seeded with a dribbler. With the exception of big sagebrush, none of the species that were seeded have been sampled in any year. Elderberry, slenderbush eriogonum, and rubber rabbitbrush occur infrequently on the site.

Seeded perennial grasses are the dominant component in the vegetative community. Crested wheatgrass and intermediate wheatgrass are the primary forage species combining to produce at least 90% of the grass cover. Native grasses are also present, but in very low frequencies. Indian ricegrass and bluebunch wheatgrass were the most common in 1997. The perennial grasses had been heavily utilized by sheep prior to sampling in June of 2002. Sheep had reportedly utilized some of the grasses in 1989 as well. Cheatgrass and Japanese brome are present in the understory, but occur in low numbers and likely will not increase enough to create any problems with fire or competition with perennial species. During the 1997 reading, the Russian wildrye found along the baseline was heavily utilized.

Diversity of forbs is fair, yet none are particularly abundant. Two noxious weeds, musk thistle and morning glory, occur on the site as well. Annual forbs, primarily bur buttercup and pale alyssum, occur in higher frequency than do perennial species. With drought in 2002, sum of nested frequency for perennial species declined by 87%, although they were already in very low numbers.

### 1989 APPARENT TREND ASSESSMENT

Shrubs have not yet colonized this 10 year old chaining. Objectives for the site include increasing browse densities. With the uneven cover created by the prominent bunchgrasses, there is ample room for seedling establishment. Future readings could help understand the impacts caused by spring sheep use. The vegetative trend appears to be slowly going up. Soil trend appears downward due to the excessive amount of bare soil, soil movement, plant pedestalling and continuing erosion. Increased plant or litter cover would help improve the soil condition.

### 1997 TREND ASSESSMENT

Trend for soil is down due to an increase in percent bare soil from 27% to 35%, and a decline in litter cover from 46% to 21%. There is a moderate amount of herbaceous vegetation on the site, but localized erosion is ongoing. Trend for browse is down slightly. Browse are lacking and the key species, mountain big sagebrush, shows increased decadence and poor vigor. Rubber rabbitbrush and slenderbush eriogonum also show heavy sheep use. Young plants are present in good numbers but no seedlings of any shrub were encountered during either of the readings. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses declined slightly, while frequency of perennial forbs increased. However, many of the forb species on the site are undesirable weeds and annuals like musk thistle, morning glory, and bur buttercup.

#### TREND ASSESSMENT

soil - down (1)

browse - down slightly (2)

herbaceous understory - stable (3)

### 2002 TREND ASSESSMENT

Trend for soil is slightly down. Bare soil increased and vegetation and litter cover are lower. Soil pedestalling is severe, and sheep trails increase erosion potential on the site. Trend for browse is slightly down. Browse is very limited on the site. Sagebrush density declined and there was no recruitment of young plants into the population. A few white-stemmed rubber rabbitbrush and bitterbrush plants observed around the site show heavy use by sheep although neither was sampled on the transect itself. With virtually no reproduction of any palatable browse, this site is losing it's value as critical winter range for big game. The area is already barely being used by big game. The herbaceous understory has a slightly downward trend as well. With drought, perennial grasses and forbs declined in sum of nested frequency. Composition has reached a level where only two species, crested wheatgrass and intermediate wheatgrass, dominate the site.

#### TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 11

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron cristatum</i>	203	198	238	76	76	81	11.51	12.36
G	<i>Agropyron intermedium</i>	<sub>b</sub> 182	<sub>a</sub> 129	<sub>a</sub> 107	71	50	37	3.53	3.68
G	<i>Agropyron spicatum</i>	<sub>a</sub> 3	<sub>b</sub> 40	<sub>a</sub> -	1	16	-	.91	-
G	<i>Bromus japonicus</i> (a)	-	4	-	-	2	-	.01	-
G	<i>Bromus tectorum</i> (a)	-	<sub>b</sub> 48	<sub>a</sub> 16	-	19	7	.33	.06
G	<i>Elymus junceus</i>	7	-	-	3	-	-	-	-
G	<i>Oryzopsis hymenoides</i>	<sub>a</sub> 4	<sub>b</sub> 23	<sub>a</sub> 5	2	9	2	.40	.15
G	<i>Poa secunda</i>	4	4	-	2	2	-	.01	-
G	<i>Sitanion hystrix</i>	<sub>b</sub> 24	<sub>a</sub> 8	<sub>a</sub> -	10	3	-	.02	-
Total for Annual Grasses		0	52	16	0	21	7	0.34	0.06
Total for Perennial Grasses		427	402	350	165	156	120	16.39	16.21
Total for Grasses		427	454	366	165	177	127	16.73	16.27
F	<i>Alyssum alyssoides</i> (a)	-	<sub>a</sub> 41	<sub>b</sub> 71	-	17	30	.40	.17
F	<i>Astragalus convallarius</i>	3	-	-	1	-	-	-	-
F	<i>Astragalus</i> spp.	-	1	-	-	1	-	.00	-
F	<i>Astragalus utahensis</i>	-	4	4	-	2	2	.01	.01
F	<i>Carduus nutans</i> (a)	<sub>a</sub> -	<sub>b</sub> 40	<sub>a</sub> -	-	19	-	.44	-
F	<i>Chaenactis douglasii</i>	-	1	-	-	1	-	.00	-
F	<i>Chenopodium fremontii</i> (a)	-	<sub>b</sub> 9	<sub>a</sub> -	-	4	-	.04	-
F	<i>Cirsium</i> spp.	-	5	-	-	3	-	.04	-
F	<i>Convolvulus arvensis</i>	<sub>a</sub> -	<sub>b</sub> 16	<sub>a</sub> -	-	7	-	.11	-
F	<i>Descurainia pinnata</i> (a)	-	11	-	-	4	-	.04	-
F	<i>Lappula occidentalis</i> (a)	-	3	-	-	3	-	.01	-
F	<i>Medicago sativa</i>	-	3	-	-	1	-	.09	-
F	<i>Phlox hoodii</i>	11	16	5	5	6	2	.25	.18
F	<i>Phlox longifolia</i>	2	4	-	1	2	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>a</sub> 163	<sub>b</sub> 196	-	56	65	.97	1.86
F	<i>Sisymbrium altissimum</i> (a)	-	4	-	-	3	-	.04	-
F	<i>Sphaeralcea coccinea</i>	1	4	-	1	2	-	.03	-
F	<i>Taraxacum officinale</i>	-	2	-	-	1	-	.00	-
F	<i>Tragopogon dubius</i>	-	1	-	-	1	-	.00	-
F	<i>Verbascum thapsus</i>	<sub>a</sub> -	<sub>b</sub> 11	<sub>a</sub> -	-	5	-	.48	-
F	<i>Viguiera multiflora</i>	-	3	-	-	2	-	.01	-
Total for Annual Forbs		0	271	267	0	106	95	1.96	2.03
Total for Perennial Forbs		17	71	9	8	34	4	1.06	0.19
Total for Forbs		17	342	276	8	140	99	3.02	2.23

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 11

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	5	2	.46	.18
B	Chrysothamnus nauseosus albicaulis	2	0	.38	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	2	.15	.15
B	Gutierrezia sarothrae	20	6	.37	.12
B	Juniperus osteosperma	1	0	.63	.15
B	Opuntia spp.	3	2	-	.03
B	Quercus gambelii	1	2	.63	.63
Total for Browse		34	14	2.63	1.27

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16B, Study no: 11

Species	Percent Cover	
	'97	'02
Artemisia tridentata vaseyana	-	.42
Chrysothamnus viscidiflorus viscidiflorus	-	.33
Gutierrezia sarothrae	-	.03
Juniperus osteosperma	-	.83
Quercus gambelii	-	1.83

Point-Quarter Tree Data  
Herd unit 16B , Study no: 11

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	47	53	5.0	5.3

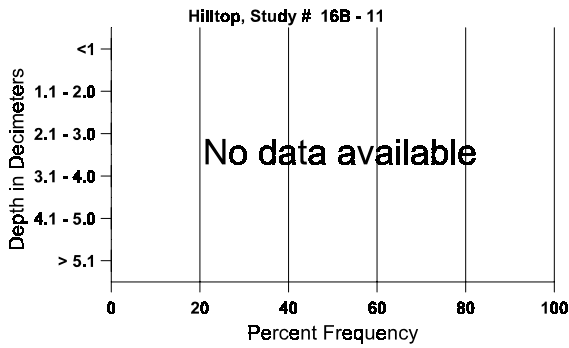
BASIC COVER --  
Herd unit 16B, Study no: 11

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	336	334	10.50	22.73	19.68
Rock	155	149	4.75	3.01	3.42
Pavement	289	257	11.25	5.28	7.03
Litter	378	369	46.75	20.90	33.79
Cryptogams	8	10	0	.04	.02
Bare Ground	331	344	26.75	35.57	48.51

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 11, Hilltop

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.8	55.6 (14.3)	7.4	38.7	25.1	36.2	3.9	8.8	134.5	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 11

Type	Quadrat Frequency	
	'97	'02
Sheep	13	15
Rabbit	6	21
Elk	1	-
Deer	25	4
Cattle	3	-

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
653	50 (124)
-	-
26	2 (5)
52	4 (10)
226	19 (47)

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 11

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	1	6	-	-	-	-	-	-	-	7	-	-	-	233	33	30	7
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	31	35	2
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	26	28	2
D	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		89%			00%			00%			-67%							
'97		20%			00%			20%			-60%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	299	Dec:	11%			
												'97	100		20%			
												'02	40		0%			
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	47	91	1
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	20	34	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	8	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+18%							
'97		50%			50%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	40		-			
												'02	0		-			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	7	9	4
	02	10	-	-	-	-	-	-	-	-	10	-	-	-	200	5	11	10
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+60%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			
												'02	200		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Eriogonum microthecum</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	4	8	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	7	11	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
												'02	0		-		
<i>Gutierrezia sarothrae</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	9	-	-	-	-	-	-	-	-	-	-	-	180			9
	02	2	-	-	-	-	-	-	-	-	-	-	-	40			2
M	89	4	-	-	-	-	-	-	-	-	-	-	-	133	7	10	4
	97	26	-	-	-	-	-	-	-	-	-	-	-	520	10	12	26
	02	1	3	2	-	-	-	-	-	-	-	-	-	120	4	7	6
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	1	-	1	-	-	-	-	-	-	-	-	-	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+82%						
'97		00%			00%			03%			-72%						
'02		30%			30%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	0%		
												'97	720		3%		
												'02	200		20%		
<i>Juniperus osteosperma</i>																	
M	89	1	-	-	-	-	-	-	-	-	-	-	-	33	69	35	1
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-39%						
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-		
												'97	20		-		
												'02	0		-		



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	20	1
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	6	19	3
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	9	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		00%			00%			00%			-33%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	60		-			
												'02	40		-			
Quercus gambelii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	98	47	2
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	6	3	5
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+20%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			
												'02	100		-			
Sambucus cerulea																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	119	98	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16B-13-02

Study site name: Oak Creek Ridge Aspen.

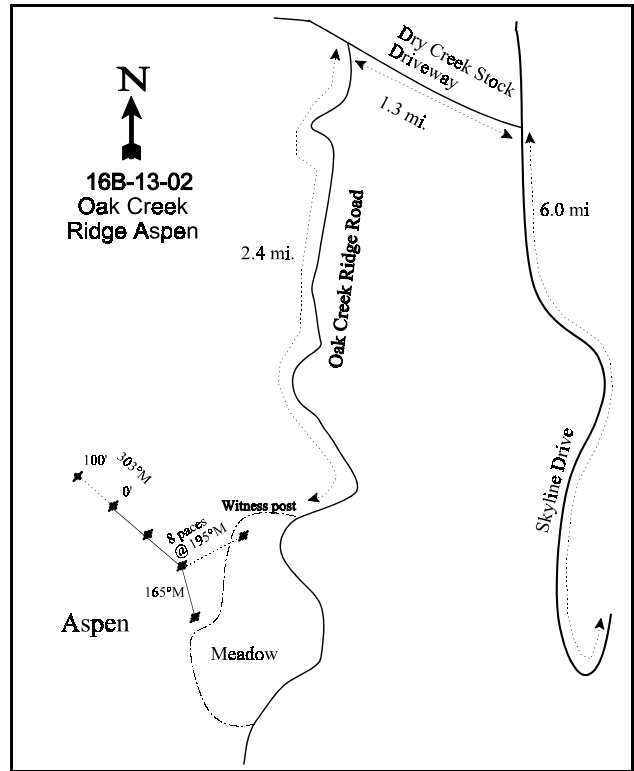
Vegetation type: Quaking Aspen.

Compass bearing: frequency baseline 303 degrees magnetic (line 4 @ 165°M).

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

LOCATION DESCRIPTION

From the intersection of Highways 91 and 31 in Fairview, take Highway 31 eastward 8.4 miles to Skyline Drive. Turn north on Skyline Drive and go approximately 6 miles, passing the Gooseberry Road. Turn west onto the Dry Creek Stock Driveway and go 1.3 miles to a fork. Take the left fork (south) through a fence and stay on the Oak Creek Ridge Road for 2.4 miles passing numerous side roads (staying left) until a sign is reached. The sign reads, “seeded area”, and is on the west side of the road in a clearing. The witness post is back in the clearing. From this post the 0-foot baseline stake is 8 paces away at an azimuth of 195 degrees magnetic.



Map Name: Fairview Lakes

Diagrammatic Sketch

Township 13S, Range SE, Section 9

GPS: NAD 27, UTM 12S 4395472 N 468617 E

## DISCUSSION

### Oak Creek Ridge Aspen - Trend Study No. 16B-13

One of two studies on Oak Creek Ridge, this study samples an aspen community in an area that is thought to be important spring elk range. This Forest Service land is permitted for cattle grazing. The allotment was rested for two seasons following the meadow seeding in 1988. Pellet group frequency data in 1997 and 2002 suggest light use by elk, deer, and cattle. Pellet group transect data collected in 2002 estimated 2 days use/acre for both deer and elk (5 edu/ha and 7 edu/ha) . Cattle use was estimated at 15 days use/acre (36 edu/ha).

The site is on a gentle slope (5-10%) with a northwest aspect and an elevation of 8,900 feet. The soil is relatively deep with few rocks within the profile. Effective rooting depth is estimated at just over 20 inches. Soil texture is a clay with a neutral pH (6.8). Organic matter is prevalent in the rich soil. A humus rich layer extends down to a depth of 4 to 6 inches, followed by a clay horizon which extends down to about 20 inches. Compaction and erosion are not a problem, although gopher activity on the site is significant. Vegetation and litter cover are abundant.

The site samples a mid-aged aspen stand with few seedling or young trees. The population consists of tall, mature trees of which most are unavailable to browsing due to their height. Point quarter data from 2002 estimated 590 trees/acre with an average diameter of 8 inches. Overhead canopy cover averages about 70%. Understory shrubs consist of elderberry and a few snowberry. Elderberry density was estimated at 1,133 plants/acre in 1989, but much less in 1997 and 2002. The change in density is due to the much larger sample used in 1997. This will help give better estimates for species that are characteristically clumped or discontinuous in their distributions. Use in 1997 was moderate to heavy, but light in 2002. Only one snowberry plant was encountered in the shrub density strips.

The dense herbaceous understory is the key component to monitor on this site. Only two species of grass, slender wheatgrass and big mountain brome, were encountered in 1989. The larger sample used in 1997 also encountered some Kentucky bluegrass. Subalpine needlegrass was picked up in the sample in 2002. Mountain brome and slender wheatgrass are the dominant species by far. Subalpine needlegrass occurs in the more open areas. Sum of nested frequency increased for grasses in 2002.

Forbs account for the majority of the vegetative cover on the site and represent the most significant vegetative component. Twenty-five species were encountered in 1997 and 2002. Common species include bedstraw, ballhead waterleaf, sweet anise, tuber starwort, American vetch, western coneflower, and slenderleaf collomia. No utilization was noticed on either grasses or forbs in 2002.

### 1989 APPARENT TREND ASSESSMENT

Data from this study indicate a productive, diverse, and stable community. There is no erosion and soils are stable. There is abundant herbaceous forage. Elk have been in the area all spring and summer, and there is sign of light and dispersed utilization in the aspen type. Proper livestock grazing management must be followed. Elk alone have not caused adverse impacts to the vegetative community in this area.

## 1997 TREND ASSESSMENT

The soil trend is stable with no erosion occurring due to abundant vegetation and litter cover. Little browse is available on this site, but trend for the most abundant understory shrub, elderberry, is stable. Trend for the aspen is stable. However, this is not a particularly healthy aspen stand. Nearly all of the trees are mature with few seedlings and young. Dead trees number 160 per/acre or one out of every 5 aspen trees. Trend for the herbaceous understory is down slightly for grasses but up for forbs. Overall trend is considered up since forbs are the key component on the site for they contribute 87% of the herbaceous understory.

### TREND ASSESSMENT

soil - stable (3)

browse - stable, but limited (3)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Soil trend is stable. Erosion is minimal with the only soil disturbance coming from gopher activity. Trend for browse is stable, but remains limited. There is very little available forage from browse as nearly the entire aspen population is composed of tall trees unavailable to wildlife. Elderberry is scattered infrequently throughout the area. Trend for the herbaceous understory is down due to a 38% decline in sum of nested frequency for perennial forbs. This loss is due to the drought conditions in 2002 and should improve with better precipitation in the future.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

## HERBACEOUS TRENDS --

Herd unit 16B, Study no: 13

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron trachycaulum	141	137	146	58	52	59	2.03	3.86
G	Bromus marginatus	<sub>b</sub> 301	<sub>a</sub> 175	<sub>a</sub> 182	97	66	67	3.23	8.60
G	Poa pratensis	<sub>a</sub> -	<sub>b</sub> 48	<sub>b</sub> 64	-	14	21	.67	1.89
G	Stipa columbiana	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 29	-	-	11	-	.90
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		442	360	421	155	132	158	5.94	15.27
Total for Grasses		442	360	421	155	132	158	5.94	15.27
F	Achillea millefolium	<sub>a</sub> -	<sub>b</sub> 33	<sub>c</sub> 47	-	13	18	1.35	2.78
F	Agoseris glauca	-	8	9	-	4	4	.04	.07
F	Aquilegia spp.	-	-	-	-	-	-	-	.03
F	Aster spp.	<sub>a</sub> -	<sub>b</sub> 16	<sub>a</sub> -	-	6	-	.54	-
F	Chenopodium spp. (a)	-	<sub>b</sub> 15	<sub>a</sub> -	-	6	-	.20	-
F	Cirsium spp.	-	2	-	-	1	-	.15	-
F	Claytonia lanceolata	<sub>a</sub> -	<sub>b</sub> 182	<sub>a</sub> 12	-	70	4	1.44	.07
F	Collomia linearis (a)	-	<sub>b</sub> 15	<sub>a</sub> 138	-	5	53	.22	2.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Cynoglossum officinale</i>	-	-	5	-	-	3	-	.21
F	<i>Descurainia californica</i>	<sub>b</sub> 125	<sub>a</sub> -	<sub>a</sub> -	59	-	-	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 40	-	-	14	-	.29
F	<i>Erigeron eatonii</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 20	-	-	8	-	.98
F	<i>Erigeron</i> spp.	-	-	-	-	-	-	.00	-
F	<i>Eriogonum racemosum</i>	-	-	-	-	-	-	-	.00
F	<i>Fritillaria atropurpurea</i>	<sub>a</sub> -	<sub>b</sub> 22	<sub>a</sub> -	-	7	-	2.68	-
F	<i>Frasera speciosa</i>	-	-	5	-	-	2	-	.01
F	<i>Galium aparine</i> (a)	-	<sub>b</sub> 249	<sub>a</sub> 169	-	75	57	8.15	5.34
F	<i>Hackelia patens</i>	<sub>b</sub> 66	<sub>a</sub> -	<sub>a</sub> -	32	-	-	-	-
F	<i>Hedysarum boreale</i>	-	-	2	-	-	1	-	.03
F	<i>Helenium hoopesii</i>	<sub>a</sub> 9	<sub>b</sub> 39	<sub>b</sub> 46	4	17	22	1.65	3.51
F	<i>Hydrophyllum capitatum</i>	<sub>a</sub> -	<sub>c</sub> 188	<sub>b</sub> 32	-	77	17	4.03	.31
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	-	-	-	.03
F	<i>Madia glomerata</i> (a)	-	<sub>a</sub> 4	<sub>b</sub> 72	-	2	24	.01	.89
F	<i>Mertensia ciliata</i>	<sub>a</sub> -	<sub>b</sub> 13	<sub>a</sub> -	-	5	-	.12	-
F	<i>Medicago sativa</i>	2	-	-	1	-	-	-	-
F	<i>Osmorhiza occidentalis</i>	<sub>a</sub> 60	<sub>a</sub> 60	<sub>b</sub> 89	27	30	38	1.37	2.53
F	<i>Phacelia</i> spp.	-	-	4	-	-	2	-	.15
F	<i>Polygonum douglasii</i> (a)	-	3	-	-	2	-	.01	-
F	<i>Rudbeckia occidentalis</i>	<sub>b</sub> 175	<sub>a</sub> 79	<sub>a</sub> 89	73	41	44	3.59	7.43
F	<i>Senecio serra</i>	4	-	5	2	-	3	.00	.78
F	<i>Stellaria jamesiana</i>	<sub>b</sub> 242	<sub>b</sub> 243	<sub>a</sub> 170	89	78	62	7.25	5.82
F	<i>Taraxacum officinale</i>	<sub>a</sub> 3	<sub>b</sub> 48	<sub>b</sub> 34	2	22	15	.88	1.74
F	<i>Thalictrum fendleri</i>	6	1	-	3	1	-	.03	-
F	Unknown forb-annual (a)	-	11	-	-	4	-	.48	-
F	Unknown forb-perennial	<sub>a</sub> -	<sub>b</sub> 75	<sub>a</sub> -	-	23	-	1.80	-
F	<i>Vaccinium caespitosum</i>	-	3	-	-	2	-	.01	-
F	<i>Vicia americana</i>	<sub>ab</sub> 107	<sub>a</sub> 82	<sub>b</sub> 134	46	34	55	1.31	6.46
F	<i>Viguiera multiflora</i>	<sub>a</sub> 13	<sub>b</sub> 68	<sub>a</sub> 10	6	24	6	.37	.42
F	<i>Viola</i> spp.	<sub>a</sub> 54	<sub>b</sub> 91	<sub>a</sub> 58	28	44	28	1.10	.70
Total for Annual Forbs		0	297	419	0	94	148	9.08	8.56
Total for Perennial Forbs		866	1253	771	372	499	332	29.76	34.10
Total for Forbs		866	1550	1190	372	593	480	38.84	42.66

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Abies concolor	0	0	.00	-
B	Populus tremuloides	31	29	.21	.36
B	Sambucus racemosa	10	2	.18	.03
B	Symphoricarpos oreophilus	1	1	.15	.15
Total for Browse		42	32	0.55	0.53

CANOPY COVER --

Herd unit 16B, Study no: 13

Point-Quarter Tree Data

Species	Percent Cover		Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02	'97	'02
Populus tremuloides	72.6	71	481	590	7.1	8.3

BASIC COVER --

Herd unit 16B, Study no: 13

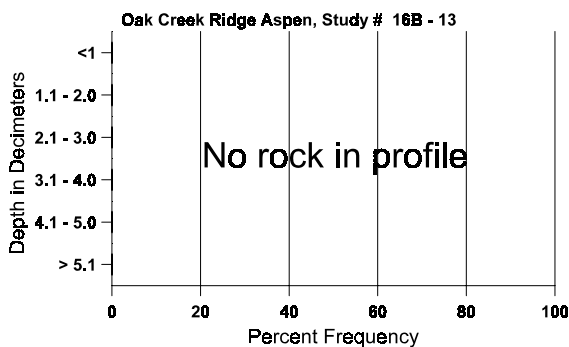
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	383	371	15.25	48.09	56.34
Rock	47	25	.25	.66	.59
Pavement	46	18	0	.10	.05
Litter	389	379	64.50	63.64	53.44
Cryptogams	2	-	0	.00	0
Bare Ground	127	159	20.00	8.44	10.53

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 13, Oak Creek Ridge Aspen

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.1	38.6 (17.7)	6.8	24.0	27.8	48.2	6.7	22.3	182.4	.4

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 13

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Rabbit	3	-	-	-
Grouse	-	1	-	-
Elk	1	1	26	2 (5)
Deer	2	-	35	3 (7)
Cattle	2	4	174	15 (36)

BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 13

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Populus tremuloides																		
S	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	-	-	-	-	-	-	4	-	4	-	-	-	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	11	-	11	-	-	-	366	393	158	11
	97	-	1	-	-	-	-	-	39	-	40	-	-	-	800	-	-	40
	02	-	-	-	-	-	-	-	32	-	32	-	-	-	640	-	-	32
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'89		00%			00%			00%						+38%				
'97		03%			00%			00%						-18%				
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	499	Dec:	-			
												'97	800		-			
												'02	660		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Sambucus racemosa																		
Y	89	21	6	-	-	-	-	-	-	-	27	-	-	-	900		27	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	6	1	-	-	-	-	-	-	-	7	-	-	-	233	79 39	7	
	97	3	5	2	-	-	-	-	-	-	10	-	-	-	200	31 14	10	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15 17	1	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		21%			00%			00%			-79%							
'97		42%			17%			08%			-75%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1133	Dec:	0%			
												'97	240		8%			
												'02	60		0%			
Symphoricarpos oreophilus																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7 12	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	20		-			



Trend Study 16B-14-02

Study site name: Oak Creek Ridge Seeding.

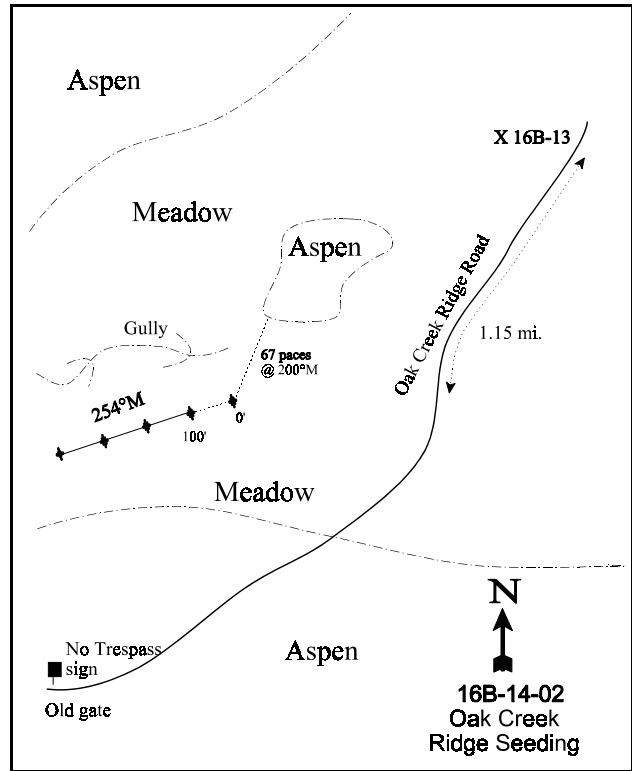
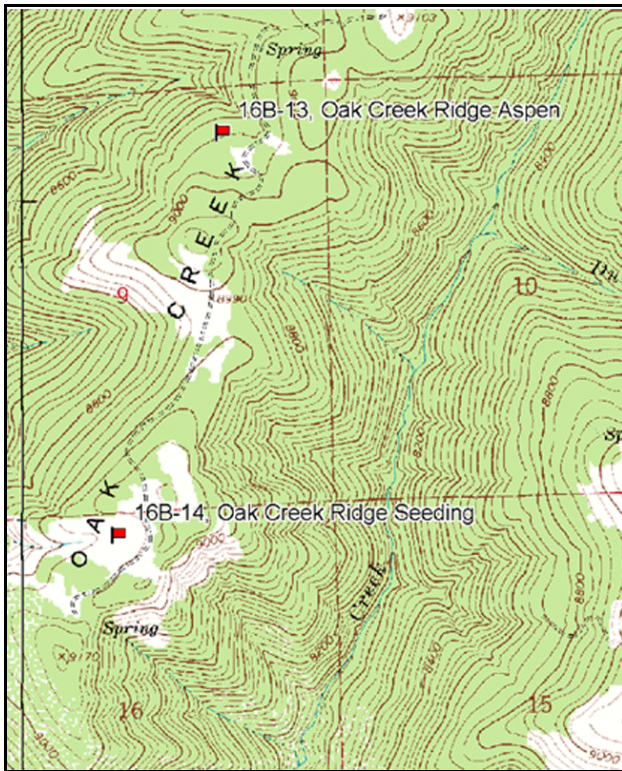
Vegetation type: Dry Meadow.

Compass bearing: frequency baseline 254 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of Highways 91 and 31 in Fairview, take Highway 31 eastward 8.4 miles to Skyline Drive. Go north on Skyline Drive for approximately 6 miles and turn left towards the Dry Creek Stock Driveway. Go 0.35 miles to an intersection, continue straight for mile to the fence marking the boundary of the Oak Creek Ridge Allotment. Drive 2.4 miles to the witness post for study #16B-13. Continue on the main road 1.15 miles to a large meadow. This is the last meadow on the ridge. The 0' baseline stake is about 100 yards into the meadow and is marked by browse tag #9089. (From the edge of the aspen patch the 0-foot baseline stake is 67 paces away at an azimuth of 200 degrees magnetic). Do not confuse the transect with a U.S.F.S. study that runs southwest/northeast and is marked by orange and green fenceposts.



Map Name: Fairview Lakes

Diagrammatic Sketch

Township 13S, Range 5E, Section 16

GPS: NAD 27, UTM 12S 4393904 N 468205 E

## DISCUSSION

### Oak Creek Ridge Seeding - Trend Study No. 16B-14

The Oak Creek Ridge Seeding study samples one of the seeded meadows on Oak Creek Ridge. Located on the end of the ridge, it is the largest seeded meadow and appeared to have better grass establishment than some of the other meadows when first sampled in 1989. Previously, these aspen openings had an abundance of tarweed. These areas were treated in the fall of 1988 to remove the weeds, then seeded. This meadow is also monitored by a Forest Service photo-point transect. The study is on a 5% slope with a westerly aspect and an elevation of 9,050 feet. Pellet group data in 1997 indicated moderately low elk and cattle use, with light use by deer. Pellet group transect data taken in 2002 estimated 2 deer days use/acre (5 ddu/ha) and 7 elk days use/acre (17 edu/ha). Cattle use was fairly high at an estimated 43 days use/acre (106 cdu/ha). A nearby landowner reported that 140 head of cattle used the site for over 90 days in 1996.

Soils are deep with an effective rooting depth of nearly 25 inches. Soil texture is a clay with a slightly acidic pH (6.5). Due to the patchy distribution of the newly seeded grasses and the abundance of annuals, protective ground cover was limited in 1989. Litter was sparse, but basal vegetative cover was moderately high at 13%, leaving 84% bare soil. There were definite signs of erosion across the meadow and down the adjacent gully in 1989. Sheet erosion and small rills occurred on the gentle slope. During the 1997 reading, percent bare ground declined to 42% and litter increased to 12%. Ground cover estimates from the 2002 sample indicate slight increases in both litter and bare ground, but litter remains limited and bare soil is still high. Gopher activity is prominent on the sight. The erosion condition class assessment was determined as stable in 2002. The erosion is minimal due to the gentle terrain.

The meadow is surrounded by mature aspen stands which have an understory of native grasses and coneflower. The browse component in the meadow itself is virtually non-existent with only one mature snowberry plant being sampled in 2002. This area should climatically fall into the tall forb community type. In 1989, the seeded species were not yet well-established. There was ample space for germination and the spread of rhizomatous species. The intermediate wheatgrass that had established were large and robust, while some of the grasses had been recently grazed. In 1997, seeded species were more abundant with sum of nested frequency for grasses doubling. Intermediate wheatgrass, smooth brome, and orchard grass were the dominant species in 1997, combining to produce 97% of the grass cover. In 2002, intermediate wheatgrass significantly increased in nested frequency and increased in cover by nearly ninefold. However, due to drought conditions, smooth brome and orchard grass both significantly declined in sum of nested frequency in 2002. It was noted in 2002 that grasses had good stature and vigor with many individuals producing seed.

Like the nearby Oak Creek Aspen site, forbs are the dominant vegetation type, especially prior to the 2002 drought season. Twenty-five species were encountered in 1997, and 23 in 2002. Forbs produced nearly 30% cover or 75% of the total vegetative cover in 1997. With drought conditions in 2002, forbs remained stable in sum of nested frequency, but their contribution of cover declined by nearly half. The stability in forb frequency during a drought year is very positive. Although forbs are abundant, composition is extremely poor. Tarweed, the reason the meadow was treated to start with, is still abundant. This species increased in frequency between 1989 and 1997, but declined between 1997 and 2002 because of drought. Tarweed is uniformly distributed throughout the site as it was sampled in 98% and 87% of the quadrats in 1997 and 2002 respectively. Cover of tarweed, which accounted for nearly half of the total vegetation cover in 1997, was greatly reduced in 2002 (18% to 3%). Other common species include thistle, pacific aster, and hounds tongue. Seeded forbs are uncommon.

1989 APPARENT TREND ASSESSMENT

Trends appear upward as the seeded grasses are increasing, resulting in additional litter and soil protection. With adequate precipitation and proper grazing management, the grasses should out-compete annual species. Browse is not important to this site and will always be an insignificant component.

1997 TREND ASSESSMENT

The soil trend is up with percent bare ground declining from 84% to 42%. Litter cover has also increased and the herbaceous cover appears to adequately protect the soil from severe erosion. However, the ratio of bare soil to protective ground cover is only 1:2. For good protection, this ratio should be at least 1:3. This should improve with time. Browse are absent and not an important component of this summer range. Trend for the herbaceous understory is up for grasses but down for forbs due to the dominance of tarweed. It currently accounts for nearly half (46%) of the vegetative cover. Overall trend is considered down slightly.

TREND ASSESSMENT

soil - up (5)

browse - absent and not important here (N/A)

herbaceous understory - down slightly and dominated by tarweed (2)

2002 TREND ASSESSMENT

Trend for soil is stable, but soils remain in less than ideal condition with relatively low litter cover and high amounts of bare soil. Erosion is minimal. Browse remains limited on the site, but is not an important component on this high elevation summer range. Trend for the herbaceous understory is considered stable, although composition remains poor. Intermediate wheatgrass is the dominant species by far. With drought conditions, other more mesic grasses such as smooth brome and orchard grass both declined. Sum of nested frequency for forbs remained stable even with drought which is a positive outcome. Perennial forbs on most of the lower elevation studies in the unit declined in 2002 because of the dry conditions. Tarweed significantly declined in frequency as well.

TREND ASSESSMENT

soil - stable (3)

browse - no trend (N/A)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16B, Study no: 14

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	-	-	1	-	-	1	-	.00
G	Agropyron intermedium	<sub>a</sub> 87	<sub>b</sub> 99	256	42	42	85	2.26	19.62
G	Agropyron trachycaulum	<sub>a</sub> -	<sub>b</sub> 12	<sub>c</sub> 54	-	5	25	.22	1.70
G	Bromus carinatus	-	-	4	-	-	2	-	.18
G	Bromus inermis	<sub>a</sub> -	<sub>c</sub> 100	<sub>b</sub> 36	-	40	13	3.39	1.58
G	Bromus japonicus (a)	1	-	-	1	-	-	-	-
G	Bromus spp.	1	2	-	1	1	-	.03	-
G	Dactylis glomerata	<sub>a</sub> -	<sub>c</sub> 116	<sub>b</sub> 25	-	51	11	3.59	.55
G	Lolium perenne	<sub>b</sub> 26	<sub>a</sub> -	<sub>a</sub> -	12	-	-	-	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Phleum pratense</i>	<sub>b</sub> 42	<sub>a</sub> 8	<sub>a</sub> 13	22	4	4	.07	.59
G	<i>Poa pratensis</i>	-	-	3	-	-	1	-	.03
G	<i>Stipa lettermani</i>	-	-	4	-	-	2	-	.18
Total for Annual Grasses		1	0	0	1	0	0	0	0
Total for Perennial Grasses		156	337	396	77	143	144	9.57	24.45
Total for Grasses		157	337	396	78	143	144	9.57	24.45
F	<i>Achillea millefolium</i>	<sub>a</sub> 2	<sub>ab</sub> 6	<sub>b</sub> 12	1	3	5	.33	.86
F	<i>Agoseris glauca</i>	<sub>a</sub> -	<sub>b</sub> 49	<sub>b</sub> 56	-	17	23	.57	1.10
F	<i>Arabis</i> spp.	-	-	4	-	-	2	-	.06
F	<i>Aster chilensis</i>	<sub>a</sub> -	<sub>a</sub> 19	40	-	6	14	1.97	3.32
F	<i>Chenopodium album</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Cirsium undulatum</i>	<sub>a</sub> 1	<sub>c</sub> 124	<sub>b</sub> 66	1	57	33	2.29	.63
F	<i>Claytonia lanceolata</i>	<sub>a</sub> -	<sub>b</sub> 174	<sub>b</sub> 206	-	59	68	1.50	1.97
F	<i>Collomia linearis</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 82	-	-	35	-	.40
F	<i>Cynoglossum officinale</i>	<sub>a</sub> 10	<sub>c</sub> 113	<sub>b</sub> 72	8	54	36	2.35	1.28
F	<i>Descurainia californica</i>	<sub>b</sub> 14	<sub>a</sub> -	<sub>a</sub> -	10	-	-	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 138	-	-	54	-	1.08
F	<i>Epilobium</i> spp.	2	-	-	2	-	-	-	-
F	<i>Eriogonum caespitosum</i>	4	6	-	1	3	-	.16	-
F	<i>Erigeron eatonii</i>	<sub>a</sub> -	<sub>a</sub> 3	<sub>b</sub> 22	-	1	11	.00	.56
F	<i>Eriogonum racemosum</i>	-	-	4	-	-	1	-	.00
F	<i>Galium aparine</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Geranium</i> spp.	-	3	1	-	1	1	.00	.03
F	<i>Hedysarum boreale</i>	6	-	-	3	-	-	-	-
F	<i>Lactuca serriola</i>	8	-	-	4	-	-	-	-
F	<i>Linum lewisii</i>	7	2	1	5	2	1	.16	.06
F	<i>Machaeranthera</i> spp	-	-	3	-	-	1	-	.03
F	<i>Madia glomerata</i> (a)	<sub>a</sub> 25	<sub>c</sub> 363	<sub>b</sub> 262	16	98	87	17.90	3.40
F	<i>Mertensia ciliata</i>	-	3	-	-	1	-	.00	-
F	<i>Melilotus officinalis</i>	<sub>b</sub> 8	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-	-
F	<i>Medicago sativa</i>	-	1	-	-	1	-	.15	-
F	<i>Oenothera flava</i>	<sub>b</sub> 11	<sub>a</sub> 3	<sub>ab</sub> 10	8	1	6	.00	.28
F	<i>Penstemon</i> spp.	-	-	10	-	-	3	.00	.21
F	<i>Polygonum douglasii</i> (a)	-	<sub>b</sub> 81	<sub>a</sub> 5	-	25	2	.27	.01
F	<i>Senecio multilobatus</i>	1	-	-	1	-	-	-	-
F	<i>Stellaria jamesiana</i>	-	2	-	-	2	-	.01	-
F	<i>Taraxacum officinale</i>	-	7	4	-	3	2	.21	.06
F	<i>Tragopogon dubius</i>	1	9	9	1	4	5	.07	.05

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Unknown forb-annual (a)	-	3	-	-	1	-	.15	-
F	Vicia americana	-	12	3	-	4	2	.02	.15
F	Viguiera multiflora	<sub>a</sub> -	<sub>b</sub> 23	<sub>b</sub> 23	-	8	11	.61	.71
F	Viola spp.	<sub>a</sub> 6	<sub>b</sub> 40	<sub>a</sub> 17	5	24	9	.39	.12
Total for Annual Forbs		25	453	487	16	126	178	18.34	4.89
Total for Perennial Forbs		81	599	563	55	251	234	10.85	11.52
Total for Forbs		106	1052	1050	71	377	412	29.19	16.42

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

BROWSE TRENDS --

Herd unit 16B, Study no: 14

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Symphoricarpos oreophilus	0	1	.00	-
Total for Browse		0	1	0.00	0

BASIC COVER --

Herd unit 16B, Study no: 14

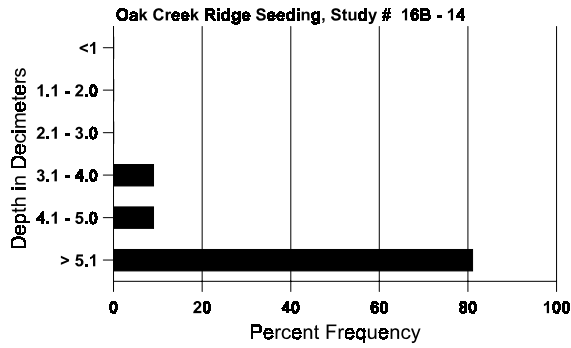
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	384	367	13.25	39.88	41.42
Rock	104	85	1.50	.70	2.25
Pavement	173	133	0	.58	.58
Litter	356	336	1.50	11.58	16.60
Cryptogams	-	-	0	0	0
Bare Ground	366	360	83.75	42.25	53.04

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 14, Oak Creek Ridge Seeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
24.8	47.9 (17.7)	6.5	24.0	32.4	43.6	3.5	35.3	214.4	.4

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16B, Study no: 14

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Elk	12	1	87	7 (17)
Deer	1	2	26	2 (5)
Cattle	9	17	513	43 (106)

## BROWSE CHARACTERISTICS --

Herd unit 16B, Study no: 14

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
Symphoricarpos oreophilus												
M	'89	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	0	-	-	0
	'02	1	-	-	-	-	-	-	20	11	15	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
		'89		00%		00%		00%				
		'97		00%		00%		00%				
		'02		00%		00%		00%				
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	-			
						'97	0		-			
						'02	20		-			

## SUSPENDED STUDIES

Trend Study 16B-7-97

Study site name: East Dairy Fork.

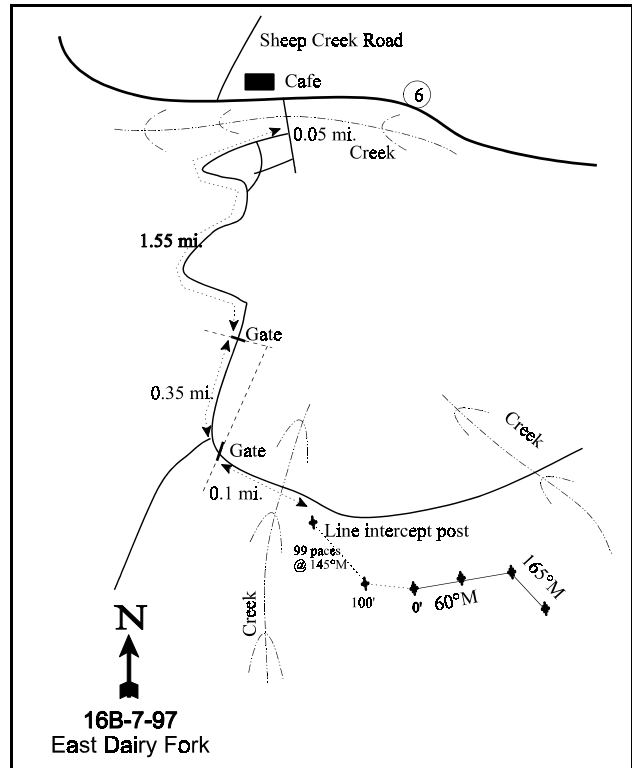
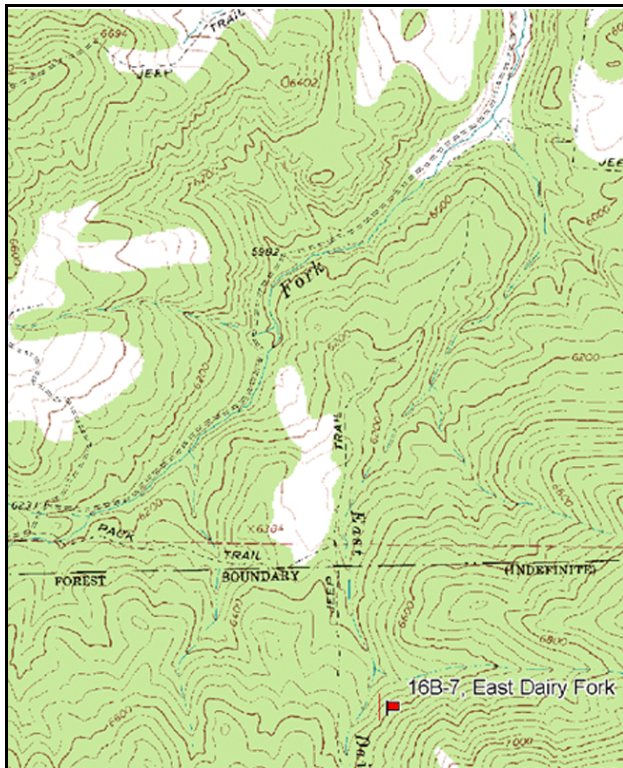
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 276 degrees magnetic (line 2-3 @ 60°M, line 4 @ 165°M).

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

LOCATION DESCRIPTION

Near the Sheep Creek cafe on Highway 6, take Dairy Fork Road on the south side of the highway 0.25 miles to a fork. Stay left on the main road 0.25 miles to another fork. Again, stay left and go 0.5 miles to another fork in the road. Take this side road to the left (east) and go 1.55 miles, crossing the creek and staying to the right at a minor fork less than 0.05 miles after the creek. Here you will encounter a fence/gate. Continue for another 0.35 miles to another fork and gate on the left (east). Take this fork 0.1 miles to the bottom of a wash. Where the road crosses the wash, take an azimuth of 133 degrees magnetic and walk 13 paces to a line intercept stake. From this stake, walk 99 paces at 145 degrees magnetic to the 0-foot baseline stake marked by some wire.



Map Name: Mill Fork

Diagrammatic Sketch

Township 10S, Range 5E, Section not surveyed

GPS: NAD 27, UTM 12S 4420531 N 470792 E



## DISCUSSION

### East Dairy Fork - Trend Study No. 16B-7

\*\*\***SUSPENDED** - This study was not read in 2002. It was evaluated by project personnel and determined that it does not provide an adequate representation of critical big game habitat, and receives very little use by wildlife. A pellet group transect was read in 2002. The site narrative and data tables from the 1997 report are included below.

The East Dairy Fork study samples a mountain brush slope with a prominent overstory of oak, pinyon, and Rocky Mountain juniper. The study is located on National Forest land adjacent to Division land, but may be on a private inholding. Use by big game has been light on the site. Cattle were in the area at the time of study establishment in 1989. Sheep droppings were observed on the site in 1997 and 2002. Pellet group transect data taken in 2002 estimated only 2 elk days use/acre (5 edu/ha) and 11 deer days use/acre (28 ddu/ha). A deer fawn was observed as project personnel walked through the site in 2002.

The study is on a steep, 41% slope with a western aspect. The soil is light colored with a clay texture and a neutral pH (7.2). Phosphorus could be a limiting factor to plant development and growth with only 7.8 ppm found in the soil. A minimum of 10 ppm have been determined necessary for normal plant growth and development. Effective rooting depth is estimated at just over 14 inches. Rock and pavement are concentrated on the surface and produce 21% average cover. Due to the high percentage of rock, pavement, litter, and vegetation cover, bare soil occupies only 4% of the surface. Soils have a moderate erosion potential, but currently erosion is not serious. The drainage channels below the site showed scouring in 1989, however they are less so in 1997. Pedestalling and terracing are common all along the steep slopes.

The site supports a variety of browse species. Overstory species consist of Rocky Mountain juniper, pinyon pine, Gambel oak, and an occasional Douglas fir. Gambel oak is numerous and provides 42% of the total browse cover with an estimated density of 4,660 stems/acre in 1997. Mature plants are tall, averaging nearly 4 feet in height. Important understory shrubs include mountain big sagebrush, true mountain mahogany, and snowberry. Sagebrush are scarce with only 180 plants/acre estimated in 1997. Many of these are decadent with poor vigor yet light use. Snowberry is numerous with an estimated density of 15,999 plants/acre in 1989 and 4,400 in 1997. Almost all of the change in density is due to the much larger sample used in 1997 as there are no dead plants in the population. The new larger sampling design gives more accurate browse density estimates for species that characteristically have clumped or discontinuous distributions like snowberry. Snowberry is mostly mature and unutilized. The most preferred browse on the site is true mountain mahogany, but this species only accounts for 8% of the browse cover. Density was estimated at 1,065 plants/acre in 1989 and 540 in 1997. Mature plants average nearly 3 feet in height. Percent decadence is low and utilization is light to moderate with a few heavily hedged individuals. Use was reported to be heavier in 1989, and a quarter of the population displayed poor vigor. In 1997, some plants showed insect damage, but vigor was normal throughout the population. Percent decadence has declined from 25% in 1989 to only 4% in 1997. The population appears stable with adequate proportion of young plants (25% in 1989 and 7% in 1997).

The herbaceous component is suffering from possible overuse. For this type of site, the grass frequency is low and all grasses combined produce less than 3% cover. Kentucky bluegrass is the most abundant species (an increaser with grazing), accounting for 50% of the grass cover. The only other common species is a sedge (*Carex*). Forbs are fairly diverse and frequency is relatively high, but most are unavailable under the shrub canopy. Common species include timber poison vetch, mat penstemon, short stem wild buckwheat, and American vetch. The limited herbaceous understory contributes little for soil protection.

1989 APPARENT TREND ASSESSMENT

Soils appear to have a downward trend. The herbaceous understory, primarily grasses, is depleted. Trend for the browse component appears more stable.

1997 TREND ASSESSMENT

The soil trend is stable, but is in poor condition. Percent bare ground is low at only 4%, however shrub interspaces continue to erode due to the lack of herbaceous ground cover. The browse trend is up slightly for the most preferred key species, true mountain mahogany. Vigor has improved and percent decadence declined from 25% to 4%. Snowberry, mountain big sagebrush, and Gambel oak are of secondary importance. Trend for the herbaceous understory is down slightly for grasses but up for forbs. Nested frequency of bluebunch wheatgrass is down significantly, while frequency of Kentucky bluegrass is up significantly. Overall, trend is considered up slightly, but very poor.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up for mahogany (4)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Herd unit 16B, Study no: 7

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	
G	Agropyron spicatum	<sub>b</sub> 38	<sub>a</sub> 8	14	5	.07
G	Carex spp.	<sub>a</sub> 17	<sub>b</sub> 31	7	16	.95
G	Oryzopsis hymenoides	<sub>b</sub> 50	<sub>a</sub> 14	24	7	.14
G	Poa fendleriana	<sub>b</sub> 16	<sub>a</sub> -	6	-	-
G	Poa pratensis	<sub>a</sub> 3	<sub>b</sub> 48	2	18	1.42
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 10	-	4	.10
G	Stipa lettermani	-	4	-	1	.15
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		124	115	53	51	2.84
Total for Grasses		124	115	53	51	2.84
F	Achillea millefolium	13	24	5	12	.26
F	Allium spp.	-	6	-	2	.01
F	Arabis spp.	-	3	-	2	.01
F	Artemisia ludoviciana	6	5	2	2	.06
F	Astragalus convallarius	<sub>a</sub> 6	<sub>b</sub> 44	4	23	.62
F	Astragalus spp.	6	12	2	4	.09
F	Astragalus utahensis	-	3	-	2	.03
F	Castilleja linariaefolia	-	2	-	2	.01
F	Calochortus nuttallii	-	4	-	2	.01
F	Chaenactis douglasii	-	3	-	2	.01
F	Cirsium spp.	<sub>b</sub> 16	<sub>a</sub> -	7	-	.18

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	'97
F	<i>Comandra pallida</i>	<sub>a</sub> -	<sub>b</sub> 18	-	8	.35
F	<i>Crepis acuminata</i>	-	1	-	1	.03
F	<i>Cymopterus</i> spp.	-	6	-	2	.01
F	<i>Cynoglossum officinale</i>	-	1	-	1	.00
F	<i>Eriogonum brevicaule</i>	<sub>a</sub> 15	<sub>b</sub> 45	7	21	.60
F	<i>Ipomopsis aggregata</i>	-	3	-	2	.03
F	<i>Lathyrus lanszwertii</i>	-	5	-	4	.08
F	<i>Lupinus</i> spp.	-	5	-	2	.01
F	<i>Machaeranthera canescens</i>	30	39	14	17	.19
F	<i>Penstemon caespitosus</i>	83	97	32	39	.93
F	<i>Penstemon cyananthus</i>	12	9	4	5	.23
F	<i>Phlox longifolia</i>	43	31	21	16	.10
F	<i>Senecio multilobatus</i>	11	5	5	3	.06
F	<i>Stellaria jamesiana</i>	<sub>a</sub> -	<sub>b</sub> 44	-	18	.19
F	<i>Taraxacum officinale</i>	3	-	1	-	-
F	<i>Thalictrum fendleri</i>	8	12	5	5	.39
F	Unknown forb-perennial	7	2	3	1	.00
F	<i>Vicia americana</i>	50	35	27	14	.73
F	<i>Viola</i> spp.	-	3	-	1	.00
Total for Annual Forbs		0	0	0	0	0
Total for Perennial Forbs		309	467	139	213	5.29
Total for Forbs		309	467	139	213	5.29

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

BROWSE TRENDS --  
Herd unit 16B, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Amelanchier utahensis	3	-
B	Artemisia tridentata vaseyana	7	.06
B	Cercocarpus montanus	21	3.56
B	Chrysothamnus nauseosus albicaulis	2	-
B	Chrysothamnus viscidiflorus viscidiflorus	10	.09
B	Juniperus scopulorum	13	12.57
B	Mahonia repens	48	4.49
B	Pachistima myrsinites	1	.03
B	Pinus edulis	3	.15
B	Prunus virginiana	2	.53
B	Pseudotsuga menziesii	1	.03
B	Quercus gambelii	55	18.79
B	Rosa woodsii	6	.45
B	Symphoricarpos oreophilus	66	4.33
B	Tetradymia canescens	2	-
Total for Browse		240	45.10

CANOPY COVER --  
Herd unit 16B , Study no: 7

Species	Percent Cover '97
Cercocarpus montanus	.4
Juniperus scopulorum	16.0
Pinus edulis	.4
Quercus gambelii	20.4

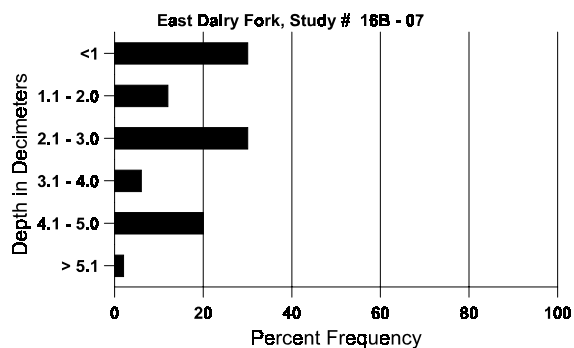
BASIC COVER --  
Herd unit 16B, Study no: 7

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	287	3.50	44.14
Rock	161	6.75	5.15
Pavement	191	17.75	15.89
Litter	377	63.00	54.85
Cryptogams	7	0	.04
Bare Ground	125	9.00	4.32

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 07, East Dairy Fork

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.3	50.2 (17.6)	7.2	22.7	31.1	46.2	3.5	7.8	89.6	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 7

Type	Quaency Frequency
	'97
Rabbit	5
Deer	4

BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 7

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier utahensis																	
S	89	3	-	-	-	-	-	1	-	-	4	-	-	-	266		4
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	4	2	-	3	-	-	2	-	-	11	-	-	733		11	
	97	1	-	-	-	-	-	-	-	-	-	1	-	20		1	
M	89	1	-	-	-	-	-	-	-	-	-	-	1	66	21	6	
	97	2	-	-	-	-	-	-	-	-	-	2	-	40	-	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		17%			00%			08%			-92%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	799	Dec:	-			
											'97	60		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	9	2	-	-	-	-	-	-	-	10	1	-	-	733	25	25	
	97	2	1	-	-	-	-	-	-	-	3	-	-	-	60	23	26	
D	89	17	3	-	-	-	-	-	-	-	18	2	-	-	1333		20	
	97	4	-	-	-	-	-	-	-	-	1	-	-	3	80		4	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		16%			00%			00%			-92%							
'97		11%			00%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2132	Dec:	63%				
											'97	180		44%				
<i>Cercocarpus montanus</i>																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	1	1	-	-	-	-	-	-	4	-	-	-	266		4	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	2	5	-	1	-	-	-	-	5	-	3	-	533	25	21	
	97	9	9	1	2	3	-	-	-	-	18	6	-	-	480	35	34	
D	89	2	2	-	-	-	-	-	-	-	3	-	1	-	266		4	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		38%			38%			25%			-49%							
'97		48%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1065	Dec:	25%				
											'97	540		4%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	17	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	80		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266	14	12	4
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200	6	9	10
D	89	15	-	-	1	-	-	-	-	-	16	-	-	-	1066			16
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-79%							
'97		00%			00%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1332	Dec:	80%			
												'97	280		7%			
<i>Juniperus scopulorum</i>																		
S	89	3	-	-	2	-	-	-	-	-	5	-	-	-	333		5	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	59	22	1
	97	5	3	-	-	-	-	1	-	-	6	-	-	3	180	-	-	9
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 4%							
'97		19%			00%			19%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	332	Dec:	-			
												'97	320		-			
<i>Mahonia repens</i>																		
S	89	21	-	-	-	-	-	6	-	-	27	-	-	-	1800		27	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	89	132	-	-	14	-	-	10	-	-	156	-	-	-	10400		156	
	97	75	-	-	-	-	-	-	-	-	75	-	-	-	1500		75	
M	89	37	-	-	29	-	-	24	-	-	90	-	-	-	6000	7	7	90
	97	670	-	-	-	-	-	1	-	-	646	25	-	-	13420	4	5	671
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	16400	Dec:	-			
												'97	14920		-			
<i>Pachistima myrsinites</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40	7	6	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Pinus edulis</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			
<i>Prunus virginiana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	3	-	-	-	-	-	-	-	-	2	1	-	-	60	31	47	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			
<i>Pseudotsuga menziesii</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	-	-	-	-	-	1	-	-	-	1	-	-	-	20	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			



A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Quercus gambelii</b>																	
S	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66		1
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180		9
Y	89	14	-	-	6	-	-	8	-	-	28	-	-	-	1866		28
	97	31	4	-	7	-	-	-	-	-	42	-	-	-	840		42
M	89	19	1	-	8	-	-	-	-	-	28	-	-	-	1866	101 31	28
	97	171	7	-	-	-	-	10	-	-	184	4	-	-	3760	42 26	188
D	89	1	-	-	-	-	-	-	1	-	1	-	1	-	133		2
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	740		37
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		02%			00%			02%			+17%						
'97		05%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	3865	Dec:	3%			
											'97	4660		1%			
<b>Rosa woodsii</b>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	17	-	-	-	-	-	-	-	-	17	-	-	-	340	20 18	17
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	380		-			
<b>Symphoricarpos oreophilus</b>																	
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2
	97	11	-	-	-	-	-	-	-	-	11	-	-	-	220		11
Y	89	43	-	-	3	-	-	3	-	-	49	-	-	-	3266		49
	97	60	-	-	-	-	-	-	-	-	60	-	-	-	1200		60
M	89	125	-	-	40	-	-	14	-	-	112	-	67	-	11933	15 14	179
	97	127	-	-	32	-	-	-	-	-	159	-	-	-	3180	14 16	159
D	89	11	-	-	1	-	-	-	-	-	4	-	8	-	800		12
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			31%			-72%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	15999	Dec:	5%			
											'97	4400		0%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	2	-	-	-	-	-	-	-	-	-	-	-	2	40	7	8	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			

Trend Study 16B-12-97

Study site name: Oak Creek.

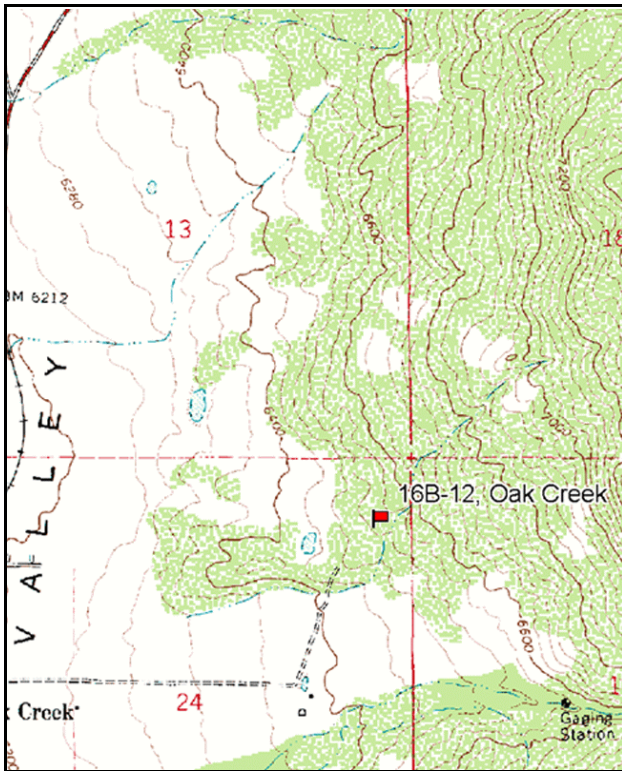
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 174 degrees magnetic (line 3 @ 142°M).

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

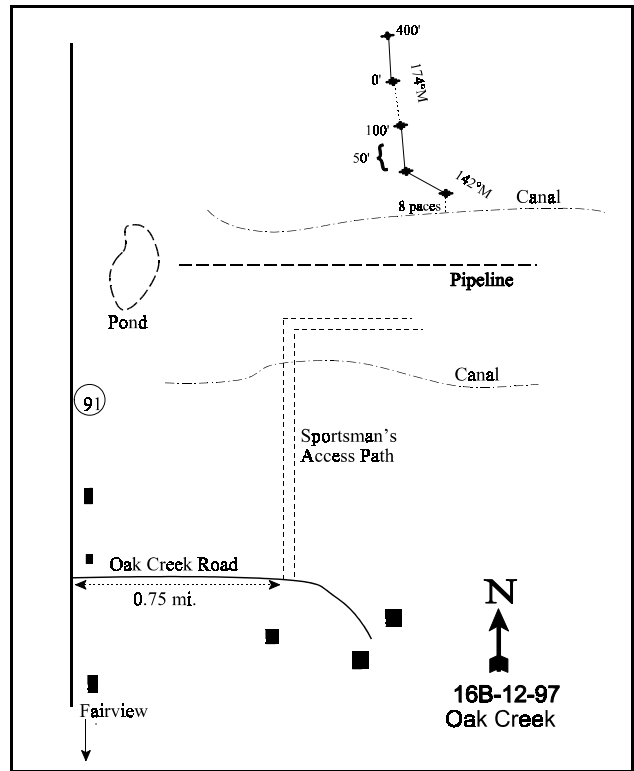
LOCATION DESCRIPTION

From Walkers Food and Fuel in Fairview, take SR-91 (Milburn Road) 2.8 miles. Turn right (east) on 27500 North which is also known as Oak Creek Road. Go 0.75 miles and stop at the locked gate/sportsmen's access route. From here, walk north between the fences, across the canal to the top of the hill where the fenced path turns and goes east. From this corner, walk 55 paces eastward along the path to a clump of oak brush next to the fence on the north side. At this point there is a red steel fence post 7 paces north of the fence which marks the beginning of the old line intercept transect. From this post, walk north crossing the canal. Eight paces past the canal is the 300-foot post.



Map Name: Fairview

Township 13S, Range 4E, Section 24



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4392077 N 464331 E

## DISCUSSION

### Oak Creek - Trend Study No. 16B-12

**\*\*\*SUSPENDED** - This study was not read in 2002. A pellet group transect was read in 2002 to determine use by wildlife and livestock. It was evaluated by project personnel and will likely be suspended in the future because it samples mostly thermal and escape cover. Very little forage for big game is found in the vicinity, and this site acts mostly as a travel corridor for big game moving to and from better wintering habitat. Data tables and the site narrative are included below from the 1997 report. This study would be a good candidate for treatment, it's value for big game would be greatly enhanced.

The original site at Oak Creek was a line-intercept transect established in 1978. It was mostly destroyed by pipeline construction and a new trend study was established nearby in the same juniper/mountain brush type in 1989. The area receives year-round deer use with some elk sign also encountered. This private land did not appear to be grazed by domestic livestock with any regularity in 1989. Some livestock use in the form of cattle, sheep, and horses was evident in 1997. Pellet group transect data collected in 2002 estimated 41 deer days use/acre (101 ddu/ha) and 5 elk days use/acre (12 edu/ha). Wildlife likely use this area as thermal cover during the winter and forage in nearby alfalfa fields.

The site is nearly level with a south-southwest aspect and an elevation of 6,500 feet. Soil depth is variable on the site with an effective rooting depth that averages almost 13 inches. Soil texture is a clay loam with a neutral pH (7.3). The soil is rocky with pavement concentrated in the bare shrub interspaces. The top soil is easily disturbed and soil movement is noticeable, yet erosion is localized due to the gentle terrain. Litter cover is relatively high (averaging 60%), but is usually associated with the shrubs and trees.

The overstory is comprised of juniper and oakbrush. They respectively account for 37% and 52% of the shrub cover. Density estimates of the mature juniper trees using point-quarter data is 253 per acre in 1997. Shrub density strip data estimated that nearly half of the population is made up of seedlings or young. Gambel oak grows in a variety of heights. Mature oak averaged nearly 4 feet in height in 1997. Density changed from 2,499 stems/acre in 1989 to 6,020 in 1997. This change is reflective of the much larger sample size used in 1997 which better estimates shrub densities which often have aggregated and/or discontinuous distributions. Where oak and juniper occur, there is litter cover and some grasses. Between trees, the ground is bare of cover.

The key understory browse species are bitterbrush and true mountain mahogany. Currently, the bitterbrush has an estimated density of 440 plants/acre with 82% being classified as mature. There are prostrate low growing forms that average only 14 inches in height. However, they have an average crown of 48 inches. Utilization was moderate to heavy in 1989, although light to moderate use was noted in 1997. Vigor is generally good and percent decadence low at 13%. The less common mountain mahogany, numbered only 20 young plants/acre in 1997. Mature plants were not encountered in the sample in 1997, but measured only for height and crown. Both species are moderately hedged. They have good vigor except when under the spreading oakbrush clones.

Grasses are scarce, although a fair stand of Kentucky bluegrass (moderately shade tolerant and an increaser with grazing) was found under the oak. However, it provides little available forage. All grasses combined produce only 2% cover. Forbs are also scarce, yet 18 species were identified. Only the small longleaf phlox are very abundant.

### 1989 APPARENT TREND ASSESSMENT

Even with all the bare interspaces, erosion is not excessive due to the gentle slope. The soil appear stable. Due to the increasing oak and juniper, browse trend looks to be declining. Another negative factor is the depleted understory.

## 1997 TREND ASSESSMENT

The soil trend is stable but in poor condition. Soil movement is noticeable but moderated by the lack of slope. Oak and juniper are increasing their dominance of the site and trend is down slightly for the more desirable understory species like bitterbrush. Overall trend for browse on this winter range is down slightly. Trend for the herbaceous understory is down for perennial grasses and up slightly for perennial forbs. Overall trend is considered down slightly and in poor condition because they combine for only 3% cover.

### TREND ASSESSMENT

soil - stable, but poor (3)

browse - down slightly with the increasing dominance of juniper and oakbrush (2)

herbaceous understory - down slightly and in poor condition (2)

### HERBACEOUS TRENDS --

Herd unit 16B, Study no: 12

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	
G	Agropyron smithii	<sub>b</sub> 29	<sub>a</sub> 8	13	6	.05
G	Agropyron spicatum	3	9	2	4	.04
G	Bromus tectorum (a)	-	47	-	17	.13
G	Carex spp.	-	6	-	4	.25
G	Oryzopsis hymenoides	<sub>b</sub> 38	<sub>a</sub> 17	17	8	.19
G	Poa pratensis	<sub>b</sub> 141	<sub>a</sub> 75	57	30	1.10
G	Poa secunda	-	5	-	3	.04
G	Sitanion hystrix	14	18	9	8	.26
Total for Annual Grasses		0	47	0	17	0.13
Total for Perennial Grasses		225	138	98	63	1.95
Total for Grasses		225	185	98	80	2.08
F	Achillea millefolium	2	8	1	3	.04
F	Arabis spp.	5	1	3	1	.00
F	Artemisia ludoviciana	-	3	-	1	.00
F	Astragalus convallarius	4	11	3	7	.11
F	Chaenactis douglasii	<sub>a</sub> 1	<sub>b</sub> 13	1	6	.10
F	Cirsium spp.	1	-	1	-	-
F	Cryptantha spp.	2	8	2	3	.06
F	Cymopterus longipes	-	3	-	1	.00
F	Cynoglossum officinale	1	-	1	-	-
F	Epilobium brachycarpum (a)	-	3	-	1	.00
F	Erysimum spp.	-	-	-	-	.00
F	Hackelia patens	3	8	2	4	.02
F	Microsteris gracilis (a)	-	10	-	5	.02
F	Oenothera spp.	-	2	-	1	.03
F	Penstemon spp.	-	2	-	2	.03
F	Phlox longifolia	46	54	24	20	.25

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	'97
F	<i>Polygonum douglasii</i> (a)	-	1	-	1	.00
F	<i>Ranunculus testiculatus</i> (a)	-	11	-	6	.05
F	<i>Senecio multilobatus</i>	5	-	3	-	-
F	<i>Streptanthus cordatus</i>	8	10	4	4	.19
F	<i>Taraxacum officinale</i>	-	3	-	2	.01
F	<i>Veronica biloba</i> (a)	-	45	-	20	.17
Total for Annual Forbs		0	70	0	33	0.26
Total for Perennial Forbs		78	126	45	55	0.88
Total for Forbs		78	196	45	88	1.15

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

#### BROWSE TRENDS --

Herd unit 16B, Study no: 12

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	<i>Artemisia tridentata vaseyana</i>	4	.15
B	<i>Cercocarpus montanus</i>	1	.00
B	<i>Juniperus osteosperma</i>	24	16.18
B	<i>Pinus edulis</i>	2	.63
B	<i>Purshia tridentata</i>	12	3.96
B	<i>Quercus gambelii</i>	62	22.93
B	<i>Rosa woodsii</i>	1	-
B	<i>Symphoricarpos oreophilus</i>	2	.15
Total for Browse		108	44.02

#### CANOPY COVER --

Herd unit 16B, Study no: 12

Species	Percent Cover
	'97
<i>Juniperus osteosperma</i>	8.8
<i>Quercus gambelii</i>	10.8

#### Point-Quarter Tree Data

Trees per Acre	Average diameter (in)
'97	'97
253	6.0
-	-

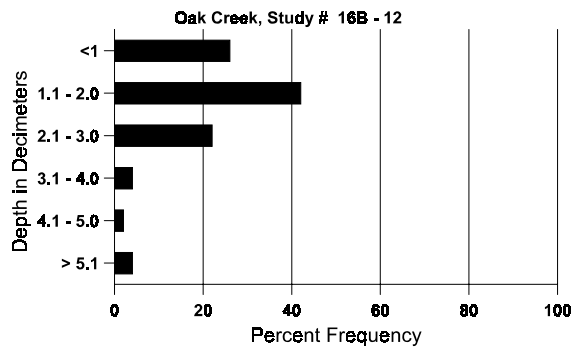
BASIC COVER --  
Herd unit 16B, Study no: 12

Cover Type	Nested Frequency	Average Cover %	
	'97	'89	'97
Vegetation	253	3.00	45.22
Rock	75	1.75	1.26
Pavement	135	11.75	5.31
Litter	379	63.00	60.33
Cryptogams	36	.75	1.39
Bare Ground	178	19.75	15.09

SOIL ANALYSIS DATA --  
Herd Unit 16B, Study no: 12, Oak Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.6	57.6 (13.9)	7.3	41.7	26.1	32.2	2.8	7.8	60.8	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16B, Study no: 12

Type	Quaency Frequency
	'97
Sheep	1
Rabbit	12
Elk	4
Deer	9
Cattle	1

BROWSE CHARACTERISTICS --  
Herd unit 16B, Study no: 12

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	1	-	-	-	-	-	-	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	2	-	-	-	-	-	-	-	-	60	29	32	3	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	1	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		20%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	100		20%			
<i>Cercocarpus montanus</i>																		
Y	89	1	1	-	-	1	-	-	-	-	-	-	-	3	-	-	-	3
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
M	89	-	1	1	-	-	-	-	-	-	-	-	-	2	-	-	-	2
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	25	47	0	
D	89	-	1	-	-	-	-	-	-	-	-	-	-	33			1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		67%			17%			17%			-90%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	17%			
												'97	20		0%			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Juniperus osteosperma</b>																		
S	89	-	-	-	1	-	-	1	-	-	2	-	-	-	66		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	7	-	-	2	-	-	1	-	-	10	-	-	-	333		10	
	97	9	-	-	-	-	-	1	-	-	10	-	-	-	200		10	
M	89	3	-	-	-	-	-	-	2	-	5	-	-	-	166	128	79	5
	97	9	1	-	-	-	-	6	1	-	17	-	-	-	340	-	-	17
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+ 8%							
'97		04%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	499	Dec:	-				
											'97	540		-				
<b>Pinus edulis</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
<b>Purshia tridentata</b>																		
Y	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	15	2	-	-	-	-	-	-	16	-	1	-	566	10	23	17
	97	1	7	-	-	10	-	-	-	-	18	-	-	-	360	14	47	18
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	1	-	-	2	-	-	-	-	2	-	-	1	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		80%			10%			05%			-34%							
'97		91%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	665	Dec:	10%				
											'97	440		14%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Quercus gambelii</i>																		
S	89	2	-	-	1	-	-	4	-	-	7	-	-	-	233			7
	97	4	-	-	3	-	-	-	-	-	7	-	-	-	140			7
Y	89	12	16	-	4	-	-	-	-	-	19	12	1	-	1066			32
	97	70	-	-	3	-	-	-	-	-	73	-	-	-	1460			73
M	89	4	7	1	-	6	-	-	-	-	11	7	-	-	600	58	28	18
	97	209	-	-	8	-	-	4	-	-	221	-	-	-	4420	40	35	221
D	89	13	8	-	-	4	-	-	-	-	3	22	-	-	833			25
	97	7	-	-	-	-	-	-	-	-	6	-	-	1	140			7
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	880			44
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		55%			01%			01%			+58%							
'97		00%			00%			.33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2499	Dec:	33%				
											'97	6020		2%				
<i>Rhus trilobata</i>																		
D	89	-	2	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	100%				
											'97	0		0%				
<i>Rosa woodsii</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
<i>Symphoricarpos oreophilus</i>																		
Y	89	8	-	-	-	-	-	-	-	-	3	5	-	-	266			8
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	3	-	-	-	-	-	3	-	-	-	60	-	-	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-70%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	266	Dec:	-				
											'97	80		-				

## SUMMARY

### WILDLIFE MANAGEMENT UNIT 16B - MANTI-NEBO, MANTI NORTH

Trend studies in this management unit were established in 1989 and reread in 1997 and 2002. Two studies, East Dairy Fork (16B-7) and Oak Creek (16B-12) were not sampled in 2002. The studies in this unit primarily monitor sagebrush, mountain brush, and chained pinyon-juniper communities.

Unit wide vegetation trends during the 2002 reading include changes in both the browse component as well as the herbaceous understory. Browse trends were stable on 7 sites, downward on 3 sites, and upward on 1 site in 2002. The key browse on some studies, especially those where big sagebrush is present, showed increases in decadence and poor vigor. Herbaceous understory trends were downward on 8 sites and stable on 4 sites. The major change occurring with herbaceous species was the reduction in perennial forbs. All 12 studies that were sampled in 2002 showed decreases in the sum of nested frequency for perennial forbs. Perennial grasses remained stable or increased in nested frequency on 7 sites, and decreased on 5 sites. Annual species showed mixed trends as far as increases/decreases are concerned. The number of herbaceous species sampled also declined on many sites in 2002. The loss of abundance and number of species sampled in 2002 is a direct result of the drought conditions experienced in 2001 and 2002.

Precipitation, both the annual total and seasonal distribution, plays an important role in vegetation trends. Data from two weather stations within the boundaries of unit 16B, Fairview 8N and Scofield-Skyland Mine, was summarized for precipitation patterns over the past two decades. Both stations show normal or above-normal annual precipitation during the early to mid 1980's, followed by below normal annual precipitation during the late 1980's and into the early 1990's. Annual totals were again normal or above normal until the current drought cycle began during the past few years. Seasonal distribution of precipitation (spring vs. fall) may have a bigger impact on vegetation trends than total annual precipitation does. Analysis of the weather station data showed that spring precipitation was below normal at both locations from 2000-2002. Spring precipitation is essential in order for cool season perennial species to be able to germinate and be productive. Below normal spring precipitation for three consecutive seasons prior to the 2002 sample helps explain the downward herbaceous understory trends on the majority of the studies in unit 16B. As explained in the site narratives, all of the studies in this unit showed a decrease in sum of nested frequency for perennial forbs in 2002. Also, increases in percent decadence, reduced vigor, and low reproduction in shrub populations can result from dry periods.

A summary table of the trends follows.

Trend Summary

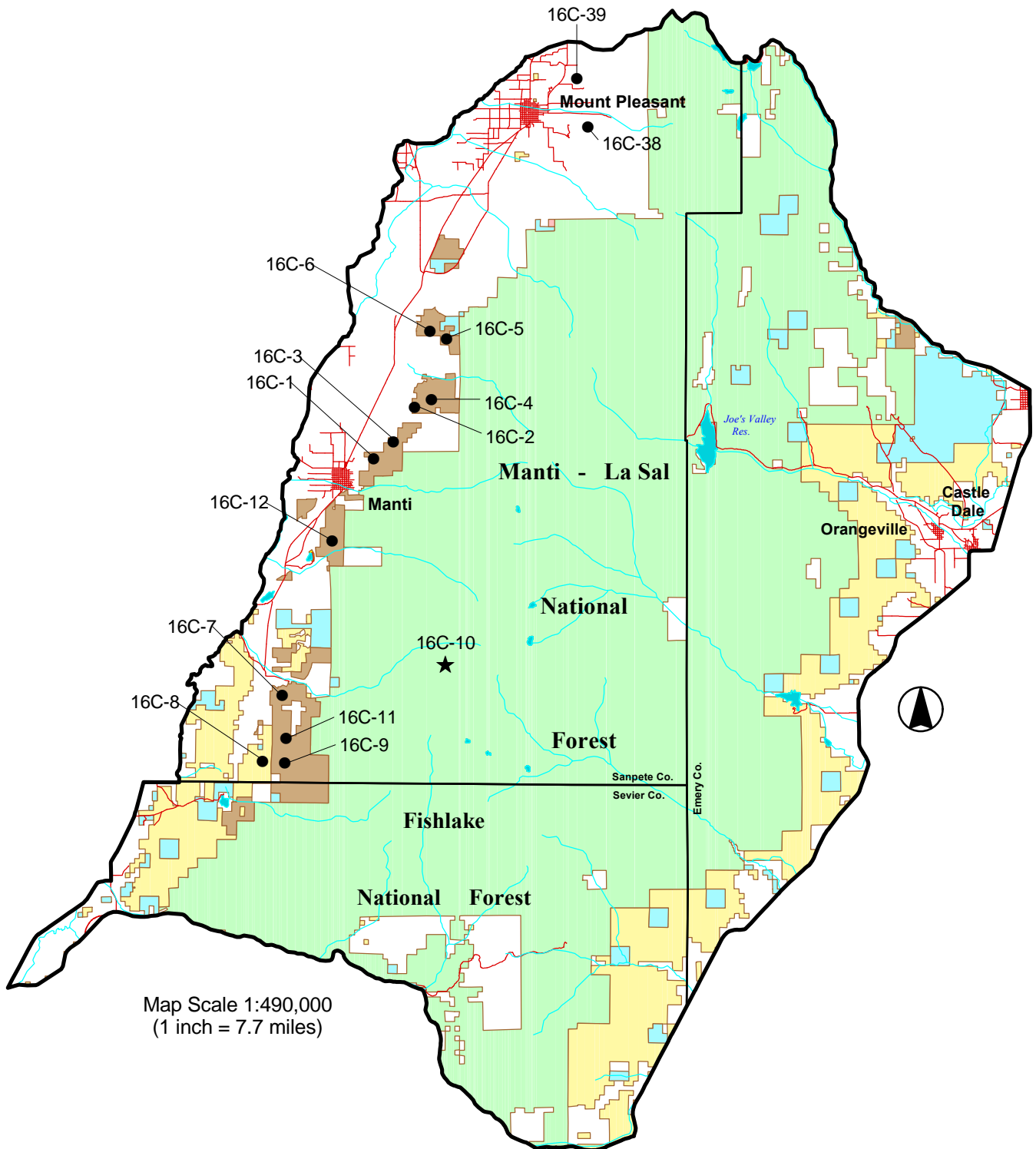
	Category	1989	1997	2002
16B-1 Long Ridge South	soil	est	4	3
	browse	est	2	2
	herbaceous understory	est	4	2
16B-2 Long Ridge North	soil	est	3	3
	browse	est	4	3
	herbaceous understory	est	4	1
16B-3 Rocky Hollow	soil	est	3	3
	browse	est	3	3
	herbaceous understory	est	4	2
16B-4 Dry Creek Chaining	soil	est	2	2
	browse	est	3	2
	herbaceous understory	est	1	1
16B-5 Jackson Unit	soil	est	4	3
	browse	est	2	3
	herbaceous understory	est	3	2
16B-6 Mill Fork	soil	est	3	3
	browse	est	5	3
	herbaceous understory	est	3	2
	Category	1989	1999	2002
16B-8 Starvation Mahogany	soil	est	3	3
	browse	est	3	3
	herbaceous understory	est	3	3
16B-9 Starvation Mountain Brush	soil	est	2	2
	browse	est	3	3
	herbaceous understory	est	4	3

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up  
 (est) = established, (n/a) = no trend, (susp) = suspended













	Category	1989	1997	2002
16B-10 Dairy Fork Burn	soil	est	3	3
	browse	est	5	4
	herbaceous understory	est	5	2
16B-11 Hilltop	soil	est	1	2
	browse	est	2	2
	herbaceous understory	est	3	2
16B-13 Oak Creek Ridge Aspen	soil	est	3	3
	browse	est	3	3
	herbaceous understory	est	5	1
16B-14 Oak Creek Ridge Seeding	soil	est	5	3
	browse	est	n/a	n/a
	herbaceous understory	est	2	3
<b>SUSPENDED STUDIES</b>				
16B-7 East Dairy Fork	soil	est	3	susp
	browse	est	4	susp
	herbaceous understory	est	4	susp
16B-12 Oak Creek	soil	est	3	susp
	browse	est	2	susp
	herbaceous understory	est	2	susp

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up  
(est) = established, (n/a) = no trend, (susp) = suspended

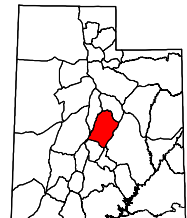
# Management Unit 16C



Map Scale 1:490,000  
(1 inch = 7.7 miles)

- |  |   |   |
|--|---|---|
|  Forest Service         |  Military        |  Transect Location |
|  BLM                    |  Water Body      |  Suspended Site    |
|  State of Utah          |  County Boundary |   |
|  Private Land           |  Road            |   |
|  State Wildlife Reserve |  Water Course    |   |

Unit Location



## WILDLIFE MANAGEMENT UNIT 16 - MANTI-NEBO

### SUBUNIT 16C - MANTI-NEBO, 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 Huntington and beginning point.

#### Management Unit Description

Management Unit 16C covers both the east and west slopes of the Wasatch Plateau that lie within the above listed unit boundaries. The western portion of this unit was monitored in 2002 which includes the areas from Fairview south to about Mayfield. The east side of this management unit is monitored as part of the Southeastern Region rotation that was last read in 1999, and will be reread in 2004. The range trend studies on the west portion of management unit 16C monitor several chained and seeded pinyon-juniper sites in the foothill ranges above Ephraim, Manti, and Mayfield. Additional studies monitor the mountain brush and sagebrush-grass types, as well as a high elevation meadow. These studies were established in 1989 and reread in 1997 and 2002.

As with management unit 16B, the availability of winter range and it's condition and productivity have always been an issue on these important deer herd units in central Utah. Due to location and access, a large number of hunters use these units, and they continue to contribute an important portion of the yearly statewide deer harvest. A large portion of the critical winter range in subunit 16C is found along highway corridors or adjacent to agricultural areas. As a result, two issues facing wildlife managers in this unit are crop depredation and highway mortality. In recent years, there have been increasing problems with elk that winter to the east of Highway 89 between Mt. Pleasant and Ephraim. Several mature bulls have been hit by vehicles during winter months over the past several years. Many of the range trend studies monitor Division owned lands (WMA's) in this unit that were purchased to try to minimize the effects of these two factors on wildlife herds. Habitat management objectives for this unit include the following: working with federal agencies, local governments, and private landowner's to achieve long term habitat protection and preservation; carrying out habitat improvements such as reseeding, controlled burns, and water developments; and providing long-term habitat quantity and quality sufficient to maintain wildlife population objectives.

A narrative of each trend study in this management unit, including maps and data tables follows. A discussion of unit-wide trends as well as a trend summary is included at the end of the site narratives.

Trend Study 16C-1-02

Study site name: Manti Face Chaining.

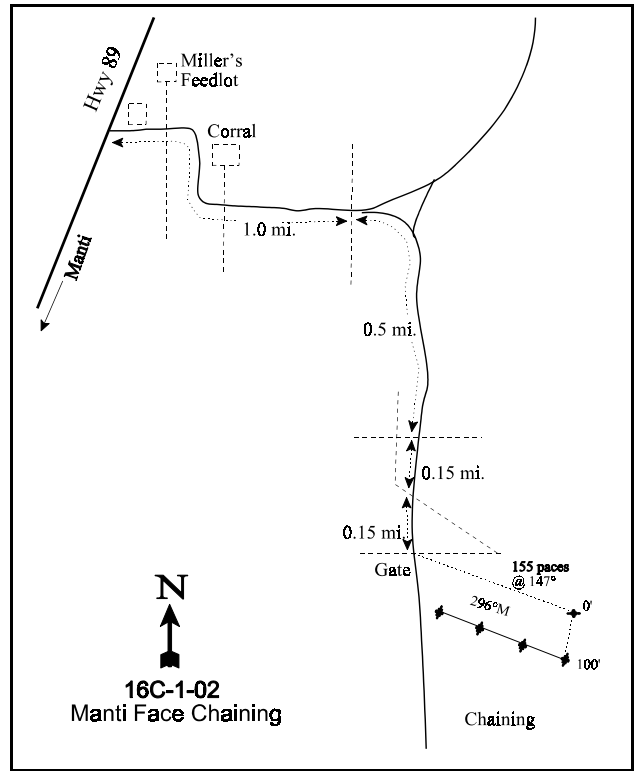
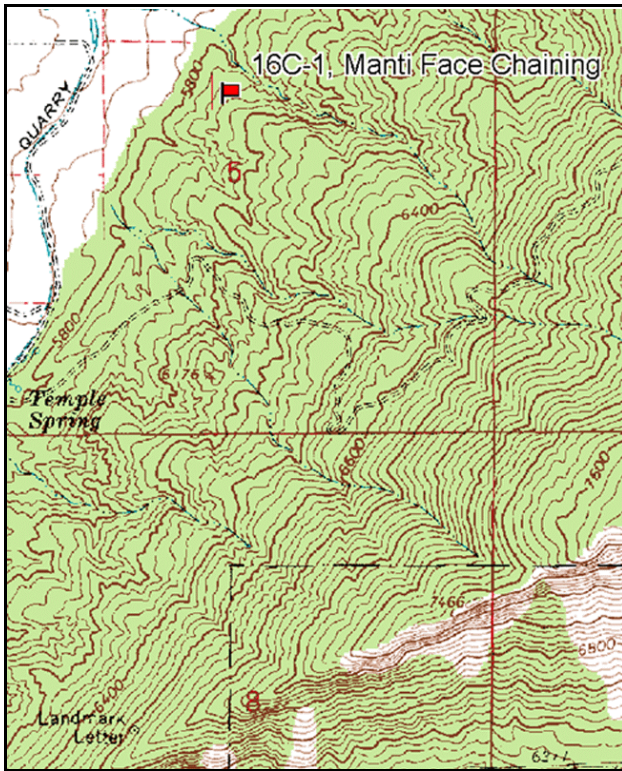
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 192 degrees magnetic (line 2-4 @ 296°M).

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

LOCATION DESCRIPTION

Go north out of Manti on Highway 89 about 1 mile or so to a feedlot on the right (east) side of the road. Turn right on south side of these corrals. Go up this county road 1 mile, following the main road around the upper corrals, to an old fence line. Just past the fence, bear right off the main road onto a faint road. Follow this road 0.5 miles to the first DWR fence. Go through this small section of DWR land 0.15 miles to another fence. Go 0.15 miles to another DWR fence. Stop at this gate. From here, the study site is up the hill in the chaining. Walk 155 paces at 139 degrees magnetic to the 0-foot baseline stake, which is marked by browse tag #9043.



Map Name: Ephraim

Diagrammatic Sketch

Township 18S, Range 3E, Section 5

GPS: NAD 27, UTM 12S 4347798 N 447717 E



## DISCUSSION

### Manti Face Chaining - Trend Study No. 16C-1

The Manti Face Chaining study is located on Division property northeast of Manti. The study is on a moderately steep (28%), west facing slope at an elevation of 5,800 feet. This site was placed on one of the many chainings along the Ephraim/Manti front that are adjacent to cultivated fields. Because the project was done when chainings were treated as large rectangular areas, protective cover is lacking on the treated area and there is limited sign of deer and elk use. Pellet group transect data taken in 2002 estimated 63 deer days use/acre (155 ddu/ha), less than 1 elk day use/acre (2 edu/ha), and 2 cow days use/acre (5 cdu/ha). A few sheep pellet groups were also sampled in the transect. Since this property is not normally grazed by livestock, the cow and sheep pellets are apparently from trespass animals.

Soils on the site are clay loam in texture and neutral to slightly alkaline in reactivity (pH = 7.3). Soils are reported to be somewhat excessively drained. Effective rooting depth is moderately low at less than 10 inches. Rock and pavement are abundant on the surface and throughout the profile. Rock and pavement combined to cover nearly 34% of the soil surface in 1997 and 2002. Bare soil was low at 15% in 2002. Litter cover is low, but well distributed over the site. The ratio of protective ground cover to bare soil is good at 3:1. Soils have a high erosion hazard due to rapid runoff, a major factor why this site was chained. Considering this, soil condition has improved since the treatment. An erosion condition class assessment done in 2002 indicated that it was in stable condition.

There is limited browse forage available on the chaining, and seeded species are relatively uncommon. A few large and robust four-wing saltbush occur on the site, along with an occasional small bitterbrush found within the planting rows left by seed dribblers. Both species have good vigor and show moderate utilization. The small native black sagebrush have a slightly increasing population due to a high proportion of young plants in the population in 1997 (48%) and 2002 (62%). Density of black sagebrush was estimated at 500 plants/acre in 1997 and 680 plants/acre in 2002. Utilization on black sagebrush is mostly light and vigor is normal in the majority of the population. Annual growth averaged about 1.4 inches on black sagebrush in 2002.

During the initial sampling in 1989, surviving juniper appeared to be rapidly increasing in size in the treated area. Point-center quarter density data from 2002 estimated 118 juniper trees/acre and 21 pinyon trees/acre. The population of broom snakeweed was abundant in 1989, but has steadily declined with continuing drought on the site since to an estimated 540 plants/acre in 2002.

As with most chainings, grasses are the dominant component in the community. Both seeded and native species are abundant including several species of wheatgrass (crested, intermediate, and bluebunch) and Sandberg bluegrass. These four species provided 79% of the total grass cover in 1997, increasing to 96% in 2002. All four of these species remained at stable frequencies between 1997 and 2002. Less abundant species include Indian ricegrass, sheep fescue, and bottlebrush squirreltail. Due to drought conditions in 2002, grass identification was difficult due to minimal production and seedhead development. Most of the understory biomass was dried up when the site was read in July 2002. Forbs are limited on this site with annual species being more abundant than perennials. With the drought in 2002, both annual and perennial species declined in sum of nested frequency. Seeded species such as alfalfa and small burnet were not sampled in 2002. Bur buttercup, a weed that has allelopathic characteristics, was the single most abundant species in 1997 and 2002.

### 1989 APPARENT TREND ASSESSMENT

For deer winter range, browse is lacking. The productive herbaceous vegetation provides attractive green-up in the spring and good forage for elk. It is clearly an improvement from pre-treatment conditions, and should continue to be productive in terms of grass. To meet management objectives, the browse component needs to improve. Soils appear to be improving due to increasing vegetation cover and the build-up of some litter.

## 1997 TREND ASSESSMENT

Even though percent bare soil has increased to 13%, it is still relatively low for a chained pinyon-juniper site. Ninety percent of the total vegetative cover is contributed by herbaceous species. Trend for soil is considered stable. The browse component is still quite low as it makes up less than 10% of the total vegetative cover on the site. Juniper provides the majority of the woody cover that is present with preferred species being almost nonexistent. Browse trend is stable, but contributes little browse for wintering big game. The herbaceous understory is stable. Sum of nested frequency values are stable for perennial grasses and forbs, although the abundance of bur buttercup has drastically increased since 1989 as well.

### TREND ASSESSMENT

soil - stable (3)

browse - stable, but preferred species are limited (3)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soils is stable. Ground cover characteristics remain stable and erosion is minimal. Browse remains limited on this site, but trend is stable. Black sagebrush slightly increased in density and has a high recruitment rate. Four-wing saltbush and bitterbrush have low densities, good vigor, and moderate use. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses slightly declined overall, but the four most abundant species all remained stable. Perennial forbs are insignificant, and bur buttercup significantly decreased in nested frequency. Although trend is stable for the herbaceous component, this site looked very poor when it was read in 2002. Drought limited production and seedhead development.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## HERBACEOUS TRENDS --

Herd unit 16C, Study no: 1

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 125	<sub>b</sub> 182	<sub>b</sub> 216	51	71	73	5.77	10.67
G	Agropyron intermedium	118	128	101	44	51	35	4.05	3.20
G	Agropyron spicatum	47	43	64	19	15	24	1.23	5.36
G	Bromus inermis	1	-	-	1	-	-	-	-
G	Bromus japonicus (a)	-	5	-	-	2	-	.15	-
G	Bromus tectorum (a)	-	<sub>b</sub> 81	<sub>a</sub> 14	-	30	6	.71	.05
G	Elymus junceus	<sub>a</sub> 18	<sub>b</sub> 26	<sub>a</sub> -	10	10	-	1.39	-
G	Festuca ovina	21	14	16	10	6	7	.25	.91
G	Oryzopsis hymenoides	1	6	-	1	2	-	.41	-
G	Poa secunda	129	158	137	50	59	53	1.60	1.41
G	Sitanion hystrix	<sub>b</sub> 130	<sub>a</sub> 28	<sub>a</sub> 7	63	13	4	.39	.07
Total for Annual Grasses		0	86	14	0	32	6	0.87	0.05
Total for Perennial Grasses		590	585	541	249	227	196	15.11	21.64
Total for Grasses		590	671	555	249	259	202	15.98	21.69

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Alyssum alyssoides</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Arabis</i> spp.	1	-	-	1	-	-	-	-
F	<i>Arenaria fendleri</i>	-	3	-	-	1	-	.00	-
F	<i>Astragalus</i> spp.	3	-	-	1	-	-	-	-
F	<i>Camelina microcarpa</i> (a)	-	<sub>b</sub> 31	<sub>a</sub> -	-	13	-	.09	-
F	<i>Chaenactis douglasii</i>	-	6	-	-	2	-	.01	-
F	<i>Chenopodium fremontii</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Chorispota tenella</i> (a)	-	3	-	-	1	-	.03	-
F	<i>Convolvulus arvensis</i>	<sub>a</sub> -	<sub>b</sub> 13	<sub>ab</sub> 11	-	6	4	.40	.07
F	<i>Collinsia parviflora</i> (a)	-	-	1	-	-	1	-	.00
F	<i>Cryptantha</i> spp.	<sub>b</sub> 14	<sub>b</sub> 21	<sub>a</sub> -	9	11	-	.22	-
F	<i>Descurainia pinnata</i> (a)	-	<sub>b</sub> 14	<sub>a</sub> -	-	7	-	.03	-
F	<i>Draba</i> spp. (a)	-	3	-	-	1	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Galium aparine</i> (a)	-	1	-	-	1	-	.00	-
F	<i>Lappula occidentalis</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Lactuca serriola</i>	3	3	-	1	1	-	.00	-
F	<i>Medicago sativa</i>	<sub>b</sub> 23	<sub>b</sub> 12	<sub>a</sub> -	11	6	-	.29	-
F	<i>Penstemon pachyphyllus</i>	3	-	-	1	-	-	-	-
F	<i>Phlox hoodii</i>	7	8	1	4	3	1	.04	.03
F	<i>Phlox longifolia</i>	-	-	1	-	-	1	-	.00
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>b</sub> 297	<sub>a</sub> 131	-	91	49	3.84	.46
F	<i>Sanguisorba minor</i>	8	-	-	4	-	-	-	-
F	<i>Sisymbrium</i> spp. (a)	7	-	-	3	-	-	-	-
F	<i>Streptanthus cordatus</i>	3	1	-	1	1	-	.00	-
F	<i>Taraxacum officinale</i>	-	-	3	-	-	1	-	.00
F	<i>Tragopogon dubius</i>	<sub>b</sub> 19	<sub>ab</sub> 14	<sub>a</sub> 1	9	8	1	.07	.00
Total for Annual Forbs		7	355	132	3	118	50	4.02	0.47
Total for Perennial Forbs		84	81	17	42	39	8	1.05	0.11
Total for Forbs		91	436	149	45	157	58	5.08	0.58

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

BROWSE TRENDS --

Herd unit 16C, Study no: 1

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia nova	12	7	.03	.15
B	Atriplex canescens	2	2	-	-
B	Ephedra viridis	2	1	.03	.00
B	Gutierrezia sarothrae	2	7	.09	.33
B	Juniperus osteosperma	11	11	2.03	2.55
B	Purshia tridentata	2	3	.03	.00
Total for Browse		31	31	2.22	3.05

CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 1

Species	Percent Cover	
	'97	'02
Artemisia nova	-	.42
Gutierrezia sarothrae	-	.08
Juniperus osteosperma	-	1.33

Key Browse Annual Leader Growth

Herd unit 16C , Study no: 1

Species	Average leader growth (in)
	'02
Artemisia nova	1.4

Point-Quarter Tree Data

Herd unit 16C , Study no: 1

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	183	118	1.5	1.8
Pinus edulis	6	21	2.1	1.3

BASIC COVER --

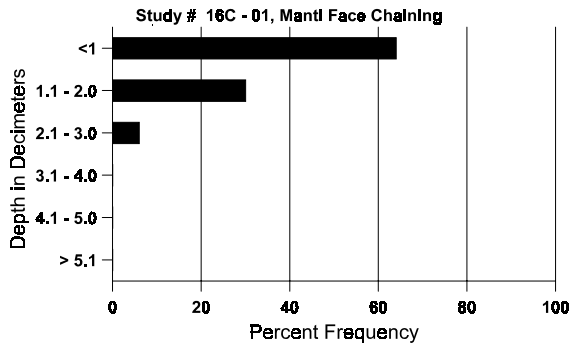
Herd unit 16C, Study no: 1

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	357	323	13.50	28.21	25.92
Rock	258	261	7.00	7.33	8.05
Pavement	330	328	47.00	26.63	25.63
Litter	381	368	25.25	31.50	34.34
Cryptogams	67	122	.25	.55	3.27
Bare Ground	263	261	7.00	13.08	15.64

SOIL ANALYSIS DATA --  
 Herd Unit 16C, Study no: 01, Manti Face Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.6	59.8 (12.4)	7.3	38.0	34.4	26.6	3.3	9.2	150.4	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 16C, Study no: 1

Type	Quadrat Frequency	
	'97	'02
Sheep	-	-
Rabbit	17	27
Elk	23	5
Deer	36	54
Cattle	1	-

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
17	1 (3)
-	-
9	1 (2)
82	63 (155)
26	2 (5)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 1

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia nova																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	-	1	1	-	-	-	-	-	-	2	-	-	-	66		2	
	97	11	1	-	-	-	-	-	-	12	-	-	-	240		12		
	02	21	-	-	-	-	-	-	-	21	-	-	-	420		21		
M	89	14	3	-	-	-	-	1	-	17	1	-	-	600	7	13	18	
	97	8	5	-	-	-	-	-	-	13	-	-	-	260	12	20	13	
	02	-	7	4	-	-	-	-	-	11	-	-	-	220	11	20	11	
D	89	4	-	1	-	-	-	-	-	2	-	2	1	166		5		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	1	1	-	-	-	-	-	-	1	-	-	1	40		2		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	60		3		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		16%			08%			12%			-40%							
'97		24%			00%			00%			+26%							
'02		24%			12%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	832	Dec:	20%				
											'97	500		0%				
											'02	680		6%				
Atriplex canescens																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	1	1	-	-	-	-	-	2	-	-	-	40	38	61	2	
	02	1	1	-	-	-	-	-	-	2	-	-	-	40	46	62	2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		50%			50%			00%			+ 0%							
'02		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
											'02	40		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>									
M	89	-	-	-	-	-	-	0	
	97	-	-	-	-	-	-	0	
	02	-	-	-	-	-	-	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
	'89	00%		00%		00%			
	'97	00%		00%		00%			
	'02	00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	-
						'97	0		-
						'02	0		-
<i>Ephedra viridis</i>									
Y	89	-	-	-	-	-	-	0	
	97	1	-	-	-	-	-	20	
	02	-	-	-	-	-	-	0	
M	89	-	-	-	-	-	-	0	
	97	-	-	1	-	-	-	20	
	02	-	-	-	-	-	-	0	
D	89	-	-	-	-	-	-	0	
	97	-	-	-	-	-	-	0	
	02	1	-	-	-	-	-	20	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
	'89	00%		00%		00%			
	'97	00%		50%		00%		-50%	
	'02	00%		00%		100%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	0%
						'97	40		0%
						'02	20		100%

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<b>Gutierrezia sarothrae</b>												
S	89	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	0		0	
Y	89	5	-	-	-	-	-	-	166		5	
	97	22	-	-	-	-	-	-	440		22	
	02	-	-	-	-	-	-	-	0		0	
M	89	40	-	-	-	-	-	-	1333	7 10	40	
	97	13	-	-	-	-	-	-	260	9 9	13	
	02	21	-	-	-	-	-	-	420	6 7	21	
D	89	8	-	-	-	-	-	-	266		8	
	97	-	-	-	-	-	-	-	0		0	
	02	6	-	-	-	-	-	-	120		6	
X	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	120		6	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		06%		-60%				
'97		00%		00%		00%		-23%				
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	1765	Dec:	15%
									'97	700		0%
									'02	540		22%
<b>Juniperus osteosperma</b>												
S	89	5	-	-	-	-	-	-	166		5	
	97	2	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	0		0	
Y	89	8	-	-	1	-	-	-	300		9	
	97	7	-	-	-	-	-	-	140		7	
	02	3	-	-	-	-	-	-	60		3	
M	89	4	-	-	-	-	-	-	133	54 44	4	
	97	2	1	-	2	-	-	-	100	15 35	5	
	02	7	1	-	-	-	-	1	180	- -	9	
D	89	1	-	-	-	-	-	-	33		1	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	120		6	
	02	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		07%		-48%				
'97		08%		00%		00%		+ 0%				
'02		08%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	466	Dec:	7%
									'97	240		0%
									'02	240		0%



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Pinus edulis																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	0		-				
											'02	0		-				
Purshia tridentata																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	1	-	-	-	-	-	-	2	-	-	-	40	6	14	2
	02	-	-	1	-	-	1	-	-	-	2	-	-	-	40	6	20	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		50%			50%			00%			+33%							
'02		00%			67%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
											'02	60		-				

Trend Study 16C-2-02

Study site name: Willow Creek .

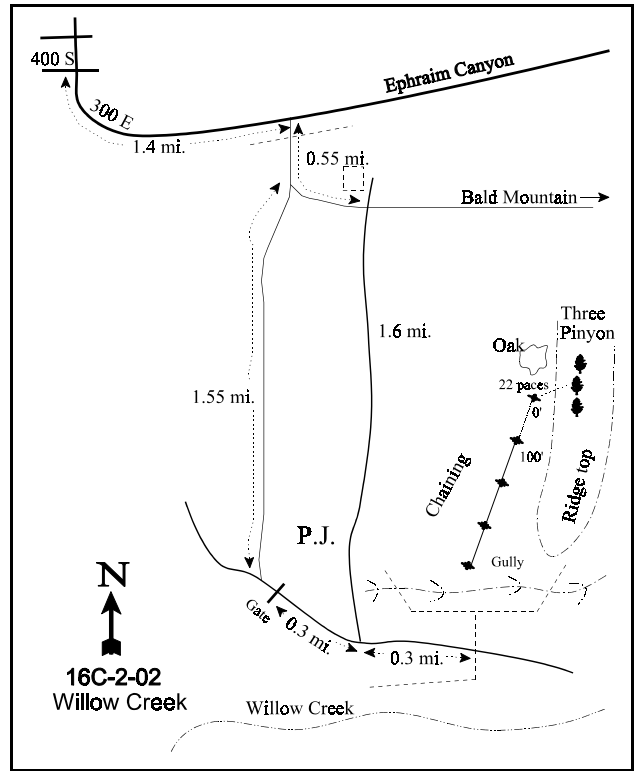
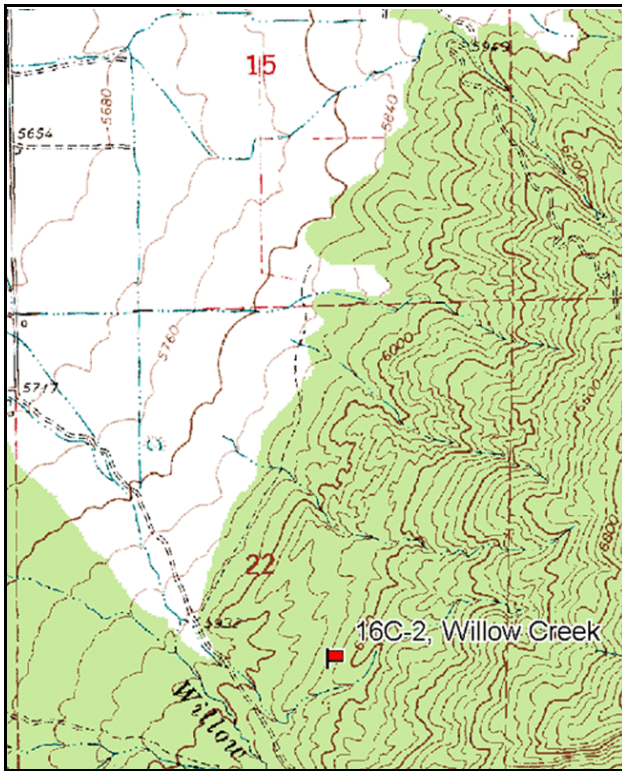
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 210 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of 400 South and 300 East in Ephraim, take 300 East south for 1.4 miles (making a 90° turn) to the Bald Mountain Road (look at map for alternate route). Take the Bald Mountain Road south and east for 0.55 miles to an intersection. Turn south and go 1.6 miles along the foothills to an intersection just north of Willow Creek. Turn left (east) and go 0.3 miles to a fence corner on the left side of the road. Park here. Cross the fence and the gully and go up the white shale ridge to the northeast (30-35 degrees magnetic). From the gully, go about 188 paces to a high point on the ridge where 3 large pinyons grow. Enroute you will pass the 400-foot stake which is near the ridge top. The 0-foot baseline stake, however, is 22 paces downhill from the 3 pinyons just south of an oak clump. The 0-foot stake is marked by browse tag #414. Consult diagrammatic sketch below for alternate route.



Map Name: Ephraim

Diagrammatic Sketch

Township 17S, Range 3E, Section 22

GPS: NAD 27, UTM 12S 4352135 N 451189 E

## DISCUSSION

### Willow Creek - Trend Study No. 16C-2

The Willow Creek study is located within a chaining on the lower slopes of Bald Mountain, southeast of Ephraim. The study site slopes to the west on a moderately steep slope (35%). Elevation is 6,150 feet. This transect lies inside the 700 acre Bald Mountain chaining and seeding treatment that was completed in 1969. This site was done to demonstrate that chaining could be done successfully on steep slopes. Sheep graze surrounding parcels of land and some trespass occurs on this piece of Division land, but overall, livestock use is light. There is abundant sign of wintering big game, especially deer. Deer pellets were sampled in over half of the quadrats in both 1997 and 2002. Pellet group transect data collected in 2002 estimated 174 deer days use/acre (430 ddu/ha) and 8 elk days use/acre (20 edu/ha). The amount of deer use on this site is one of the highest in the unit. Thermal cover is abundant around the site, and there is a better preferred browse component compared to most of the other chainings in the area.

Soils are a well-drained, shallow, shaley clay loam of the Atepic-Badland Association. The substratum is a layer of very strongly calcareous shaley silty clay loam. Runoff is usually rapid and the hazard from erosion is severe. It is classified as an Upland Shallow Shale (Juniper-Pinyon) range site. Moderately large patches of bare soil can be found on the surface, and rock-pavement cover is moderately high as well. Bare soil increased from 19% in 1997 to 32% in 2002. Rock and pavement combine for just over 21% of the soil surface in 2002. Litter is moderately low for a chaining at 33%. With drought in 2002, the ratio of protective ground cover to bare soil declined from 3:1 to 2.4:1. An erosion condition class assessment completed in 2002 determined it to be susceptible to slight erosion. Some gullying and sheet erosion are normal for this soil type.

Browse diversity on this study is higher than what is normally found on most chainings. Although the most numerous species are less desirable species such as broom snakeweed, low rabbitbrush, and pinyon-juniper, there are a significant number of valuable winter browse species. The most common preferred forage browse is bitterbrush, numbering an estimated 640 plants/acre in 2002. Age class of the bitterbrush population is composed mostly of mature plants, with reproduction from young plants being moderately low at 6% in 2002. Utilization has been moderate to heavy in all years, but vigor has been generally good. Decadency increased from 0% in 1997 to 16% in 2002. Leader growth on bitterbrush plants averaged just over 3 inches in 2002.

True mountain mahogany is the second most abundant preferred browse with an estimated density of 300 plants/acre in 2002, a decline from 420 plants/acre in 1997. The decline is the result in the loss of the young age class which numbered 100 plants/acre in 1997. As with bitterbrush, mahogany shows moderate to heavy use, normal vigor, and a slight increase in decadency (0% to 13%). Increased decadency and low reproduction are normal occurrences during periods of drought. Leader growth on mahogany averaged 1.8 inches in 2002. Less abundant palatable browse include mountain big sagebrush, white-stemmed rubber rabbitbrush, cliffrose, green ephedra, and serviceberry. Due to low densities and high deer use, most of these less abundant species displayed moderate to heavy use in 2002.

Scattered clumps of oakbrush and a moderate stand of pinyon-juniper occur throughout the area. Point-center quarter data estimated 109 juniper trees/acre and 69 pinyon trees/acre in 2002. Most of the trees are smaller as stem diameters average less than 3 inches for both species.

Grasses are abundant and diverse. Seeded species, especially the wheatgrass's and wildrye, dominate the understory. Sum of nested frequency for perennial grasses has slowly, but steadily decreased since the initial sample taken in 1989. The decline in 2002 is due in part to drought conditions. Cheatgrass is present on the site, but is being held in check by the abundance of competitive perennials. Forbs have been limited in all readings, but especially so in 2002 with drought. Bur buttercup was moderately abundant in 1997, but significantly declined in 2002. Alfalfa, which was seeded at the time of treatment, has remained on the site

although it is only occasionally sampled. The herbaceous component on this study looked considerably better than that on study 16C-1, Mayfield Mountain Face, during the drought year of 2002.

#### 1989 APPARENT TREND ASSESSMENT

This chaining hardly looks 20 years old as release of juniper and pinyon has been slow. There is a vigorous, diverse stand of browse and also a fairly productive herbaceous understory. Overall, the site appears to have a stable trend with a desirable mix of vegetation. Considering the soil limitations of this site, the seeding was quite successful and a beneficial conversion from a predominately juniper community. However, the soil trend appears to be down due to continued erosion.

#### 1997 TREND ASSESSMENT

The trend for soil is now improving with a noticeable decline in bare soil for the site. Litter cover declined in 1997, but 56% of the total vegetative cover comes from herbaceous species which are effective at protecting soils from high intensity summer storms. There is a good mixture of shrubs, although the preferred species contribute only about half of the total browse cover. The two most abundant preferred species are bitterbrush and true mountain mahogany, with both showing improving trends. The trend for the herbaceous understory is stable. Perennial grass sum of nested frequency has remained fairly stable. The abundance of bur buttercup, an allelopathic winter annual, is the most negative part of the herbaceous understory.

##### TREND ASSESSMENT

soil - slightly up (4)

browse - up (5)

herbaceous understory - stable (3)

#### 2002 TREND ASSESSMENT

Trend for soil is slightly down. Percent bare soil increased to 32%, resulting in a decrease in the ratio of protective cover to bare soil. Erosion is not severe, but is ongoing as evidenced by pedestalling around bunchgrasses. Trend for browse is slightly down. Bitterbrush and true mountain mahogany have slightly increased decadence, low reproduction, and slightly declining densities. Utilization is heavy on both species as winter deer use is high on this site. Trend for the herbaceous understory is stable. Although the sum of nested frequency for perennial grasses declined by 9% overall, the most abundant species remained stable. Perennial forbs declined due to drought conditions, but they were infrequent prior to the 2002 reading. Composition remains dominated by perennial grasses.

##### TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 2

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron cristatum</i>	<sub>b</sub> 190	<sub>a</sub> 116	<sub>a</sub> 119	78	48	49	4.50	5.72
G	<i>Agropyron intermedium</i>	<sub>b</sub> 159	<sub>ab</sub> 122	<sub>a</sub> 87	60	46	35	2.95	1.27
G	<i>Agropyron spicatum</i>	20	32	35	7	15	15	2.37	2.14
G	<i>Bromus inermis</i>	8	9	4	4	4	2	.04	.16
G	<i>Bromus tectorum</i> (a)	-	<sub>b</sub> 92	<sub>a</sub> 12	-	31	4	1.39	.02
G	<i>Elymus junceus</i>	17	9	18	9	5	8	.90	1.17
G	<i>Festuca ovina</i>	<sub>ab</sub> 40	<sub>a</sub> 35	<sub>b</sub> 64	17	15	25	1.71	3.81
G	<i>Oryzopsis hymenoides</i>	<sub>a</sub> 6	<sub>b</sub> 37	<sub>a</sub> 12	3	17	4	.65	.25
G	<i>Poa secunda</i>	<sub>a</sub> 31	<sub>b</sub> 84	<sub>b</sub> 66	13	32	27	1.50	.84
G	<i>Sitanion hystrix</i>	-	2	-	-	1	-	.01	-
Total for Annual Grasses		0	92	12	0	31	4	1.39	0.01
Total for Perennial Grasses		471	446	405	191	183	165	14.66	15.40
Total for Grasses		471	538	417	191	214	169	16.05	15.42
F	<i>Agoseris glauca</i>	-	3	-	-	1	-	.03	-
F	<i>Alyssum alyssoides</i> (a)	-	<sub>b</sub> 118	<sub>a</sub> 1	-	49	1	.34	.00
F	<i>Astragalus utahensis</i>	<sub>a</sub> -	<sub>b</sub> 13	<sub>ab</sub> 1	-	5	1	.34	.03
F	<i>Balsamorhiza sagittata</i>	-	5	-	-	3	-	.02	-
F	<i>Camelina microcarpa</i> (a)	-	6	-	-	2	-	.01	-
F	<i>Chaenactis douglasii</i>	-	8	-	-	4	-	.02	-
F	<i>Cirsium</i> spp.	1	-	-	1	-	-	-	-
F	<i>Convolvulus arvensis</i>	3	8	-	1	3	-	.06	.00
F	<i>Cryptantha</i> spp.	-	4	-	-	2	-	.18	-
F	<i>Cymopterus</i> spp.	-	2	-	-	1	-	.00	-
F	<i>Descurainia pinnata</i> (a)	-	4	-	-	2	-	.01	-
F	<i>Machaeranthera canescens</i>	-	4	-	-	2	-	.06	-
F	<i>Medicago sativa</i>	<sub>b</sub> 33	<sub>a</sub> 16	<sub>a</sub> 12	14	7	5	.78	.15
F	<i>Microsteris gracilis</i> (a)	-	9	-	-	4	-	.02	-
F	<i>Petradoria pumila</i>	-	1	-	-	1	-	.03	-
F	<i>Phlox hoodii</i>	4	9	6	2	3	2	.18	.15
F	<i>Phlox longifolia</i>	3	6	12	1	3	6	.01	.08
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>b</sub> 183	<sub>a</sub> 23	-	65	8	1.70	.04
F	<i>Tragopogon dubius</i>	-	5	1	-	2	1	.06	.00
Total for Annual Forbs		0	320	24	0	122	9	2.08	0.04
Total for Perennial Forbs		44	84	32	19	37	15	1.79	0.42
Total for Forbs		44	404	56	19	159	24	3.88	0.46

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier utahensis	1	1	.03	.15
B	Artemisia tridentata vaseyana	3	2	.03	-
B	Cercocarpus montanus	18	14	.93	.54
B	Chrysothamnus nauseosus albicaulis	5	5	.81	.38
B	Chrysothamnus viscidiflorus stenophyllus	23	26	.76	1.10
B	Cowania mexicana stansburiana	1	1	-	-
B	Eriogonum microthecum	1	2	.03	.03
B	Gutierrezia sarothrae	9	12	.06	.21
B	Juniperus osteosperma	9	9	4.97	4.35
B	Opuntia spp.	4	2	.15	.03
B	Pinus edulis	5	7	1.99	3.33
B	Purshia tridentata	30	28	5.79	3.56
B	Quercus gambelii	1	1	.00	-
Total for Browse		110	110	15.58	13.71

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16C, Study no: 2

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.17
Cercocarpus montanus	-	1.08
Chrysothamnus nauseosus hololeucus	-	.33
Chrysothamnus viscidiflorus	-	3.00
Eriogonum microthecum	-	.17
Gutierrezia sarothrae	-	.25
Juniperus osteosperma	3.8	6.92
Opuntia spp.	-	.05
Pinus edulis	.6	3.83
Purshia tridentata	-	3.67
Rhus trilobata	-	.50

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 2

Species	Average leader growth (in) '02
Cercocarpus montanus	1.8
Purshia tridentata	3.1

Point-Quarter Tree Data  
Herd unit 16C , Study no: 2

Species	Trees per Acre '02	Average diameter (in) '02
Juniperus osteosperma	109	2.5
Pinus edulis	69	2.7

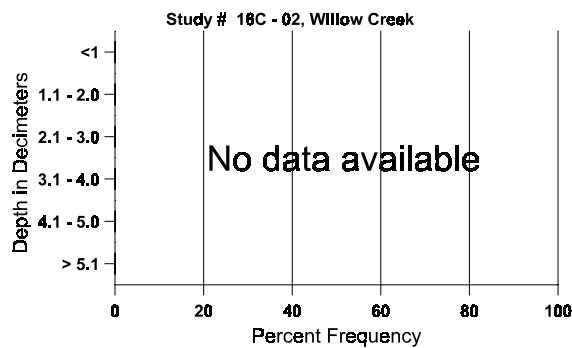
BASIC COVER --  
Herd unit 16C, Study no: 2

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	329	267	8.00	33.14	29.02
Rock	160	167	9.00	6.12	7.28
Pavement	234	266	8.00	10.93	14.11
Litter	370	375	47.25	33.43	33.65
Cryptogams	82	47	0	1.17	1.71
Bare Ground	254	283	27.75	19.32	32.48

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 02, Willow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.9	59.0 (14.9)	7.4	48.0	25.4	26.6	7.4	9.2	150.4	.5

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 2

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Rabbit	19	9	-	-
Elk	8	5	104	8 (20)
Deer	56	54	2262	174 (430)
Cattle	-	1	-	-

BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 2

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
<i>Amelanchier utahensis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	13	17	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	17	0
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	13	18	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+ 0%							
'97		100%			00%			00%										
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	20		-			
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	2	-	-	-	-	-	-	3	-	-	-	60	18	26	3
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20	15	21	1
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66	-	-	2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20	-	-	1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		33%			67%			00%			-33%							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	100%			
												'97	60		0%			
												'02	40		50%			



A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Atriplex canescens</b>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	22	19	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	13	18	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
												'02	0		-		
<b>Cercocarpus montanus</b>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	1	-	-	-	-	-	-	-	-	100			5
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	3	-	-	-	-	1	-	4	-	-	133	8	9	4
	97	2	9	3	-	1	1	-	-	-	16	-	-	320	25	34	16
	02	-	-	4	-	-	8	-	-	1	13	-	-	260	24	31	13
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	2	-	-	-	-	2	-	-	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			75%			00%			+68%						
'97		48%			19%			00%			-29%						
'02		00%			100%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	0%		
												'97	420		0%		
												'02	300		13%		
<b>Chrysothamnus nauseosus albicaulis</b>																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	33			1
	97	-	-	-	1	-	-	-	-	-	1	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	1	-	-	20			1
M	89	2	1	-	-	-	-	-	-	-	3	-	-	100	22	24	3
	97	3	1	-	-	-	-	-	-	-	4	-	-	80	35	37	4
	02	2	-	-	-	-	-	-	-	-	2	-	-	40	31	32	2
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	1	-	-	-	-	-	-	2	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		25%			00%			00%			-25%						
'97		20%			00%			00%			+ 0%						
'02		00%			20%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	0%		
												'97	100		0%		
												'02	100		40%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus stenophyllus</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	9	-	-	-	-	-	-	-	-	9	-	-	-	300			9
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	28	-	-	1	-	-	-	-	-	28	-	1	-	966	14	17	29
	97	40	-	-	-	-	-	-	-	-	40	-	-	-	800	15	20	40
	02	45	2	-	3	-	-	-	-	-	50	-	-	-	1000	12	19	50
D	89	4	-	-	-	-	-	-	-	-	3	-	-	1	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	3	2	-	-	-	-	-	-	-	4	-	-	1	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			05%			-23%							
'97		00%			00%			00%			+ 2%							
'02		07%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1399	Dec:	10%			
												'97	1080		0%			
												'02	1100		9%			
<i>Cowania mexicana stansburiana</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	13	14	1
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	24	18	2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	33	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	1	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+18%							
'97		100%			00%			00%			-50%							
'02		00%			100%			100%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	0%			
												'97	40		0%			
												'02	20		100%			
<i>Ephedra viridis</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	17	15	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	40	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	13	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Eriogonum microthecum</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	5	7	1
	02	1	-	-	-	-	1	-	-	-	-	-	-	40	6	14	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%			+50%						
'02		00%			50%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	20		-		
												'02	40		-		
<i>Gutierrezia sarothrae</i>																	
Y	89	8	-	-	-	-	-	-	-	-	-	-	-	266			8
	97	8	-	-	-	-	-	-	-	-	-	-	-	160			8
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	34	-	-	-	-	-	-	-	-	-	-	-	1133	9	11	34
	97	25	-	-	-	-	-	-	-	-	-	-	-	500	11	13	25
	02	35	-	-	-	-	-	-	-	-	-	-	-	700	7	9	35
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	1	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-51%						
'97		00%			00%			03%			+ 3%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	1399	Dec:	0%		
												'97	680		3%		
												'02	700		0%		
<i>Juniperus osteosperma</i>																	
Y	89	5	-	-	-	-	-	-	-	-	-	-	-	166			5
	97	4	-	-	-	-	-	-	-	-	-	-	-	80			4
	02	3	-	-	-	-	-	-	-	-	-	-	-	60			3
M	89	1	-	-	-	-	-	-	-	-	-	-	-	33	33	59	1
	97	3	-	-	-	-	1	1	-	-	-	-	-	100	-	-	5
	02	6	-	-	1	-	-	-	-	-	-	-	-	140	-	-	7
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	80			4
	02	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-10%						
'97		00%			00%			00%			+10%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	-		
												'97	180		-		
												'02	200		-		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Opuntia</i> spp.																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	6	-	-	-	-	-	-	-	-	-	-	-	120	4	5	6
	02	1	-	-	-	-	-	-	-	-	-	-	-	20	5	6	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	1	-	-	-	-	1	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-71%						
'97		00%			00%			00%									
'02		00%			00%			50%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%		
												'97	140		0%		
												'02	40		50%		
<i>Pinus edulis</i>																	
Y	89	2	-	-	-	-	-	-	-	-	-	-	-	66			2
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	2	-	-	1	-	-	-	-	-	-	-	-	60			3
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	-	-	-	80	-	-	4
	02	4	-	-	-	-	-	-	-	-	-	-	-	80	-	-	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+34%						
'97		00%			00%			00%			+29%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-		
												'97	100		-		
												'02	140		-		
<i>Purshia tridentata</i>																	
Y	89	-	1	-	-	-	-	-	-	-	-	-	-	33			1
	97	3	-	-	-	-	-	-	-	-	-	-	-	60			3
	02	-	-	2	-	-	-	-	-	-	-	-	-	40			2
M	89	-	8	3	-	-	-	-	-	-	-	-	-	366	8	23	11
	97	6	13	17	3	-	-	-	-	-	-	-	-	780	18	38	39
	02	1	-	13	-	1	9	-	-	-	1	-	-	500	14	48	25
D	89	1	3	-	-	-	-	-	-	-	-	-	-	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	4	-	-	-	-	2	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		75%			19%			06%			+37%						
'97		31%			40%			02%			-24%						
'02		03%			94%			06%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	532	Dec:	25%		
												'97	840		0%		
												'02	640		16%		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	1	-	-	-	-	-	-	-	-	1	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	20	26	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	31	17	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			-39%							
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	20		-			
												'02	20		-			
Rhus trilobata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	43	89	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-3-02

Study site name: North Manti Face.

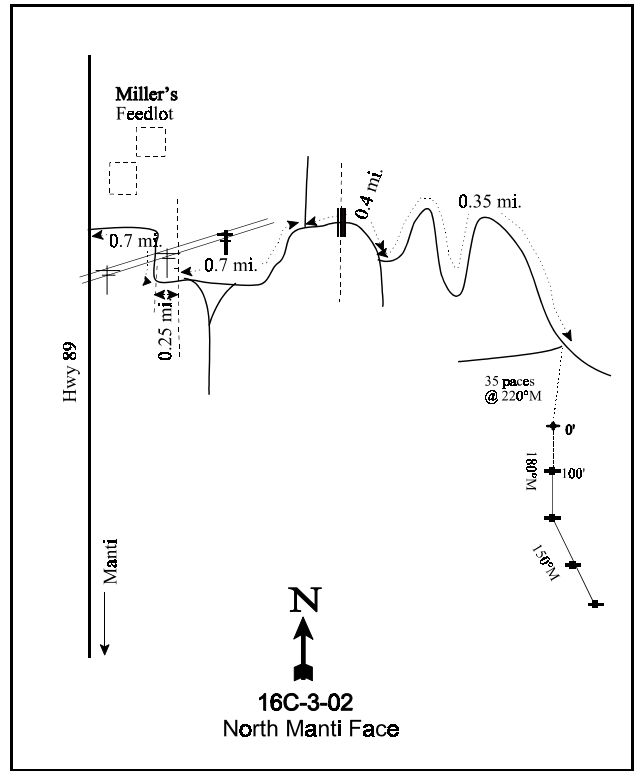
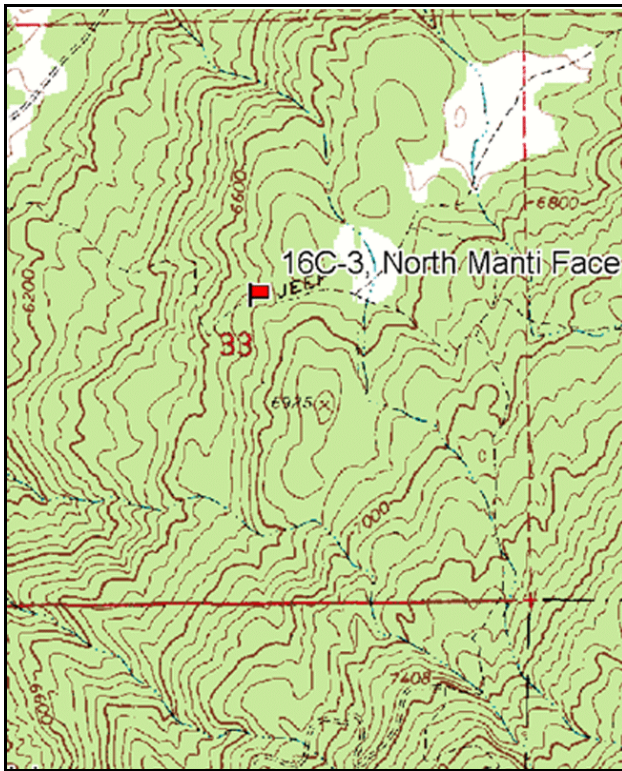
Vegetation type: Big Sagebrush - Grass.

Compass bearing: frequency baseline 180 degrees magnetic (line 3-4 @ 150°M).

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

LOCATION DESCRIPTION

From the Manti LDS temple visitor's center in Manti, proceed north on Highway 89 for 1.5 miles. Just south of Miller's feedlot, turn east on a dirt road (Miller's Lane) and go 0.7 miles to a gate. Proceed down the road another 0.25 miles to a fence. Continue 0.7 miles to a fork in the road. Go right for 0.4 miles crossing a cattle guard onto DWR property to another fork in the road. From here, stay left switchbacking up the mountain for 0.35 miles to another fork. Stop here and walk 35 paces at 220 degrees magnetic to the 0-foot baseline stake, which is marked by browse tag #9044.



Map Name: Ephraim

Diagrammatic Sketch

Township 17S, Range 3E, Section 33

GPS: NAD 27, UTM 12S 4349221 N 449397 E

## DISCUSSION

### North Manti Face - Trend Study No. 16C-3

The North Manti Face trend study samples a mountain big sagebrush community with a substantial juniper component. Like many of the trend studies in management unit 16C, it is located on Division land. The area is important winter range for big game, especially deer. Quadrat frequency of deer pellets was high in 1997 and 2002 at 67% and 58% respectively. Pellet group transect data taken in 2002 estimated 181 deer days use/acre (448 ddu/ha) and only 2 elk days use/acre (5 edu/ha). Several sheep pellet groups were also sampled in the transect which were apparently from trespass. The abundance of juniper on the site provides good thermal cover for wintering animals. The site lies on a moderately steep (30-40%), west facing slope at an elevation of 6,760 feet.

The SCS classifies the soil as somewhat excessively drained, very cobbly loam in the Fontreen series. Effective rooting depth, at the site, was estimated at less than 9 inches in 1997. Soil textural and chemical analysis indicates a clay soil with a slightly alkaline reactivity (pH = 7.4). Rock and pavement are abundant on the surface and throughout the profile providing 41% cover in 1997 and 49% in 2002. Due to the abundance of rock and pavement, bare soil was low at about 8% in 1997 and 2002. Over half of the vegetative cover on the site comes from herbaceous species which provide important soil protection on the steep slopes. The amount of litter cover on the site is moderately low, but did increase in 2002 to 33%. Originally, sheet erosion was active and there were numerous rills and small gullies. There has been heavy terracing in the past, but erosion is currently minimal as the soil surface is heavily armored with rock and pavement. The ratio of protective cover to bare soil is good at over 3:1 in both 1997 and 2002. Soils were determined as stable by an erosion condition class assessment done in 2002.

The key browse species is a moderately small population of mountain big sagebrush. In 1989, sagebrush were heavily hedged and 93% of the mature population showed heavy use. Utilization was more moderate in 1997 with 36% of the population showing heavy use. However, heavily browsed plants increased up to 76% in 2002. Mountain big sagebrush density was initially estimated at 2,865 plants/acre from density plot data in 1989. With the extension of the sampling baseline and use of strip counts rather than circular plots in 1997 and 2002, actual density is much lower. These sampling modifications give more accurate estimates of shrub densities which are often clumped and/or discontinuous in their distributions. Density was estimated at 1,000 plants/acre in 1997, declining to 840 plants/acre in 2002. The increase in dead plants and the loss of the entire young age class in 2002 are the reasons for the decline in density. Percent decadence and plants displaying poor vigor both increased between 1997 and 2002. Increases in decadence (36% to 52%) and poor vigor (18% to 33%), and a decline in reproduction (young plants), often accompany drought as was the case in 2002. In addition, the proportion of the decadent age class classified as dying (>50% crown death) was high in 1997 and 2002 at 50%. With no seedling or young plants sampled in 2002, declines in density may continue in the future as the recruitment from young plants is not adequate to maintain the population at the present time. Leader growth on mountain big sagebrush was low averaging only 1.3 inches in 2002.

Other palatable browse species on the site include squaw-apple, white-stemmed rubber rabbitbrush, four-wing saltbush, serviceberry, and snowberry. Most of these have been moderately to heavily browsed as they occur in low densities. Even the junipers showed evidence of highlining. Juniper density was estimated at 75 trees/acre from point-center quarter data taken in 2002. A zone of oakbrush occurs to the east and up slope of the site. Broom snakeweed is moderately abundant but made up only 4% of the browse cover in 2002, with a population density estimated at about 3,100 plants/acre.

Bluebunch wheatgrass is the most important understory species as it provides an important role in soil stabilization on the site. Bluebunch wheatgrass is distributed uniformly over the site as it occurred in over 90% of the quadrats in all sampling years. It provided 94% of the grass cover in 2002, an increase from 89% in 1997. Even with drought in 2002, nested frequency of bluebunch remained stable. Sandberg bluegrass is the second most abundant grass, but this species significantly declined between 1997 and 2002 with drought. Grasses showed little to no use in 2002, and Sandberg bluegrass was already dried up when the site was read in July of 2002. Two annual bromes, cheatgrass and Japanese, were present on the site in 1997 at low

densities. In 2002, Japanese brome was not sampled at all, and cheatgrass was sampled in only one quadrat. As a group, perennial grasses showed an 18% decline in sum of nested frequency in 2002 with nearly all of this decline coming from Sandberg bluegrass.

Forb cover was average in 1997, but species diversity was moderately high with 29 species being sampled. As with other sites in the Central Region, forbs declined in 2002 with drought. One species, rock goldenrod, remained stable in frequency and is the dominant forb species on the site. As a group, perennial forbs showed a 39% decline in sum of nested frequency between 1997 and 2002.

#### 1989 APPARENT TREND ASSESSMENT

With the important but variable ground cover provided by the bunch grasses on this steep and erodible slope, soil loss appears to continue. Soil trend seems to be on the down side. The vegetative trend appears stable in terms of species diversity and age class distributions. The abundance of snakeweed is not always necessarily an indication of a downward trend.

#### 1997 TREND ASSESSMENT

There have been some changes in the characteristics of the ground cover. Combined rock and pavement cover has decreased from 59% to 41%. With the increase in percent bare soil, this would probably indicate that soil has covered some of the surface rock. Percent litter and bare soil both increased slightly. The ratio of protective cover (vegetation and litter cover) to bare soil is good at over 3:1, but the slope is steep at 40%. Soil trend is considered stable at this time. Browse trend is considered slightly down for mountain big sagebrush, which makes up 29% of the browse cover. The decline in density from 2,800 plants/acre to 1,000 plants/acre is more a reflection of the greatly improved sampling design than an actual loss of plants. Reproduction increased, and use remains moderate to heavy. More plants had a poor vigor rating in 1997, and decadence remains high at 36%. Juniper makes up over half of the browse cover on the site, which may be detrimental to the sagebrush population in the future. Browse trend will continue to decline in the future if juniper becomes more dominant and the forage species decline. Trend for perennial herbaceous species is slightly down with sum of nested frequency for grasses and forbs both showing slightly downward trends.

##### TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly down (2)

#### 2002 TREND ASSESSMENT

Trend for soil is stable. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil remains good at over 3:1. The dominant understory species, bluebunch wheatgrass, remained stable in frequency and cover. Erosion remains minimal. Trend for browse is down. With drought and heavy deer use in winter months, sagebrush is showing several negative effects. Density and reproduction both declined, while use, decadency, and poor vigor all increased. Other palatable species such as serviceberry, fourwing saltbush, and squaw apple remain in low densities and show moderate to heavy use as well. The herbaceous understory has a slightly downward trend. The dominant species, bluebunch wheatgrass remained stable in 2002, but Sandberg bluegrass significantly declined in nested frequency as did the perennial forb component due to drought.

##### TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - slightly down (2)



HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 3

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron intermedium</i>	-	-	3	-	-	1	-	.00
G	<i>Agropyron spicatum</i>	287	268	254	98	96	93	10.96	11.42
G	<i>Bromus japonicus</i> (a)	-	<sub>b</sub> 42	<sub>a</sub> -	-	13	-	.16	-
G	<i>Bromus tectorum</i> (a)	-	<sub>b</sub> 35	<sub>a</sub> 1	-	15	1	.15	.00
G	<i>Oryzopsis hymenoides</i>	-	1	-	-	1	-	.03	-
G	<i>Poa fendleriana</i>	<sub>b</sub> 60	<sub>a</sub> 23	<sub>a</sub> 14	26	10	6	.15	.22
G	<i>Poa secunda</i>	<sub>ab</sub> 105	<sub>b</sub> 137	<sub>a</sub> 79	47	56	34	.85	.46
Total for Annual Grasses		0	77	1	0	28	1	0.31	0.00
Total for Perennial Grasses		452	429	350	171	163	134	12.00	12.12
Total for Grasses		452	506	351	171	191	135	12.31	12.13
F	<i>Alyssum alyssoides</i> (a)	-	8	1	-	3	1	.01	.00
F	<i>Antennaria rosea</i>	-	3	1	-	1	1	.00	.03
F	<i>Arabis</i> spp.	-	3	1	-	1	1	.00	.00
F	<i>Arenaria fendleri</i>	<sub>a</sub> -	<sub>c</sub> 111	<sub>b</sub> 49	-	43	20	1.11	.25
F	<i>Astragalus megacarpus</i>	<sub>b</sub> 24	<sub>a</sub> 5	<sub>a</sub> -	10	2	-	.01	-
F	<i>Astragalus</i> spp.	<sub>a</sub> -	<sub>b</sub> 15	<sub>a</sub> -	-	7	-	.26	-
F	<i>Astragalus utahensis</i>	-	7	-	-	3	-	.01	-
F	<i>Camelina microcarpa</i> (a)	-	9	-	-	4	-	.02	-
F	<i>Calochortus nuttallii</i>	-	4	-	-	2	-	.01	-
F	<i>Cirsium</i> spp.	<sub>b</sub> 18	<sub>a</sub> 5	<sub>a</sub> 1	12	3	1	.06	.00
F	<i>Crepis acuminata</i>	12	6	3	6	4	1	.02	.00
F	<i>Cryptantha</i> spp.	<sub>b</sub> 16	<sub>a</sub> 4	<sub>a</sub> -	7	1	-	.03	-
F	<i>Cymopterus</i> spp.	-	1	-	-	1	-	.00	-
F	<i>Descurainia pinnata</i> (a)	-	4	-	-	1	-	.03	-
F	<i>Eriogonum brevicaule</i>	-	-	8	-	-	4	-	.07
F	<i>Erigeron</i> spp.	-	4	-	-	2	-	.04	-
F	<i>Eriogonum jamesii</i>	<sub>b</sub> 13	<sub>b</sub> 13	<sub>a</sub> -	5	5	-	.36	-
F	<i>Eriogonum umbellatum</i>	-	2	-	-	1	-	.03	-
F	<i>Haplopappus acaulis</i>	<sub>a</sub> 6	<sub>a</sub> 3	<sub>b</sub> 20	2	1	11	.15	.22
F	<i>Helianthus annuus</i> (a)	1	-	-	1	-	-	-	-
F	<i>Lathyrus brachycalyx</i>	-	-	2	-	-	1	-	.00
F	<i>Lappula occidentalis</i> (a)	-	2	-	-	1	-	.00	-
F	<i>Leucelene ericoides</i>	<sub>ab</sub> 21	<sub>b</sub> 41	<sub>a</sub> 20	7	14	10	.98	.15
F	<i>Penstemon humilis</i>	-	-	2	-	-	2	-	.03
F	<i>Penstemon</i> spp.	<sub>b</sub> 50	<sub>a</sub> 11	<sub>a</sub> 18	23	5	6	.10	.10
F	<i>Petradoria pumila</i>	46	47	49	16	22	22	1.78	2.18
F	<i>Phlox hoodii</i>	<sub>b</sub> 182	<sub>a</sub> 29	<sub>a</sub> 15	68	13	7	.14	.16

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Phlox longifolia	10	18	16	4	7	7	.06	.10
F	Ranunculus testiculatus (a)	-	<sub>b</sub> 160	<sub>a</sub> 34	-	56	13	.62	.06
F	Streptanthus cordatus	-	1	-	-	1	-	.00	-
F	Tragopogon dubius	1	-	-	1	-	-	-	-
F	Vicia americana	-	3	-	-	1	-	.03	-
Total for Annual Forbs		1	183	35	1	65	14	0.69	0.07
Total for Perennial Forbs		399	336	205	161	140	94	5.22	3.34
Total for Forbs		400	519	240	162	205	108	5.91	3.41

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

#### BROWSE TRENDS --

Herd unit 16C, Study no: 3

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier utahensis	1	2	.00	-
B	Artemisia nova	2	0	-	-
B	Artemisia tridentata vaseyana	37	33	3.92	4.14
B	Atriplex canescens	2	0	.15	-
B	Chrysothamnus depressus	17	12	.54	.40
B	Chrysothamnus nauseosus hololeucus	5	5	.09	.38
B	Chrysothamnus viscidiflorus viscidiflorus	4	5	.01	.19
B	Gutierrezia sarothrae	37	42	.25	.53
B	Juniperus osteosperma	5	6	8.07	7.50
B	Peraphyllum ramosissimum	1	2	.38	-
B	Pinus edulis	0	0	-	.63
B	Symphoricarpos oreophilus	1	2	.00	.03
Total for Browse		112	109	13.45	13.82

CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 3

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.08
Artemisia tridentata vaseyana	-	3.50
Chrysothamnus nauseosus	-	.17
Chrysothamnus nauseosus hololeucus	-	.33
Gutierrezia sarothrae	-	.58
Juniperus osteosperma	12.6	6.58
Symphoricarpos oreophilus	-	.03

Key Browse Annual Leader Growth

Herd unit 16C, Study no: 3

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.3

Point-Quarter Tree Data

Herd unit 16C, Study no: 3

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	84	75	6.0	5.7

BASIC COVER --

Herd unit 16C, Study no: 3

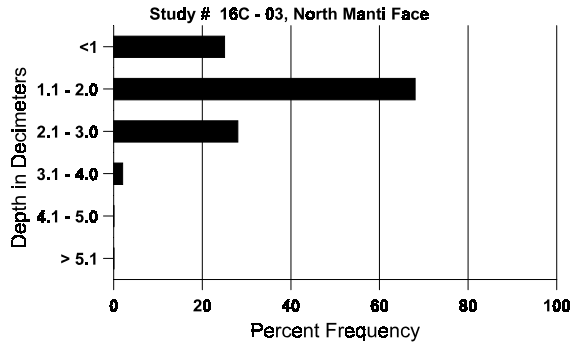
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	341	299	13.00	31.28	30.78
Rock	287	277	18.00	10.76	13.59
Pavement	345	349	41.25	30.36	35.96
Litter	381	373	23.00	25.97	33.26
Cryptogams	96	75	0	.58	1.37
Bare Ground	222	244	4.75	8.14	8.81

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 03, North Manti Face

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.7	56.4 (13.5)	7.4	32.0	27.4	40.6	7.4	9.4	201.6	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 3

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
			02	02
Sheep	-	1	17	1 (3)
Rabbit	18	30	-	-
Elk	6	1	26	2 (5)
Deer	67	58	2358	181 (448)

## BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 3

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
Amelanchier utahensis															
M	89	-	-	-	-	-	-	-	0	-	-	0			
	97	-	-	1	-	-	-	-	1	-	-	20	21	37	1
	02	1	-	-	-	-	-	-	1	-	-	20	17	23	1
D	89	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	1	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%			00%			00%							
'97		00%			100%			00%		+50%					
'02		00%			00%			50%							
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	0%						
						'97	20		0%						
						'02	40		50%						

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia nova</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40	12	33	2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		50%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
												'02	0		-			
<i>Artemisia tridentata vaseyana</i>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	1	24	-	-	-	-	-	-	25	-	-	-	1666	23	27	25
	97	2	12	12	-	-	-	-	-	-	26	-	-	-	520	21	33	26
	02	3	2	12	-	-	3	-	-	-	20	-	-	-	400	17	29	20
D	89	-	-	16	-	-	-	-	-	-	15	-	-	1	1066			16
	97	3	9	6	-	-	-	-	-	-	9	-	-	9	360			18
	02	3	1	11	-	1	6	-	-	-	8	-	3	11	440			22
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	520			26
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		02%			93%			02%			-65%							
'97		42%			36%			18%			-16%							
'02		10%			76%			33%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2865	Dec:	37%			
												'97	1000		36%			
												'02	840		52%			
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	38	38	2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	20	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		100%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus depressus</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	3	6	1
	97	24	13	-	-	2	-	-	-	-	39	-	-	-	780	15	11	39
	02	27	-	-	-	-	1	-	-	-	28	-	-	-	560	4	10	28
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	2	1	-	-	-	-	-	-	3	-	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+85%							
'97		40%			02%			00%			-35%							
'02		00%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	0%			
												'97	860		7%			
												'02	560		0%			
<b>Chrysothamnus nauseosus hololeucus</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	1	1	-	-	-	-	-	-	1	1	-	-	133	19	14	2
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	32	39	3
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	21	24	1
D	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
	02	-	1	1	-	1	1	-	-	-	4	-	-	-	80			4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		33%			67%			00%			-40%							
'97		17%			00%			17%			-17%							
'02		40%			40%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	33%			
												'97	120		17%			
												'02	100		80%			
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	9	11	3
	02	3	-	1	-	-	-	-	-	-	4	-	-	-	80	5	11	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-29%							
'02		00%			20%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	140		-			
												'02	100		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	6	-	-	2	-	-	-	-	-	8	-	-	-	160		8	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	97	80	-	-	-	-	-	-	-	-	80	-	-	-	1600		80	
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	89	40	-	-	-	-	-	-	-	-	40	-	-	-	2666	7	7	40
	97	45	-	-	-	-	-	-	-	-	45	-	-	-	900	9	9	45
	02	133	-	-	-	-	-	-	-	-	133	-	-	-	2660	4	5	133
D	89	6	-	-	-	-	-	-	-	-	3	-	-	3	400		6	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	18	-	-	-	-	-	-	-	-	15	-	-	3	360		18	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	420		21	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			06%			-29%							
'97		00%			00%			00%			+19%							
'02		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3532	Dec:	11%				
											'97	2520		1%				
											'02	3120		12%				
<i>Juniperus osteosperma</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	79	98	1
	97	4	-	-	-	-	-	1	-	-	5	-	-	-	100	-	-	5
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120	-	-	6
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+34%							
'97		00%			00%			00%			+17%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	100		-				
											'02	120		-				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Peraphyllum ramosissimum</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	4	-	-	-	-	-	-	4	-	-	-	266	24	16	4
	97	-	-	-	-	-	-	-	-	1	1	-	-	-	20	18	29	1
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	18	24	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			80%			00%			-94%							
'97		00%			100%			00%			+50%							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	332	Dec:	0%				
											'97	20		0%				
											'02	40		50%				
<b>Symphoricarpos oreophilus</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	6	15	1
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	3	7	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			100%			00%			+50%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
											'02	40		-				



Trend Study 16C-4-02

Study site name: Bald Mountain.

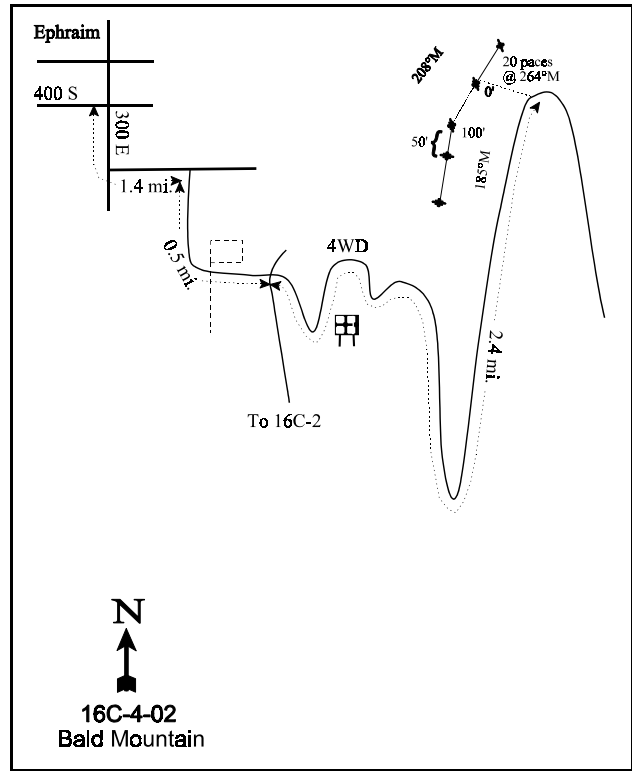
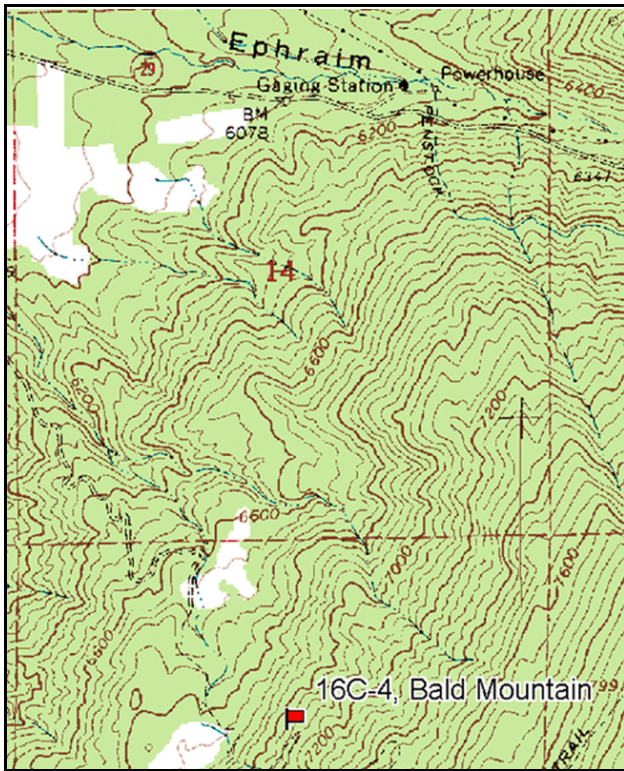
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 208 degrees magnetic (lines 2-3 @ 185°M).

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

LOCATION DESCRIPTION

From the intersection of 400 South and 300 East in Ephraim, go south on 300 East for 0.6 miles to where the road makes a 90° turn to the east. Stay on this main road heading east for another 0.8 miles. Turn south at this point and go 0.5 miles to a 4-way intersection. Go straight through the intersection for 2.4 miles and stop on a large switchback in the road. From the edge of the road, the 0-foot baseline stake is 20 paces away at 264degrees magnetic. The 0-foot baseline stake is marked by browse tag #9075.



Map Name: Ephraim

Diagrammatic Sketch

Township 17S, Range 3, Section 23

GPS: NAD 27, UTM 12S 4352762 N 452608 E

## DISCUSSION

### Bald Mountain - Trend Study No. 16C-4

The Bald Mountain trend study is located on a steep (45%), west facing slope at an elevation of 7,050 feet. It samples a higher elevation big game winter range within the mixed mountain brush type. This site is composed mostly of pinyon, juniper, oak, and sagebrush that is located above the Bald Mountain chainings on Division property. Browsing pressure was classified as high during the 1989 sampling period with the majority of the preferred species showing heavy use. Use has since stabilized at a moderate level. Pellet group transect data estimated 77 deer days use/acre (190 ddu/ha) and 3 elk days use/acre (7 edu/ha) in 2002. Several domestic sheep pellets were also sampled in the transect (7 sheep days use/acre, 18 sdu/ha).

Soils have a clay loam texture and are slightly alkaline in reactivity (pH = 7.4). Effective rooting depth was estimated at less than 10 inches in 1997. The surface layer is shallow, but the soil has a deep root zone. Due to the steep slope, erosion hazard is high. An erosion condition class assessment done in 2002 was determined to be slight. Soil pedestalling is moderate around the base of shrubs and bunch grasses. Erosion would likely be higher on the site were it not for a moderate cover of rock and pavement on the surface, which combined for 25% cover in 2002. Although vegetative cover is moderate at 36%, less than 20% of the total comes from herbaceous species. Herbaceous species are more effective at protecting soils from high intensity summer thunderstorms. Bare soil is moderate at around 20% in both 1997 and 2002.

The overstory is dominated by pinyon, juniper, and oakbrush. The oak shows mostly light use and had an estimated density of 3,320 stems/acre in 2002. There are a significant number of young pinyon and juniper in an uneven-aged stand. Point-center quarter data estimate 137 pinyon and 51 juniper trees/acre in 2002. Some of the juniper trees had been highlined.

The most important component of the vegetative community is the browse understory. Several species provide valuable forage for wintering animals including mountain big sagebrush, serviceberry, true mountain mahogany, and squaw-apple. Mountain big sagebrush is the key species providing nearly one-fourth of the browse cover. Density of mountain big sagebrush was estimated at 1,360 plants/acre in 2002. Age class analysis indicates the population was composed of about one-half mature and one-half decadent plants in 1997 and 2002. The decadent age class made up 95% of the total population in 1989, but has since declined to 46% in 1997 and 44% in 2002. Utilization has been moderate to heavy in all sampling periods. Plants displaying poor vigor has been stable during all readings, currently at 18% ('02). Individuals have noticeably better vigor and growth in open areas where there is less competition from trees. No seedling or young plants were sampled in 2002.

True mountain mahogany has an estimated density of 200 plants/acre, with most plants being heavily used. Reproduction has been stable with about 10% of the population being young in both 1997 and 2002. Squaw-apple density was estimated at just over 1,000 plants/acre in both 1997 and 2002, with most plants showing moderate to heavy use. Decadence is low as is recruitment from the young age class. Vigor has been normal on all but a few plants in all sampling years.

The understory is sparse, especially for a site at this elevation and precipitation zone. Seven perennial grasses were sampled in 1997, and four of these were resampled in 2002. Grasses are sparse and are found mainly under shrubs. Mutton bluegrass is the most common, followed by bluebunch wheatgrass, crested wheatgrass, and other occasional species. Total grass cover is only 6%, but sum of nested frequency remained nearly stable in 2002. Forbs are less abundant than grasses, although diversity has been good. Long-leaf phlox and low penstemon are the most abundant perennial species. In 2002, sum of nested frequency for perennial forbs declined from 133 to 93 with drought.

### 1989 APPARENT TREND ASSESSMENT

Soil trend appears normal and considering the soil type, trend appears stable. The overstory of pinyon, juniper, and oak appears to be increasing to the detriment of mountain big sagebrush. There are other browse plants available with stable and healthy populations. In the long term, the overall vegetative trend appears to be declining, especially at the present levels of utilization. This site should get some protection in years of heavy snowfall, allowing recruitment of young plants into the populations of palatable browse species.

### 1997 TREND ASSESSMENT

Soil trend is slightly downward as percent bare soil has increased from 14% to 22%. In addition, protective cover provided by herbaceous species makes up only 19% of the total vegetation cover. The browse trend is stable. Mountain big sagebrush, the most abundant preferred species, has a stable density and showed improvement in percent decadence (95% to 46%). Utilization has improved as heavy use declined from 70% to 21%. Reproduction improved in 1997 as well. All other preferred species show less heavy use and fewer plants classified as decadent. The overall trend for perennial herbaceous species is down, with the sum of nested frequency values declining for both grasses and forbs.

#### TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - down (1)

### 2002 TREND ASSESSMENT

Soil trend is stable. Erosion is slight on the site, but not excessive with the steep slope. Ground cover characteristics have changed only slightly since 1997. Trend for browse is stable. Mountain big sagebrush is stable in density, percent decadence, and vigor. The young age class disappeared from the population in 2002, but that is not unexpected with drought. Use increased to a heavier level, but the population does not appear to be negatively effected with the higher use at the present time. Other preferred browse show stable densities and generally healthy populations. Trend for the herbaceous understory is stable. Although sparse, perennial grasses remained stable in sum of nested frequency with perennial forbs slightly declining. The most abundant perennial species, mutton bluegrass, increased in nested frequency in 2002.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Herd unit 16C, Study no: 4

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	a-	c30	b8	-	13	5	.84	.22
G	Agropyron spicatum	b69	a24	a33	30	10	13	.46	.65
G	Bromus inermis	-	2	-	-	1	-	.03	-
G	Oryzopsis hymenoides	-	2	-	-	1	-	.00	-
G	Poa fendleriana	b169	a110	ab138	67	40	57	3.87	4.35
G	Poa secunda	13	22	15	6	9	6	.54	.24
G	Sitanion hystrix	6	11	-	2	4	-	.25	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		257	201	194	105	78	81	6.01	5.47
Total for Grasses		257	201	194	105	78	81	6.01	5.47
F	Allium spp.	1	-	-	1	-	-	-	-
F	Arabis spp.	-	1	2	-	1	1	.03	.00
F	Arenaria fendleri	-	8	5	-	3	2	.04	.01
F	Astragalus convallarius	-	2	-	-	1	-	.03	.03
F	Astragalus spp.	-	3	2	-	2	1	.01	.03
F	Carduus nutans (a)	-	3	-	-	1	-	.03	-
F	Calochortus nuttallii	-	1	-	-	1	-	.00	-
F	Chenopodium album (a)	-	2	-	-	1	-	.00	-
F	Chaenactis douglasii	b11	ab3	a-	5	1	-	.00	-
F	Cirsium spp.	11	12	3	5	6	2	.08	.04
F	Collinsia parviflora (a)	-	b52	a1	-	19	1	.09	.00
F	Crepis acuminata	-	2	-	-	1	-	.00	-
F	Cymopterus spp.	9	13	11	3	5	8	.03	.11
F	Eriogonum umbellatum	a-	b16	a-	-	9	-	.19	-
F	Hackelia patens	-	3	-	-	1	-	.00	-
F	Machaeranthera canescens	b35	a3	a2	19	2	1	.01	.00
F	Penstemon humilis	b92	a30	a42	46	14	19	.80	.73
F	Phlox longifolia	b51	ab32	a24	24	13	11	.14	.13
F	Ranunculus testiculatus (a)	-	b31	a-	-	11	-	.05	-
F	Streptanthus cordatus	1	-	-	1	-	-	-	-
F	Taraxacum officinale	1	1	-	1	1	-	.00	-
F	Unknown forb-annual (a)	-	1	-	-	1	-	.00	-
F	Veronica biloba (a)	-	6	-	-	2	-	.01	-
F	Viguiera multiflora	-	-	2	-	-	1	-	.00
F	Viola spp.	-	3	-	-	1	-	.00	-
Total for Annual Forbs		0	95	1	0	35	1	0.20	0.00
Total for Perennial Forbs		212	133	93	105	62	46	1.40	1.11
Total for Forbs		212	228	94	105	97	47	1.60	1.11

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier utahensis	5	2	.03	.03
B	Artemisia tridentata vaseyana	42	39	7.05	6.69
B	Cercocarpus montanus	9	10	.86	.33
B	Chrysothamnus nauseosus albicaulis	1	0	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	.15	.03
B	Ephedra viridis	1	0	.03	-
B	Juniperus osteosperma	3	4	.91	.88
B	Opuntia spp.	0	2	-	.00
B	Peraphyllum ramosissimum	32	32	2.78	3.46
B	Pinus edulis	19	12	8.65	8.19
B	Purshia tridentata	1	0	-	-
B	Quercus gambelii	24	32	7.52	6.30
B	Symphoricarpos oreophilus	37	44	3.75	3.42
Total for Browse		175	178	31.75	29.37

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16C, Study no: 4

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.07
Artemisia tridentata vaseyana	-	4.25
Cercocarpus montanus	-	.25
Juniperus osteosperma	-	4.00
Peraphyllum ramosissimum	-	3.50
Pinus edulis	7.4	10.00
Quercus gambelii	6.6	11.33
Symphoricarpos oreophilus	-	5.67

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 4

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.4
Cercocarpus montanus	1.7

Point-Quarter Tree Data  
Herd unit 16C , Study no: 4

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	19	51	3.8	3.3
Pinus edulis	164	137	5.1	5.1

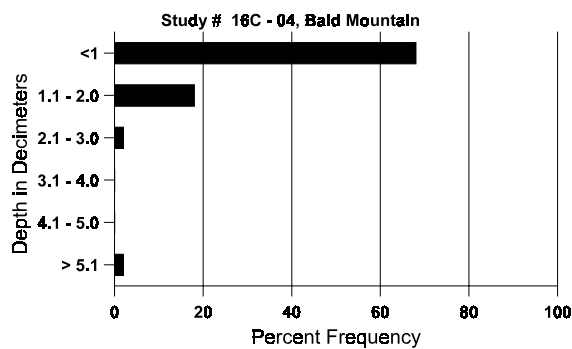
BASIC COVER --  
Herd unit 16C, Study no: 4

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	289	245	10.75	35.77	33.74
Rock	249	263	10.25	13.61	18.95
Pavement	234	250	21.00	5.78	6.78
Litter	382	364	43.50	43.58	40.77
Cryptogams	24	41	.75	.13	1.73
Bare Ground	252	238	13.75	22.21	20.37

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 04, Bald Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.8	55.6 (13.9)	7.4	28.0	33.4	38.6	5.6	12.9	124.8	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 4

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Sheep	4	2	96	7 (18)
Rabbit	6	1	-	-
Elk	7	-	35	3 (7)
Deer	28	27	1001	77 (190)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 4

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60	12	13	3
	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20	6	9	1
D	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+34%							
'97		00%			00%			00%			-60%							
'02		00%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	100%				
											'97	100		0%				
											'02	40		0%				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	20	12	1
	97	8	13	6	2	-	-	1	-	-	30	-	-	-	600	24	33	30
	02	1	8	27	-	2	-	-	-	-	38	-	-	-	760	23	31	38
D	89	1	5	12	-	-	1	-	-	-	16	-	-	3	1266		19	
	97	11	9	7	1	-	-	-	-	-	17	-	-	11	560		28	
	02	1	9	17	2	1	-	-	-	-	18	-	-	12	600		30	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	760		38	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	700		35	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		25%			70%			15%			- 8%							
'97		36%			21%			18%			+10%							
'02		29%			65%			18%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1332	Dec:	95%				
											'97	1220		46%				
											'02	1360		44%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<b>Cercocarpus montanus</b>													
S	89	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	0		0		
	02	1	-	-	-	-	-	-	20		1		
Y	89	-	-	-	-	-	-	-	0		0		
	97	1	-	-	-	-	-	-	20		1		
	02	-	-	1	-	-	-	-	20		1		
M	89	-	-	1	-	-	-	-	66	22	25	1	
	97	-	-	7	-	-	1	-	160	23	31	8	
	02	1	-	5	-	-	2	-	160	24	31	8	
D	89	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	1	20		1		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		100%		00%		+63%					
'97		00%		89%		00%		+10%					
'02		00%		90%		10%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	66	Dec:	0%
										'97	180		0%
										'02	200		10%
<b>Chrysothamnus nauseosus albicaulis</b>													
M	89	-	-	-	-	-	-	-	0	-	-	0	
	97	-	1	-	-	-	-	-	20	15	23	1	
	02	-	-	-	-	-	-	-	0	-	-	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%							
'97		100%		00%		00%							
'02		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-
										'97	20		-
										'02	0		-
<b>Chrysothamnus viscidiflorus viscidiflorus</b>													
M	89	-	-	-	1	-	-	-	66	12	8	1	
	97	-	1	-	-	-	-	-	20	9	18	1	
	02	-	1	-	-	-	-	-	20	7	21	1	
D	89	-	-	-	-	-	1	-	66			1	
	97	-	-	-	-	-	-	-	0			0	
	02	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%		-85%					
'97		100%		00%		00%		+ 0%					
'02		100%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	132	Dec:	50%
										'97	20		0%
										'02	20		0%



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Ephedra viridis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			
<i>Juniperus osteosperma</i>																		
Y	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66	85	79	1
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-55%							
'97		00%			00%			00%			+25%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	-			
												'97	60		-			
												'02	80		-			
<i>Opuntia spp.</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40	3	3	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	40		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total									
		1	2	3	4												
<b>Peraphyllum ramosissimum</b>																	
Y	89	1	-	-	1	-	-	4	-	-	6	-	-	-	400		6
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	3	16	1	1	4	1	-	-	26	-	-	-	1733	16 30	26
	97	17	11	9	8	-	-	2	-	-	46	-	-	1	940	17 31	47
	02	2	7	31	-	1	3	2	-	-	46	-	-	-	920	15 28	46
D	89	-	1	4	-	-	-	-	-	1	5	-	-	1	400		6
	97	1	1	-	-	-	-	-	-	-	-	-	-	2	40		2
	02	-	1	1	-	2	1	-	-	-	4	-	-	1	100		5
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'89		13%		66%		03%		-58%									
'97		23%		17%		06%		-2%									
'02		21%		69%		02%											
Total Plants/Acre (excluding Dead & Seedlings)										'89	2533	Dec:	16%				
										'97	1060		4%				
										'02	1040		10%				
<b>Pinus edulis</b>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	3	-	-	1	-	-	4	-	-	-	80		4
	02	3	-	-	3	-	-	-	-	-	6	-	-	-	120		6
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2
	97	11	-	-	2	-	-	-	-	-	13	-	-	-	260		13
	02	10	-	-	1	-	-	-	-	-	11	-	-	-	220		11
M	89	1	-	-	2	-	-	-	-	-	3	-	-	-	200	113 89	3
	97	2	-	-	1	-	-	3	-	-	6	-	-	-	120	-	6
	02	3	-	-	-	-	-	1	-	-	4	-	-	-	80	-	4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'89		00%		00%		00%		+12%									
'97		00%		00%		00%		-21%									
'02		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'89	333	Dec:	-				
										'97	380		-				
										'02	300		-				
<b>Purshia tridentata</b>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'89		00%		00%		00%											
'97		00%		100%		00%											
'02		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-				
										'97	20		-				
										'02	0		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Quercus gambelii</b>																	
S	89	5	-	-	-	-	-	-	-	-	4	-	1	-	333		5
	97	6	-	-	1	-	-	1	-	-	8	-	-	-	160		8
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
Y	89	3	11	-	-	-	-	1	-	-	15	-	-	-	1000		15
	97	53	-	1	23	-	-	-	-	-	77	-	-	-	1540		77
	02	72	1	-	1	-	-	-	-	-	74	-	-	-	1480		74
M	89	4	5	-	1	-	-	-	1	-	11	-	-	-	733	75 30	11
	97	73	-	-	21	-	-	1	-	-	95	-	-	-	1900	32 23	95
	02	41	7	8	5	-	-	-	14	-	75	-	-	-	1500	27 19	75
D	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	4	-	-	1	-	-	-	-	-	4	-	-	-	120		6
	02	15	-	2	-	-	-	-	-	-	17	-	-	-	340		17
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	300		15
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		63%			00%			00%			+49%						
'97		00%			.56%			00%			- 7%						
'02		05%			06%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	1799	Dec:	4%		
												'97	3560		3%		
												'02	3320		10%		
<b>Symphoricarpos oreophilus</b>																	
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	9	3	3	-	-	-	2	-	-	17	-	-	-	1133		17
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
M	89	4	12	1	3	3	-	1	-	-	24	-	-	-	1600	8 11	24
	97	59	-	-	14	-	-	2	-	-	75	-	-	-	1500	15 23	75
	02	83	3	-	3	-	-	1	-	-	90	-	-	-	1800	11 22	90
D	89	-	3	4	-	-	-	-	-	-	6	-	-	1	466		7
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		44%			17%			02%			-48%						
'97		00%			00%			00%			+14%						
'02		03%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	3199	Dec:	15%		
												'97	1660		1%		
												'02	1920		1%		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	17	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-5-02

Study site name: Cane Valley.

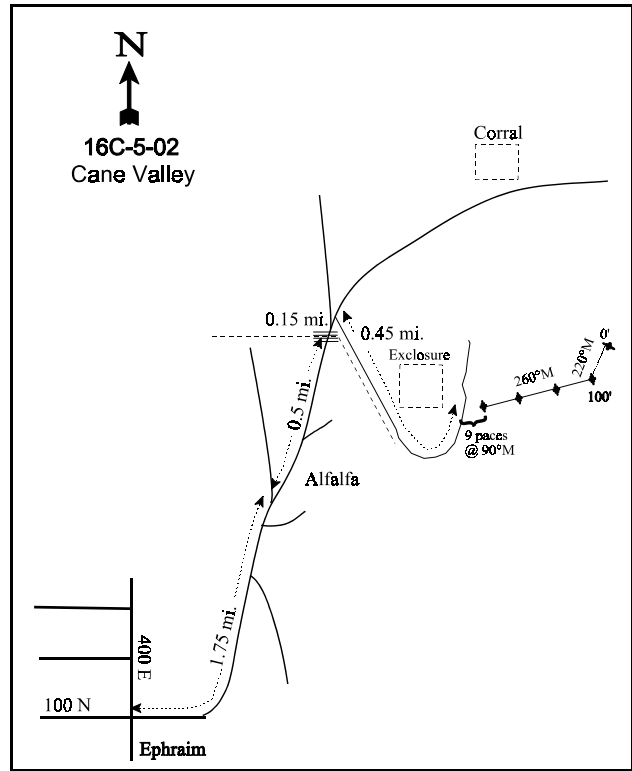
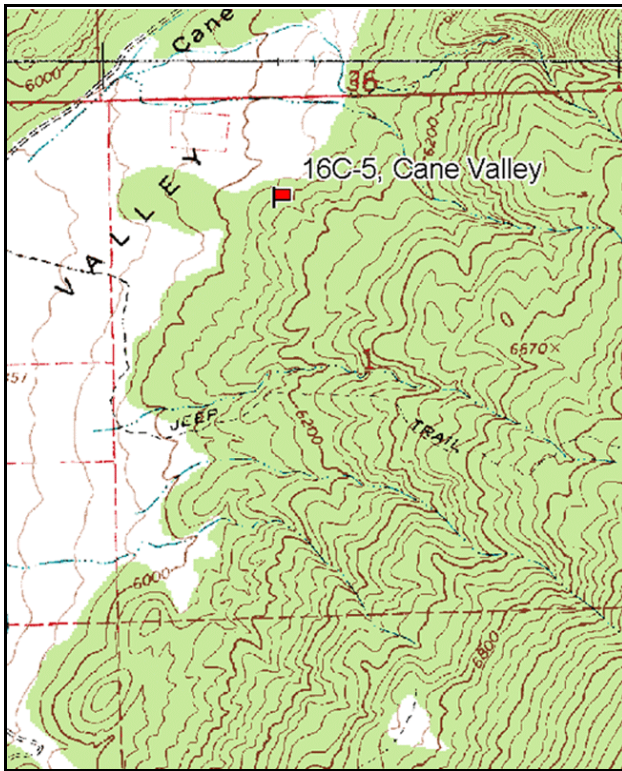
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 220 degrees magnetic (lines 2-4 @ 260°M).

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

LOCATION DESCRIPTION

From the intersection of 400 East and 100 North in Ephraim, proceed up 100 North for 1.75 miles. The pavement will end and the road will head in a northerly direction. At 1.75 miles the road will fork, stay right. Proceed up road for an additional 0.50 miles until you come to a cattleguard where a fence crosses the road. At this point the road forks twice. Take the road to the right for 0.15 miles. Turn right and follow along the fence in a southeasterly direction for 0.25 miles to an enclosure on the east side of the road. From the enclosure, continue left up the road for 0.2 miles where the 400-foot stake is 50 feet east of the road.



Map Name: Ephraim

Diagrammatic Sketch

Township 17S, Range 3E, Section 1

GPS: NAD 27, UTM 12S 4357864 N 453877 E

## DISCUSSION

### Cane Valley - Trend Study No. 16C-5

This study monitors a chained and seeded juniper site east of Ephraim. The juniper slopes above Cane Valley were two-way chained and aerial seeded in 1982, including 650 acres of Division land. The trend study is located in the center of the chained area on a west facing, 30% slope at an elevation of 6,100 feet. Big game use is moderate on the site. Pellet group transect data collected in 2002 estimated 76 deer days use/acre (187 ddu/ha) and 25 elk days use/acre (61 edu/ha). Several domestic sheep pellet groups were also sampled in the transect in 2002 (13 sheep days use/acre, 31 sdu/ha). Sheep are grazed on private land adjacent to the Division land. Chukar partridge, mourning doves, and rabbits have also been observed on the site. A spring about 200 yards north of the site provides a permanent water source for the area.

Like the chaining at Willow Creek (16C-2), this treatment is an Upland Shallow Shale juniper-pinyon range site. This type of site is dominated by juniper, usually with an understory of 20% (by weight) grasses, 5% forbs and 10% shrubs. Soil at the site is moderately deep with an effective rooting depth estimated at 14 inches. Soils are clay to clay loam in texture and slightly alkaline in reactivity (pH = 7.4). Erosion hazard is commonly severe on these Atepic Association soils, and sheet erosion was active on the site before the treatment. With abundant herbaceous cover following the chaining and seeding treatment, there is little sign of erosion at the present time. There are large gullies on both sides of the study that are not currently active. Vegetation and litter cover averaged about 36% each in 2002, a common level for chainings. Percent bare soil had increased between 1989 and 1997 to 21%, but declined to 15% in 2002. An erosion condition class assessment was determined as stable in 2002.

Palatable browse forage is limited on the site due to poor establishment following seeding. Serviceberry, four-wing saltbush, mountain big sagebrush, winterfat, white rubber rabbitbrush, and bitterbrush all occur on or around the site in densities lower than 100 plants/acre. All of these species show moderate to heavy use. None of the preferred browse had any seedling or young in their populations in 2002. Average leader growth on mountain big sagebrush was estimated at 2 inches in 2002. Young juniper appear to be quickly increasing in size. Juniper cover doubled between 1997 and 2002, and it made up 64% of the total browse cover in 2002. Juniper density was estimated at 343 trees/acre from point-center quarter data in 2002. Low rabbitbrush followed by broom snakeweed are the most abundant species in terms of density.

Perennial grasses provide the bulk of the forage on this site, and contribute over one-half of the total vegetation cover. Both native and introduced species are present with three wheatgrass species, bluebunch, intermediate, and crested, being the most abundant. Bluebunch wheatgrass significantly increased in nested frequency between 1997 and 2002, while intermediate and crested remained stable. Other grasses that have been sampled on the site include orchard grass, Russian wildrye, Indian ricegrass, mutton bluegrass, Sandberg bluegrass, and bottlebrush squirreltail. Sum of nested frequency of all perennial grasses declined by 13% between 1997 and 2002. Annual species, specifically cheatgrass, were infrequent in 1997, and were not sampled at all in 2002.

Forbs are moderately diverse with low growing species being the most abundant. Rock goldenrod, Hoods phlox, stemless goldenweed, and Fendler sandwort are the most abundant perennial species. Annual forbs are infrequent, with bur buttercup being the most common. Two important seeded forbs, small burnet and alfalfa were not sampled in 2002. Sum of nested frequency of perennial forbs declined by 14% in 2002. Declines in nested frequency values for grasses and forbs in 2002 is due to drought.

### 1989 APPARENT TREND ASSESSMENT

The treated area provides abundant herbaceous forage for spring and fall use, but there are restricted limits to cover with little preferred browse for winter range. The site appears to be quickly returning to dominance of juniper cover. The lack of good quantities of preferred browse indicates a downward trend for deer winter range. Soil trend appears down as excessive erosion continues.

## 1997 TREND ASSESSMENT

The trend for soil is stable. There is no sign of erosion at this time, especially with the very high proportion of cover provided by the herbaceous species. The trend for preferred browse is down because there is little preferred browse on the site. Most cover (forage) provided by browse species is from low rabbitbrush (51%) and juniper (48%). Trend for the herbaceous understory is stable, with nearly no change in the sum of nested frequency values for perennial grasses and forbs.

### TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soils is stable. Percent bare soil declined, and vegetation and litter cover remain abundant and minimize erosion. Trend for browse is stable, but preferred forage species are limited. Preferred species are present in densities lower than 100 plants/acre, and all show moderate to heavy use as wintering animals key on individual plants. None of the forage species showed any reproduction in 2002, so population increases are not likely in the near future. Juniper continues to increase and a retreatment project may need to be considered. The herbaceous understory is dominated by perennial grasses which slightly decreased (13%) in sum of nested frequency in 2002 with drought. Even with the decrease in overall frequency, the most abundant species bluebunch wheatgrass, significantly increased in nested frequency. Intermediate wheatgrass, which is second in abundance to bluebunch, decreased slightly in 2002, but not significantly. Forbs also declined in sum of nested frequency overall, but forbs provide less than 10% of the total cover on the site. Trend for the herbaceous component is slightly down, but will improve with better precipitation.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

## HERBACEOUS TRENDS --

Herd unit 16C, Study no: 5

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	a5	b18	ab20	3	10	8	.85	1.54
G	Agropyron intermedium	a18	b117	b91	8	38	33	3.94	4.74
G	Agropyron spicatum	a61	b118	c162	26	44	57	7.21	12.67
G	Bromus japonicus (a)	-	2	-	-	1	-	.00	-
G	Bromus tectorum (a)	-	b33	a-	-	15	-	.15	-
G	Dactylis glomerata	a3	b23	a3	3	11	1	.64	.03
G	Elymus junceus	1	2	4	1	1	2	.15	.18
G	Oryzopsis hymenoides	b47	ab30	a10	22	16	5	.95	.26
G	Poa fendleriana	7	1	4	3	1	2	.03	.03
G	Poa secunda	b30	a15	a9	16	7	4	.58	.02
G	Sitanion hystrix	c230	b31	a5	84	17	2	.56	.03

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
	Total for Annual Grasses	0	35	0	0	16	0	0.15	0
	Total for Perennial Grasses	402	355	308	166	145	114	14.93	19.53
	Total for Grasses	402	390	308	166	161	114	15.09	19.53
F	<i>Alyssum alyssoides</i> (a)	-	7	6	-	4	3	.02	.01
F	<i>Antennaria rosea</i>	-	6	4	-	3	2	.01	.01
F	<i>Arabis</i> spp.	1	3	-	1	1	-	.00	-
F	<i>Arenaria fendleri</i>	a-	b34	b23	-	16	10	.10	.12
F	<i>Astragalus</i> spp.	ab5	b12	a-	2	5	-	.05	-
F	<i>Astragalus utahensis</i>	-	5	2	-	2	1	.01	.00
F	<i>Camelina microcarpa</i> (a)	-	5	-	-	2	-	.01	-
F	<i>Carduus nutans</i> (a)	-	-	-	-	-	-	.03	-
F	<i>Chaenactis douglasii</i>	-	5	-	-	3	-	.04	-
F	<i>Chenopodium fremontii</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Cirsium</i> spp.	7	1	-	3	1	-	.00	-
F	<i>Convolvulus arvensis</i>	8	-	-	2	-	-	-	-
F	<i>Cryptantha</i> spp.	c33	b8	a-	17	6	-	.03	-
F	<i>Erigeron</i> spp.	-	1	-	-	1	-	.00	-
F	<i>Eriogonum</i> spp.	3	4	-	1	2	-	.03	-
F	<i>Haplopappus acaulis</i>	a5	b21	b37	2	10	16	.61	.91
F	<i>Lactuca serriola</i>	12	-	-	4	-	-	-	-
F	<i>Machaeranthera canescens</i>	8	-	-	4	-	-	-	-
F	<i>Medicago sativa</i>	-	-	-	-	-	-	.01	-
F	<i>Penstemon humilis</i>	8	2	8	4	2	3	.01	.01
F	<i>Petrorhiza pumila</i>	a1	b30	c45	1	13	16	1.82	1.54
F	<i>Phlox hoodii</i>	107	97	89	47	43	37	1.09	.78
F	<i>Phlox longifolia</i>	-	-	4	-	-	2	-	.03
F	<i>Ranunculus testiculatus</i> (a)	-	b111	a29	-	42	12	.65	.08
F	<i>Sanguisorba minor</i>	b19	a3	a-	10	2	-	.03	-
F	<i>Sphaeralcea coccinea</i>	3	3	-	2	2	-	.01	-
F	<i>Streptanthus cordatus</i>	5	-	-	3	-	-	-	-
F	<i>Trifolium douglasii</i>	a-	b11	a-	-	5	-	.07	-
F	<i>Tragopogon dubius</i>	b31	a3	a1	19	1	1	.00	.00
	Total for Annual Forbs	0	126	35	0	49	15	0.71	0.10
	Total for Perennial Forbs	256	249	213	122	118	88	3.99	3.43
	Total for Forbs	256	375	248	122	167	103	4.70	3.53

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



BROWSE TRENDS --  
Herd unit 16C, Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier utahensis	1	0	-	-
B	Artemisia tridentata vaseyana	2	3	-	-
B	Atriplex canescens	0	1	-	.03
B	Ceratoides lanata	5	3	.06	.04
B	Chrysothamnus depressus	2	0	-	-
B	Chrysothamnus nauseosus albicaulis	1	0	-	-
B	Chrysothamnus viscidiflorus stenophyllus	46	53	3.88	4.23
B	Ephedra viridis	0	1	-	-
B	Gutierrezia sarothrae	3	14	-	.84
B	Juniperus osteosperma	18	23	3.65	9.14
B	Purshia tridentata	2	2	-	-
B	Symphoricarpos oreophilus	0	0	-	-
Total for Browse		80	100	7.60	14.28

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16C, Study no: 5

Species	Percent Cover	
	'97	'02
Artemisia tridentata vaseyana	-	.07
Ceratoides lanata	-	.02
Chrysothamnus viscidiflorus	-	3.92
Gutierrezia sarothrae	-	.17
Juniperus osteosperma	-	12.75
Purshia tridentata	-	.17

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 5

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.0

Point-Quarter Tree Data  
Herd unit 16C , Study no: 5

Species	Trees per Acre	Average diameter (in)
	'02	'02
Juniperus osteosperma	343	2.2

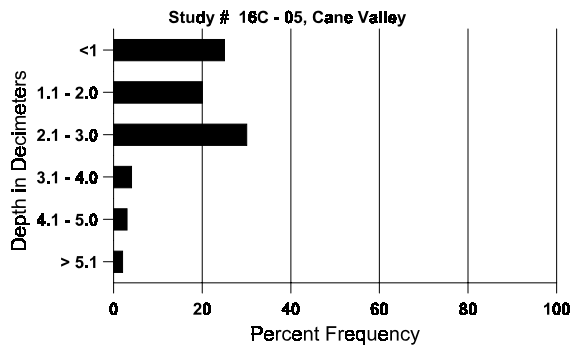
BASIC COVER --  
Herd unit 16C, Study no: 5

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	328	318	11.50	27.65	35.98
Rock	233	245	11.75	8.64	10.51
Pavement	261	300	15.25	6.38	15.90
Litter	391	378	48.50	33.02	35.79
Cryptogams	38	59	0	.27	1.75
Bare Ground	244	261	13.00	20.74	15.79

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 05, Cane Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.0	60.0 (14.7)	7.4	28.0	29.4	42.6	5.0	12.4	188.8	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 5

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Sheep	4	7	165	13 (31)
Rabbit	4	24	-	-
Elk	26	10	322	25 (61)
Deer	25	43	983	76 (187)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 5

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	7	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40	12	11	2
	02	2	1	1	-	-	-	-	-	-	4	-	-	-	80	15	23	4
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		50%			00%			00%			+50%							
'02		25%			25%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
												'02	80		-			
<i>Atriplex canescens</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	37	26	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	61	77	0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	30	48	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Ceratoides lanata</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	5	-	-	-	-	-	-	7	-	-	-	140	4	5	7
	02	1	1	2	-	-	-	-	-	-	4	-	-	-	80	7	10	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-43%							
'97		14%			71%			00%										
'02		25%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	140		-			
												'02	80		-			
<b>Chrysothamnus depressus</b>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	9	1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+18%							
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	40		-			
												'02	0		-			
<b>Chrysothamnus nauseosus albicaulis</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	17	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	9	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus stenophyllus</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28	
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	89	16	-	-	-	-	-	-	-	-	16	-	-	-	533	8 10	16	
	97	142	12	-	-	-	-	-	-	-	154	-	-	-	3080	11 16	154	
	02	207	10	-	-	-	-	-	-	-	217	-	-	-	4340	8 15	217	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	14	6	1	-	2	-	-	-	-	22	-	-	1	460		23	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+84%							
'97		07%			00%			00%			+26%							
'02		07%			.40%			.40%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	566	Dec:	0%			
												'97	3640		0%			
												'02	4920		9%			
<i>Ephedra viridis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	5 4	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	20		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Gutierrezia sarothrae</b>																		
M	89	10	-	-	-	-	-	-	-	-	10	-	-	-	333	9	12	10
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	6	6	5
	02	40	-	-	-	-	-	-	-	-	40	-	-	-	800	7	9	40
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-73%							
'97		00%			00%			00%			+88%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	366	Dec:	9%				
											'97	100		0%				
											'02	860		7%				
<b>Juniperus osteosperma</b>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	97	11	-	-	-	-	-	1	-	-	12	-	-	-	240			12
	02	4	-	1	-	-	-	-	-	-	5	-	-	-	100			5
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	71	52	1
	97	5	-	-	1	-	-	1	-	-	7	-	-	-	140	-	-	7
	02	16	-	-	-	-	-	-	3	-	19	-	-	-	380	-	-	19
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+30%							
'97		00%			00%			00%			+21%							
'02		00%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	266	Dec:	-				
											'97	380		-				
											'02	480		-				
<b>Purshia tridentata</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	2	-	-	-	-	-	-	2	-	-	-	40	6	14	2
	02	-	-	-	-	-	2	-	-	-	2	-	-	-	40	8	17	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			100%			00%			+ 0%							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
											'02	40		-				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	21	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-6-02

Study site name: Black Hill.

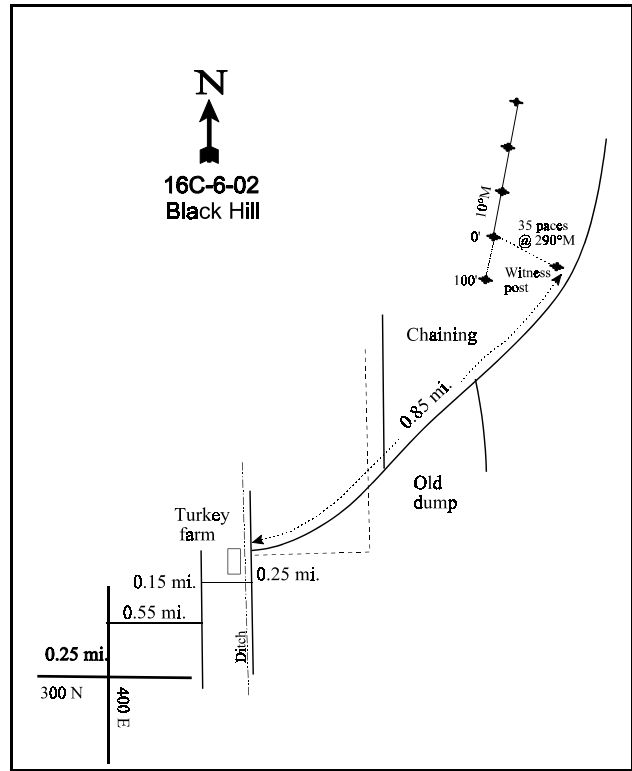
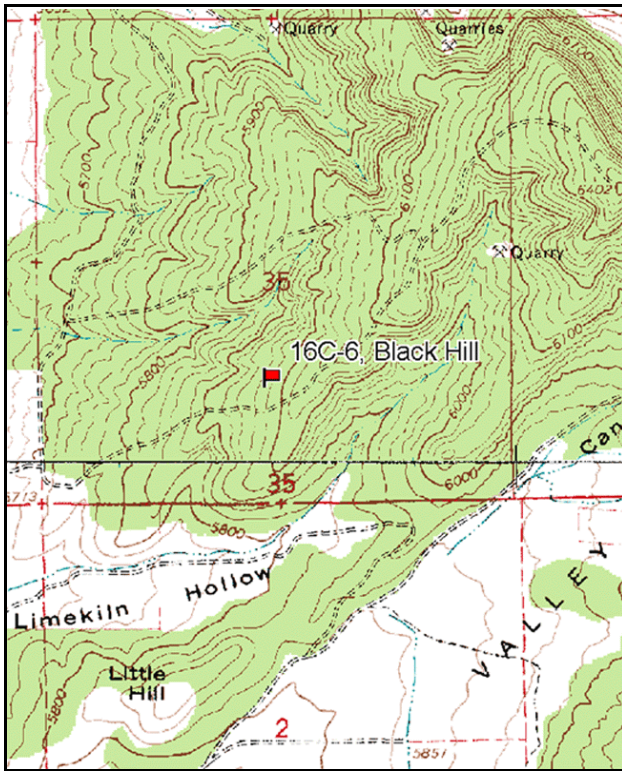
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 190 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of 300 North and 400 East in Ephraim, go north on 400 East for 0.25 miles. Just before the white brick home, turn east and go 0.55 miles. From here, bear left and then right, going 0.15 miles to where the road crosses the Gobble field ditch on the south side of a turkey pen. Cross the ditch and turn left (north) for 0.25 miles. Turn right here and go 0.85 miles into the chaining where you will come to a 4 foot, green witness post on the west side of the road. Stop here and walk 35 paces westward at 290 degrees magnetic to the 0-foot baseline stake marked by browse tag # 427.



Map Name: Chester

Diagrammatic Sketch

Township 16S, Range 3E, Section 35

GPS: NAD 27, UTM 12S 4358578 N 452497 E



## DISCUSSION

### Black Hill - Trend Study No. 16C-6

The Black Hill study is located on a chained and seeded juniper site northeast of Ephraim. The site is located on Division land above several turkey farms, pastures, and alfalfa fields. The Black Hills drop sharply down to Cane Valley on the east, but slope moderately to the west. The site is on a 16%, west facing slope at an elevation of 6,075 feet. In 1987, a chain was used to mechanically eliminate the juniper on the site. The site was also seeded as part of the treatment. The area was previously characterized as an open stand of juniper with a sparse understory of black sagebrush in association with cheatgrass. Patches of juniper were left on the ridge for cover and travel corridors for big game. Most of the big game use on this site comes from wintering deer. Pellet group transect data taken in 2002 estimated moderate deer use of 66 deer days use/acre (164 ddu/ha) and light elk use at 13 elk days use/acre (33 edu/ha). Livestock also graze the area during the summer. Cow use was estimated at 11 days use/acre (27 cdu/ha) in 2002.

This site is limited by the more shallow soils and lower annual precipitation compared to the nearby Cane Valley study. The soil is described as Amtoft flaggy loam which characteristically are 12-18 inches deep over limestone. Therefore, the root zone may be somewhat restricted. Effective rooting depth at the site was estimated at about 10 inches. Soil textural analysis indicates a clay loam with a neutral to slightly alkaline reactivity (pH = 7.3). Erosion hazard is considered moderate, but with appreciable litter buildup and the abundance of seeded grasses, erosion is minimal. Rock and pavement combined cover are moderate at 12% in 2002. Bare soil was also moderate at 18% in 2002, a slight increase from 13% in 1997. The erosion condition class assessment was determined to be stable in 2002.

As with the Cane Valley study, palatable browse is limited on this site. Black sagebrush, Wyoming big sagebrush, four-wing saltbush, and bitterbrush are all present, but only black sagebrush is moderately abundant. Black sagebrush density was estimated at 760 plants/acre in 2002. Reproduction declined in 2002, probably due to drought conditions, but decadence was low at 16%, vigor was mostly normal, and use was moderate. Wyoming big sagebrush density was estimated at 440 plants/acre in 1997, but only 40 plants/acre in 2002. Apparently, most of the plants classified as Wyoming big sagebrush in 1997 were classified as black sage in 2002. The growth form of Wyoming big sagebrush on this site is low and many of the plants displayed characteristics of black sagebrush. It is likely that many of the sagebrush on the site are hybrids between Wyoming big sagebrush and black sage. Total sagebrush density between 1997 and 2002 is nearly unchanged.

The junipers on the ridge surrounding the study have been highlined. Juniper density on the study site was estimated at 77 trees/acre in 2002, a slight increase from 69 trees/acre in 1997. A small proportion of the trees are survivors from the treatment but many were young trees in the 2 to 3 foot size class. Average diameter of juniper was estimated at only 3 inches. Low rabbitbrush is the most common shrub on the study site with a density of about 2,500 plants/acre in 2002. It had very poor vigor in 1989 due to moisture stress, but showed mostly normal vigor in 1997 and 2002.

Perennial grasses, both seeded and native, dominant the vegetative community. Perennial grasses contributed 48% of the total vegetative cover in 1997, increasing to 65% in 2002. Intermediate wheatgrass is the most abundant species significantly increasing in nested frequency in 2002. Crested wheatgrass, Indian ricegrass, and muttongrass are moderately abundant. As a group, perennial grass sum of nested frequency declined by 7% in 2002 with drought conditions. Grasses appeared to have been grazed by cattle prior to sampling in 2002, but with abundant litter and wolfy material on many plants, grazing has not been a problem in the past. Cheatgrass was moderately abundant in 1997 with a nested frequency of 181 (400 maximum) and a quadrat frequency of 61%. In 2002, cheatgrass was sampled in only 20 quadrats and nested frequency declined significantly. The decline in cheatgrass abundance is not unexpected during drought as was the case in 2002.

Forbs, especially perennial species, have not been significant in the understory since the site was established. Annual species were moderately abundant in 1997, but drastically declined in 2002 with drought. Perennial forbs were sampled in only four total quadrats in 2002. Small burnet, a seeded species, was moderately abundant in 1989, but has since disappeared from the site. Bur buttercup is currently ('02) the most abundant forb on the site.

#### 1989 APPARENT TREND ASSESSMENT

This recently treated area has not yet reached its potential, especially with the poor moisture conditions in the years since the treatment. Site potential is limited, and black sagebrush will likely become the predominant browse because of the shallow soils. Grasses and forbs are clearly an important component on this range for spring and fall big game use. Site management objectives should include the increase of the perennial species to more competitively exclude weedy annuals and cheatgrass. Soils appear to be stable to improving with increasing ground cover.

#### 1997 TREND ASSESSMENT

Trend for soil is up. Percent bare soil declined to 13%, and herbaceous cover continues to increase. Cover contributed by herbaceous species is better for protecting soils from high intensity summer storms. The two preferred browse species for this site are black sagebrush and Wyoming big sagebrush which are almost equal in abundance, 420 and 440 plants/acre respectively. The much better sampling design is responsible for the more accurate estimates of sagebrush density. Percent decadence is low and vigor is good. Trend for browse is stable. The herbaceous understory is more difficult to determine because of the abundance of weedy species. The trend for perennial species is improving, but weedy species should be monitored closely for population trends of three species, cheatgrass, pale alyssum, and bur buttercup. These species currently contribute 21% of the total vegetative cover.

##### TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - slightly up (4)

#### 2002 TREND ASSESSMENT

Soil trend is stable. Although percent bare soil increased in 2002, herbaceous vegetation dominates the site. Vegetation and litter cover are well disbursed and effectively limit erosion. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil remains good at almost 4:1. Trend for browse is stable. In 1997, Wyoming big sagebrush and black sagebrush were estimated at nearly identical densities. In 2002, most of the sagebrush on the site was classified as black sagebrush. Overall sagebrush density is stable, use is moderate, vigor is mostly normal, and decadence is low at 16%. Trend for the herbaceous understory is stable as perennial grasses remain dominant and only slightly decreased in sum of nested frequency in 2002. Intermediate wheatgrass, the most abundant species, significantly increased in 2002.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 6

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 16	<sub>ab</sub> 34	<sub>b</sub> 52	9	17	23	1.50	2.34
G	Agropyron intermedium	<sub>a</sub> 93	<sub>b</sub> 178	<sub>c</sub> 225	37	64	78	12.55	16.99
G	Agropyron spicatum	-	-	-	-	-	-	.00	-
G	Bromus inermis	-	3	-	-	1	-	.03	-
G	Bromus tectorum (a)	-	<sub>b</sub> 181	<sub>a</sub> 52	-	61	20	1.98	.34
G	Elymus junceus	-	4	4	-	3	2	.21	.03
G	Oryzopsis hymenoides	<sub>ab</sub> 52	<sub>b</sub> 90	<sub>a</sub> 35	24	34	14	1.21	1.47
G	Poa fendleriana	1	-	-	1	-	-	-	-
G	Poa pratensis	1	-	-	1	-	-	-	-
G	Poa secunda	<sub>a</sub> 9	<sub>b</sub> 44	<sub>b</sub> 43	5	17	16	.16	.26
G	Sitanion hystrix	<sub>b</sub> 46	<sub>b</sub> 39	<sub>a</sub> 6	22	21	3	1.14	.07
Total for Annual Grasses		0	181	52	0	61	20	1.98	0.34
Total for Perennial Grasses		218	392	365	99	157	136	16.81	21.18
Total for Grasses		218	573	417	99	218	156	18.80	21.52
F	Alyssum alyssoides (a)	-	<sub>b</sub> 271	<sub>a</sub> 32	-	87	16	1.96	.10
F	Allium spp.	-	-	7	-	-	2	-	.01
F	Arabis spp.	-	3	-	-	1	-	.03	-
F	Astragalus spp.	3	-	-	1	-	-	-	-
F	Camelina microcarpa (a)	-	5	-	-	2	-	.01	-
F	Chenopodium album (a)	-	1	-	-	1	-	.00	-
F	Cirsium spp.	6	-	-	2	-	-	-	-
F	Cymopterus spp.	-	1	-	-	1	-	.00	-
F	Lactuca serriola	<sub>b</sub> 14	<sub>ab</sub> 4	<sub>a</sub> -	5	2	-	.01	-
F	Linum lewisii	1	2	-	1	1	-	.03	-
F	Mentzelia albicaulis (a)	-	3	-	-	1	-	.03	-
F	Medicago sativa	7	2	-	4	2	-	.04	-
F	Phlox longifolia	-	2	1	-	1	1	.00	.00
F	Ranunculus testiculatus (a)	-	<sub>b</sub> 272	<sub>a</sub> 193	-	86	66	3.46	2.81
F	Sanguisorba minor	<sub>c</sub> 88	<sub>b</sub> 15	<sub>a</sub> -	40	5	-	1.12	-
F	Sisymbrium altissimum (a)	3	3	-	1	1	-	.41	-
F	Sphaeralcea coccinea	-	1	1	-	1	1	.03	.00
F	Trifolium douglasii	-	3	-	-	2	-	.06	-
F	Tragopogon dubius	3	6	-	2	4	-	.04	-
Total for Annual Forbs		3	555	225	1	178	82	5.87	2.91
Total for Perennial Forbs		122	39	9	55	20	4	1.39	0.01
Total for Forbs		125	594	234	56	198	86	7.27	2.93

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia nova	10	21	.39	.66
B	Artemisia tridentata wyomingensis	15	2	.45	.30
B	Atriplex canescens	3	1	-	-
B	Chrysothamnus viscidiflorus stenophyllus	57	50	5.29	4.30
B	Gutierrezia sarothrae	5	7	.07	.03
B	Juniperus osteosperma	7	8	2.51	2.75
B	Opuntia spp.	0	1	-	-
Total for Browse		97	90	8.72	8.06

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16C, Study no: 6

Species	Percent Cover	
	'97	'02
Artemisia nova	-	.92
Artemisia tridentata wyomingensis	-	.25
Atriplex canescens	-	.58
Chrysothamnus viscidiflorus stenophyllus	-	4.58
Gutierrezia sarothrae	-	.05
Juniperus osteosperma	-	3.58

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 6

Species	Average leader growth (in)
	'02
Artemisia nova	1.4

Point-Quarter Tree Data  
Herd unit 16C , Study no: 6

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	69	77	2.6	3.2

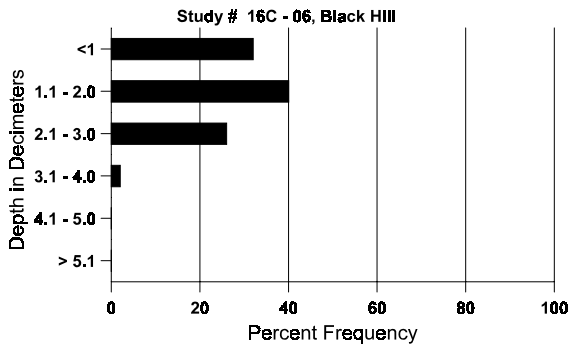
BASIC COVER --  
Herd unit 16C, Study no: 6

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	374	344	4.50	34.90	32.80
Rock	139	184	2.50	2.73	4.11
Pavement	237	251	13.75	4.38	7.83
Litter	378	388	63.25	40.56	50.98
Cryptogams	99	123	1.00	1.42	4.36
Bare Ground	210	232	15.00	12.78	18.33

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 06, Black Hill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.5	61.6 (10.4)	7.3	36.7	34.7	28.6	4.5	13.1	160.0	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 6

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Sheep	1	-	-	-
Rabbit	12	19	-	-
Elk	1	9	174	13 (33)
Deer	40	31	861	66 (164)
Cattle	-	2	131	11 (27)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 6

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia nova																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	-	1	-	-	-	-	-	-	3	-	-	-	100		3	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	4	6	1	-	-	-	-	-	-	10	1	-	-	366	12 12	11	
	97	15	-	-	-	-	-	-	-	-	15	-	-	-	300	13 23	15	
	02	12	15	5	-	-	-	-	-	-	32	-	-	-	640	10 18	32	
D	89	5	3	-	-	-	-	-	-	-	7	-	1	-	266		8	
	97	3	-	-	-	-	-	-	-	-	-	-	-	60		3		
	02	4	1	1	-	-	-	-	-	-	5	-	-	120		6		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		41%			09%			05%			-43%							
'97		00%			00%			14%			+45%							
'02		42%			16%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	732	Dec:	36%				
											'97	420		14%				
											'02	760		16%				
Artemisia tridentata wyomingensis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	13	1	-	5	-	-	-	-	-	19	-	-	-	380	15 20	19	
	02	1	1	-	-	-	-	-	-	-	2	-	-	-	40	19 20	2	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		05%			00%			00%			-91%							
'02		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	440		5%				
											'02	40		0%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	41	21	3
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	59	57	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-67%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			
												'02	20		-			
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	54	85	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	38	44	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Chrysothamnus viscidiflorus stenophyllus</i>																		
Y	89	2	-	-	-	-	-	-	-	-	1	-	1	-	66			2
	97	20	-	-	-	-	-	-	-	-	20	-	-	-	400			20
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	35	-	-	-	-	-	-	-	-	2	-	28	5	1166	15	22	35
	97	121	-	-	1	-	-	-	-	-	122	-	-	-	2440	14	23	122
	02	105	1	-	1	-	-	-	-	-	106	1	-	-	2140	12	21	107
D	89	18	-	-	-	-	-	-	-	-	1	-	12	5	600			18
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80			4
	02	11	2	-	-	1	-	1	-	-	12	-	-	3	300			15
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			93%			+37%							
'97		00%			00%			.68%			-16%							
'02		03%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1832	Dec:	33%			
												'97	2920		3%			
												'02	2460		12%			

A Y G R E		Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	3	-	-	-	-	-	-	-	-	-	-	-	60			3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	7	-	-	-	-	-	-	-	-	-	-	-	140			7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	8	-	-	-	-	-	-	-	-	-	-	-	160	10	9	8	
	02	12	-	-	-	-	-	-	-	-	-	-	-	240	6	8	12	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	4	-	-	-	-	-	-	-	-	-	-	-	80			4	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	100			5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+ 6%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	300		0%			
												'02	320		25%			
<i>Juniperus osteosperma</i>																		
S	89	1	-	-	-	-	-	-	-	-	-	-	-	33			1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	89	2	-	-	-	-	-	-	-	-	-	-	-	66			2	
	97	3	-	-	-	-	-	-	-	-	-	-	-	60			3	
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	5	-	-	-	-	-	-	-	-	-	-	-	100	-	-	5	
	02	8	-	-	-	-	-	-	1	-	-	-	-	180	-	-	9	
D	89	4	-	-	-	-	-	-	-	-	-	-	-	133			4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	2	-	-	-	-	-	-	-	-	-	-	-	40			2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	40			2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	40			2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			17%			-20%							
'97		00%			00%			00%			+33%							
'02		00%			00%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	67%			
												'97	160		0%			
												'02	240		17%			



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	15	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	18	0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	30	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	0		-			
												'02	20		-			
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	10	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-7-02

Study site name: Mayfield Mtn. Face .

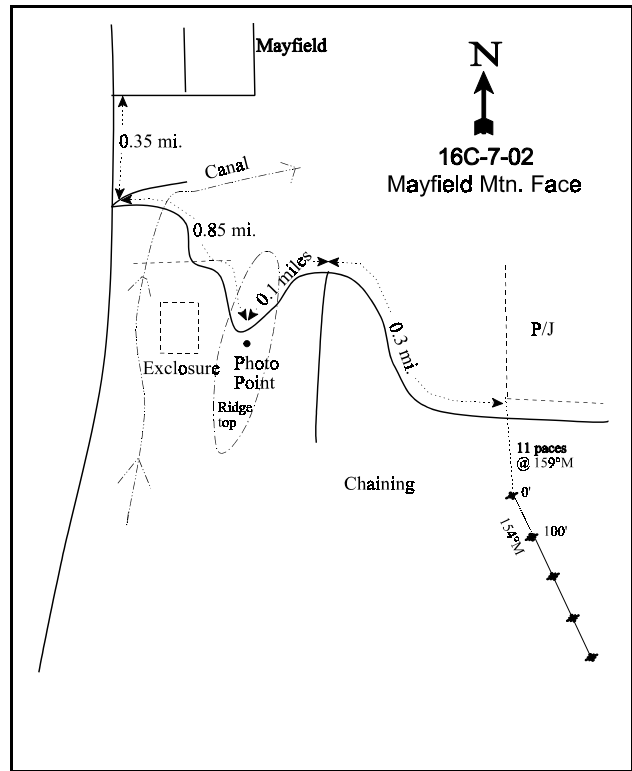
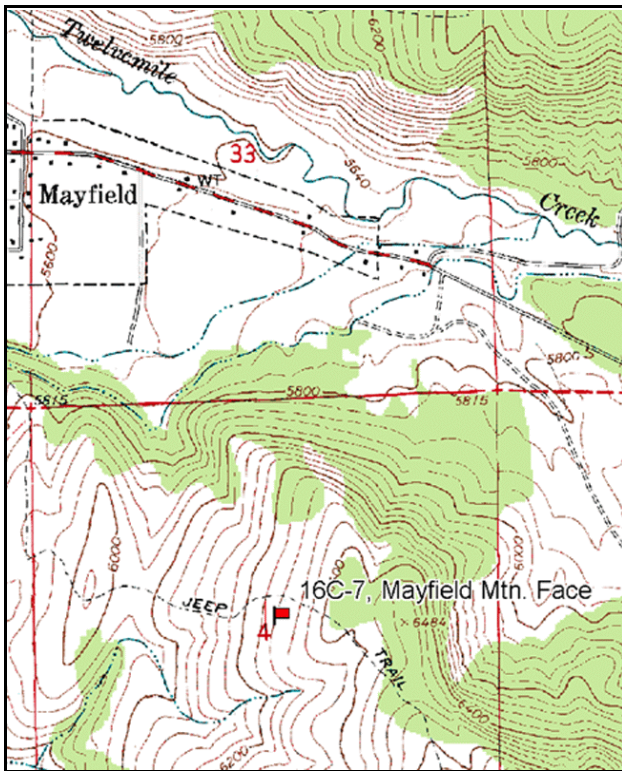
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 154 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 main road and Twelve Mile Canyon Road in Mayfield, go south out of town on the main road for 0.35 miles into Arapien Valley to an intersection. At the intersection, turn east up a steep four-wheel drive road that goes up the hill. Take this road 0.85 miles to an old line-intercept photo point on the ridge top (a canal and fence will be crossed 0.1 miles east of the ridge top and you will come to a fork in the road). Go straight (east) for 0.3 miles to a fence corner on the north side of the road. From the fence corner, walk 11 paces at 159 degrees magnetic to the 0-foot baseline stake.



Map Name: Mayfield

Diagrammatic Sketch

Township 20S, Range 2E, Section 4

GPS: NAD 27, UTM 12S 4327808 N 440012 E

## DISCUSSION

### Mayfield Mountain Face - Trend Study No. 16C-7

The Mayfield Mountain Face study is located on a large, 30-year old chaining and seeding treatment southeast of Mayfield. The site lies on a moderately steep (15-20%), west facing slope at an elevation of 6,200 feet. The area is critical for wintering deer, but also receives some spring-fall use by big game. Quadrat frequency of deer pellets was moderately high in 1997 and 2002 at 47% and 43% respectively. Deer use was estimated at 56 days use/acre (139 ddu/ha) from pellet group transect data taken in 2002. Elk use was very light at only 3 days use/acre (7 edu/ha). A few cattle pats were also encountered.

The soil is classified as Fontreen very cobbly loam. Soils are strongly calcareous, allowing calcium carbonate precipitates to form a hardened caliche layer. Soil at the site has a clay loam texture and reactivity is neutral to slightly alkaline (pH of 7.3). There is a well developed hardpan within localized areas about 10 inches below the surface. Soils are shallow with an estimated effective rooting depth of under 9 inches. Rock and pavement cover are high and armor the surface. Percent bare soil was also moderately high at 22% in 2002, an increase from only 5% in 1997. Vegetation and litter cover are not as abundant on this site compared to most chained and seeded sites. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil declined from 5:1 in 1997 to 3:1 in 2002 with the drought conditions. However, the vegetation and litter that are present are well distributed over the site and are adequate to prevent serious erosion. An erosion condition class assessment was determined as slight in 2002.

The increase of juniper since treatment has been slow. Juniper density was estimated at 32 trees/acre using point quarter data in 2002. Pinyon density was estimated at only 8 trees/acre. Juniper density estimates from 1989 and 1997 (35 and 31 trees/acre respectively) show that juniper has remained stable since the initial reading. Older trees within the adjacent unchained stand have been highlined.

Black sagebrush is the most common shrub, and the key browse species within this chained area. Density of black sagebrush was estimated at 2,540 plants/acre in 1997, slightly increasing to 2,660 plants/acre in 2002. Percent decadence remained stable between 1997 and 2002 (12% and 13% respectively), as did vigor which is mostly normal throughout the population. Recruitment from young plants decreased from 16% in 1997 to 1% in 2002, but with drought, this is expected and has occurred in browse populations on many other sites in the area. Utilization on black sagebrush is moderate, and annual leader growth averaged less than 1 inch in 2002. The few mountain big sagebrush, bitterbrush, and four-wing saltbush that occur on site have been very heavily browsed.

Perennial grasses are the dominant vegetative component on the site, although their sum of nested frequency value declined by 29% in 2002 with the drought. Perennial grasses made up 52% of the total vegetative cover in 1997, decreasing to 41% in 2002. Bluebunch wheatgrass, crested wheatgrass, and Sandberg bluegrass are the most abundant species. In 2002, nested frequency of crested wheatgrass declined but not significantly, bluebunch wheatgrass remained almost identical, and Sandberg bluegrass significantly declined. Grasses had been heavily utilized by cattle prior to sampling in July 2002, and most plants including the perennial species were already dried up. Visually, this site looked poor in 2002 due to drought and heavy use. The forb composition is dominated by bur buttercup, a species that has allelopathic properties. Perennial forbs have been nearly non-existent on the site in all readings.

### 1989 APPARENT TREND ASSESSMENT

Slight soil movement is detectable, but not excessive. Soil trend appears stable. Compared to the unchained areas, this treatment was successful in providing abundant grass forage. Browse production is less than optimum and the more palatable species are heavily utilized. The trend appears to be slightly declining.

1997 TREND ASSESSMENT

Trend for soil is slightly up as percent bare soil has decreased from 9% to 5%. Another important factor is that the herbaceous understory makes up almost 70% of the total plant cover. Herbaceous cover provides the best form of soil protection from erosive events that can occur during high intensity summer storms. The browse trend is stable. Black sagebrush density is estimated to be much lower than the 1989 reading. However, most of this difference can be accounted for by the significantly larger sample size that is now utilized. Use and decadence have declined since 1989, and recruitment from young plants remains good at 16% of the population. The herbaceous understory trend is stable overall because perennial grasses slightly increased in sum of nested frequency. However, the annual bur buttercup, should be closely watched for future population trends. This species provides almost 6% average cover which is excessive for an annual species with a small growth form.

TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Trend for soil is down. Bare soil increased from 5% to 22%, and cover and nested frequency of herbaceous vegetation decreased. Vegetation and litter are low for a chained and seeded site. Rock and pavement are very high at nearly 30%. Erosion is only slight because of the abundance of rock and pavement on the surface and the level terrain. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil declined significantly in 2002, but remains good at nearly 3:1. Trend for browse is stable. Black sagebrush density slightly increased, decadence remains low and vigor is generally good throughout the population. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses declined by 29% in 2002. Project personnel noted that this site looked very poor due to drought conditions and heavy use on the grasses by cattle prior to sampling. Bur buttercup remains abundant, and perennial forbs are non-existent.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Herd unit 16C, Study no: 7

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 94	<sub>b</sub> 147	<sub>ab</sub> 127	40	53	48	6.38	4.06
G	Agropyron intermedium	<sub>a</sub> 7	<sub>b</sub> 36	<sub>a</sub> 5	6	15	2	.89	.03
G	Agropyron spicatum	<sub>b</sub> 226	<sub>a</sub> 135	<sub>a</sub> 134	81	53	50	6.23	5.69
G	Bromus inermis	<sub>b</sub> 27	<sub>b</sub> 35	<sub>a</sub> 1	14	16	1	.40	.00
G	Bromus tectorum (a)	-	<sub>b</sub> 31	<sub>a</sub> 3	-	13	1	.40	.00
G	Elymus junceus	<sub>a</sub> -	<sub>b</sub> 7	<sub>a</sub> 2	-	3	1	.30	.00
G	Oryzopsis hymenoides	1	7	-	1	2	-	.53	-
G	Poa pratensis	-	-	3	-	-	2	-	.03
G	Poa secunda	<sub>b</sub> 196	<sub>b</sub> 205	<sub>a</sub> 135	82	73	50	4.19	1.18

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
	Total for Annual Grasses	0	31	3	0	13	1	0.40	0.00
	Total for Perennial Grasses	551	572	407	224	215	154	18.93	11.02
	Total for Grasses	551	603	410	224	228	155	19.34	11.02
F	Antennaria rosea	1	-	-	1	-	-	-	-
F	Arabis spp.	5	1	-	3	1	-	.00	-
F	Astragalus utahensis	2	2	-	1	1	-	.03	-
F	Camelina microcarpa (a)	-	1	-	-	1	-	.00	-
F	Calochortus nuttallii	-	5	-	-	3	-	.01	-
F	Cryptantha spp.	4	-	-	2	-	-	-	-
F	Descurainia pinnata (a)	-	<sub>b</sub> 9	<sub>a</sub> -	-	5	-	.02	-
F	Holosteum umbellatum (a)	-	1	-	-	1	-	.00	-
F	Lactuca serriola	-	4	-	-	2	-	.01	-
F	Medicago sativa	2	5	-	1	2	-	.18	-
F	Phlox hoodii	<sub>b</sub> 22	<sub>a</sub> 6	<sub>a</sub> 2	10	2	2	.06	.01
F	Ranunculus testiculatus (a)	-	<sub>b</sub> 317	<sub>a</sub> 255	-	95	79	5.05	5.85
	Total for Annual Forbs	0	328	255	0	102	79	5.08	5.85
	Total for Perennial Forbs	36	23	2	18	11	2	0.30	0.01
	Total for Forbs	36	351	257	18	113	81	5.38	5.86

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

#### BROWSE TRENDS --

Herd unit 16C, Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia nova	51	53	8.85	8.24
B	Artemisia tridentata vaseyana	10	9	.96	.93
B	Atriplex canescens	0	1	-	-
B	Chrysothamnus nauseosus albicaulis	0	3	-	-
B	Chrysothamnus viscidiflorus stenophyllus	21	17	1.50	.28
B	Ephedra viridis	0	1	-	-
B	Gutierrezia sarothrae	19	13	.10	.04
B	Juniperus osteosperma	1	1	-	.53
	Total for Browse	102	98	11.42	10.03

CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 7

Species	Percent Cover	
	'97	'02
Artemisia nova	-	7.75
Artemisia tridentata vaseyana	-	.58
Atriplex confertifolia	-	.05
Chrysothamnus viscidiflorus	-	.17
Gutierrezia sarothrae	-	.03
Juniperus osteosperma	-	.83

Key Browse Annual Leader Growth

Herd unit 16C , Study no: 7

Species	Average leader growth (in)
	'02
Artemisia nova	0.6

Point-Quarter Tree Data

Herd unit 16C , Study no: 7

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	31	32	2.5	3.0
Pinus edulis	9	8	3.5	5.2

BASIC COVER --

Herd unit 16C, Study no: 7

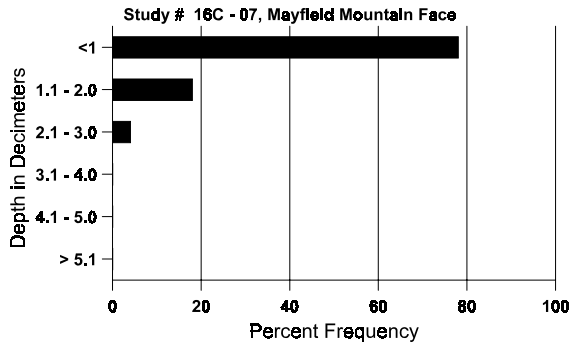
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	367	349	10.00	36.70	27.01
Rock	277	280	7.75	11.17	13.73
Pavement	295	325	46.00	12.71	15.39
Litter	377	370	27.25	25.64	29.80
Cryptogams	198	141	0	6.10	2.51
Bare Ground	189	291	9.00	5.19	22.09

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 07, Mayfield Mountain Face

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.7	61.0 (10.2)	7.3	30.0	37.4	32.6	4.9	11.9	144.0	.4

## Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 7

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
			02	02
Rabbit	19	10	-	-
Elk	4	2	35	3 (7)
Deer	47	43	731	56 (139)
Cattle	-	5	44	4 (9)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 7

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total						
		1	2	3	4		Ht. Cr.								
<b>Artemisia nova</b>															
S	89	4	-	-	-	-	-	-	4	-	-	266		4	
	97	4	-	-	-	-	-	-	4	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	6	5	-	-	-	-	-	7	-	4	733		11	
	97	20	-	-	-	-	-	-	20	-	-	400		20	
	02	1	-	-	-	-	-	-	1	-	-	20		1	
M	89	21	21	3	-	-	-	-	27	-	18	3000	14	16	45
	97	79	13	-	-	-	-	-	92	-	-	1840	15	28	92
	02	52	20	43	-	-	-	-	115	-	-	2300	13	26	115
D	89	18	7	1	-	-	-	-	21	-	5	1733		26	
	97	15	-	-	-	-	-	-	10	-	-	300		15	
	02	10	3	4	-	-	-	-	12	-	-	340		17	
X	89	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>					
'89		40%		05%		33%				-54%					
'97		10%		00%		04%				+ 5%					
'02		17%		35%		04%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	5466	Dec:	32%		
										'97	2540		12%		
										'02	2660		13%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		5	6		7	8	9	
<i>Artemisia tridentata vaseyana</i>													
Y	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	0	-	-	0
M	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	3	2	-	-	-	-	-	160	18	30	8
	02	1	4	4	-	-	-	-	-	180	15	30	9
D	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	2	-	-	-	-	-	-	40	-	-	2
	02	-	-	3	-	-	-	-	-	60	-	-	3
X	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%							
'97		45%		18%		09%		+ 8%					
'02		33%		58%		08%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%
										'97	220		18%
										'02	240		25%
<i>Atriplex canescens</i>													
M	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	0	60	80	0
D	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	1	-	-	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%							
'97		00%		00%		00%							
'02		100%		00%		100%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%
										'97	0		0%
										'02	20		100%
<i>Chrysothamnus nauseosus albicaulis</i>													
M	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	3	-	-	-	-	-	60	26	37	3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%							
'97		00%		00%		00%							
'02		00%		100%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-
										'97	0		-
										'02	60		-



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
Y	89	-	-	-	-	-	-	-	0	-	0	
	97	2	-	-	-	-	-	-	40	11	12	2
	02	-	-	-	-	-	-	-	0	7	16	0
M	89	-	-	-	-	-	-	-	0	-	-	0
	97	35	-	-	-	-	-	-	700	11	12	35
	02	-	-	20	-	1	-	-	420	7	16	21
D	89	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	20	-	-	1
	02	-	-	10	-	-	-	-	200	2	6	10
X	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%						
'97		00%		00%		00%		-18%				
'02		03%		97%		26%						
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	0%			
						'97	760		3%			
						'02	620		32%			
<i>Ephedra viridis</i>												
M	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	1	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%						
'97		00%		00%		00%						
'02		00%		100%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	-			
						'97	0		-			
						'02	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	22	-	-	-	-	-	-	-	-	22	-	-	-	440		22	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	9	-	-	-	-	-	-	-	-	9	-	-	-	600	8	5	9
	97	26	-	-	-	-	-	-	-	-	26	-	-	-	520	9	11	26
	02	18	-	-	-	-	-	-	-	-	18	-	-	-	360	5	6	18
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	6	-	1	-	-	-	2	-	-	6	-	-	3	180		9	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+38%							
'97		00%			00%			00%			-44%							
'02		00%			04%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	600	Dec:	0%			
												'97	960		0%			
												'02	540		33%			
<i>Juniperus osteosperma</i>																		
Y	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-70%							
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	20		-			
												'02	20		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	19	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			00%			00%										
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-8-02

Study site name: Pole Canyon Chaining .

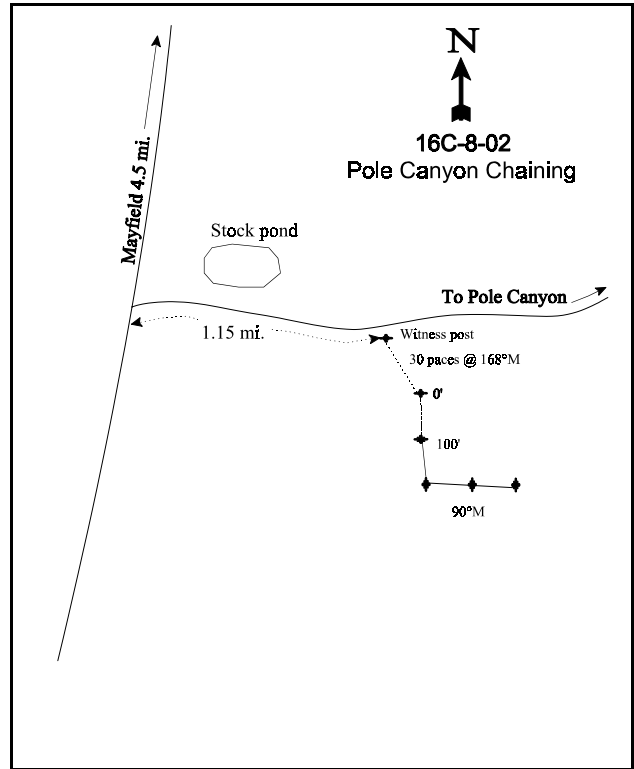
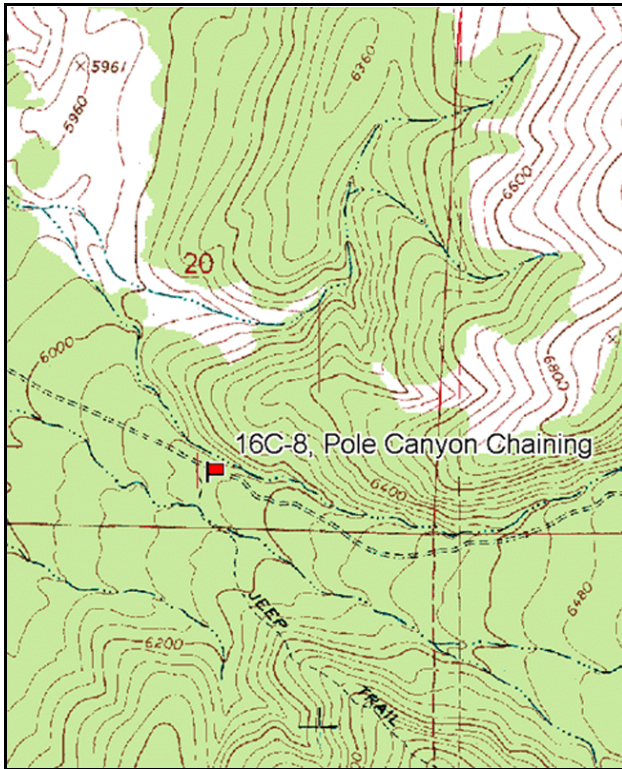
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 180 degrees magnetic (line 2-3 @ 90°M).

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

LOCATION DESCRIPTION

From Mayfield, go south down Arapien Valley for 4.5 miles to the Pole Canyon Road. Turn east and go 1.1 miles to a witness post in a chaining. The witness post is 6 paces south of the road. From the witness post to the 0-foot baseline stake is 32 paces at 215 degrees magnetic. Browse tag #4091 marks the 0-foot baseline stake.



Map Name: Mayfield

Diagrammatic Sketch

Township 20S, Range 2E, Section 20

GPS: NAD 27, UTM 12S 4322204 N, 438353 E

## DISCUSSION

### Pole Canyon Chaining - Trend Study No. 16C-8

This study is located on an old pinyon-juniper chaining at the south end of the Mayfield Face. The treatment was done on this BLM land more than 30 years ago. The same area was sampled by a line-intercept transect in 1978. The site is on a fairly level alluvial fan at the mouth of Pole Canyon. Elevation at the site is 6,160 feet, and topography slopes gently to the west. The area is considered an important wintering area for deer. Pellet group quadrat frequency was moderately high in 1997 and 2002 at 53% and 48% respectively. Pellet group transect data collected in 2002 estimated 99 deer days use/acre (245 ddu/ha). No elk pellet groups were sampled and cattle use was light at an estimated 2 days use/acre (5 cdu/ha). Grasses were reported to be heavily to severely grazed by cattle in 1989 and 1997. In the past, this area has been permitted for grazing as part of the South Hollow allotment from May 1 to June 30.

Soils in the area are a very strongly calcareous, cobbly loam in the Fontreen series. Soil survey information characterizes this soil type to be moderately deep with a cobbly loam surface layer with 20-50% gravel and cobbles. Soil at the site have an effective rooting depth estimated at just over 10 inches. Soils are sandy clay loam in texture and have a slightly alkaline reactivity (pH = 7.4). Initially, the combined cover value for rock and pavement was high at 25% in 1989. This estimate was significantly lower in 1997 and 2002 at 11% and 15%. Litter cover has remained moderately high in all sampling periods, currently ('02) at 54%. However, vegetation cover is low, especially in 2002 with drought (9%). In 2002, percent bare soil had nearly the same estimate as the initial reading (27%). In the past, the area was susceptible to sheet erosion and excessive soil movement, and active gullies were present north and south of the site. An erosion condition class assessment was determined as slight in 2002. With the decline in vegetation cover in 2002, the ratio of protective cover (vegetation, litter, and cryptogams) to bare soil is marginal at 2.6:1.

For a chaining treatment done more than 30 years ago, the density of juniper and pinyon is moderately low. Point-center quarter data in 1997 estimated juniper density at 76 trees/acre and pinyon density at 26 trees/acre. The pinyon-juniper trees on the site had been cut down by chainsaws prior to the 2002 reading. The most numerous browse on the site is broom snakeweed, but density has oscillated greatly between readings. Initial density estimates were 8,733 plants/acre in 1989, increasing to nearly 15,000 plants/acre in 1997. Broom snakeweed density drastically declined with dry conditions in 2001 and 2002 to only 3,740 plants/acre. Preferred browse is very limited on the site with white-stemmed rubber rabbitbrush being the most common. Density was estimated at 1,640 plants/acre in 2002, with excellent young recruitment. Rabbitbrush was split into two subspecies in 2002, the white-stemmed palatable form (*Chrysothamnus nauseosus albicaulis*) and a green-stemmed less palatable form (*Chrysothamnus nauseosus consimilis*). Use has been light to moderate on white rubber rabbitbrush during all readings. Other preferred species that are present in very low numbers include four-wing saltbush, bitterbrush, and true mountain mahogany.

The herbaceous understory is very poor on this site, especially considering that the site was chained and seeded. Crested wheatgrass, the most common perennial species, significantly declined in nested frequency between 1997 and 2002. This species is often heavily grazed, but the decline in 2002 doesn't appear to be from livestock use. Project personnel described crested wheatgrass as being 3 inches of stem with no leaves in early July 2002. The combination of drought and defoliation by grasshoppers appears to be the causative factors. Perennial forbs are almost non-existent in all years, currently ('02) providing less than one-quarter of 1% cover. Annual forbs are moderately abundant, primarily bur buttercup, which provided three-fourths of the total forb cover in 2002. Most of the forbs are low growing and/or weedy increasers that provide very little forage or cover. The herbaceous component on this site is one of the poorest ever seen by project personnel on a chained pinyon-juniper site.

### 1989 APPARENT TREND ASSESSMENT

For a basically level site, there is an inordinate amount of soil erosion resulting in poor soil conditions. Soil trend appears down. Browse forage is very limited. The herbaceous understory is depleted, and at least in 1989, the key grass species were grazed beyond the 60% utilization stated in the allotment objectives.

### 1997 TREND ASSESSMENT

Trend for soil is slightly up. Erosion has declined since 1989, and appears to be minimal at this time. Percent bare soil has decreased from 27% to 19%. Another positive characteristic is that almost 50% of the vegetative cover is contributed by herbaceous species which protect soils better from high intensity summer storms. The only useful browse of much consequence is white-stemmed rabbitbrush which provides 25% of the browse cover. Its density is now up to 3,000 plants/acre, and shows good vigor and high reproductive potential. Use is light to moderate and percent decadence is low at 3%. Other preferred browse are in very low densities on this site (four-wing saltbush, true mountain mahogany, and antelope bitterbrush) and provide little forage. The major concern for the browse component is the alarming increase in broom snakeweed which has increased from 8,733 to 14,940 plants/acre. This increaser shrub may continue to increase with continued heavy livestock grazing in May and June of each year. The only positive attribute of this population is that it is now primarily composed of mature plants (83%). Trend for browse is considered stable, but quality of browse is very limited. The herbaceous understory has a slightly downward trend as both grasses and forbs declined in sum of nested frequency. Weedy annual species now make up almost 50% of the total herbaceous cover.

#### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3), but quality browse is very limited

herbaceous understory - slightly down (2)

### 2002 TREND ASSESSMENT

Trend for soil is slightly down. Percent bare soil increased from 19% to 27%, and herbaceous vegetation cover declined as well. There was evidence of erosion even with low precipitation during the drought. Trend for browse is stable. White-stemmed rubber rabbitbrush is the most abundant palatable species on the site, although this species is rarely considered a key species. Recruitment is high at 44% and vigor is mostly normal. The herbaceous understory is in very poor condition and trend is down. Perennial species, both forbs and grasses, declined in sum of nested frequency. Crested wheatgrass, the most important perennial species, significantly declined in nested frequency and provided less cover than the annual forb bur buttercup in 2002. The herbaceous component is one of the poorest ever seen by project personnel on a chained and seeded site.

#### TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 8

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>b</sub> 278	<sub>b</sub> 262	<sub>a</sub> 103	97	95	51	5.89	.55
G	Bromus tectorum (a)	-	<sub>b</sub> 91	<sub>a</sub> 4	-	36	2	.57	.01
G	Poa fendleriana	4	3	-	2	1	-	.01	-
G	Poa secunda	3	-	1	1	-	1	-	.00
G	Sitanion hystrix	5	2	-	2	1	-	.03	-
Total for Annual Grasses		0	91	4	0	36	2	0.57	0.00
Total for Perennial Grasses		290	267	104	102	97	52	5.93	0.55
Total for Grasses		290	358	108	102	133	54	6.51	0.56
F	Alyssum alyssoides (a)	-	50	53	-	18	24	.22	.28
F	Antennaria rosea	-	1	2	-	1	2	.00	.01
F	Astragalus utahensis	<sub>ab</sub> 10	<sub>b</sub> 18	<sub>a</sub> -	4	8	-	.28	-
F	Castilleja linariaefolia	-	2	-	-	1	-	.03	-
F	Collinsia parviflora (a)	-	<sub>b</sub> 11	<sub>a</sub> -	-	5	-	.02	-
F	Cryptantha spp.	<sub>b</sub> 18	<sub>ab</sub> 13	<sub>a</sub> 6	11	7	2	.14	.04
F	Descurainia pinnata (a)	-	27	25	-	14	10	.09	.28
F	Erodium cicutarium (a)	-	<sub>b</sub> 9	<sub>a</sub> -	-	5	-	.02	-
F	Haplopappus acaulis	2	-	-	1	-	-	-	-
F	Lactuca serriola	<sub>b</sub> 20	<sub>ab</sub> 7	<sub>a</sub> -	10	4	-	.04	-
F	Leucelene ericoides	-	-	3	-	-	1	-	.00
F	Lithospermum spp.	7	3	4	3	1	3	.15	.05
F	Machaeranthera canescens	<sub>b</sub> 13	<sub>a</sub> 3	<sub>a</sub> -	7	1	-	.00	-
F	Microsteris gracilis (a)	-	<sub>b</sub> 23	<sub>a</sub> -	-	10	-	.10	-
F	Ranunculus testiculatus (a)	-	<sub>b</sub> 299	<sub>a</sub> 151	-	89	53	4.55	2.01
F	Senecio multilobatus	2	-	-	1	-	-	-	-
F	Streptanthus cordatus	14	5	11	6	3	6	.01	.03
F	Tragopogon dubius	1	-	-	1	-	-	-	-
F	Unknown forb-perennial	-	1	-	-	1	-	.01	-
Total for Annual Forbs		0	419	229	0	141	87	5.01	2.57
Total for Perennial Forbs		87	53	26	44	27	14	0.69	0.14
Total for Forbs		87	472	255	44	168	101	5.71	2.72

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Chrysothamnus nauseosus albicaulis	51	35	3.30	1.14
B	Chrysothamnus nauseosus consimilis	0	18	-	1.49
B	Chrysothamnus viscidiflorus viscidiflorus	6	0	.78	-
B	Gutierrezia sarothrae	77	57	4.39	1.24
B	Juniperus osteosperma	11	1	3.08	.03
B	Pinus edulis	6	2	1.74	.38
B	Purshia tridentata	1	1	.15	.15
B	Quercus gambelii	1	1	-	.03
Total for Browse		153	115	13.46	4.46

CANOPY COVER -- LINE INTERCEPT  
Herd unit 16C, Study no: 8

Species	Percent Cover	
	'97	'02
Chrysothamnus nauseosus	-	.83
Chrysothamnus nauseosus hololeucus	-	1.42
Gutierrezia sarothrae	-	1.08
Juniperus osteosperma	5	.25
Pinus edulis	2	.67

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 8

Species	Average leader growth (in)
	'02
Atriplex canescens	6.7

Point-Quarter Tree Data  
Herd unit 16C , Study no: 8

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	76	-	6.7	-
Pinus edulis	26	-	4.8	-



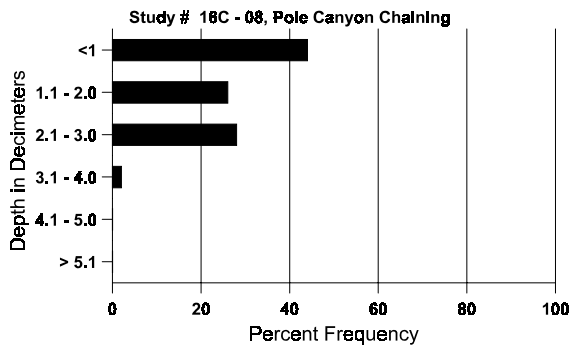
BASIC COVER --  
Herd unit 16C, Study no: 8

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	356	246	4.00	30.03	9.11
Rock	164	187	5.75	4.93	7.54
Pavement	278	285	19.25	6.02	7.19
Litter	381	388	44.25	45.14	53.75
Cryptogams	81	50	0	1.67	1.52
Bare Ground	250	262	26.75	19.13	27.63

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 08, Pole Canyon Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.3	61.4 (11.7)	7.4	48.7	27.1	24.2	5.9	11.25	195.2	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 8

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Sheep	-	1	17	1 (3)
Rabbit	19	28	-	-
Elk	3	-	-	-
Deer	53	48	1288	99 (245)
Cattle	5	2	26	2 (5)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 8

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	50	73	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	43	44	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Cercocarpus montanus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	32	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	31	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Chrysothamnus nauseosus albicaulis</i>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	89	13	1	-	-	-	-	-	-	-	14	-	-	-	466			14
	97	71	14	-	-	-	-	-	-	-	83	-	2	-	1700			85
	02	29	4	3	-	-	-	-	-	-	36	-	-	-	720			36
M	89	13	-	-	-	-	-	-	-	-	13	-	-	-	433	28	25	13
	97	41	18	1	1	-	-	-	-	-	61	-	-	-	1220	29	30	61
	02	27	2	2	-	-	-	-	-	-	31	-	-	-	620	20	23	31
D	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	97	2	1	-	1	-	-	-	-	-	4	-	-	-	80			4
	02	5	5	3	-	2	-	-	-	-	11	-	-	4	300			15
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		04%			04%			00%			+69%							
'97		22%			.66%			01%			-45%							
'02		16%			10%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	932	Dec:	4%			
												'97	3000		3%			
												'02	1640		18%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus nauseosus consimilis</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	14	11	-	3	-	-	-	-	-	28	-	-	-	560	21	27	28
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	6	-	-	1	-	-	-	-	-	7	-	-	-	140		7	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		30%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	0		0%				
											'02	740		19%				
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	7	1	-	-	-	-	-	-	-	8	-	-	-	160	32	38	8
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		10%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	200		10%				
											'02	0		0%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<i>Gutierrezia sarothrae</i>															
S	89	779	-	-	-	-	-	-	779	-	-	-	25966		779
	97	6	-	-	-	-	-	-	6	-	-	-	120		6
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	40	-	-	-	-	-	-	40	-	-	-	1333		40
	97	122	1	-	-	-	-	-	123	-	-	-	2460		123
	02	7	-	-	-	-	-	-	7	-	-	-	140		7
M	89	219	-	-	-	-	-	-	219	-	-	-	7300	10 9	219
	97	621	-	-	-	-	-	-	621	-	-	-	12420	10 9	621
	02	146	-	-	-	-	-	-	143	-	3	-	2920	7 8	146
D	89	3	-	-	-	-	-	-	3	-	-	-	100		3
	97	3	-	-	-	-	-	-	3	-	-	-	60		3
	02	34	-	-	-	-	-	-	21	-	-	13	680		34
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	120		6
	02	-	-	-	-	-	-	-	-	-	-	-	3140		157
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		+42%							
'97		.13%		00%		00%		-75%							
'02		00%		00%		09%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	8733	Dec:	1%		
										'97	14940		0%		
										'02	3740		18%		
<i>Juniperus osteosperma</i>															
S	89	1	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	3	-	-	-	-	-	-	3	-	-	-	100		3
	97	12	-	-	-	-	-	-	12	-	-	-	240		12
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	1	-	-	-	-	-	-	1	-	-	-	33	91 71	1
	97	5	-	-	-	-	2	-	7	-	-	-	140	- -	7
	02	1	-	-	-	-	-	-	1	-	-	-	20	- -	1
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	80		4
	02	-	-	-	-	-	-	-	-	-	-	-	100		5
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		+65%							
'97		00%		00%		00%		-95%							
'02		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	133	Dec:	-		
										'97	380		-		
										'02	20		-		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Pinus edulis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
	02	1	-	-	-	-	-	1	-	-	1	-	1	-	40			2
M	89	-	-	-	1	-	-	-	-	-	1	-	-	-	33	71	79	1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+73%							
'97		00%			00%			00%			-67%							
'02		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	120		-			
												'02	40		-			
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	17	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	31	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	1	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			100%			00%			+ 0%							
'02		00%			100%			100%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	20		100%			
												'02	20		100%			
Quercus gambelii																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	85	17	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	100	22	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		100%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	20		-			

Trend Study 16C-9-02

Study site name: Pole Canyon Oak.

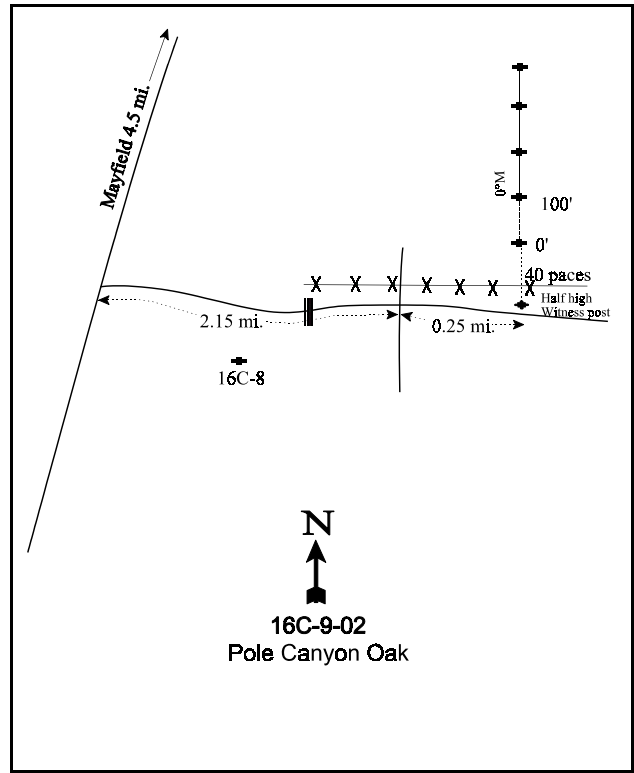
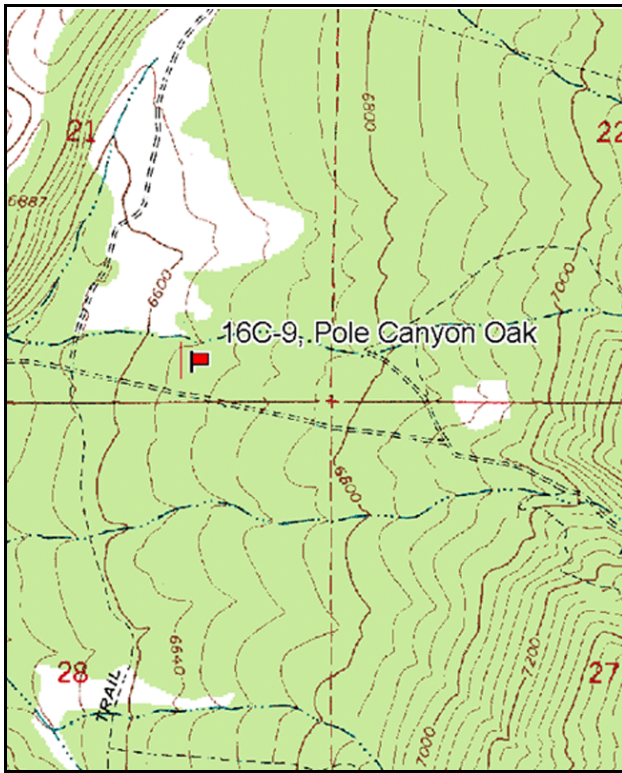
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

Go south from Mayfield through Arapien Valley for 4.5 miles to the Pole Canyon Road. Turn east and go 2.15 miles, passing study number 16C-8 and crossing a cattle guard to a 4-way intersection (South Hollow Road). From the intersection, go east (straight) for another 0.25 miles to a half high witness post on the north side of the road. The 0-foot baseline stake (marked by browse tag #9042) is 40 paces due north.



Map Name: Mayfield

Diagrammatic Sketch

Township 20S, Range 2E, Section 21

GPS: NAD 27, UTM 12S 4322125 N 440234 E

## DISCUSSION

### Pole Canyon Oak - Trend Study No. 16C-9

This study is located on the south end of South Hollow, up Pole Canyon on Division property. It samples a mixed mountain brush community dominated by oak, pinyon, and juniper. The site lies on a gentle, west facing slope at 6,600 feet in elevation. Some of the area was experimentally treated with herbicide, in strips to remove the dense overstory of oak. However, this study does not lie within a treated area. It receives moderate use by deer as indicated by pellet group data. Pellet group transect data taken in 2002 estimated 88 deer days use/acre (217 ddu/ha). Elk, cattle, and sheep use was light.

Soils are similar to those at the Pole Canyon chaining study (16C-8), which are a Fontreen cobbly loam in the Upland Stony Loam range. The soil at the site is shallow with abundant rock and pavement on the surface and throughout the profile. Effective rooting depth is estimated at only about 9 inches. Chemical and textural analysis places soils in the loam category with neutral reactivity (pH of 7.2). Percent bare soil has slowly but steadily increased from 11% in 1989 to 17% in 2002. Litter cover has remained high during all readings at over 60%, but most of the litter is found underneath trees and shrubs. Most of the areas of bare soil are in the interspaces between trees and shrubs. This is where the majority of the erosion occurs. The erosion class assessment was determined as slight in 2002.

The dominant overstory is oakbrush in association with a considerable stand of juniper and pinyon. Point-center quarter data estimated 179 juniper trees/acre and 51 pinyon trees/acre in 2002. Average diameter of juniper trees was estimated at 5 inches, while pinyon averaged 6 inches. Oak is dense and has steadily increased over the site. Oak density was estimated at 3,265 stems/acre in 1989, increasing to 4,980 stems/acre in 1997, and 6,260 stems/acre in 2002. Utilization is mostly light on oak, with a small proportion of the population showing moderate and heavy use. Young oak plants are abundant, making up 42% of the population in 2002.

Several preferred browse species are present in lower densities. Mountain big sagebrush, bitterbrush, true mountain mahogany, and serviceberry are the most important of these. Mountain big sagebrush is the most common understory shrub with an estimated density of 780 plants/acre in 2002, a decrease from 960 plants/acre in 1997. The loss in density is due to an increase in the number of dead plants. The decadent age class made up almost the entire population in 1989 (97%), and the majority of the population had poor vigor (73%). Decadence declined to 42% in 1997, but again increased to 72% in 2002. No young plants were sampled in 2002, a decline from only 40 plants/acre in 1997. The entire population was classified as being heavily utilized in 1989, but use decreased to light in 1997. In 2002, use was moderate to heavy with 23% of the population displaying heavy browsing. About one-third of the population showed poor vigor in 2002. Drought and competition with increasing tree canopy are negatively impacting sagebrush on this site.

Bitterbrush has a stable density at just over 500 plants/acre. The population has shown normal vigor and no decadent plants in all readings. Use has been moderate to heavy in all years. True mountain mahogany had an estimated density of 180 mature plants/acre in 2002. The population is moderate to heavily utilized, but vigor is normal. All of the preferred browse species showed any recruitment from young plants in 2002. Low reproduction is likely due to a combination of competition with the dense overstory of pinyon-juniper and oak as well as drought prior to and during the 2002 sample. Annual growth for all of the preferred species averaged 2 inches or less in 2002. This site is a good candidate for treatment.

The herbaceous understory is sparse and is not significant in the vegetative community. Heavy competition with woody plants limits sunlight and moisture for understory species. Herbaceous species provided only 7% of the total vegetation cover on the site in 2002. Although sparse in total cover, species diversity is moderately high with over 30 species of grasses and forbs being sampled on the site since it was established in 1989. The diversity of species indicates that with less canopy from pinyon, juniper, and oak, this site has the potential for a greater productive understory. Mutton bluegrass is the dominant grass with all other species having a quadrat frequency of 7% or less. Perennial forbs are less abundant than grasses with no species being particularly important. Annual species of both grasses and forbs are present but are not significant in the

composition. The herbaceous plants that are present grow mainly under the protection of woody plants, which leaves the large shrub interspaces devoid of vegetation. A treatment to decrease woody overstory cover and the subsequent seeding of herbaceous plants should be considered to improve the vegetative community.

#### 1989 APPARENT TREND ASSESSMENT

The site appears to have good potential. The herbicide treatments in the area will help demonstrate the possibilities for rehabilitation of this important winter range. Opening up the canopy by eliminating oakbrush cover should stimulate the herbaceous understory and reduce competition for key browse species. Current data indicators point to a downward vegetative trend on the undisturbed site. The soil condition is poor with sheet erosion causing plant pedestalling and root exposure.

#### 1997 TREND ASSESSMENT

With total canopy cover at 35% (oak, pinyon, and juniper), the herbaceous understory will continue to remain very low or will decline even further. The herbaceous understory only contributes to 10% of the total cover. Browse and tree cover is not as efficient at protecting soils from high intensity summer storms as herbaceous cover is. The only mitigating characteristic of the site is that slope is only about 2-3%. Percent bare soil has increased since 1989 (11% to 14%). Trend for soil on this site is slightly down with continued soil loss at a moderately low rate. Preferred browse consists of mountain big sagebrush, true mountain mahogany, and antelope bitterbrush. Together they make up only 18% of the total browse cover. In past years they were mostly classified as decadent, now they all have improved vigor and mostly light to moderate use. Gambel oak alone contributes 43% of the browse cover. Individuals that are not out of reach show light to moderate use. For preferred browse trend appears to be stable, but if canopy cover continues to increase, they will decline in vigor competing for sunlight and moisture. The herbaceous understory is a very minor component of this plant community as it only contributes a total of 4% cover. This is one of the lowest values we have recorded in the pinyon-juniper type. The trend for the herbaceous understory is down, with the overall sum of nested frequency value for perennial species declining.

##### TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - down (1)

#### 2002 TREND ASSESSMENT

Trend for soil is stable. Bare interspaces between trees and shrubs show erosion, but it is not extreme due to the gentle slope. Although trend is stable, soil conditions are poor. Herbaceous vegetation remains low and most of the litter cover is found underneath the oak and pinyon-juniper trees. Browse trend is slightly down. The preferred species have no measurable recruitment by young plants and use is moderate to heavy. Mountain big sagebrush is the key species as it has the highest density of all the palatable species. Mountain big sagebrush has very high decadency at 72%, and one-third of the population displays poor vigor. It is likely that the preferred browse will continue to decline, especially if oak brush continues to increase in the future. The herbaceous understory has a slightly downward trend as sum of nested frequency declined for both perennial grasses and forbs. The understory component is already sparse on this site and cannot afford further declines.

##### TREND ASSESSMENT

soil - stable (3), but in poor condition

browse - slightly down (2)

herbaceous understory - slightly down (2)



HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 9

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron spicatum</i>	9	14	7	4	6	4	.08	.08
G	<i>Bromus tectorum</i> (a)	-	<sub>b</sub> 40	<sub>a</sub> 20	-	16	7	.82	.03
G	<i>Oryzopsis hymenoides</i>	<sub>b</sub> 42	<sub>a</sub> 15	<sub>a</sub> 11	21	8	6	.11	.18
G	<i>Poa fendleriana</i>	<sub>b</sub> 143	<sub>a</sub> 75	<sub>a</sub> 84	58	30	35	2.24	1.56
G	<i>Poa pratensis</i>	-	11	-	-	4	-	.07	-
G	<i>Poa secunda</i>	<sub>b</sub> 21	<sub>a</sub> 5	<sub>ab</sub> 8	12	3	5	.06	.02
G	<i>Sitanion hystrix</i>	-	-	1	-	-	1	-	.00
G	<i>Stipa comata</i>	<sub>ab</sub> 6	<sub>b</sub> 15	<sub>a</sub> 1	2	8	1	.11	.00
Total for Annual Grasses		0	40	20	0	16	7	0.81	0.03
Total for Perennial Grasses		221	135	112	97	59	52	2.69	1.86
Total for Grasses		221	175	132	97	75	59	3.51	1.89
F	<i>Agoseris glauca</i>	1	3	3	1	1	1	.03	.00
F	<i>Arabis</i> spp.	-	5	-	-	2	-	.01	-
F	<i>Astragalus consobrinus</i>	2	-	-	1	-	-	-	-
F	<i>Astragalus</i> spp.	2	-	-	2	-	-	.00	-
F	<i>Balsamorhiza sagittata</i>	3	-	-	1	-	-	-	-
F	<i>Castilleja linariaefolia</i>	1	2	3	1	1	1	.00	.00
F	<i>Chaenactis douglasii</i>	5	8	-	3	4	-	.02	-
F	<i>Comandra pallida</i>	<sub>a</sub> -	<sub>b</sub> 33	<sub>a</sub> -	-	15	-	.10	-
F	<i>Collinsia parviflora</i> (a)	-	23	33	-	11	15	.05	.07
F	<i>Crepis acuminata</i>	-	2	-	-	1	-	.03	-
F	<i>Cymopterus</i> spp.	<sub>a</sub> -	<sub>b</sub> 19	<sub>b</sub> 26	-	11	14	.08	.07
F	<i>Erigeron divergens</i>	-	2	3	-	1	1	.00	.03
F	<i>Eriogonum umbellatum</i>	7	9	1	4	5	1	.07	.00
F	<i>Lactuca serriola</i>	-	1	-	-	1	-	.00	-
F	<i>Lesquerella</i> spp.	-	7	-	-	3	-	.04	-
F	<i>Lomatium</i> spp.	<sub>b</sub> 66	<sub>a</sub> 3	<sub>a</sub> -	35	2	-	.01	-
F	<i>Machaeranthera</i> spp	-	3	-	-	1	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	<sub>b</sub> 15	<sub>a</sub> -	-	7	-	.03	-
F	<i>Penstemon</i> spp.	-	3	-	-	1	-	.03	-
F	<i>Petradoria pumila</i>	-	-	2	-	-	2	-	.18
F	<i>Phlox longifolia</i>	12	14	11	7	8	5	.11	.02
F	<i>Ranunculus testiculatus</i> (a)	-	10	16	-	5	7	.02	.03
F	<i>Senecio multilobatus</i>	5	7	-	2	3	-	.06	-
F	<i>Taraxacum officinale</i>	-	1	-	-	1	-	.01	-
F	<i>Tragopogon dubius</i>	1	-	-	1	-	-	-	-
F	<i>Zigadenus paniculatus</i>	1	2	-	1	1	-	.03	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
	Total for Annual Forbs	0	48	49	0	23	22	0.11	0.10
	Total for Perennial Forbs	106	124	49	59	62	25	0.67	0.31
	Total for Forbs	106	172	98	59	85	47	0.78	0.43

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

#### BROWSE TRENDS --

Herd unit 16C, Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	5	2	.21	.03
B	Artemisia tridentata vaseyana	35	28	2.45	3.32
B	Cercocarpus montanus	7	8	1.54	.78
B	Gutierrezia sarothrae	7	6	.04	.18
B	Juniperus osteosperma	8	6	6.83	6.23
B	Opuntia spp.	1	3	-	.03
B	Pinus edulis	5	8	7.35	6.19
B	Purshia tridentata	11	14	2.77	2.57
B	Quercus gambelii	46	54	16.01	8.21
	Total for Browse	125	129	37.22	27.57

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 9

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.17
Artemisia tridentata vaseyana	-	3.17
Cercocarpus montanus	.4	1.83
Gutierrezia sarothrae	-	.25
Juniperus osteosperma	9.8	16.58
Pinus edulis	11.2	8.58
Purshia tridentata	-	2.00
Quercus gambelii	13.6	12.08

Key Browse Annual Leader Growth  
Herd unit 16C , Study no: 9

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.8
Cercocarpus montanus	1.6
Purshia tridentata	1.7

Point-Quarter Tree Data  
Herd unit 16C , Study no: 9

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	141	179	4.0	5.1
Pinus edulis	89	51	9.4	6.2

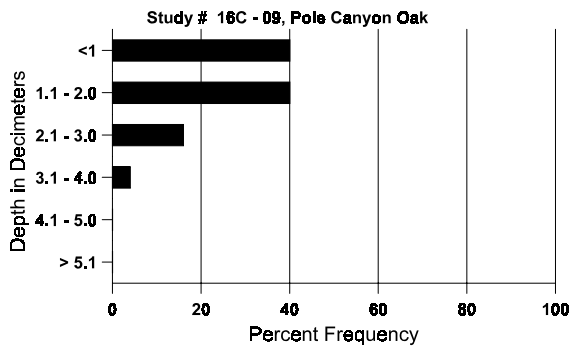
BASIC COVER --  
Herd unit 16C, Study no: 9

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	242	184	5.00	40.13	29.32
Rock	67	88	2.75	2.16	2.30
Pavement	155	152	13.75	5.42	5.69
Litter	390	392	67.00	59.63	66.83
Cryptogams	21	6	.50	.28	.21
Bare Ground	170	147	11.00	14.36	17.06

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 09, Pole Canyon Oak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.1	54.4 (11.3)	7.2	46.7	28.7	24.6	3.5	9.9	108.8	.7

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 9

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Sheep	-	-	9	1 (2)
Rabbit	12	10	-	-
Elk	3	1	-	-
Deer	28	26	1140	88 (217)
Cattle	1	1	-	-

BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 9

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Amelanchier alnifolia																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20	43	23	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	27	16	0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	1	-	-	-	-	1	20	43	23	1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	27	16	0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	3	-	-	1	-	-	-	-	-	-	-	4	80	43	23	4	
	02	2	-	-	-	-	-	-	-	-	-	-	2	40	27	16	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-60%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	100		-			
												'02	40		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	1	-	-	-	-	-	-	-	-	-	33	19	28	1	
	97	21	2	-	3	-	-	-	-	-	-	-	-	520	29	33	26	
	02	3	2	6	-	-	-	-	-	-	-	-	-	220	27	32	11	
D	89	-	-	36	-	-	-	-	-	-	-	-	-	1200			36	
	97	19	1	-	-	-	-	-	-	-	-	-	-	400			20	
	02	18	2	2	2	-	1	3	-	-	-	-	-	560			28	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	380			19	
	02	-	-	-	-	-	-	-	-	-	-	-	-	580			29	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			73%			-22%							
'97		06%			00%			19%			-19%							
'02		10%			23%			31%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1233	Dec:	97%			
												'97	960		42%			
												'02	780		72%			
<i>Cercocarpus montanus</i>																		
M	89	-	-	1	-	-	-	-	-	-	-	-	-	33	60	55	1	
	97	2	3	2	-	-	-	-	-	-	-	-	-	140	34	40	7	
	02	-	-	3	1	1	4	-	-	-	-	-	-	180	34	37	9	
D	89	-	-	-	-	-	1	-	-	-	-	-	-	33			1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+53%							
'97		43%			29%			00%			+22%							
'02		11%			78%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	50%			
												'97	140		0%			
												'02	180		0%			
<i>Chrysothamnus depressus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	9	12	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Chrysothamnus viscidiflorus</b>																		
M	89	-	-	3	-	-	-	-	-	-	3	-	-	-	100	3	2	3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	-	-	4	-	-	-	-	-	-	1	-	-	3	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			43%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	233	Dec:	57%			
												'97	0		0%			
												'02	0		0%			
<b>Gutierrezia sarothrae</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	32	-	-	-	-	-	-	-	-	32	-	-	-	1066	9	9	32
	97	12	-	-	-	-	-	-	-	-	12	-	-	-	240	9	7	12
	02	11	-	-	-	-	-	-	-	-	11	-	-	-	220	8	9	11
D	89	2	-	-	-	-	-	-	-	-	1	-	-	1	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			03%			-79%							
'97		00%			00%			00%			-8%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1165	Dec:	6%			
												'97	240		0%			
												'02	220		0%			
<b>Juniperus osteosperma</b>																		
Y	89	4	-	-	-	-	-	-	-	-	3	-	1	-	133			4
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
	02	1	-	-	-	1	-	-	-	-	1	-	-	1	40			2
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	2	-	-	-	5	-	-	-	100	-	-	5
	02	3	-	-	1	-	-	-	-	-	4	-	-	-	80	-	-	4
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			25%			+17%							
'97		00%			00%			00%			-25%							
'02		17%			00%			17%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	-			
												'97	160		-			
												'02	120		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Opuntia</i> spp.																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40	7	12	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+60%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
											'02	100		-				
<i>Peraphyllum ramosissimum</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	12	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	0		-				
											'02	0		-				
<i>Pinus edulis</i>																		
S	89	-	-	-	-	-	-	2	-	-	2	-	-	-	66		2	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	2	-	-	-	-	-	1	-	-	3	-	-	-	60		3	
	02	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33	177	171	
	97	2	-	-	-	-	-	1	-	-	3	-	-	-	60	-	-	
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		00%			00%			00%			+33%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	120		-				
											'02	180		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Purshia tridentata</b>																	
Y	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33		1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	-	6	-	-	-	-	-	-	6	-	-	-	200	13 18	6
	97	5	15	3	-	-	-	-	-	-	23	-	-	-	460	13 49	23
	02	-	1	6	-	5	14	-	-	-	26	-	-	-	520	13 38	26
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			100%			00%			+57%						
'97		56%			11%			00%			-4%						
'02		23%			77%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	233	Dec:	-		
												'97	540		-		
												'02	520		-		
<b>Quercus gambelii</b>																	
S	89	36	1	-	-	-	-	12	-	-	49	-	-	-	1633		49
	97	9	-	-	6	-	-	-	-	-	15	-	-	-	300		15
	02	1	-	-	1	-	-	1	-	-	3	-	-	-	60		3
Y	89	68	1	-	1	1	-	-	-	-	71	-	-	-	2366		71
	97	65	5	-	22	-	-	-	-	-	91	1	-	-	1840		92
	02	108	-	-	22	-	-	-	-	-	130	-	-	-	2600		130
M	89	10	6	-	-	-	-	-	-	-	16	-	-	-	533	39 30	16
	97	90	37	1	11	-	-	5	-	-	119	25	-	-	2880	55 44	144
	02	151	8	6	-	-	-	3	6	-	108	-	66	-	3480	42 22	174
D	89	3	8	-	-	-	-	-	-	-	11	-	-	-	366		11
	97	6	2	-	5	-	-	-	-	-	6	1	-	6	260		13
	02	4	-	5	-	-	-	-	-	-	1	-	1	7	180		9
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	980		49
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	660		33
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		16%			00%			00%			+34%						
'97		18%			.40%			02%			+20%						
'02		03%			04%			24%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	3265	Dec:	11%		
												'97	4980		5%		
												'02	6260		3%		
<b>Tetradymia canescens</b>																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-		
												'97	0		-		
												'02	0		-		



Trend Study 16C-11-02

Study site name: Above South Hollow .

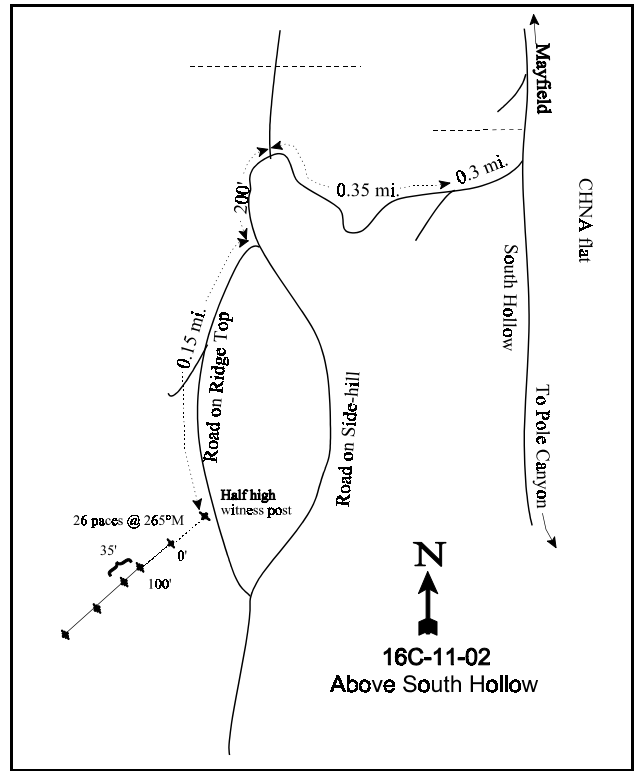
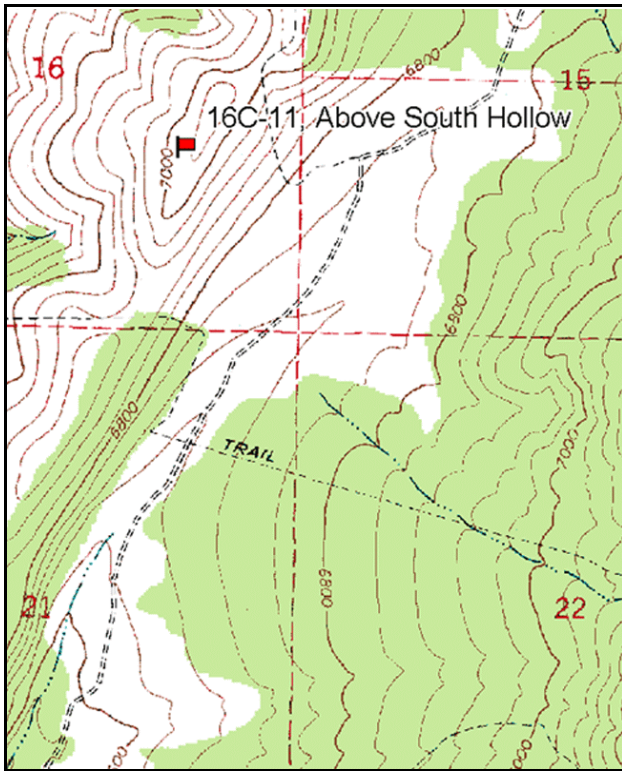
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 255 degrees magnetic.

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

LOCATION DESCRIPTION

From the Mayfield post office, go 1.75 miles up the Twelve Mile Canyon Road. Take the right hand fork south down South Hollow 3 miles to a large rabbitbrush flat. Take the fork past the fence west for 0.3 miles to another fork. Take the right fork up a steep dugway for 0.35 miles to a fence line where the road forks again. Take the left fork south for 200 feet to another fork. Take the right fork up a very steep dugway for 0.15 miles to a half high witness post on the west side of the road. From here, walk 26 paces at 265 degrees magnetic to the 0-foot baseline stake.



Map Name: Mayfield

Diagrammatic Sketch

Township 20S, Range 2E, Section 16

GPS: NAD 27, UTM 12S 4324210 N 440347 E

## DISCUSSION

### Above South Hollow - Trend Study No. 16C-11

The Above South Hollow study samples another 30 year old chaining on the upper slope of the Mayfield Face west of South Hollow. Evidence of the treatment is found primarily with the presence of seeded grasses as juniper and pinyon have become well established again on the site. The study is on a 20 to 25% slope with a westerly aspect at an elevation of 7,000 feet. Pellet group quadrat frequencies in 1997 showed moderate use of the site by deer, with elk and cattle use being light. In 2002, pellet group transect data estimated 60 deer days use/acre (149 ddu/ha), 8 elk days use/acre (20 edu/ha), and 11 cow days use/acre (27 cdu/ha).

According to the soil survey, the prominent soils along the upper side of the South Mayfield Face are the Fontreen series soils. This site is located on a ridge with an area of shallow Lodar very channery loam. This soil is somewhat excessively drained, 10-20 inches deep over bedrock, and rock fragments are normally present up to 50% in the surface layer. Soils at the site have an estimated effective rooting depth of 11 inches and soil temperature is 58°F at about 15 inches in depth. Soil textural analysis indicates a clay loam which is neutral in reactivity (pH 7.1). Combined rock and pavement cover was estimated at about 12% in 1997, increasing to 30% in 2002. With drought conditions in 2002, more rock and pavement were exposed with decreased cover of perennial grasses. Bare soil also increased from 9% to 17% between 1997 and 2002. Litter cover is satisfactory, averaging 51% in 1997 and 2002, with most being concentrated around trees. The erosion condition class assessment determined the site to be stable in 2002.

The pinyon-juniper overstory that existed prior to treatment has again regained dominance on this site. Total pinyon-juniper canopy cover was estimated at just under 28% in 2002 from line-intercept data. The two species have a combined density of 157 trees/acre from point-center quarter data taken in 2002. Under these canopy cover conditions, the herbaceous understory will be negatively effected. Retreatment of the pinyon-juniper overstory will have to be done in the near future if this site is to maintain a healthy understory. Gambel oak had an estimated density of 280 stems/acre in 1997, increasing to 760 stems/acre in 2002. The oak population shows good vigor, low decadence, and light to moderate use. During the initial reading in 1989, 27% of the oak was classified as being heavily hedged. Preferred browse is limited to true mountain mahogany (120 plants/acre in 2002) and bitterbrush (80 plants/acre in 2002) being the most important species. Both species had high decadence and poor vigor and were heavily browsed in 2002. The combination of drought and competition with an increasing pinyon-juniper overstory play a role in the depressed condition of mahogany and bitterbrush.

Perennial grasses are moderately abundant on the site. Grass production was high in 1997, but decreased considerably in 2002 with drought. Smooth brome is the most common seeded species, with crested wheatgrass being second in abundance. Smooth brome showed declines in both cover and nested frequency in 2002. This is a more mesic species so these declines are not surprising. As a group, perennial grass sum of nested frequency declined by 21% between the 1997 and 2002 readings. Forbs are sparse, and have not been significant on this site since it began to be monitored in 1989. The understory is fairly poor for a chained and seeded site.

### 1989 APPARENT TREND ASSESSMENT

As the juniper and pinyon trees continue to increase on this old treatment, the more valuable browse species will decline leading to a downward trend for deer winter range. No detrimental effects are evident on the abundant, vigorous grass understory. As long as there is adequate grass cover, the soil trend should remain stable.

1997 TREND ASSESSMENT

The trend for soils would be considered stable as percent bare soil has slightly decreased and almost half of the vegetative cover comes from the herbaceous species. The trend for browse is more difficult to determine because all of the preferred species are in relatively low numbers. Only true mountain mahogany shows any indication of any reproductive potential as it is the only species with seedlings. All appear to have good vigor, but little recruitment. This would result because of the pinyon and juniper increasing their overstory cover and competition with the vigorous understory of seeded grasses, especially rhizomatous grasses (smooth brome and intermediate wheatgrass). The trend is slightly declining because of the inevitable increases in canopy cover which will eventually lead to a decline in the preferred understory browse species. The herbaceous understory, which is dominated by grasses, has a stable overall trend.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2), preferred species are in relatively low numbers

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Soil trend is slightly down. Bare soil increased, and cover and nested frequency of herbaceous vegetation decreased. Even with these changes, the ratio of protective cover (vegetation, litter, and cryptogams) to bare soil remains good, and erosion is minimal. Trend for browse is slightly down. The densities of mahogany and bitterbrush are stable, but low. Density will likely not increase as there was no recruitment of seedlings or young plants for either species in 2002. Increases in the density of preferred browse is also hampered by the continued increase in canopy of pinyon and juniper trees. Utilization is heavy on the preferred browse and decadency is high. Trend for the herbaceous understory is slightly down. Diversity is low, with smooth brome and crested wheatgrass being the most abundant. Sum of nested frequency for all perennial grasses combined declined by 21% in 2002. This decline is due in part to drought, but also the increasing canopy cover of pinyon-juniper. A retreatment project needs to be done to halt further deterioration of the understory.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 16C, Study no: 11

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	94	105	92	39	46	39	3.54	.95
G	Agropyron intermedium	<sub>b</sub> 48	<sub>b</sub> 26	<sub>a</sub> -	16	11	-	.13	-
G	Agropyron spicatum	-	1	3	-	1	1	.03	.03
G	Bromus inermis	<sub>a</sub> 231	<sub>b</sub> 271	<sub>a</sub> 236	77	86	81	11.03	5.71
G	Bromus japonicus (a)	-	-	3	-	-	1	-	.03
G	Carex spp.	<sub>b</sub> 13	<sub>a</sub> 3	<sub>a</sub> -	5	2	-	.06	-
G	Oryzopsis hymenoides	<sub>b</sub> 13	<sub>a</sub> -	<sub>a</sub> -	6	-	-	-	-
G	Poa fendleriana	<sub>b</sub> 50	<sub>a</sub> 3	<sub>a</sub> 6	26	1	3	.03	.16
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 17	<sub>a</sub> -	-	6	-	.34	-

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
	Total for Annual Grasses	0	0	3	0	0	1	0	0.03
	Total for Perennial Grasses	449	426	337	169	153	124	15.17	6.85
	Total for Grasses	449	426	340	169	153	125	15.17	6.88
F	Astragalus convallarius	-	1	-	-	1	-	.00	-
F	Astragalus spp.	1	-	-	1	-	-	-	-
F	Convolvulus arvensis	1	-	-	1	-	-	-	-
F	Collinsia parviflora (a)	-	1	6	-	1	2	.00	.01
F	Cryptantha spp.	6	3	1	3	1	1	.03	.00
F	Descurainia pinnata (a)	-	5	-	-	2	-	.01	-
F	Medicago sativa	11	13	4	3	6	2	.87	.03
F	Microsteris gracilis (a)	-	<sub>b</sub> 30	<sub>a</sub> -	-	11	-	.05	-
F	Penstemon humilis	9	-	-	4	-	-	-	-
F	Phlox longifolia	<sub>b</sub> 24	<sub>ab</sub> 9	<sub>a</sub> 2	9	4	2	.02	.01
F	Senecio multilobatus	3	-	-	2	-	-	-	-
F	Tragopogon dubius	1	9	1	1	5	1	.17	.00
F	Unknown forb-annual (a)	-	3	-	-	1	-	.00	-
	Total for Annual Forbs	0	39	6	0	15	2	0.07	0.00
	Total for Perennial Forbs	56	35	8	24	17	6	1.09	0.05
	Total for Forbs	56	74	14	24	32	8	1.17	0.06

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

#### BROWSE TRENDS --

Herd unit 16C, Study no: 11

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Cercocarpus montanus	4	4	1.48	.39
B	Chrysothamnus nauseosus consimilis	2	1	.00	.03
B	Juniperus osteosperma	13	9	9.55	6.90
B	Pinus edulis	5	6	3.54	6.50
B	Purshia tridentata	2	3	.30	.56
B	Quercus gambelii	4	9	2.09	1.99
	Total for Browse	30	32	16.98	16.38

CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 11

Species	Percent Cover	
	'97	'02
Cercocarpus montanus	-	.42
Juniperus osteosperma	8.0	19.17
Pinus edulis	3.2	8.50
Purshia tridentata	-	.92
Quercus gambelii	2.4	1.50

Key Browse Annual Leader Growth

Herd unit 16C , Study no: 11

Species	Average leader growth (in)
	'02
Cercocarpus montanus	2.0
Purshia tridentata	2.9

Point-Quarter Tree Data

Herd unit 16C , Study no: 11

Species	Trees per Acre	Average diameter (in)
	'02	'02
Juniperus osteosperma	90	7.0
Pinus edulis	67	5.5

BASIC COVER --

Herd unit 16C, Study no: 11

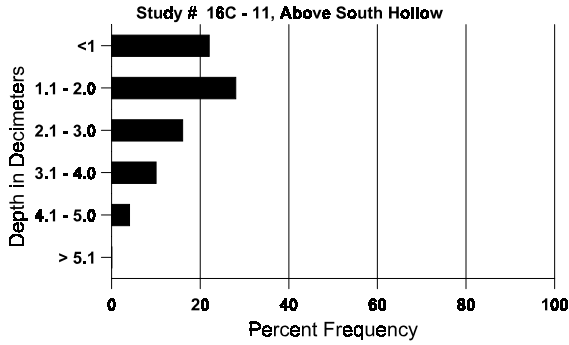
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	322	278	9.00	31.20	23.18
Rock	192	215	8.00	3.42	9.11
Pavement	254	287	11.50	8.08	21.08
Litter	394	383	60.75	50.84	52.78
Cryptogams	11	-	0	.05	0
Bare Ground	190	240	10.75	9.65	17.61

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 11, Above South Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.0	58.0 (15.4)	7.1	36.4	31.1	32.6	6.6	18.0	268.8	.9

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 11

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre Ø2	Days Use per Acre (ha) Ø2
Rabbit	14	18	-	-
Elk	9	2	104	8 (20)
Deer	31	36	783	60 (149)
Cattle	1	1	131	11 (27)

## BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 11

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total						
		1	2	3	4									
<b>Cercocarpus montanus</b>														
S	89	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	1	1	1	-	-	-	-	80	52	50	4
	02	-	-	-	-	-	-	1	-	-	20	44	39	1
D	89	-	-	1	-	-	-	-	-	-	33			1
	97	-	-	-	1	-	-	-	-	-	20			1
	02	-	-	-	-	-	5	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'89		00%		100%		100%		+67%						
'97		40%		20%		00%		+17%						
'02		00%		83%		67%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	33	Dec:	100%	
										'97	100		20%	
										'02	120		83%	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus consimilis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	40	40	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	13	6	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	50%			00%			00%			-50%							
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
												'02	20		-			
<i>Cowania mexicana stansburiana</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	30	33	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			00%			00%										
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	0		-			
<i>Ephedra viridis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	29	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	29	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'89	00%			00%			00%										
	'97	00%			00%			00%										
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Juniperus osteosperma</b>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	-	-	-	-	-	1	-	-	-	-	-	-	1	20			1
M	89	2	-	-	2	-	-	1	-	-	5	-	-	-	166	61	67	5
	97	2	-	-	4	-	-	7	-	-	13	-	-	-	260	-	-	13
	02	6	-	-	2	-	-	-	1	-	9	-	-	-	180	-	-	9
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+17%							
'97		00%			00%			00%			-29%							
'02		00%			10%			10%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	232	Dec:	-			
												'97	280		-			
												'02	200		-			
<b>Pediocactus simpsonii</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	81	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			
<b>Pinus edulis</b>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	3	-	-	4	-	-	-	80	-	-	4
	02	4	-	-	-	-	-	-	1	-	5	-	-	-	100	-	-	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+34%							
'97		00%			00%			00%			+17%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	100		-			
												'02	120		-			



A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Pseudotsuga menziesii</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	0		-				
											'02	0		-				
<i>Purshia tridentata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	3	-	-	-	-	-	-	3	-	-	-	60	27	58	3
	02	-	-	2	-	-	-	-	-	-	1	-	1	-	40	29	77	2
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	2	-	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			100%			00%			+25%							
'02		00%			100%			25%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	60		0%				
											'02	80		50%				
<i>Quercus gambelii</i>																		
S	89	2	-	-	1	-	-	-	-	-	3	-	-	-	100			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	16	1	-	24	-	-	9	-	-	50	-	-	-	1666			50
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	89	4	-	22	-	-	-	-	-	-	26	-	-	-	866	71	33	26
	97	-	2	-	12	-	-	-	-	-	14	-	-	-	280	47	49	14
	02	13	11	-	3	-	-	-	-	-	27	-	-	-	540	47	25	27
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	2	-	-	-	-	-	-	-	-	1	-	1	-	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		01%			28%			00%			-89%							
'97		14%			00%			00%			+63%							
'02		29%			00%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2598	Dec:	3%				
											'97	280		0%				
											'02	760		5%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Sambucus cerulea																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	22	31	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	0		-			

Trend Study 16C-12-02

Study site name: Manti Dump.

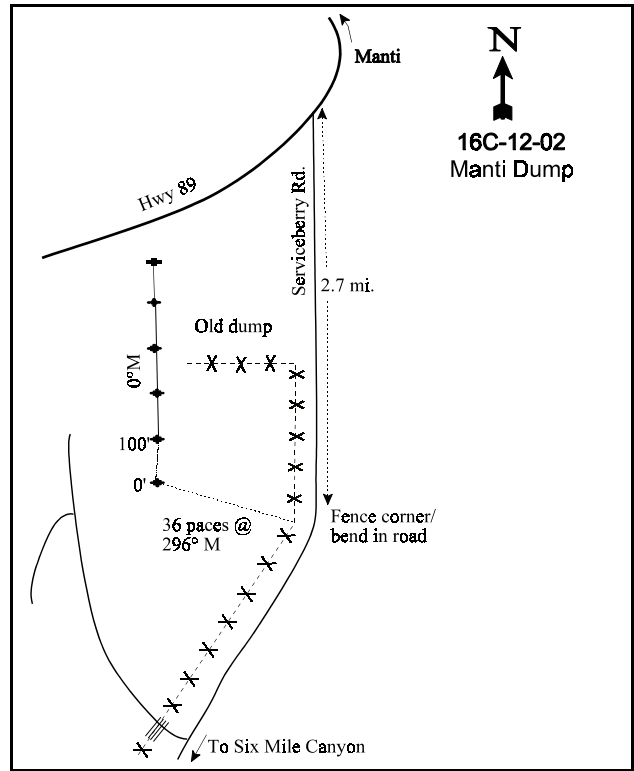
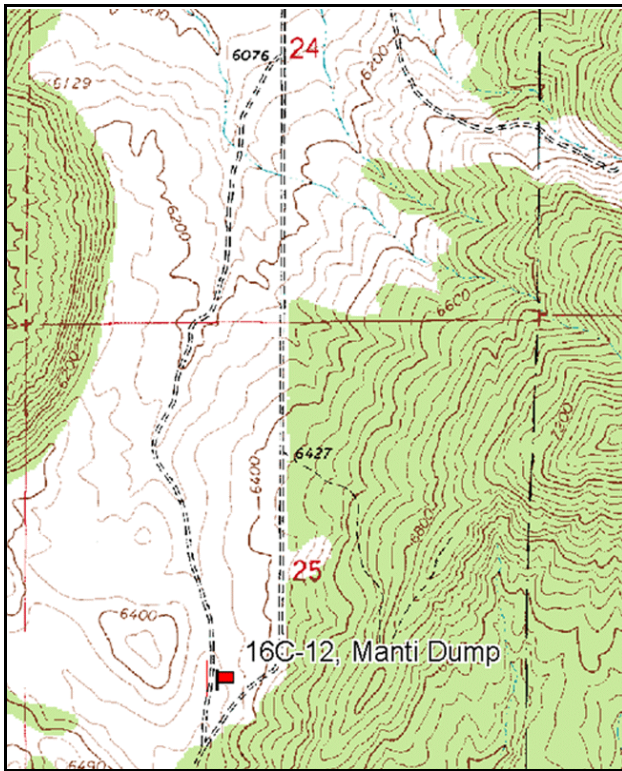
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

On Highway 89 south of Manti, just outside of town, the highway makes a gradual turn to the southwest. At this point (Serviceberry Road), there is a graded gravel road that goes straight south past the old city dump and over to Six Mile Canyon. Take this road for approximately 2.7 miles to where the road turns rather sharply to the southwest. The fence on the west side of the road also makes a slight corner here and begins to head southwest. From where the fence makes a corner, walk 36 paces at 296 degrees magnetic to the 0-foot baseline stake marked by browse tag #179.



Map Name: Sterling

Diagrammatic Sketch

Township 18S, Range 2E, Section 25

GPS: NAD 27, UTM 12S 4340837 N 444243 E

## DISCUSSION

### Manti Dump - Trend Study No. 16C-12

This study is on Division land south of the old Manti dump. It samples a Wyoming big sagebrush range type that was part of the east Manti Dump chain and seeding project completed in 1961. There is little evidence of the chaining except for a few remnant tree trunks on the slopes above the study site. The site has a 10-12% slope with a southwest aspect at an elevation of 6,400 feet. This site usually receives 1-2 feet of snow, yet it still receives moderately heavy use by wintering deer. Elk use is light in most years. Quadrat frequency of deer pellet groups was high in 1997 and 2002. Pellet group transect data collected in 2002 estimated 37 deer days use/acre (93 ddu/ha) on the site. No elk pellets were sampled in the transect, while cattle use was estimated at only 2 days/use acre (5 cdu/ha). Several deer antler sheds have also been observed on the site during past readings. The seeded grasses have been utilized by sheep in the past which graze the area in the spring.

Like several other studies in this unit, the soils are a Fontreen cobbly loam. Precipitation averages 12-14 inches annually. Soils at the site have a clay loam texture which is neutral in reactivity (pH of 7.3). Effective rooting depth is estimated at just over 12 inches with a relatively cool soil temperature of 63°F. One possible limiting factor for this site is that phosphorus (8.1 ppm) is lower than the 10 ppm thought necessary for normal plant growth and development. Soils have a severe erosion hazard on the steeper slopes above the study site as evidenced by active sheet and rill erosion. On the study site, there was evidence of soil movement and plant pedestalling in 1989. Erosion appears to have lessened in 1997 and 2002. Pavement and rock combined to provide over 30% of the surface cover during all readings. Bare soil is low and averaged 8% in 2002. There is a good ratio of herbaceous cover to total vegetative cover, producing good protection for the soils from high intensity summer storms. The erosion condition class assessment for the site was determined as stable in 2002.

The vegetative component has low diversity with two seeded grasses, crested and intermediate wheatgrass, and Wyoming big sagebrush being the dominant species. In 1989, the density of the Wyoming big sagebrush stand was estimated at just over 4,000 plants/acre. Density has since declined to 2,360 plants/acre in 1997 and 1,900 plants/acre in 2002. The decline in density of Wyoming big sagebrush can be partly explained by the high number of dead in both 1997 and 2002. Some of the change in density between 1989 and 1997 is also due to a greatly increased sample size used in 1997 and 2002. This much larger sample gives more accurate estimates for shrub populations that have clumped and/or discontinuous distributions. Use on big sagebrush has been moderate to heavy in all sampling years, as has the decadency rate. Percent decadence was moderate in 1989 and 1997 at just under 40%, but increased to 68% in 2002. Vigor was normal in 1989, but many plants displayed poor vigor in 1997 (23%) and 2002 (35%). Recruitment and biotic potential (# of seedlings) have been low in all years, especially in 1997 and 2002. High decadency and poor vigor coupled with low reproduction are often linked with drought conditions. Drought periods in the late 1980's as well as from 2000-2002 have undoubtedly played a role in the overall condition of Wyoming big sagebrush on this site. Moderate to heavy browsing for an extended period of time may have played a role as well. The Wyoming big sagebrush population may decline in the future as half of the decadent age class was classified as dying in 2002. Annual leader growth on Wyoming big sagebrush averaged only 1 inch in 2002.

The presence of black sagebrush indicates areas of more shallow soil. Initially, black sagebrush had an estimated density of 1,132 plants/acre in 1989. In 2002, density was estimated at 800 plants/acre. As with Wyoming big sagebrush, the decline in density is due to the improved sampling design which more accurately estimates shrub populations. Black sagebrush shows light to moderate use, generally good vigor, and low to moderate decadency in all years. The combined density of pinyon-juniper trees post-treatment was estimated at 51 trees/acre in 2002. Most of the trees occur in the 10-12 foot height class.

As mentioned above, the understory displays low diversity and is dominated by crested and intermediate wheatgrass. These two species provided 82% and 98% of the total grass cover in 1997 and 2002 respectively. Both species have remained at stable frequency values since 1989, and are found mostly in the protection of the sagebrush crowns. Sandberg bluegrass, bottlebrush squirreltail, and Indian ricegrass have also been sampled on the site in at least one of the three sampling years, although all of them occur in very low frequencies. Cheatgrass is also present on the site but has not reached high enough frequencies to be a problem as of yet. It was only sampled in two quadrats in 2002. Perennial forbs are almost nonexistent. The noxious annual, bur buttercup, made up nearly all of the forb cover in 1997 and 2002.

#### 1989 APPARENT TREND ASSESSMENT

The key species, Wyoming big sagebrush, appears to have a stable population. They appear to be sustaining the rather heavy use. The understory is depleted, although potential is naturally low on this site. The vegetative trend appears to be stable to slightly downward overall. The soil trend appears down with evidence of pedestalling and soil movement.

#### 1997 TREND ASSESSMENT

The trend for soil is slightly improved. Soil movement is less apparent with bare soil declining slightly. Most importantly, the herbaceous species make up over 50% of the vegetative cover. Herbaceous cover is critical for protecting soils from high intensity summer storm events. Trend for the preferred browse (Wyoming big sagebrush) is down. Density declined, use continues to be heavy while vigor declined. Decadency remains stable (36%), but the proportion of decadent plants classified as dying is high at 58%. Reproduction is low and not adequate to replace the portion of the population that will likely die in the future. The trend for the herbaceous understory is slightly improved, with sum of nested frequency for perennial grass species showing notable improvement. Most all of the grass cover is contributed by two seeded species which make up 93% of the total herbaceous cover. There are almost no forbs on the site with them only making up 9% of the herbaceous cover. Bur buttercup ( a noxious weed) makes up 99% of what little forb cover there is.

##### TREND ASSESSMENT

soil - slightly up (4)

browse - down (1)

herbaceous understory - slightly up (4)

#### 2002 TREND ASSESSMENT

Trend for soil is stable. Bare soil remains low with minimal erosion. Herbaceous cover and the associated litter are adequate to protect the soil. Trend for browse is down. Density of Wyoming big sagebrush declined while decadency (68%) and poor vigor (35%) both increased to higher than acceptable levels. The proportion of decadent plants classified as dying remains high at 51%, making it likely that Wyoming big sagebrush will continue to decline in the future as no young or seedling plants were sampled in 2002. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses slightly declined in 2002, but the two dominant species, crested and intermediate wheatgrass, remained at stable levels.

##### TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 12

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron cristatum</i>	174	225	193	64	73	67	8.59	8.35
G	<i>Agropyron intermedium</i>	168	183	158	59	64	56	5.50	5.27
G	<i>Bromus tectorum</i> (a)	-	<sub>b</sub> 67	<sub>a</sub> 4	-	24	2	.43	.01
G	<i>Oryzopsis hymenoides</i>	-	2	-	-	1	-	.03	-
G	<i>Poa bulbosa</i>	-	-	4	-	-	3	-	.04
G	<i>Poa secunda</i>	<sub>a</sub> 3	<sub>b</sub> 27	<sub>c</sub> 38	1	11	19	.21	.29
G	<i>Sitanion hystrix</i>	<sub>b</sub> 13	<sub>b</sub> 24	<sub>a</sub> -	10	11	-	.31	-
Total for Annual Grasses		0	67	4	0	24	2	0.43	0.00
Total for Perennial Grasses		358	461	393	134	160	145	14.64	13.97
Total for Grasses		358	528	397	134	184	147	15.08	13.98
F	<i>Alyssum alyssoides</i> (a)	-	3	-	-	1	-	.00	-
F	<i>Penstemon</i> spp.	1	-	-	1	-	-	-	-
F	<i>Phlox longifolia</i>	-	-	2	-	-	1	-	.00
F	<i>Ranunculus testiculatus</i> (a)	-	251	253	-	90	80	1.44	1.57
F	<i>Sphaeralcea coccinea</i>	-	2	-	-	1	-	.00	-
Total for Annual Forbs		0	254	253	0	91	80	1.44	1.57
Total for Perennial Forbs		1	2	2	1	1	1	0.00	0.00
Total for Forbs		1	256	255	1	92	81	1.45	1.58

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 12

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Artemisia nova</i>	16	20	1.55	1.00
B	<i>Artemisia tridentata wyomingensis</i>	66	58	10.78	8.16
B	<i>Atriplex canescens</i>	2	0	-	-
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	2	0	-	-
B	<i>Gutierrezia sarothrae</i>	23	23	.41	1.19
B	<i>Juniperus osteosperma</i>	3	3	1.97	1.54
B	<i>Pinus edulis</i>	0	0	.38	.63
Total for Browse		112	104	15.10	12.52

CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 12

Species	Percent Cover	
	'97	'02
Artemisia nova	-	1.00
Artemisia tridentata wyomingensis	-	6.50
Gutierrezia sarothrae	-	1.67
Juniperus osteosperma	1.4	.83
Pinus edulis	1.4	-

Key Browse Annual Leader Growth

Herd unit 16C, Study no: 12

Species	Average leader growth (in)
	'02
Artemisia tridentata wyomingensis	1.1

Point-Quarter Tree Data

Herd unit 16C, Study no: 12

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	32	40	3.9	2.8
Pinus edulis	7	11	4.4	3.1

BASIC COVER --

Herd unit 16C, Study no: 12

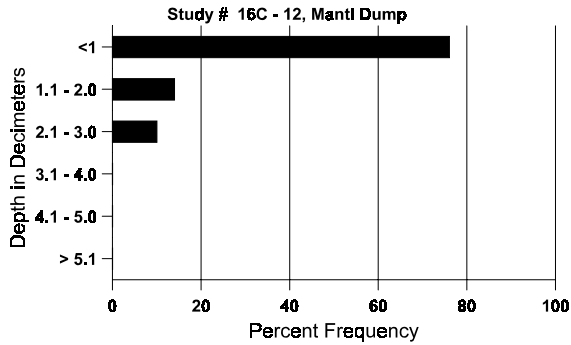
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	363	355	9.00	29.62	28.17
Rock	147	159	1.00	1.15	2.36
Pavement	325	335	29.00	31.22	30.13
Litter	379	371	55.00	31.75	38.28
Cryptogams	198	237	.75	3.03	6.03
Bare Ground	154	239	5.25	4.92	8.87

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 12, Manti Dump

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.2	63.0 (14.2)	7.3	38.4	35.1	26.6	3.1	8.1	137.6	.6

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 12

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
			02	02
Sheep	11	-	-	-
Rabbit	7	25	-	-
Elk	3	-	-	-
Deer	53	44	487	37 (93)
Cattle	-	1	26	2 (5)

## BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 12

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia nova																	
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3
	97	4	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	3	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	4	8	-	1	-	-	-	-	-	13	-	-	-	866	16 25	13
	97	4	11	-	-	-	-	-	-	15	-	-	-	300	17 27	15	
	02	21	5	1	-	-	-	-	-	27	-	-	-	540	13 24	27	
D	89	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	97	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
	02	8	2	-	-	-	-	-	-	5	-	-	5	200		10	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		53%			00%			00%			-65%						
'97		55%			00%			05%			+50%						
'02		18%			03%			13%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1132	Dec:	6%			
											'97	400		5%			
											'02	800		25%			



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<i>Artemisia tridentata wyomingensis</i>															
S	89	2	-	-	2	-	-	-	-	4	-	-	266		4
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	3	-	-	-	-	-	-	-	3	-	-	200		3
	97	2	1	1	-	-	-	-	-	4	-	-	80		4
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	13	22	-	-	-	-	-	35	-	-	2333	27 29	35
	97	2	19	49	-	1	-	-	-	69	-	2	1420	42 64	71
	02	9	16	5	-	-	-	-	-	30	-	-	600	20 33	30
D	89	-	2	21	-	-	-	-	-	23	-	-	1533		23
	97	1	15	23	2	1	-	-	-	17	-	25	860		43
	02	12	32	15	2	2	2	-	-	32	-	33	1300		65
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	800		40
	02	-	-	-	-	-	-	-	-	-	-	-	980		49
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		25%		70%		00%		-42%							
'97		31%		62%		23%		-19%							
'02		53%		23%		35%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	4066	Dec:	38%		
										'97	2360		36%		
										'02	1900		68%		
<i>Atriplex canescens</i>															
Y	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	1	-	-	-	-	-	1	-	-	20	33 43	1
	02	-	-	-	-	-	-	-	-	-	-	-	0	49 61	0
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%									
'97		00%		50%		00%									
'02		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-		
										'97	40		-		
										'02	0		-		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus stenophyllus</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	3	-	-	-	-	-	-	3	-	-	60	8	11	3
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			100%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	60		-		
												'02	0		-		
<i>Ephedra viridis</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	21	35	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
												'02	0		-		
<i>Gutierrezia sarothrae</i>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	60			3
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	66			1
	97	36	-	-	-	-	-	-	-	-	36	-	-	720			36
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	2	-	-	-	-	-	-	-	-	2	-	-	133	12	6	2
	97	119	-	-	-	-	-	-	-	-	119	-	-	2380	8	7	119
	02	61	-	-	-	-	-	-	-	-	61	-	-	1220	4	7	61
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	90	-	-	-	-	-	-	-	-	58	-	2	1800			90
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	360			18
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+94%						
'97		00%			00%			00%			- 3%						
'02		00%			00%			21%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	0%		
												'97	3100		0%		
												'02	3020		60%		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Juniperus osteosperma																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	2
	02	2	-	-	-	-	-	-	1	-	3	-	-	-	60	-	3
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%			+ 0%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	60		-			
											'02	60		-			

Trend Study 16C-38-02

Study site name: Pleasant Creek.

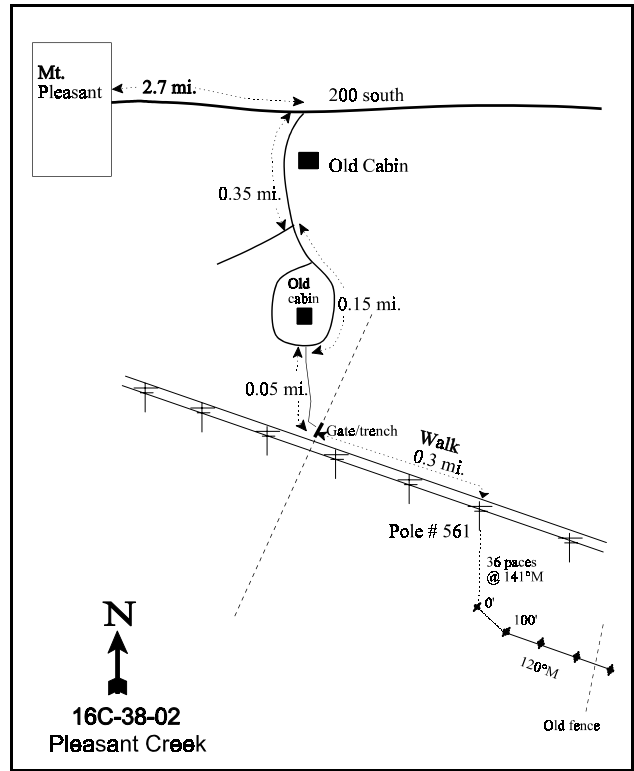
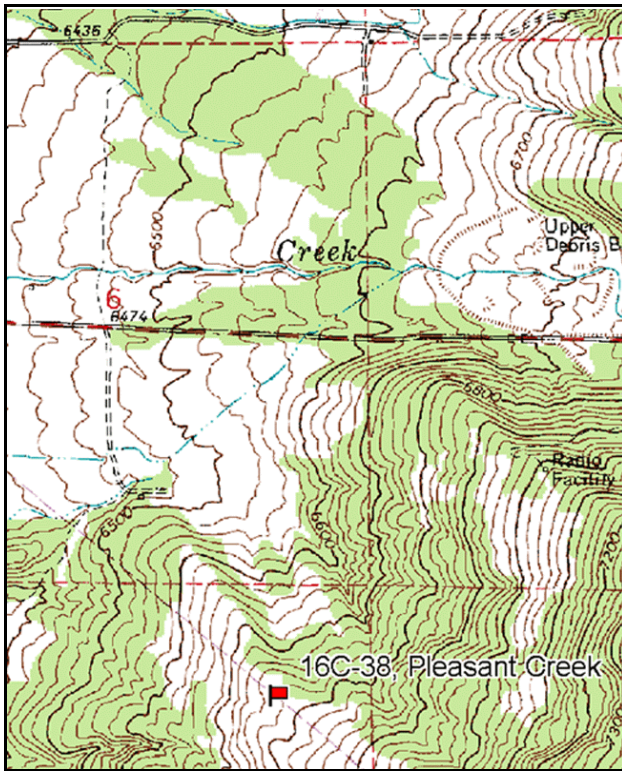
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 133 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of Highway 89 and 200 South in downtown Mt. Pleasant, take 200 South east for 2.7 miles. Turn right (south) and go 0.35 miles. Stay to the right and go 0.15 miles to the powerline road. Take a left (east) here and go 0.05 miles to a gate (which may be locked). From this gate, continue eastward for another 0.3 miles and stop at the third set of power poles from the gate. The 0-foot baseline stake is 36 paces from power pole # 561 at an azimuth of 141 degrees magnetic.



Map Name: Mt. Pleasant

Diagrammatic Sketch

Township 15S, Range 5E, Section 7

GPS: NAD 27, UTM 12S 4375785 N 465807 E

## DISCUSSION

### Pleasant Creek - Trend Study No. 16C-38

The Pleasant Creek study samples a mixed mountain brush community located in the foothills above the town of Mt. Pleasant. The transect is located beneath the large power transmission lines which cross the mountain. The site lies on a gentle slope (7%) facing the northwest at an elevation of 6,700 feet. This area is considered important winter range as the site supports several preferred browse species. Pellet group quadrat frequencies indicate elk and deer use to be light to moderate, with cattle and sheep use being light. A pellet group transect read in 2002 estimated 80 deer days use/acre (197 ddu/ha) and 27 elk days use/acre (68 edu/ha). No cattle pats or sheep pellets were sampled in the transect in 2002.

Soils are moderate in depth, with an estimated effective rooting depth of just over 12 inches. Soil textural analysis indicates a clay soil with a neutral reaction (pH of 7.2). The soil temperature is relatively cool at 53°F (depth of 14 inches). Rock is common throughout the upper 16 inches of the profile. Vegetative cover is very good with adequate litter cover in most places. Percent bare soil has remained stable in all sampled years at an average of 25%. Bare interspaces exhibit slight erosion, with moderate pedestalling around the base of shrubs and bunch grasses. An erosion condition class assessment determined the site as stable in 2002.

The area has a moderately low density of juniper interspersed with the mountain brush community. Point-center quarter data taken in 2002 estimated 80 trees/acre. In 1989, most of the trees were between 1 and 4 feet in height. In 1997 and 2002, trees ranged from 7 to 10 feet in height. The mixed mountain brush community is the key component, along with a significant herbaceous understory. The most numerous woody species is low rabbitbrush. In 1989, the population showed signs of significant browsing by domestic sheep that were in the area earlier in the season. Low rabbitbrush had a stable population estimated at 12,340 plants/acre in 2002, composed mostly of mature plants.

The key browse species is mountain big sagebrush which provided 24% of the browse cover in 1997 and 2002. Density for this species increased from 1,780 plants/acre in 1997 to 2,740 plants/acre in 2002. The recruitment of the young age class has been moderately abundant in all years, ranging from 19% to 27% of the population. The mountain big sagebrush population shows generally good vigor, low decadency, and light to moderate use in 2002. Leader growth was minimal in 2002 averaging just over 1 inch.

Other palatable browse species sampled on the site include serviceberry, basin big sagebrush, bitterbrush, and snowberry. These less common species together contribute an additional 32% of the total browse cover. In 2002, serviceberry and bitterbrush show mostly heavy use, while snowberry and basin big sagebrush display light and moderate use respectively. Bitterbrush was noted as having an abundance of leaders in 2002, although growth was minimal, averaging 2.5 inches.

Forbs are one of the key components on this site. Diversity is high, as 36 species were identified in 1997 and 30 in 2002. The forb component contributed 37% of the herbaceous cover in 1997, decreasing to 29% in 2002. Sum of nested frequency for perennial forbs declined by 26% between 1997 and 2002. Decreases in number of species sampled, cover, and nested frequency between 1997 and 2002 are mostly the results of the drought. This should improve with better precipitation in the future. The most abundant species include low penstemon and longleaf phlox. Several weedy increasers are present in the understory including houndstongue, stickseed, and aster. The grass component is also diverse with 11 perennial species being sampled in 2002. Grass abundance is moderate due to the presence of Kentucky bluegrass and bluebunch wheatgrass. Together they provided almost 80% of the grass cover in 1997, increasing to 92% in 2002. Both showed moderate utilization during the 1997 reading. However, neither showed noticeable use during the 2002 reading. Most of the other perennials occur in only a few quadrats. Sum of nested frequency for perennial grasses declined by 19% between 1997 and 2002. As with the forb component, this decline is likely a result of drought conditions in 2002 and should improve with better precipitation.

1989 APPARENT TREND ASSESSMENT

Soil trend appears stable with good cover from the herbaceous understory. Diversity and a high density of forbs and shrubs contribute to an apparently stable vegetative community. There are some increaser species, but without knowing the grazing history, it is difficult to predict future trends as they relate to current management. Overall, it appears to be a rather dynamic, but in the long-term, a stable and productive site.

1997 TREND ASSESSMENT

Soil trend is stable with percent cover of bare soil remaining about the same and almost 50% of the total vegetative cover coming from herbaceous species. The trend for preferred browse is stable, and should remain so as long as canopy cover and density of juniper stay relatively low. Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses indicates that it is slightly improved, but for perennial forbs it has gone down slightly. Because grasses make up the majority of the herbaceous cover (63%), the overall trend is assessed as stable.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics remain nearly identical to 1997 estimates. Bare soil is moderately high at 26%, but the ratio of protective cover to bare soil remains good at over 3:1. Soils show minimal erosion. Trend for browse is stable. The key species, mountain big sagebrush, has a slightly increasing population due to a moderately abundant young age class. Mountain big sagebrush has low decadence, generally good vigor, and shows light to moderate use. Bitterbrush provides additional forage and has a stable, but heavily browsed mature population. The herbaceous understory trend is slightly down. Sum of nested frequency for perennial grasses and forbs declined in 2002 with drought. However, diversity remains high, and abundance should improve with normal precipitation patterns.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 16C, Study no: 38

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	-	6	5	-	2	2	.06	.15
G	Agropyron spicatum	<sub>a</sub> 166	<sub>ab</sub> 171	<sub>b</sub> 196	66	60	65	8.60	8.50
G	Bromus japonicus (a)	-	<sub>b</sub> 93	<sub>a</sub> 7	-	33	4	.99	.02
G	Bromus tectorum (a)	-	<sub>b</sub> 73	<sub>a</sub> 8	-	28	5	.63	.02
G	Carex spp.	-	-	1	-	-	1	-	.03
G	Melica bulbosa	1	2	2	1	1	2	.00	.16
G	Oryzopsis hymenoides	<sub>a</sub> -	<sub>b</sub> 9	<sub>ab</sub> 5	-	5	2	.08	.16
G	Poa fendleriana	<sub>b</sub> 8	<sub>a</sub> -	<sub>a</sub> 1	3	-	1	-	.00
G	Poa pratensis	<sub>b</sub> 115	<sub>b</sub> 101	<sub>a</sub> 45	43	31	20	3.78	1.49

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Poa secunda</i>	<sub>a</sub> 10	<sub>b</sub> 48	<sub>ab</sub> 33	7	19	15	.46	.56
G	<i>Sitanion hystrix</i>	<sub>ab</sub> 16	<sub>b</sub> 29	<sub>a</sub> 2	7	12	1	.34	.03
G	<i>Stipa columbiana</i>	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 18	-	1	9	.03	.83
G	<i>Stipa lettermani</i>	<sub>ab</sub> 15	<sub>b</sub> 24	<sub>a</sub> 8	6	13	4	.71	.24
Total for Annual Grasses		0	166	15	0	61	9	1.62	0.04
Total for Perennial Grasses		331	392	316	133	144	122	14.10	12.17
Total for Grasses		331	558	331	133	205	131	15.73	12.21
F	<i>Achillea millefolium</i>	-	4	4	-	1	1	.38	.15
F	<i>Agoseris glauca</i>	-	3	5	-	1	3	.00	.01
F	<i>Alyssum alyssoides</i> (a)	-	7	3	-	3	1	.01	.00
F	<i>Allium</i> spp.	<sub>a</sub> 3	<sub>ab</sub> 12	<sub>b</sub> 16	1	6	10	.05	.07
F	<i>Arabis</i> spp.	4	2	-	2	1	-	.00	-
F	<i>Astragalus convallarius</i>	40	45	32	18	23	13	.59	.38
F	<i>Aster</i> spp.	79	76	54	31	31	25	1.18	.52
F	<i>Astragalus</i> spp.	<sub>b</sub> 14	<sub>a</sub> 1	<sub>a</sub> 2	7	1	1	.00	.03
F	<i>Astragalus utahensis</i>	-	5	5	-	2	3	.01	.01
F	<i>Carduus nutans</i> (a)	-	10	12	-	4	7	.21	.10
F	<i>Chaenactis douglasii</i>	<sub>b</sub> 13	<sub>b</sub> 16	<sub>a</sub> 4	9	8	2	.06	.01
F	<i>Cirsium</i> spp.	13	15	12	6	8	6	.06	.10
F	<i>Convolvulus arvensis</i>	-	3	-	-	1	-	.01	-
F	<i>Collomia linearis</i> (a)	-	<sub>b</sub> 15	<sub>a</sub> -	-	7	-	.03	-
F	<i>Collinsia parviflora</i> (a)	-	58	41	-	24	15	.12	.17
F	<i>Cymopterus</i> spp.	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 14	-	2	7	.01	.06
F	<i>Cynoglossum officinale</i>	<sub>b</sub> 94	<sub>a</sub> 21	<sub>a</sub> 12	40	9	7	.17	.08
F	<i>Epilobium brachycarpum</i> (a)	-	3	3	-	3	1	.02	.03
F	<i>Erigeron eatonii</i>	-	-	1	-	-	1	-	.00
F	<i>Eriogonum ovalifolium</i>	-	-	3	-	-	2	-	.03
F	<i>Eriogonum umbellatum</i>	<sub>b</sub> 28	<sub>a</sub> -	<sub>a</sub> 9	13	-	5	.00	.05
F	<i>Hackelia patens</i>	<sub>b</sub> 97	<sub>b</sub> 89	<sub>a</sub> 30	44	36	16	.77	.45
F	<i>Lepidium</i> spp. (a)	-	6	-	-	2	-	.01	-
F	<i>Linum kingii</i>	7	-	-	2	-	-	-	-
F	<i>Lithospermum ruderales</i>	3	4	6	3	2	3	.03	.21
F	<i>Machaeranthera canescens</i>	<sub>c</sub> 79	<sub>b</sub> 40	<sub>a</sub> 3	37	16	2	.26	.06
F	<i>Microsteris gracilis</i> (a)	-	<sub>b</sub> 30	<sub>a</sub> 3	-	12	1	.08	.00
F	<i>Penstemon humilis</i>	<sub>b</sub> 242	<sub>a</sub> 190	<sub>a</sub> 181	94	73	72	3.26	3.89
F	<i>Phlox longifolia</i>	123	114	89	55	45	40	.30	.32
F	<i>Polygonum douglasii</i> (a)	-	8	-	-	3	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>b</sub> 132	<sub>a</sub> 4	-	47	2	.45	.01
F	<i>Senecio multilobatus</i>	-	-	3	-	-	1	-	.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 10	<sub>ab</sub> 19	<sub>b</sub> 24	3	8	11	.14	.15
F	<i>Taraxacum officinale</i>	<sub>ab</sub> 1	<sub>b</sub> 10	<sub>a</sub> -	1	5	-	.02	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> 4	<sub>b</sub> 20	<sub>a</sub> 2	3	9	2	.04	.01
F	Unknown forb-annual (a)	-	2	-	-	1	-	.00	-
F	<i>Veronica biloba</i> (a)	-	<sub>b</sub> 106	<sub>a</sub> -	-	38	-	.46	-
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>b</sub> 33	<sub>b</sub> 22	-	15	11	.27	.10
F	<i>Viguiera multiflora</i>	<sub>b</sub> 35	<sub>a</sub> 4	<sub>a</sub> 6	19	4	3	.05	.04
F	<i>Viola</i> spp.	-	3	-	-	1	-	.03	-
Total for Annual Forbs		0	377	66	0	144	27	1.44	0.33
Total for Perennial Forbs		889	731	539	388	308	247	7.77	6.79
Total for Forbs		889	1108	605	388	452	274	9.22	7.13

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

BROWSE TRENDS --  
Herd unit 16C, Study no: 38

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Amelanchier alnifolia</i>	2	3	.03	-
B	<i>Artemisia tridentata tridentata</i>	11	19	.90	2.64
B	<i>Artemisia tridentata vaseyana</i>	49	67	7.25	7.91
B	<i>Chrysothamnus nauseosus albicaulis</i>	2	10	.38	.72
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	94	93	7.21	5.82
B	<i>Eriogonum heracleoides</i>	0	2	-	-
B	<i>Gutierrezia sarothrae</i>	2	5	.06	.18
B	<i>Juniperus osteosperma</i>	6	7	5.63	7.75
B	<i>Mahonia repens</i>	0	2	-	-
B	<i>Purshia tridentata</i>	24	27	5.65	4.80
B	<i>Rosa woodsii</i>	2	2	.30	.03
B	<i>Symphoricarpos oreophilus</i>	50	53	2.62	2.83
B	<i>Tetradymia canescens</i>	2	2	.15	.03
Total for Browse		244	292	30.21	32.73



CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 38

Species	Percent Cover	
	'97	'02
Artemisia tridentata tridentata	-	3.25
Artemisia tridentata vaseyana	-	6.58
Chrysothamnus nauseosus	-	.75
Chrysothamnus viscidiflorus viscidiflorus	-	9.42
Eriogonum heracleoides	-	.02
Juniperus osteosperma	4.6	10.83
Mahonia repens	-	.05
Purshia tridentata	-	6.67
Rosa woodsii	-	.02
Symphoricarpos oreophilus	-	2.75
Tetradymia canescens	-	.25

Key Browse Annual Leader Growth

Herd unit 16C , Study no: 38

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.2
Purshia tridentata	2.5

Point-Quarter Tree Data

Herd unit 16C , Study no: 38

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	70	80	3.8	4.8

BASIC COVER --

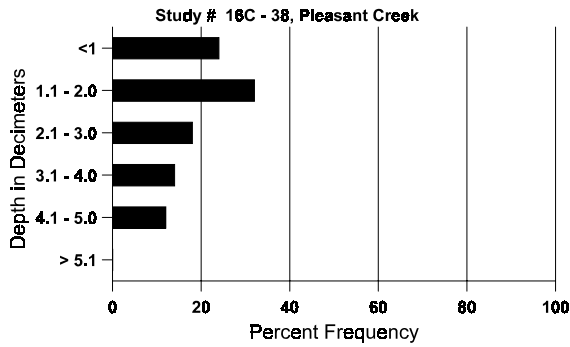
Herd unit 16C, Study no: 38

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	369	332	16.50	46.87	51.43
Rock	68	99	1.75	.58	1.11
Pavement	175	172	2.75	1.09	1.56
Litter	392	378	54.00	42.92	37.88
Cryptogams	49	77	0	1.62	3.67
Bare Ground	259	244	25.00	24.11	26.76

SOIL ANALYSIS DATA --  
 Herd Unit 16C, Study no: 38, Pleasant Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.2	53.0 (14.1)	7.2	25.7	29.4	44.8	4.7	10.9	246.4	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 16C, Study no: 38

Type	Quadrat Frequency	
	'97	'02
Sheep	6	-
Rabbit	3	4
Elk	11	11
Deer	12	24
Cattle	1	-

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
-	-
-	-
357	27 (68)
1035	80 (197)
-	-

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 38

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
<i>Amelanchier alnifolia</i>																
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	1	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	1	1	-	-	-	-	-	1	1	-	-	133	17 15	2
	97	-	-	1	-	-	-	-	-	1	-	-	-	20	21 27	1
	02	-	-	1	-	-	-	-	-	1	-	-	-	20	16 19	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	1	-	-	-	1	-	-	-	-	2	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'89		50%			50%			00%			-70%					
'97		00%			50%			00%			+33%					
'02		00%			67%			67%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	133	Dec:	0%			
										'97	40		0%			
										'02	60		67%			
<i>Artemisia tridentata tridentata</i>																
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	8	-	-	-	-	-	-	-	8	-	-	-	160		8
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	6	-	-	1	-	-	-	-	7	-	-	-	140	54 53	7
	02	12	11	-	1	-	-	-	-	24	-	-	-	480	49 52	24
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	5	-	-	-	-	-	-	-	1	-	-	4	100		5
	02	1	-	-	-	-	1	-	-	1	-	-	1	40		2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	260		13
	02	-	-	-	-	-	-	-	-	-	-	-	-	120		6
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'89		00%			00%			00%								
'97		00%			00%			20%			+26%					
'02		41%			04%			04%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%			
										'97	400		25%			
										'02	540		7%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	15	-	-	-	-	-	-	-	-	15	-	-	-	300		15
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
Y	89	5	-	-	-	-	-	-	-	-	5	-	-	-	333		5
	97	21	-	-	3	-	-	-	-	-	24	-	-	-	480		24
	02	26	-	-	-	-	-	-	-	-	26	-	-	-	520		26
M	89	13	3	-	-	-	-	-	-	-	15	-	1	-	1066	27 34	16
	97	29	22	1	2	-	-	-	-	-	54	-	-	-	1080	29 32	54
	02	84	12	2	-	-	1	-	-	-	99	-	-	-	1980	23 28	99
D	89	5	1	-	-	-	-	-	-	-	6	-	-	-	400		6
	97	4	6	1	-	-	-	-	-	-	6	-	-	5	220		11
	02	9	-	1	-	-	-	2	-	-	7	-	-	5	240		12
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	620		31
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	740		37
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		15%			00%			04%			- 1%						
'97		31%			02%			06%			+35%						
'02		09%			03%			04%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1799	Dec:	22%			
											'97	1780		12%			
											'02	2740		9%			
<i>Chrysothamnus nauseosus albicaulis</i>																	
Y	89	2	-	-	1	-	-	-	-	-	3	-	-	-	200		3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	3	1	-	-	-	-	2	-	-	6	-	-	-	400	35 22	6
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	30 40	1
	02	22	-	-	-	-	-	-	-	-	22	-	-	-	440	13 13	22
D	89	3	1	-	-	-	-	-	-	-	4	-	-	-	266		4
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20		1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		15%			00%			00%			-95%						
'97		100%			00%			50%			+91%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	866	Dec:	31%			
											'97	40		50%			
											'02	440		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	19	-	-	-	-	-	-	-	-	19	-	-	-	380		19	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	85	3	3	-	-	-	-	-	-	91	-	-	-	6066		91	
	97	109	-	-	7	-	-	-	-	-	116	-	-	-	2320		116	
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	98	34	13	-	-	-	-	-	-	145	-	-	-	9666	11 12	145	
	97	452	18	-	61	-	-	-	-	-	531	-	-	-	10620	9 12	531	
	02	582	9	-	3	-	-	-	-	-	587	7	-	-	11880	9 12	594	
D	89	10	20	5	-	-	-	-	-	-	35	-	-	-	2333		35	
	97	10	-	-	-	-	-	-	-	-	8	-	-	2	200		10	
	02	19	-	-	-	-	-	1	-	-	17	-	-	3	400		20	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		21%			08%			00%			-27%							
'97		03%			00%			.30%			- 6%							
'02		01%			00%			.48%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	18065	Dec:	13%				
											'97	13140		2%				
											'02	12340		3%				
<b>Eriogonum heracleoides</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	6	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	0		-				
											'02	40		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120	8	7	
	02	11	-	-	-	-	-	-	-	-	11	-	-	-	220	8	9	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+25%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	180		0%				
											'02	240		8%				
<i>Juniperus osteosperma</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	93	89	
	97	-	-	-	-	-	4	-	-	-	4	-	-	-	80	-	-	
	02	3	-	-	1	-	-	1	1	-	5	1	-	-	120	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		00%			00%			00%			+25%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	120		-				
											'02	160		-				
<i>Mahonia repens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	02	18	-	-	-	-	-	-	-	-	18	-	-	-	360	2	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	0		-				
											'02	360		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	'89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	16	26	1
	'97	-	1	9	-	5	21	-	-	-	36	-	-	-	720	44	49	36
	'02	16	-	30	-	-	-	-	-	-	46	-	-	-	920	11	39	46
D	'89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	'02	1	-	-	-	-	-	-	-	1	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+91%							
'97		17%			83%			00%			+23%							
'02		00%			64%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	0%			
												'97	720		0%			
												'02	940		2%			
Rosa woodsii																		
Y	'89	18	-	-	-	-	-	-	-	-	18	-	-	-	1200			18
	'97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	'89	17	-	-	-	-	-	-	-	-	17	-	-	-	1133	14	16	17
	'97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	17	8
	'02	10	-	-	-	-	-	-	-	-	10	-	-	-	200	6	7	10
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-91%							
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2333	Dec:	-			
												'97	200		-			
												'02	200		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Symphoricarpos oreophilus</b>																		
S	89	-	-	-	4	-	-	-	-	-	4	-	-	-	266		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	20	-	-	-	-	-	-	-	-	20	-	-	-	1333		20	
	97	22	-	-	2	-	-	-	-	-	24	-	-	-	480		24	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	26	6	-	-	1	-	-	-	-	31	-	2	-	2200	17	17	33
	97	45	23	1	23	-	-	-	-	-	92	-	-	-	1840	11	23	92
	02	91	3	-	-	-	-	-	-	-	93	1	-	-	1880	13	20	94
D	89	4	-	-	1	-	-	-	-	-	5	-	-	-	333		5	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	2	-	1	-	-	-	-	-	-	3	-	-	-	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		12%			00%			03%			-39%							
'97		20%			.85%			00%			-14%							
'02		03%			.99%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3866	Dec:	9%				
											'97	2340		1%				
											'02	2020		3%				
<b>Tetradymia canescens</b>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	12	-	-	-	-	-	-	-	-	12	-	-	-	240		12	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200	12	25	10
	02	24	-	-	-	-	-	-	-	-	24	-	-	-	480	11	18	24
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+21%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	440		-				
											'02	560		-				



Trend Study 16C-39-02

Study site name: Cove Creek.

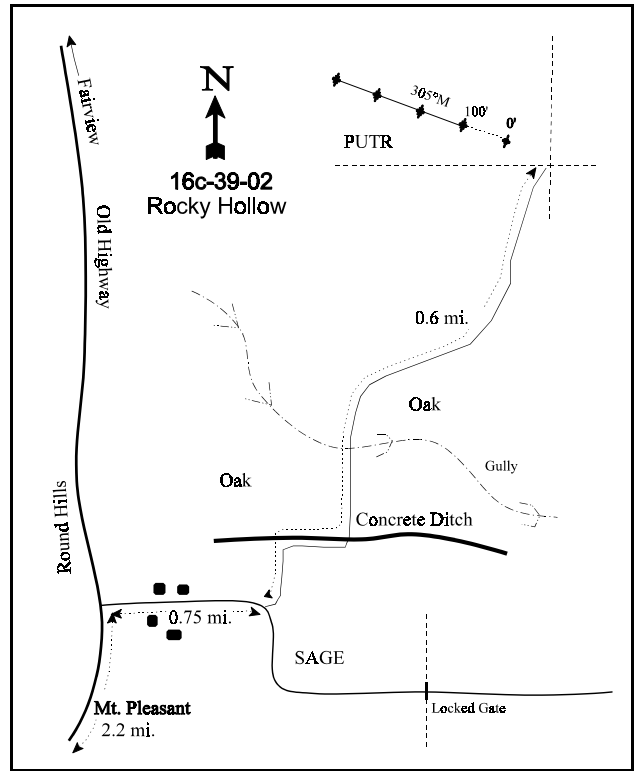
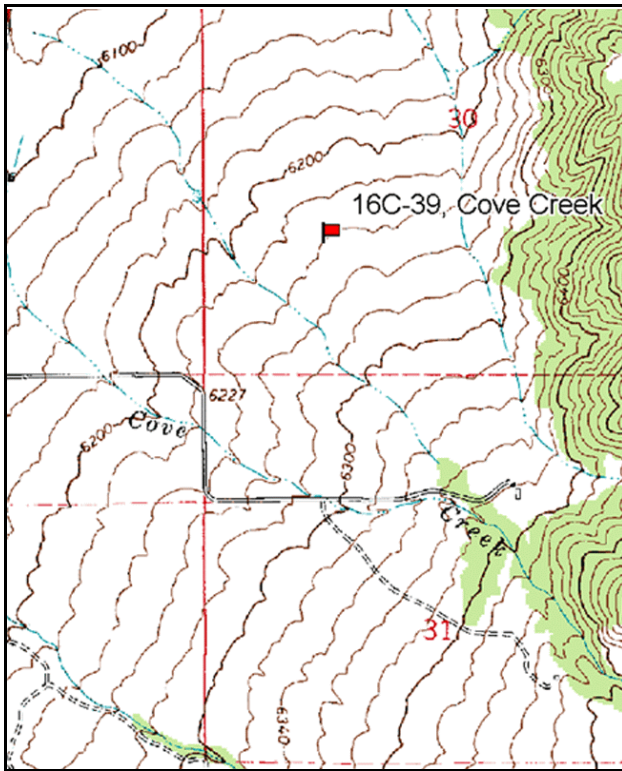
Vegetation type: Bitterbrush.

Compass bearing: frequency baseline 305 degrees magnetic.

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

LOCATION DESCRIPTION

From State Street (Highway 89) and 200 North in Mt. Pleasant, proceed east on 200 North which curves northward and becomes the old highway to Fairview. Follow this road for 2.2 miles, then turn east on a gravel road for 0.75 miles to an intersection at the first curve in the road. Turn left and drive (~0.6 miles) until a concrete ditch is reached. Drive east along the fence until the road ends or a place where 3 fences intersect and the road ends. The 0-foot baseline stake, which is red, is 12 paces west of the fence corner. The 100-foot baseline stake is rebar.



Map Name: Mount Pleasant.

Diagrammatic Sketch

Township 14 S, Range 5E, Section 30

GPS: NAD 27, UTM 12S 4379842 N 464880 E

## DISCUSSION

### Cove Creek - Trend Study No. 16C-39

Cove Creek is a distinctive, yet favorable location for a trend study. It was also the location of an old 1978 line-intercept transect. It is representative of a unique bitterbrush type (tall form) in the foothills between Fairview and Mt. Pleasant. The site slopes very gently (0-5%) to the northwest at an elevation of 6,280 feet. All of the area is privately owned. Domestic sheep graze the area in winter and/or spring, and there have been a few cows in the large pasture. One fawn carcass from the previous winter was found in 1989. Rabbits and small rodents are fairly common. Pellet group transect data taken in 2002 estimated 35 deer days use/acre (88 ddu/ha), 8 elk days use/acre (20 edu/ha), and less than 1 cow day use/acre (2 cdu/ha).

Textural and chemical analysis designates soils as sandy loam with a neutral to slightly acidic reactivity (pH of 6.6). Effective rooting depth is estimated at almost 10 inches. Soil temperature was 66°F at almost 14 inches in depth. This soil is classified in the Birdow series which is well-drained with medium runoff and a slight hazard of erosion. In the Upland Loam range site, the potential plant community consists of 80% grasses, 10% forbs and 10% shrubs (by weight). Due to the long history of grazing, annuals and increasers dominate the herbaceous understory. Shrub interspaces are bare or are occupied by morning glory, storksbill, cheatgrass, and pricklypear cactus. These weedy species contribute a high proportion of the total vegetative cover. Vegetation and litter cover are high and adequately protect soils from erosion. An erosion condition class assessment determined this site as stable in 2002.

The dominant overstory species on the site is bitterbrush. It is a tall growth form which may be hybridizing with cliffrose. There are also prostrate forms on the site, often looking distorted due to severe hedging. Vigor has been generally normal on most of the bitterbrush population even though use has been heavy. Decadence has remained low ranging from 8% -13%. Utilization noticeably declined to a more moderate level in 2002, compared to the previous readings. Recruitment by young plants was high in 1989 at 48%, but has been very low since at 4% in 1997 and 0% in 2002. Density of bitterbrush has remained stable at just over 900 plants/acre. Bitterbrush leader growth averaged about 3.5 inches in 2002.

There are exceptionally large patches of pricklypear cactus throughout the site. Pricklypear density was estimated at 5,400 plants/acre in 2002. Basin big sagebrush had an estimated density of 2,940 plants/acre in 2002, an 18% increase since 1997. Young plants were abundant making up 22% of the population in both 1997 and 2002. Basin big sagebrush shows little to no use, normal vigor, and very low decadence. Tall oak clones occur scattered around the site.

Most of the preferred perennial grasses are associated with and protected by shrubs or cactus. In the past, cheatgrass and bulbous bluegrass were common in the interspaces, and combined to provide 91% of the grass cover in 1997. With drought conditions in 2002, cheatgrass significantly decreased in frequency, while bulbous bluegrass significantly increased. Bulbous bluegrass now provides an astounding 47% average cover value, which can best be described as a carpet over the site. Bulbous bluegrass is a short-lived perennial that has many characteristics of a winter annual. The most negative aspect is that it dries out early in the summer. More desirable perennial grasses are in relatively low abundance and include bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, needle-and-thread, and sand dropseed. Sum of nested frequency for perennial grasses increased in 2002, due to the increase in bulbous bluegrass. The forb component is weedy and includes species such as morning glory, storksbill, bur buttercup, musk thistle, and houndstongue. Morning glory is by far the dominant forb on the site. With drought in 2002, sum of nested frequency for perennial forbs declined by one-third.

## 1989 APPARENT TREND ASSESSMENT

Trend for the key browse species, bitterbrush and big sagebrush, appears stable. They have sustained themselves for many years under heavy utilization. Much of the new bitterbrush growth is unavailable due to height. As far as overall range condition is concerned, the prominence of annuals, increasers, and pricklypear cactus indicates a downward trend for plant composition. The soil condition is good and trend appears stable.

## 1997 TREND ASSESSMENT

The trend for soil is up, with percent bare soil decreasing from 23% to 6%. Herbaceous cover is high, although the majority of the plant cover is contributed by annual and/or weedy species. Seventy percent of the total vegetative cover comes from herbaceous species which are more protective of the soils during intense summer storms. The key preferred browse is bitterbrush and basin big sagebrush. Together they contribute 70% of the browse cover. Both have good vigor and increased densities. Trend for browse is also up. Anymore increases for prickly pear cactus should be watched closely as it has shown significant increases since 1989. This site probably has more herbaceous cover than any other site in the unit with a total cover value of almost 52%. However, the majority of the cover is contributed by weedy species or annuals which make up 86% of the herbaceous cover. Trend for the herbaceous understory is down because of the very poor composition attributed by too many weedy species.

### TREND ASSESSMENT

soil - up (5)

browse - up (5)

herbaceous understory - down (1) because of poor composition

## 2002 TREND ASSESSMENT

Trend for soil is slightly up. Bare soil continues to decrease and herbaceous vegetation is abundant. Sum of nested frequency of perennial species increased by 15%. Soils continue to show minimal erosion. Trend for browse is slightly up. Bitterbrush has a stable density, low decadency, and good vigor. Heavy use declined from 90% to 51%. Basin big sagebrush has an increasing population due to a high proportion of young plants (22%). Use is light, decadency is low, and vigor is normal. Trend for the herbaceous understory remains down. Although sum of nested frequency increased overall for perennial species, nearly all of this is attributed to the increase of bulbous bluegrass. Bulbous bluegrass is a short-lived perennial that has low forage value and has many annual characteristics. The forb composition remains dominated by weeds, primarily morning glory. With drought in 2002, sum of nested frequency for perennial forbs declined by one-third.

### TREND ASSESSMENT

soil - slightly up (4)

browse - slightly up (4)

herbaceous understory - down (1)

HERBACEOUS TRENDS --  
Herd unit 16C, Study no: 39

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	<i>Agropyron intermedium</i>	-	-	9	-	-	4	-	.19
G	<i>Agropyron spicatum</i>	15	17	10	8	6	4	.77	.36
G	<i>Bromus japonicus</i> (a)	-	a <sup>2</sup>	b <sup>30</sup>	-	1	14	.03	.07
G	<i>Bromus tectorum</i> (a)	-	b <sup>302</sup>	a <sup>162</sup>	-	87	55	15.94	4.80
G	<i>Oryzopsis hymenoides</i>	1	-	5	1	-	2	.00	.18
G	<i>Poa bulbosa</i>	a <sup>-</sup>	b <sup>214</sup>	c <sup>303</sup>	-	65	84	14.45	47.29
G	<i>Poa fendleriana</i>	-	9	-	-	4	-	.07	-
G	<i>Poa pratensis</i>	b <sup>19</sup>	ab <sup>18</sup>	a <sup>3</sup>	8	7	1	.25	.03
G	<i>Poa secunda</i>	a <sup>23</sup>	a <sup>32</sup>	b <sup>67</sup>	9	13	25	1.11	1.14
G	<i>Sporobolus cryptandrus</i>	22	15	33	10	7	15	.13	.83
G	<i>Stipa comata</i>	ab <sup>27</sup>	a <sup>13</sup>	b <sup>59</sup>	11	4	19	.71	7.05
Total for Annual Grasses		0	304	192	0	88	69	15.97	4.87
Total for Perennial Grasses		107	318	489	47	106	154	17.52	57.09
Total for Grasses		107	622	681	47	194	223	33.49	61.95
F	<i>Alyssum alyssoides</i> (a)	-	a <sup>-</sup>	b <sup>76</sup>	-	-	29	-	.99
F	<i>Allium</i> spp.	a <sup>-</sup>	b <sup>10</sup>	a <sup>-</sup>	-	8	-	.09	-
F	<i>Artemisia ludoviciana</i>	3	-	-	1	-	-	-	-
F	<i>Carduus nutans</i> (a)	-	10	-	-	4	-	.40	-
F	<i>Cirsium</i> spp.	1	7	-	1	4	-	.21	-
F	<i>Convolvulus arvensis</i>	b <sup>234</sup>	b <sup>202</sup>	a <sup>148</sup>	86	71	63	12.14	3.55
F	<i>Collinsia parviflora</i> (a)	-	-	1	-	-	1	-	.00
F	<i>Cryptantha</i> spp.	-	4	-	-	2	-	.01	-
F	<i>Cynoglossum officinale</i>	b <sup>16</sup>	a <sup>-</sup>	a <sup>-</sup>	7	-	-	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	11	5	-	6	2	.03	.01
F	<i>Erodium cicutarium</i> (a)	b <sup>127</sup>	c <sup>221</sup>	a <sup>9</sup>	49	74	4	3.83	.02
F	<i>Eriogonum racemosum</i>	9	8	7	3	3	3	.16	.04
F	<i>Lactuca serriola</i>	9	-	-	4	-	-	-	-
F	<i>Lepidium</i> spp. (a)	-	b <sup>55</sup>	a <sup>31</sup>	-	22	10	.92	.39
F	<i>Lithospermum ruderales</i>	4	-	-	2	-	-	-	-
F	<i>Machaeranthera canescens</i>	b <sup>23</sup>	ab <sup>10</sup>	a <sup>2</sup>	9	6	1	.03	.03
F	<i>Phlox longifolia</i>	3	3	5	3	2	2	.01	.01
F	<i>Polygonum douglasii</i> (a)	-	b <sup>38</sup>	c <sup>11</sup>	-	16	6	.13	.03
F	<i>Ranunculus testiculatus</i> (a)	-	b <sup>54</sup>	a <sup>11</sup>	-	20	5	.25	.05
F	<i>Sisymbrium altissimum</i> (a)	b <sup>6</sup>	a <sup>-</sup>	ab <sup>3</sup>	4	-	1	.00	.00
F	<i>Sphaeralcea coccinea</i>	-	2	4	-	1	2	.15	.03
F	<i>Taraxacum officinale</i>	-	3	-	-	1	-	.03	-
F	<i>Tragopogon dubius</i>	-	3	-	-	1	-	.00	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Viguiera multiflora	-	1	-	-	1	-	.03	-
	Total for Annual Forbs	133	389	147	53	142	58	5.57	1.50
	Total for Perennial Forbs	302	253	166	116	100	71	12.87	3.67
	Total for Forbs	435	642	313	169	242	129	18.44	5.18

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

#### BROWSE TRENDS --

Herd unit 16C, Study no: 39

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	47	48	5.71	11.89
B	Gutierrezia sarothrae	4	1	.03	.00
B	Opuntia spp.	67	65	5.97	3.95
B	Purshia tridentata	37	42	10.05	12.92
B	Quercus gambelii	4	4	.53	1.00
B	Rosa woodsii	1	2	-	-
	Total for Browse	160	162	22.29	29.78

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 16C, Study no: 39

Species	Percent Cover	
	'97	'02
Artemisia tridentata tridentata	-	11.75
Artemisia tridentata wyomingensis	-	3.42
Opuntia spp.	-	2.83
Purshia tridentata	-	12.58
Quercus gambelii	-	.83
Rosa woodsii	-	.05

#### Key Browse Annual Leader Growth

Herd unit 16C, Study no: 39

Species	Average leader growth (in)
	'02
Artemisia tridentata tridentata	3.2
Purshia tridentata	3.5

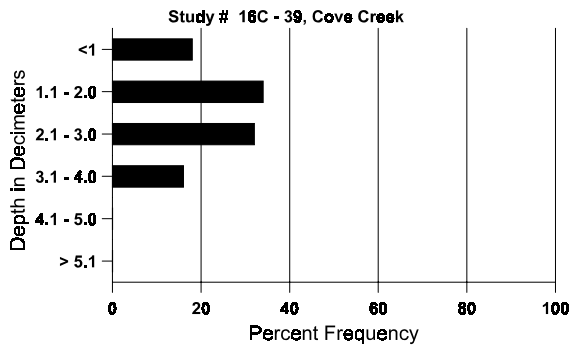
BASIC COVER --  
Herd unit 16C, Study no: 39

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	391	386	20.50	62.59	80.27
Rock	35	24	3.75	1.16	.66
Pavement	50	47	0	.15	.25
Litter	392	360	53.25	49.92	28.67
Cryptogams	24	41	0	.26	.71
Bare Ground	147	122	22.50	5.58	3.61

SOIL ANALYSIS DATA --  
Herd Unit 16C, Study no: 39, Cove Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.7	65.8 (13.3)	6.6	66.4	19.8	13.8	1.7	30.9	208.0	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 16C, Study no: 39

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Sheep	20	1	17	1 (3)
Rabbit	18	29	-	-
Horse	-	1	-	-
Elk	11	3	104	8 (20)
Deer	34	22	461	35 (88)
Cattle	-	2	9	1 (2)

BROWSE CHARACTERISTICS --  
Herd unit 16C, Study no: 39

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata tridentata</i>																		
S	89	12	-	-	6	-	-	-	-	-	18	-	-	-	600		18	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
Y	89	13	11	3	8	-	-	-	-	-	33	-	-	2	1166		35	
	97	25	1	-	-	-	-	-	-	-	26	-	-	-	520		26	
	02	33	-	-	-	-	-	-	-	-	33	-	-	-	660		33	
M	89	1	1	1	-	-	-	-	-	-	3	-	-	-	100	28 30	3	
	97	82	5	-	6	-	-	-	-	-	93	-	-	-	1860	34 39	93	
	02	109	-	-	-	-	-	-	-	-	109	-	-	-	2180	31 37	109	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	3	-	-	-	-	-	2	-	-	3	-	-	2	100		5	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		32%			11%			05%			+47%							
'97		05%			00%			00%			+18%							
'02		00%			00%			01%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1266	Dec:	0%				
											'97	2400		1%				
											'02	2940		3%				
<i>Gutierrezia sarothrae</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	5 4	1	
	97	17	-	-	-	-	-	-	-	-	17	-	-	-	340	16 15	17	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	10 13	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+90%							
'97		00%			00%			00%			-94%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	340		-				
											'02	20		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	5	-	-	-	-	-	-	-	-	-	-	-	166			5
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	12	-	-	-	-	-	-	-	-	-	-	-	240			12
M	89	13	-	-	-	-	-	-	-	-	-	-	-	433	9	52	13
	97	310	-	-	13	-	-	-	-	-	-	-	-	6460	7	21	323
	02	231	-	-	2	-	-	-	-	-	-	-	-	4660	7	15	233
D	89	4	-	-	-	-	-	-	-	-	-	-	-	133			4
	97	19	-	-	-	-	-	-	-	-	-	-	-	380			19
	02	23	-	-	-	-	-	2	-	-	-	-	-	500			25
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	160			8
	02	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			05%			+89%						
'97		00%			00%			05%			-21%						
'02		00%			00%			04%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	732	Dec:	18%		
												'97	6840		6%		
												'02	5400		9%		
Purshia tridentata																	
S	89	-	1	-	2	-	-	-	-	-	-	-	-	100			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	2	5	3	1	1	-	-	-	-	-	-	-	400			12
	97	1	1	-	-	-	-	-	-	-	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	-	1	9	-	-	-	1	-	-	-	-	-	366	38	53	11
	97	1	1	18	1	-	19	-	-	-	-	-	-	800	48	67	40
	02	5	11	22	-	-	-	1	4	-	-	-	-	860	37	57	43
D	89	-	-	1	-	-	1	-	-	-	-	-	-	66			2
	97	-	-	5	-	-	1	-	-	-	-	-	-	120			6
	02	-	-	2	-	2	-	-	-	-	-	-	-	80			4
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	100			5
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		28%			56%			00%			+13%						
'97		04%			90%			02%			- 2%						
'02		28%			51%			06%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	832	Dec:	8%		
												'97	960		13%		
												'02	940		9%		



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
	02	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	12	27	-	-	-	-	-	-	-	39	-	-	-	780	17	17	39
	02	33	-	-	-	-	-	-	-	-	33	-	-	-	660	25	14	33
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	36	-	-	-	-	-	-	-	-	36	-	-	-	720			36
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		57%			00%			00%			+43%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	940		0%				
											'02	1640		44%				
Rosa woodsii																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	13	12	4
	02	7	-	-	-	-	-	-	-	-	7	-	-	-	140	11	7	7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+43%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	80		-				
											'02	140		-				

## SUSPENDED STUDIES

Trend Study 16C-10-97

Study site name: Julius Pasture.

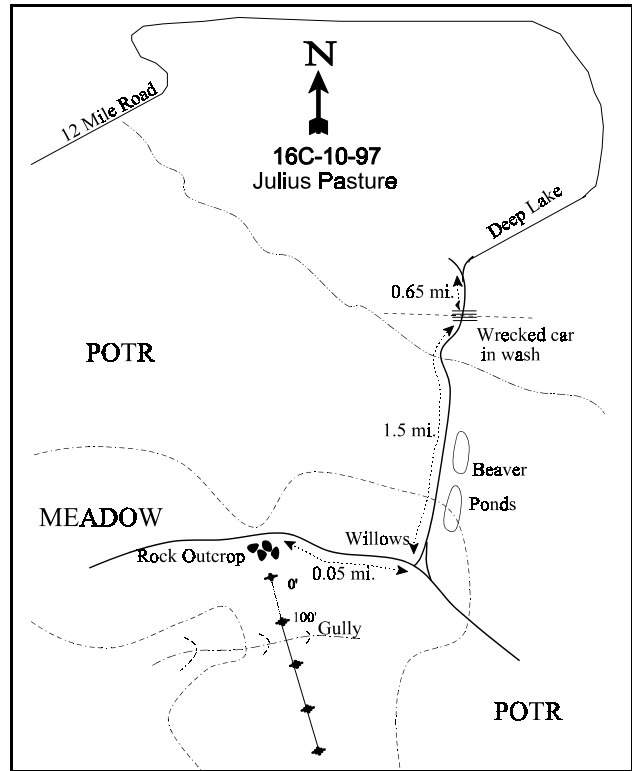
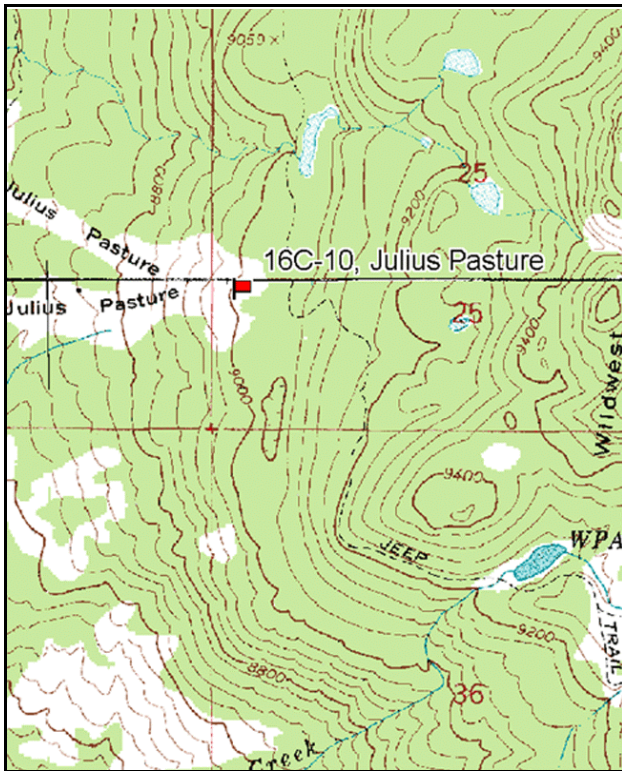
Vegetation type: Dry Meadow.

Compass bearing: frequency baseline 174 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Mayfield, go east up Twelve Mile Canyon for about 15 miles to the Cowboy Camp/Deep Lake Road. This jeep trail no longer exists. Must continue on Twelve Mile Road around to the east of the site. It may require a map and GPS to find this site. At this old fork, go 0.65 miles to a pole fence and a cattle guard. Continue on for another 1.5 miles to another fork in the road. Turn right again and go 0.05 miles to a rock outcropping on the south side of the road. From the edge of the road, walk 13 paces (through the rock outcropping) to the 0-foot baseline stake which is marked by browse tag #9046.



Map Name: Woods Lake

Diagrammatic Sketch

Township 19S, Range 3E, Section 25

GPS: NAD 27, UTM 12S 4330511 N 453759 E

## DISCUSSION

### Julius Pasture - Trend Study No. 16C-10

\*\*\*This site was not read in 2002 due to access problems and will be reevaluated in 2007. The site narrative and data tables have been retained from the 1997 report.

The Julius Pasture trend study was established on the mountain above Mayfield. The site is in a meadow surrounded by mature aspen stands. The topography of the site slopes gently to the west at an elevation of 8,700 feet. Species composition is fairly consistent over the site. Elk are believed to use this area of the Twelve Mile drainage mainly in spring. The site is on Forest Service land and is within a cattle allotment. The study was initially established in the rested pasture of a rotation, however recent trespass was evident at that time. In 1997, the pellet group transect associated with the trend transect indicated that use was as follows: 1 deer day use/acre, 3 elk days use/acre, and 35 cow days use/acre.

The soil is deep and dark with a fine loam texture. Soil textural analysis shows it to be a clay soil with a pH of 6.2, giving it a slightly acidic soil reaction. Effective rooting depth is almost two feet with a moderately cool soil temperature of 46°F at 20 inches in depth. Activity by burrowing rodents is common. Nearby beaver ponds and a spring supply abundant water. Grasses provide only 22% of the herbaceous cover while the forbs provide the remainder of the cover. Tarweed makes up 44% of the total herbaceous cover and is a major problem on this site from past abusive grazing practices. Percent bare ground decreased from 32% to 27% between 1989 and 1997. Herbaceous cover is uniform with no large bare areas, so sheet erosion is not obvious. An active gully runs through the middle of the meadow as evidence of earlier problems. The heavy soil is subject to slumping as there are landslides adjacent to the site.

The aspens surrounding the meadow are mostly mature trees, although within the sampling belts, most were classified as young. Other browse observed near the site include mountain big sagebrush, snowberry, and serviceberry.

Herbaceous vegetation is the key component on this spring and summer range site. Grass abundance is moderate, contributing 22% of the herbaceous cover. The most common species is the sod-forming Kentucky bluegrass which makes up 50% of the grass cover. Kentucky bluegrass is an increaser species with moderate to heavy livestock use. Two productive forage species, slender wheatgrass and mountain brome, are also fairly common. Grass vigor is satisfactory, yet there was a noticeable decline in sum of nested frequency for the grasses. The majority of the loss was to one species, Kentucky bluegrass.

Forbs are an important forage resource for big game. On this site they provide 78% of the herbaceous understory cover, although 56% of the forb cover is provided by tarweed, a weedy undesirable. The most numerous forbs are weedy increasers and together they contribute 82% of the forb cover. None are especially preferred forage species. Mulesears wyethia, a species that begins growth early in the spring and provides important early spring forage for elk, was not found within the transect itself, although it is abundant in other parts of the meadow. It is generally considered an increaser with cattle grazing as it is relatively unpalatable, especially as it dries later in the grazing season.

### 1989 APPARENT TREND ASSESSMENT

The lack of comparable baseline data and study sites makes it difficult to assess trend on this high elevation meadow. Further study is warranted. Changes in species composition would provide definite indicators of trend direction. Livestock trespass should be controlled. The abundance of tarweed and lack of prime forb species are downward trend indicators. Unless the adjacent slumping activity expands, soils on this site appear to be stable.

## 1997 TREND ASSESSMENT

Trend for soil is considered stable. Percent bare soil has declined from 32% to 27%. Almost all of the vegetative cover comes from herbaceous species which provide good soil protection from high intensity summer storms. Because of the elevation, the browse component is not of particular importance as it is a spring-summer elk range. The herbaceous understory is critical for this area, unfortunately the composition is dominated by weedy increasers. Sum of nested frequency for grasses has shown a noticeable decrease since 1989. The forbs have also shown a decrease, more importantly, the majority are made up of weedy species. Tarweed is one that shows a significant increase since 1989. By itself, it contributes 56% of the forb cover.

### TREND ASSESSMENT

soil - stable (3)

browse - not present and not critical (n/a)

herbaceous understory - down (1)

### HERBACEOUS TRENDS --

Herd unit 16C, Study no: 10

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	
G	Agropyron trachycaulum	146	156	62	59	3.15
G	Bromus carinatus	<sub>b</sub> 93	<sub>a</sub> 28	36	12	.73
G	Carex spp.	15	13	5	5	.34
G	Dactylis glomerata	19	7	10	4	.24
G	Phleum pratense	<sub>a</sub> 5	<sub>b</sub> 24	3	13	.97
G	Poa pratensis	<sub>b</sub> 285	<sub>a</sub> 193	82	64	7.26
G	Stipa columbiana	-	4	-	2	.18
G	Stipa lettermani	41	50	15	19	1.61
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		604	475	213	178	14.49
Total for Grasses		604	475	213	178	14.49
F	Achillea millefolium	<sub>b</sub> 213	<sub>a</sub> 141	74	59	3.75
F	Agoseris glauca	14	26	8	13	.14
F	Allium spp.	3	7	2	2	.18
F	Arabis spp.	<sub>b</sub> 81	<sub>a</sub> 11	33	7	.06
F	Aster spp.	<sub>a</sub> 69	<sub>b</sub> 112	25	41	4.53
F	Cirsium spp.	<sub>a</sub> 29	<sub>b</sub> 72	13	36	2.49
F	Collomia linearis (a)	-	12	-	4	.19
F	Cynoglossum officinale	1	-	1	-	-
F	Epilobium brachycarpum (a)	-	21	-	7	.06
F	Fragaria virginiana	<sub>b</sub> 27	<sub>a</sub> -	12	-	-
F	Madia glomerata (a)	<sub>a</sub> 218	<sub>b</sub> 330	72	91	29.52
F	Microsteris gracilis (a)	-	7	-	5	.02
F	Polygonum douglasii (a)	-	155	-	56	4.08
F	Potentilla spp.	<sub>a</sub> -	<sub>b</sub> 22	-	8	.90
F	Rudbeckia occidentalis	26	18	12	7	1.16

Type	Species	Nestled Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	'97
F	Taraxacum officinale	<sub>b</sub> 159	<sub>a</sub> 94	63	44	2.44
F	Tragopogon dubius	1	7	1	4	.07
F	Trifolium spp.	<sub>b</sub> 208	<sub>a</sub> 66	67	21	2.71
F	Vicia americana	<sub>a</sub> 7	<sub>b</sub> 33	3	15	.54
F	Viola spp.	7	3	3	1	.00
Total for Annual Forbs		218	525	72	163	33.88
Total for Perennial Forbs		845	612	317	258	19.00
Total for Forbs		1063	1137	389	421	52.88

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

BROWSE TRENDS --

Herd unit 16C, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Populus tremuloides	10	-
Total for Browse		10	0

BASIC COVER --

Herd unit 16C, Study no: 10

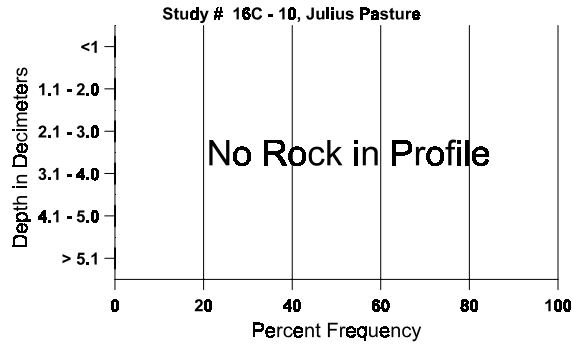
Cover Type	Nestled Frequency	Average Cover %	
		'89	'97
Vegetation	393	26.75	57.89
Rock	8	.25	.19
Pavement	17	0	.03
Litter	374	40.50	26.61
Cryptogams	21	.25	1.92
Bare Ground	308	32.25	26.81

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 10, Julius Pasture

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.7	46.0 (17.7)	6.2	29.3	25.2	45.6	3.1	10.1	137.6	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 16C, Study no: 10

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'97	97	97
Elk	3	44	3 (8)
Deer	3	17	1 (3)
Cattle	15	418	35 (86)

## BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 10

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Populus tremuloides																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	11	9	-	-	-	-	-	-	-	-	-	-	20	400		20
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
'89		00%			00%			00%									
'97		43%			00%			05%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%		
												'97	420		5%		

## SUMMARY

### WILDLIFE MANAGEMENT UNIT 16C - MANTI-NEBO, MANTI-SOUTH

Fourteen trend studies were established in this management unit in 1989. All of these were reread in 1997 and 2002 except for the study at Julius Pasture (16C-10) which was not read in 2002 due to access problems. Eight of the 14 studies sample pinyon-juniper sites that have been chained and seeded. Four studies sample mountain brush communities, one study samples a sagebrush-grass community, and one study samples a high elevation meadow.

Several of the studies in this management unit would be good candidates for habitat restoration projects. The majority of the range trend studies in this unit monitor previously treated and seeded pinyon-juniper sites that have limited preferred browse populations. Some of these sites are showing an increasing overstory of pinyon, juniper, and oak. Another site, Pole Canyon Oak (16C-9), has never been treated. The increasing pinyon, juniper, and oak canopy at this site is negatively impacting the key browse component. Competition between preferred browse populations and increasing canopy from trees is further exacerbated by the drought conditions which the state has experienced for the past several years.

A common trend throughout the unit in 2002 was declining nested frequency values for herbaceous species. Sum of nested frequency of perennial grasses decreased on 11 of the 13 sites, while perennial forbs had lower sum of nested frequency values on 12 of the 13 sites in 2002. These declines are expected with the drought conditions experienced during 2001 and 2002. The forb component on many of the sites, especially the treated pinyon-juniper sites, was already sparse and is even more so now. Cheatgrass declined in nested frequency on all of the studies where it was sampled in 2002 (11 sites). However, cheatgrass was not very common on any of the sites except for at the Cove Creek study (16C-39) prior to the 2002 reading. Herbaceous trends were downward on 8 of the 13 sites in 2002 due to decreases in perennial grass and forb abundance. These downward trends are driven by the drought conditions and should improve as precipitation returns to more normal patterns.

Key browse populations are of critical importance on the winter ranges in this unit. Browse trends were downward on 5 of the 13 sites in 2002 which is acceptable, especially with drought. However, unit-wide changes in key browse parameters that did not necessarily always translate into downward trends need to be mentioned here. These include the following: increased decadence on 55% of the sites, increased use on 73% of the sites, reduced vigor on 64% of the sites, and decreased recruitment from young plants on 73% of the sites. The combination of these changes and the fact that browse populations are already limited is cause for concern for browse populations in the future.

Precipitation data from two weather stations, Ephraim and Manti, was analyzed for trends. Specific parameters looked at included total annual precipitation and seasonal distribution throughout the year. Spring precipitation (March-May) is essential for cool season herbaceous species to be able to attain good production and for the formation of seed. Over the past two decades, annual precipitation at both stations was at or above normal for the majority of the years. Exceptions included the drought period during the late 1980's and into the early 1990's. Fall precipitation was below normal at both stations in 2001. In the spring of 2002, precipitation was only 50% of normal at Manti, and 61% of normal at Ephraim. With low precipitation in fall 2001 and very low spring precipitation in 2002, soils were very dry when the range trend studies were read in the summer of 2002. It is understandable why perennial species decreased in nested frequency, and why browse species had increased decadence and poor vigor and decreased recruitment.



Trend Summary

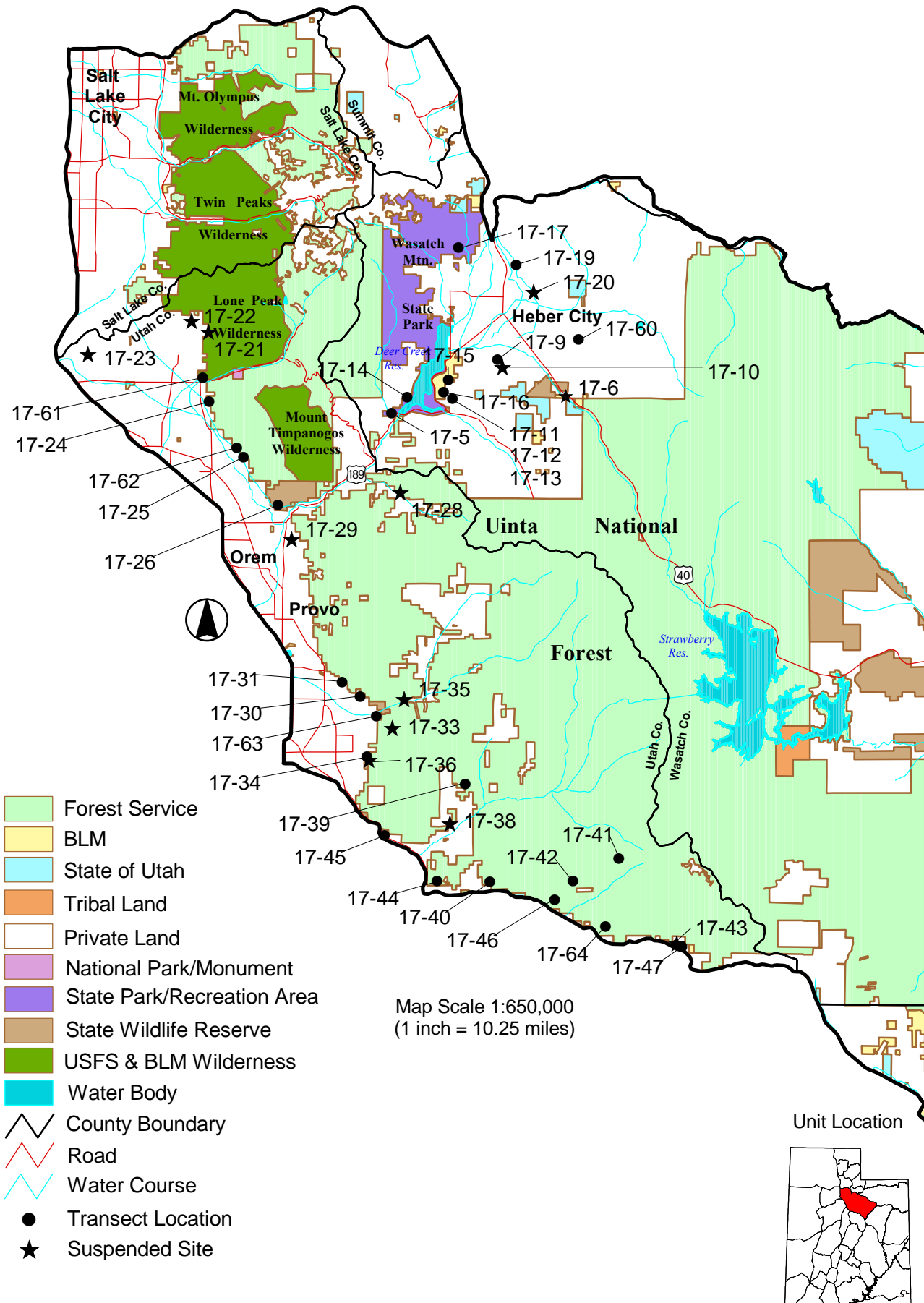
	Category	1989	1997	2002
16C-1 Manti Face Chaining	soil	est	3	3
	browse	est	3	3
	herbaceous understory	est	3	3
16C-2 Willow Creek	soil	est	4	2
	browse	est	5	2
	herbaceous understory	est	3	3
16C-3 North Manti Face	soil	est	3	3
	browse	est	2	1
	herbaceous understory	est	2	2
16C-4 Bald Mountain	soil	est	2	3
	browse	est	3	3
	herbaceous understory	est	1	3
16C-5 Cane Valley	soil	est	3	3
	browse	est	1	3
	herbaceous understory	est	3	2
16C-6 Black Hill	soil	est	5	3
	browse	est	3	3
	herbaceous understory	est	4	3
16C-7 Mayfield Mountain Face	soil	est	4	1
	browse	est	3	3
	herbaceous understory	est	3	1
16C-8 Pole Canyon Chaining	soil	est	4	2
	browse	est	3	3
	herbaceous understory	est	2	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	1989	1997	2002
16C-9 Pole Canyon Oak	soil	est	2	3
	browse	est	3	2
	herbaceous understory	est	1	2
16C-11 Above South Hollow	soil	est	3	2
	browse	est	2	2
	herbaceous understory	est	3	2
16C-12 Manti Dump	soil	est	4	3
	browse	est	1	1
	herbaceous understory	est	4	3
16C-38 Pleasant Creek	soil	est	3	3
	browse	est	3	3
	herbaceous understory	est	3	2
16C-39 Cove Creek	soil	est	5	4
	browse	est	5	4
	herbaceous understory	est	1	1
Suspended Sites				
16C-10 Julius Pasture	soil	est	3	NR
	browse	est	n/a	NR
	herbaceous understory	est	1	NR

(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 17



## MANAGEMENT UNIT 17 - WASATCH MOUNTAINS

### BOUNDARY DESCRIPTION

**Salt Lake, Summit, Wasatch, Duchesne, Carbon, Utah counties** - Boundary begins at the junction of I-15 and I-80 in Salt Lake City; east on I-80 to US-40; south on US-40 to SR-32; east on SR-32 to SR-35; southeast on SR-35 to SR-87; south on SR-87 to Duchesne and US-191; south on US-191 to US-6; northeast on US-6 to I-15; north on I-15 to I-80 in Salt Lake City and beginning point.

### MANAGEMENT UNIT DESCRIPTION

Management unit 17 is divided into eight smaller, more manageable subunits. These are: Diamond Fork, Hobble Creek, Timpanogas, Salt Lake County-East Bench, Heber, Currant Creek, Avintaquin, and Price Canyon. The 2002 report covers only the Diamond Fork, Hobble Creek, Timpanogas, and Heber subunits. The Salt Lake County-East Bench subunit no longer contains range trend studies due to lack of access and development. The Currant Creek and Avintaquin subunits are monitored as part of the Division's Northeastern Region rotation which were last read in 2000 and will be reread in 2005. The Price Canyon subunit is monitored as part of the Division's Southeastern Region rotation which was last read in 1999 and will be reread in 2004.

Of the total area within this management unit, 63% is summer range, 35% is winter range, and 2% is classified as yearlong range. The areas of most concern in this unit are the winter ranges, which are very limited in quantity and quality. Residential developments along the Wasatch Front have consumed much of the critical winter range that was available to wildlife, and this will continue in the future. Because most of the winter range in this unit now lies on private land, managing wildlife populations is a challenge. Critical issues facing management of big game in unit 17 include crop depredation, habitat quantity and quality, and highway mortality (Deer Herd Unit Management Plan 2001).

### Habitat Management Objectives/Strategies

The primary habitat management objectives for this unit are: 1) maintain and/or enhance forage production through direct range improvements throughout the unit on winter range; 2) work with private landowners and federal, state, local, and tribal governments to maintain and protect critical and existing winter range from future losses; and 3) provide improved habitat security and escapement opportunities for deer. The strategies to be used to accomplish these objectives are: 1) monitor range trend studies throughout the unit, specifically those found on remaining winter ranges; 2) work cooperatively to utilize grazing, prescribed burning, and other recognized vegetative manipulation techniques to enhance deer forage quantity and quality; 3) utilize antlerless deer harvest to improve or protect forage when vegetative declines are attributed to deer over-utilization; and 4) cooperate with and provide input to land management planning efforts dealing with management affecting habitat security, quality, and quantity (Deer Herd Unit Management Plan 2001).

### Range Trend Studies

The range trend studies in the Diamond Fork, Hobble Creek, and Timpanogas subunits were established in 1983, and resampled in 1989, 1997, and 2002. The trend studies in the Heber subunit were established in 1983 and 1984, and resampled in 1989, 1996, and 2002. Several studies were suspended in 2002 due to lack of access and loss to development. Some studies were not read because they no longer are representative of critical winter range. Several new studies were established in 2002 to monitor new areas considered critical for big game, including a few for Rocky Mountain bighorn sheep. The suspension of old studies and the establishment of new sites is done with input from Division biologists and federal land managers.

Trend Study 17-5-02

Study site name: Deer Creek Dam.

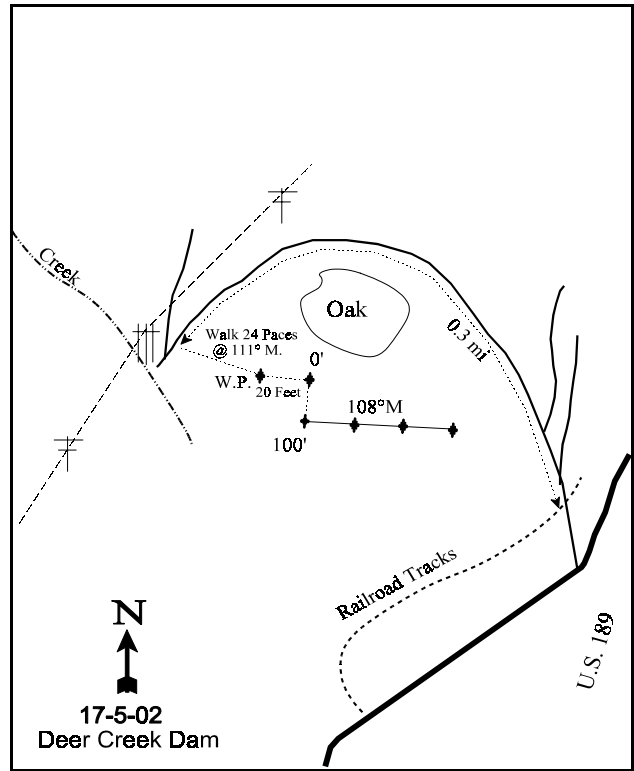
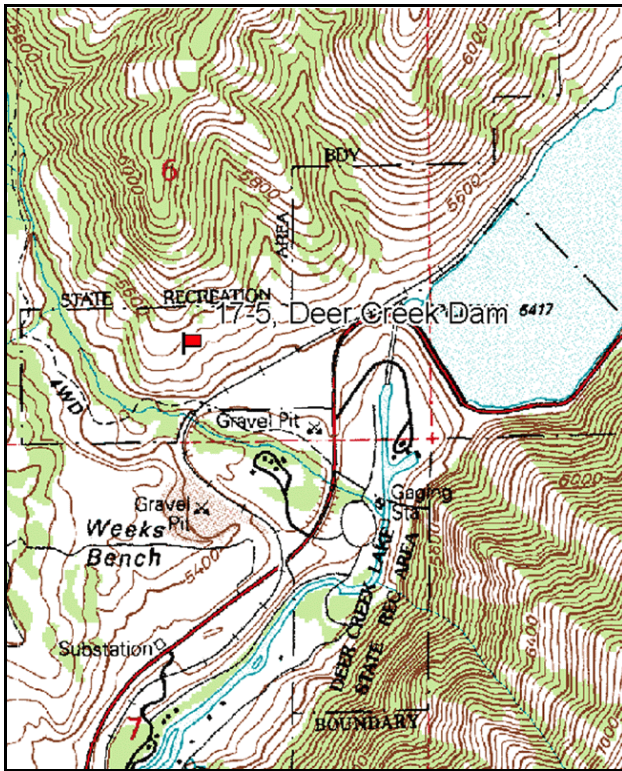
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic (line 2-4 @ 108°M).

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

LOCATION DESCRIPTION

From the dam at the south end of Deer Creek Reservoir, proceed south on U.S. 189 for 0.10 miles to an intersection to the west. Turn right toward Deer Creek and proceed northwesterly to the intersection of the Denver and Rio-Grande railroad tracks. Continue for 0.3 miles to a three pole power pole. Walk 29 paces from the pole at an azimuth of 111 degrees magnetic to a full high witness post. The 0-foot baseline stake is 20 feet from the witness post. A red browse tag, number 3914, is attached to the 0-foot baseline stake. Line 4 belt was mistakenly put at 71 feet.



Map Name: Aspen Grove

Diagrammatic Sketch

Township 5S, Range 4E, Section 6

GPS: NAD 27, UTM 12S 4472864 N 454533 E

## DISCUSSION

### Deer Creek Dam - Trend Study No. 17-5

This study is located within deer winter range on a moderately sloping (20%) bench at the mouth of Deer Creek. Elevation is approximately 5,540 feet on a south to southeast exposure. The study is on land administered by the Utah Division of Parks and Recreation about ½ mile west of Deer Creek dam. Power line construction previous to site establishment in 1989 disturbed the ground along the end of the frequency lines. This resulted in many of the mature sagebrush being eliminated and a proliferation of sagebrush seedlings and annual weeds being present in 1989. The range type is big sagebrush-grass which receives moderate deer use in winter and spring. Pellet group transect data collected on the site in 2002 estimated 32 deer days use/acre (79 ddu/ha) and 6 elk days use/acre (15 edu/ha).

Soil is alluvially deposited from sedimentary parent material. It has a clay loam texture. Soils are moderately deep with an effective rooting depth estimated at nearly 14 inches. However, the profile is very rocky especially in the upper 12 inches. A calcium carbonate layer is present 9 inches below the surface. Erosion potential is moderate on the site. In 2002, bare soil increased to 17% due to a decrease in herbaceous and litter cover. Even with the decline, vegetation and litter cover are still abundant and help minimize soil loss. An erosion condition class assessment done in 2002 gave soils a stable rating.

Mountain big sagebrush represents the key browse on this study. Density has been sporadic between years, but most of the change in numbers can be attributed to the greatly increased sample size used in 1996 and 2002 which is more accurate at determining shrub densities. Density was estimated at 4,120 plants/acre in 1996, increasing to 5,320 plants/acre in 2002. The increase appears to be due to many of the young plants in 1996 (1,560 plants/acre) attaining maturity. Recruitment by young plants decreased in 2002, but is still moderate at 800 plants/acre (15% of the population). Due to the construction of a power line prior to the 1989 sampling, sagebrush seedlings were estimated at 21,000 plants/acre. This number declined to 2,020 plants/acre in 1996 with no seedlings being sampled in 2002. Percent decadence has been low in most years and is currently ('02) at 15%. Vigor improved between 1996 and 2002 with only 5% of the population being rated as poor. Utilization was moderate to heavy in 1983, but has since been mostly light to moderate. It was noted in 2002 that many of the mature plants have a smaller growth form, probably due to intraspecific competition with other sagebrush plants. In 1996, it was reported that a portion of the population located further downslope appeared to have some crown death, possibly associated with insects or rodents. In 2002, the sagebrush was vigorous with annual leader growth averaging 3.3 inches.

Low rabbitbrush had an estimated density of 2,060 plants/acre in 1996, decreasing to 1,760 plants/acre in 2002. The population is mostly mature with no young plants sampled in 2002. Very few plants showed utilization in any reading. Broom snakeweed density was estimated at 1,140 plants/acre in 1996, increasing to 2,940 plants/acre in 2002. This increase is somewhat surprising during a drought year as snakeweed often decreases during dry conditions. Other species encountered in low densities included: chokecherry, bitterbrush, snowberry, serviceberry, and white-stemmed rubber rabbitbrush.

The herbaceous understory is weedy in composition with cheatgrass providing the bulk of the herbaceous cover in 1996. Cheatgrass was sampled in 96% of the quadrats in 1996, with a cover value of 19%, and a nested frequency value of 356 out of a possible 400. Due to the dry conditions in 2002, cheatgrass significantly decreased in nested frequency and was sampled in only 52% of the quadrats. Average cover declined to only about 2%. It only contributed 25% of the total grass cover compared to 86% in 1996. Even with drought, cheatgrass remains abundant enough to dominate the site when precipitation conditions are right. The perennial grass component is poor with Kentucky bluegrass and bluebunch wheatgrass being the most abundant species. Bluebunch wheatgrass has slowly increased with every reading, while Kentucky

bluegrass has steadily declined. Sum of nested frequency of perennial grasses decreased by 10% in 2002. This decline is likely a combination of drought in 2002, as well as the dense browse component that may be starting to have a negative impact on the herbaceous understory.

Many of the forbs encountered are increasers and weeds, including both annuals and biennials. Dalmation toad flax, thistle, houndstongue, yellow salsify, and bur buttercup are examples of these. The most abundant forb is longleaf phlox. Utah sweetvetch, a valuable forb, showed an increase in nested frequency between 1989 and 1996, but was not sampled in 2002. Perennial forbs showed a 20% decrease in sum of nested frequency in 2002.

#### 1983 APPARENT TREND ASSESSMENT

Soil appears stable on the study site proper, but appears to be declining on nearby steeper slopes. The predominant plant cover is annual vegetation, which on these slopes is inadequate to prevent soil loss. Sagebrush appears to have a stable population but there are concerns with its vigor. Perennial grasses and forbs are not abundant and the site is dominated by annual species.

#### 1989 TREND ASSESSMENT

Soil trend is stable. The slight changes in ground cover percentages cannot be interpreted as a downward trend, since they were a result of disturbance from the power line corridor. Bare soil remains low at 5%. Trend for browse is difficult to determine because of the loss of sagebrush plants due to the power line disturbance. Although density declined, the abundance of seedling plants is positive. Trend is considered slightly down. Trend for the herbaceous understory is stable overall. Sum of nested frequency more than doubled for perennial grasses, but decreased for perennial forbs.

##### TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

#### 1996 TREND ASSESSMENT

Soil trend is stable at this time with abundant vegetation and litter cover. Bare soil remains relatively low at 6%. In 1983, mountain big sagebrush was reported as having generally poor vigor. The mountain big sagebrush population now appears to be healthy with mostly light hedging and generally good vigor. Some surrounding sagebrush showed partial crown death, but this is very limited. Due to the increased vigor of mountain big sagebrush, and because other species appear to be stable, the browse trend is considered upward. Herbaceous understory has poor composition at this time and is dominated by cheatgrass. Many of the abundant forbs are annuals or biennials and are considered weeds and increasers. Perennial species are found scattered throughout the site in low abundance. Because annual species were not recorded in the past, it is difficult to give a trend assessment for the herbaceous understory. Trend for perennial species is stable for now and the health of this site is dependant on these species. Because of the fine fuels contributed by the abundant annuals in the understory, this site has the potential to carry a fire that would eliminate the browse.

##### TREND ASSESSMENT

soil - stable (3)

browse - upward (5)

herbaceous understory - stable (3), but composition is poor

2002 TREND ASSESSMENT

Trend for soil is down slightly. Bare soil increased from 6% to 17%, litter cover declined and total herbaceous cover declined from 33% to 16%. However, protective cover remains good and an erosion condition class assessment indicated soils to be stable with only minimal erosion. Trend for browse is slightly up. Mountain big sagebrush increased in density and shows improved vigor. Decadence slightly increased, but only to 15% of the population. Recruitment by young plants is moderate at 15%. Further increases in density may start to negatively impact the herbaceous understory. The herbaceous component has a slightly downward trend. Sum of nested frequency decreased for both perennial grasses and forbs. This decline is most likely due to a combination of drought and an increasing dominance of mountain big sagebrush which has a total canopy cover value estimated at nearly 25%. The herbaceous composition still includes many annual and biennial weeds.

TREND ASSESSMENT

soil - down slightly (2)

browse - slightly up (4)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 5

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	<i>Aegilops cylindrica</i> (a)	-	-	-	3	-	-	-	2	-	.03
G	<i>Agropyron cristatum</i>	-	-	-	3	-	-	-	1	-	.03
G	<i>Agropyron spicatum</i>	<sub>a</sub> 5	<sub>b</sub> 37	<sub>bc</sub> 70	<sub>c</sub> 93	3	16	25	39	2.07	2.19
G	<i>Bromus japonicus</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 171	-	-	-	69	-	1.43
G	<i>Bromus tectorum</i> (a)	-	-	<sub>b</sub> 356	<sub>a</sub> 125	-	-	96	52	19.20	1.63
G	<i>Elymus cinereus</i>	-	-	5	-	-	-	2	-	.18	.00
G	<i>Melica bulbosa</i>	-	-	3	7	-	-	1	3	.00	.21
G	<i>Oryzopsis hymenoides</i>	-	-	-	3	-	-	-	1	-	.15
G	<i>Poa fendleriana</i>	<sub>ab</sub> 3	<sub>b</sub> 10	<sub>a</sub> -	<sub>a</sub> -	1	5	-	-	-	-
G	<i>Poa pratensis</i>	<sub>b</sub> 96	<sub>c</sub> 164	<sub>b</sub> 92	<sub>a</sub> 43	35	62	34	22	1.24	.52
G	<i>Poa secunda</i>	1	3	-	1	1	1	-	1	-	.00
G	<i>Sitanion hystrix</i>	-	-	-	3	-	-	-	1	-	.03
Total for Annual Grasses		0	0	356	299	0	0	96	123	19.20	3.11
Total for Perennial Grasses		105	214	170	153	40	84	62	68	3.50	3.15
Total for Grasses		105	214	526	452	40	84	158	191	22.70	6.26
F	<i>Alyssum alyssoides</i> (a)	-	-	<sub>a</sub> 96	<sub>b</sub> 157	-	-	32	63	.36	.81
F	<i>Allium</i> spp.	<sub>bc</sub> 31	<sub>a</sub> 9	<sub>ab</sub> 16	<sub>c</sub> 46	12	4	7	18	.06	.44
F	<i>Artemisia ludoviciana</i>	3	-	6	6	1	-	2	3	.06	.21
F	<i>Astragalus beckwithii</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 24	-	-	-	12	-	.78
F	<i>Astragalus convallarius</i>	13	5	24	25	6	3	10	11	.24	.50



Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	<i>Astragalus utahensis</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Camelina microcarpa</i> (a)	-	-	-	3	-	-	-	1	-	.03
F	<i>Calochortus nuttallii</i>	<sub>b</sub> 14	<sub>ab</sub> 3	<sub>a</sub> -	<sub>ab</sub> 7	7	3	-	4	-	.02
F	<i>Cirsium undulatum</i>	<sub>a</sub> 21	<sub>a</sub> 12	<sub>b</sub> 47	<sub>a</sub> 20	9	9	25	9	.82	.35
F	<i>Collomia linearis</i> (a)	-	-	-	9	-	-	-	4	-	.02
F	<i>Comandra pallida</i>	-	-	2	3	-	-	1	2	.00	.01
F	<i>Collinsia parviflora</i> (a)	-	-	-	2	-	-	-	1	-	.00
F	<i>Cynoglossum officinale</i>	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 37	<sub>a</sub> -	-	1	16	-	2.34	-
F	<i>Eriogonum brevicaulis</i>	-	7	6	1	-	3	2	1	.18	.00
F	<i>Erodium cicutarium</i> (a)	-	-	-	11	-	-	-	3	-	.09
F	<i>Galium</i> spp.	-	-	<sub>b</sub> 147	<sub>a</sub> 60	-	-	50	26	1.05	1.14
F	<i>Gayophytum ramosissimum</i> (a)	-	-	<sub>b</sub> 20	<sub>a</sub> 3	-	-	8	1	.04	.00
F	<i>Hackelia patens</i>	-	3	-	-	-	1	-	-	-	-
F	<i>Helianthus annuus</i> (a)	-	1	-	5	-	1	-	2	-	.03
F	<i>Hedysarum boreale</i>	<sub>c</sub> 69	<sub>b</sub> 13	<sub>b</sub> 28	<sub>a</sub> -	35	8	15	-	.63	-
F	<i>Lactuca serriola</i>	<sub>a</sub> -	<sub>b</sub> 20	<sub>b</sub> 17	<sub>a</sub> 3	-	9	9	2	.04	.01
F	<i>Linaria dalmatica</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 52	<sub>b</sub> 41	-	-	23	18	.85	1.37
F	<i>Lithospermum ruderalis</i>	1	3	6	6	1	1	3	2	.44	.18
F	<i>Lupinus argenteus</i>	<sub>a</sub> 8	<sub>ab</sub> 1	<sub>ab</sub> 2	<sub>a</sub> -	3	1	2	-	.15	.16
F	<i>Machaeranthera canescens</i>	2	5	1	-	1	2	1	-	.00	.03
F	<i>Melilotus officinalis</i>	-	-	9	-	-	-	3	-	.04	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	4	-	-	-	2	-	.01
F	<i>Oenothera</i> spp.	<sub>a</sub> 4	<sub>b</sub> 10	<sub>a</sub> 3	<sub>a</sub> -	1	7	1	-	.00	-
F	<i>Phlox longifolia</i>	<sub>a</sub> 26	<sub>a</sub> 15	<sub>b</sub> 109	<sub>b</sub> 123	12	9	39	43	2.21	2.59
F	<i>Ranunculus testiculatus</i> (a)	-	-	12	30	-	-	7	11	.06	.13
F	<i>Solidago</i> spp.	3	-	-	-	1	-	-	-	-	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> -	<sub>b</sub> 10	<sub>c</sub> 61	<sub>d</sub> 92	-	7	24	49	.39	1.08
Total for Annual Forbs		0	1	128	224	0	1	47	88	0.45	1.13
Total for Perennial Forbs		195	118	573	458	89	68	233	201	9.56	8.91
Total for Forbs		195	119	701	682	89	69	280	289	10.02	10.05

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	<i>Acer grandidentatum</i>	0	1	-	-
B	<i>Amelanchier alnifolia</i>	2	3	-	.53
B	<i>Artemisia tridentata vaseyana</i>	78	82	20.79	23.60
B	<i>Chrysothamnus nauseosus albicaulis</i>	18	16	.90	.58
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	39	31	3.54	1.55
B	<i>Crataegus douglasii</i>	0	1	-	-
B	<i>Gutierrezia sarothrae</i>	26	40	.32	1.21
B	<i>Mahonia repens</i>	0	10	-	.36
B	<i>Prunus virginiana</i>	3	11	.36	.63
B	<i>Purshia tridentata</i>	2	1	.15	-
B	<i>Rosa woodsii</i>	0	2	-	-
B	<i>Symphoricarpos oreophilus</i>	19	17	3.25	3.36
Total for Browse		187	215	29.33	31.84

CANOPY COVER -- LINE INTERCEPT  
Herd unit 17 , Study no: 5

Species	Percent Cover	
	'96	'02
<i>Amelanchier utahensis</i>	-	.17
<i>Artemisia tridentata vaseyana</i>	-	24.83
<i>Chrysothamnus nauseosus hololeucus</i>	-	1.33
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	1.50
<i>Gutierrezia sarothrae</i>	-	2.58
<i>Mahonia repens</i>	-	.67
<i>Prunus virginiana</i>	-	.92
<i>Symphoricarpos oreophilus</i>	-	4.92

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 5

Species	Average leader growth (in)
	'02
<i>Artemisia tridentata vaseyana</i>	3.4

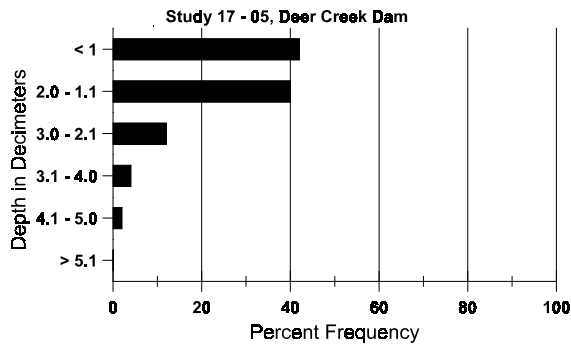
BASIC COVER --  
Herd unit 17 , Study no: 5

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	395	341	4.25	9.25	56.32	46.84
Rock	200	146	1.25	1.75	5.36	3.31
Pavement	219	238	5.50	15.25	5.72	6.73
Litter	397	379	82.75	68.50	57.25	45.51
Cryptogams	-	-	.25	0	0	0
Bare Ground	198	221	6.00	5.25	6.69	17.03

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 05, Deer Creek Dam

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.8	66.2 (14.0)	7.3	29.3	42.7	28.0	3.3	12.9	150.4	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 5

Type	Quadrat Frequency	
	'96	'02
Elk	1	3
Deer	15	11

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
78	6 (15)
418	32 (79)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 5

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.			Total
		1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Acer grandidentatum</b>																			
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	15	6	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
	'83	00%			00%			00%											
	'89	00%			00%			00%											
	'96	00%			00%			00%											
	'02	00%			00%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-				
												'89	0		-				
												'96	0		-				
												'02	40		-				
<b>Amelanchier alnifolia</b>																			
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'96	-	-	1	-	-	-	-	-	-	1	-	-	-	20	25	26	1	
	'02	-	-	1	-	-	-	1	-	-	2	-	-	-	40	52	46	2	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	'89	-	-	1	-	-	-	-	-	-	-	-	1	-	66			1	
	'96	-	-	1	-	-	-	-	-	-	-	-	1	-	20			1	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
	'83	00%			00%			00%											
	'89	00%			100%			100%			-39%								
	'96	00%			100%			50%			+33%								
	'02	00%			33%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%				
												'89	66		100%				
												'96	40		50%				
												'02	60		33%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata vaseyana																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	315	-	-	-	-	-	-	-	-	315	-	-	-	21000		315	
	'96	96	3	-	2	-	-	-	-	-	98	-	3	-	2020		101	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	'89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	'96	76	1	-	1	-	-	-	-	-	78	-	-	-	1560		78	
	'02	40	-	-	-	-	-	-	-	-	40	-	-	-	800		40	
M	'83	16	8	3	-	-	-	-	-	-	16	-	11	-	1800	23 33	27	
	'89	13	-	-	-	-	-	-	-	-	13	-	-	-	866	27 41	13	
	'96	76	30	4	1	-	-	-	-	-	96	2	13	-	2220	24 39	111	
	'02	146	35	4	-	-	-	-	-	-	176	9	-	-	3700	24 28	185	
D	'83	1	4	4	-	-	-	-	-	-	-	-	9	-	600		9	
	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	'96	11	6	-	-	-	-	-	-	-	2	-	4	11	340		17	
	'02	27	4	-	1	6	2	1	-	-	27	1	-	13	820		41	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	440		22	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	880		44	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		32%			18%			53%			-53%							
'89		00%			00%			00%			+71%							
'96		18%			02%			14%			+23%							
'02		17%			02%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2533	Dec:	24%			
												'89	1199		11%			
												'96	4120		8%			
												'02	5320		15%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Chrysothamnus nauseosus albicaulis																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	4	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	-	1	-	-	-	66	21	27	1
	96	12	1	6	1	-	-	-	-	17	-	2	1	400	23	26	20
	02	18	-	-	-	-	-	-	-	17	-	1	-	360	17	20	18
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	5	-	-	-	-	-	-	-	1	-	1	3	100		5	
	02	7	-	-	1	-	-	-	-	3	-	-	5	160		8	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%			+89%						
'96		03%			21%			24%			-10%						
'02		00%			00%			23%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	66		0%				
										'96	580		17%				
										'02	520		31%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
Chrysothamnus viscidiflorus viscidiflorus												
S	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	6	-	-	-	-	-	-	6	-	6	
	02	-	-	-	-	-	-	-	0	-	0	
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	14	-	-	-	-	-	-	14	-	14	
	02	-	-	-	-	-	-	-	0	-	0	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	74	10	-	4	1	-	-	89	12	21	
	02	83	-	-	3	-	-	-	86	12	17	
D	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	-	-	-	-	-	-	-	0	-	0	
	02	2	-	-	-	-	-	-	1	-	2	
X	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	20	-	1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'96		11%		00%		00%		-15%				
'02		00%		00%		01%						
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	0%
									'89	0		0%
									'96	2060		0%
									'02	1760		2%
Crataegus douglasii												
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	96	-	-	-	-	-	-	-	0	-	0	
	02	-	-	2	-	-	-	-	2	28	40	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'96		00%		00%		00%						
'02		00%		100%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	-
									'89	0		-
									'96	0		-
									'02	40		-

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																																		
		1	2	3	4		1	2																																			
<i>Gutierrezia sarothrae</i>																																											
S	83	-	-	-	-	-	-	-	0		0																																
	89	2	-	-	-	-	-	-	133		2																																
	96	30	-	-	-	-	-	-	600		30																																
	02	-	-	-	-	-	-	-	0		0																																
Y	83	-	-	-	-	-	-	-	0		0																																
	89	-	-	-	-	-	-	-	0		0																																
	96	17	-	-	-	-	-	-	340		17																																
	02	4	-	-	-	-	-	-	80		4																																
M	83	-	-	-	-	-	-	-	0	-	0																																
	89	1	-	-	-	-	-	-	66	19	20																																
	96	36	-	1	-	1	-	-	760	6	9																																
	02	127	-	-	5	-	-	-	2640	10	13																																
D	83	-	-	-	-	-	-	-	0		0																																
	89	-	-	-	-	-	-	-	0		0																																
	96	2	-	-	-	-	-	-	40		2																																
	02	10	-	-	-	-	1	-	220		11																																
X	83	-	-	-	-	-	-	-	0		0																																
	89	-	-	-	-	-	-	-	0		0																																
	96	-	-	-	-	-	-	-	0		0																																
	02	-	-	-	-	-	-	-	320		16																																
<table border="0"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+94%</td> </tr> <tr> <td>'96</td> <td>02%</td> <td>02%</td> <td>05%</td> <td>+61%</td> </tr> <tr> <td>'02</td> <td>00%</td> <td>00%</td> <td>03%</td> <td></td> </tr> </table>												% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%		'89	00%	00%	00%	+94%	'96	02%	02%	05%	+61%	'02	00%	00%	03%								
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																							
'83	00%	00%	00%																																								
'89	00%	00%	00%	+94%																																							
'96	02%	02%	05%	+61%																																							
'02	00%	00%	03%																																								
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Total Plants/Acre (excluding Dead & Seedlings)				'83	0	Dec:	0%																																				
				'89	66		0%																																				
				'96	1140		4%																																				
				'02	2940		7%																																				
<i>Mahonia repens</i>																																											
M	83	-	-	-	-	-	-	-	0	-	0																																
	89	-	-	-	-	-	-	-	0	-	0																																
	96	-	-	-	-	-	-	-	0	-	0																																
	02	259	-	-	-	-	-	-	5180	4	5																																
<table border="0"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'96</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> <tr> <td>'02</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>												% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%		'89	00%	00%	00%		'96	00%	00%	00%		'02	00%	00%	00%								
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																							
'83	00%	00%	00%																																								
'89	00%	00%	00%																																								
'96	00%	00%	00%																																								
'02	00%	00%	00%																																								
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Total Plants/Acre (excluding Dead & Seedlings)				'83	0	Dec:	-																																				
				'89	0		-																																				
				'96	0		-																																				
				'02	5180		-																																				



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Prunus virginiana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	96	21	-	-	-	-	-	-	-	-	-	-	-	420			21	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	4	-	-	-	-	-	-	-	-	-	-	-	266			4	
	96	14	-	-	-	-	-	-	-	-	-	-	-	280			14	
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	96	-	2	-	-	-	-	-	-	-	-	-	-	40	46	23	2	
	02	6	3	23	-	-	-	-	-	-	-	-	-	640	11	8	32	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	-	-	-	-	1	-	-	-	-	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			+17%							
'96		13%			00%			00%			+53%							
'02		12%			68%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	266		0%			
												'96	320		0%			
												'02	680		3%			
<i>Purshia tridentata</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	96	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	96	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	96	-	4	-	-	-	-	-	-	-	-	-	-	80	14	42	4	
	02	-	1	-	-	-	-	-	-	-	-	-	-	20	19	33	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		80%			00%			00%			-80%							
'02		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	100		-			
												'02	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4	5	6	7	8	9	1	2	3	4														
Quercus gambelii																												
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0										
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0										
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0										
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	37	27	0										
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>																	
'83		00%			00%			00%																				
'89		00%			00%			00%																				
'96		00%			00%			00%																				
'02		00%			00%			00%																				
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-													
												'89	0		-													
												'96	0		-													
												'02	0		-													
Rosa woodsii																												
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0										
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0										
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0										
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2										
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>																	
'83		00%			00%			00%																				
'89		00%			00%			00%																				
'96		00%			00%			00%																				
'02		00%			00%			00%																				
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-													
												'89	0		-													
												'96	0		-													
												'02	40		-													

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	96	19	2	3	-	-	-	-	-	-	24	-	-	-	480	25	33	
	02	16	2	1	-	-	-	-	-	-	19	-	-	-	380	25	31	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66		1	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	3	-	1	-	-	-	-	-	-	4	-	-	-	80		4	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		100%			00%			00%			+88%							
'96		07%			11%			00%			-11%							
'02		08%			08%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	66		100%			
												'96	540		0%			
												'02	480		17%			

Trend Study 17-9-02

Study site name: Lower Big Hollow.

Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 346 degrees magnetic.

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

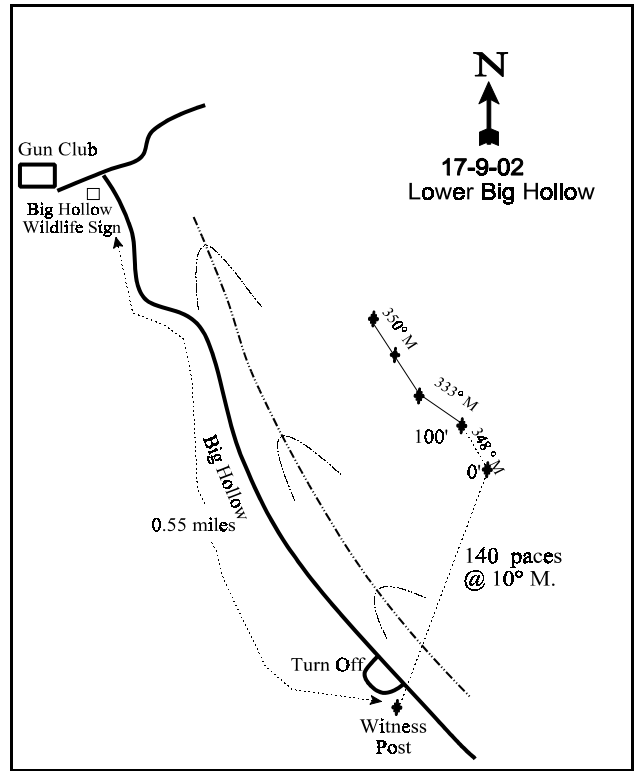
LOCATION DESCRIPTION

Beginning at the gun club parking lot at the mouth of Big Hollow, proceed east 0.10 miles to the road which runs up Big Hollow. Turn right and proceed up Big Hollow for 0.55 miles to a turnoff to the south and a green steel "T" fencepost. From the fencepost, the 0-foot baseline stake is located 140 paces away across Big Hollow, at an azimuth of 10 degrees magnetic. A red browse tag, number 67, is attached to the 0-foot stake of the frequency baseline.



Map Name: Charleston

Township 4S, Range 5E, Section 19,



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4477987 N 46435 E

## DISCUSSION

### Lower Big Hollow - Trend Study No. 17-9

This study is located on Division property approximately ½ mile above the mouth of Big Hollow. Aspect is to the southwest with a moderate (30%-35%) slope. Elevation is approximately 6,200 feet. The site samples a mountain brush community with a rather sparse native understory. The majority of Big Hollow, at least the portion south of the stream, was consumed by an extremely hot fire in 1976. It was seeded the following fall with perennial grasses and forbs. Wildlife use during the winter is probably restricted to more open, snow-free winters. In management terms, the area may be equally or even more important as fawn rearing habitat for deer and spring-fall range for elk. During 1983, at least two yearling bucks and several does with fawns were observed in the vicinity. In 1996, several deer were observed on the sight as well as a deer carcass. Pellet group transect data collected in 2002 estimated 38 deer days use/acre (94 ddu/ha) and 4 elk days use/acre (10 edu/ha).

Textural analysis indicates the soil is a sandy clay loam with neutral reactivity (pH of 7.1). Average soil temperature was 49°F at 16 inches in depth in 1996. The soil is moderately deep with many small rocks on the surface. Effective rooting depth was estimated at over 14 inches. Litter from dead cheatgrass and Gambel oak leaves is abundant. Soil erosion appears slight. Vegetative cover was estimated at 43% in 1996, declining slightly to 38% in 2002. Litter cover is quite high at 59% in 1996 and 55% in 2002. The soil surface has a prevalence of large rocks, which together with pavement made up 13% and 19% of the surface cover respectively in 1996 and 2002. Bare ground cover was estimated at 12% in 2002, the highest level in any reading. A erosion condition class assessment done in 2002 gave soils a stable to slightly erosion rating.

The sagebrush on this site appears to be a mix of basin big sagebrush (*Artemisia tridentata tridentata*) and mountain big sagebrush (*Artemisia tridentata vaseyana*), although all plants were classified as mountain big sagebrush. Density was estimated between 1,500 and 2,000 plants/acre in all years. The population has shown light to moderate use in all readings. Poor vigor and decadence have been at acceptable levels, with the exception of 1989, when 28% of the population displayed poor vigor and 76% of the population was classified as decadent. Young recruitment has been low in all years, except for the 1996 reading, when young plants made up 22% of the population. The dead to live ratio remained about the same in 1996 and 2002 at 1:2.5. Sagebrush leaders averaged just under 2 inches of growth in 2002.

Several bitterbrush plants are scattered across the site and exhibit moderate to heavy hedging. Mature plants are just over 2 feet in height and have a clubbed appearance. Serviceberry increased in 2002 due to the abundance of young plants (260 plants/acre). In 2002, moderate and heavy use increased and decadence was low (15%), but 45% of the serviceberry plants displayed poor vigor. The population of Gambel oak is increasing on the site. Density was estimated at 1,200 stems/acre in 1996, increasing to 2,840 stems/acre in 2002. Use on oak is mostly light, vigor is good, and decadence is low. Young stems were moderate in abundance for 1996 and 2002, respectively at 17% and 15% of the population. The oak clones provide some escape and cover for wildlife during the summer and fall. Increaser shrubs are represented by small numbers of broom snakeweed and prickly pear cactus.

The herbaceous understory has fairly high diversity, but desirable species are limited. Nine perennial grass species have been sampled in at least one year, but cheatgrass is the dominant grass. Nested frequency and cover of cheatgrass declined in 2002 due to the dry conditions, but quadrat frequency remained nearly the same at over 80%. Bluebunch wheatgrass and Sandberg bluegrass are the most abundant perennials with a nested frequency values around 50 in 2002. The forb composition has contained a lot of weeds and increasers including aster, thistle, and curlycup gumweed. In 2002, most forbs were inconsequential with perennial species declining in sum of nested frequency by 72%. Annual forbs slightly increased in nested frequency in 2002.

### 1983 APPARENT TREND ASSESSMENT

Soil appears stable. Some erosion pavement is evident but overall, vegetative and litter cover provide good protection. A cautionary note might refer to the abundance of annual grasses in the understory. Cheatgrass constitutes a fire hazard and is relatively ineffective in holding soil when cured and subjected to high intensity thunderstorms. Vegetative trend of the important shrub species appears stable. The herbaceous understory is below optimum in forage quality and production to provide good fawning habitat.

### 1989 TREND ASSESSMENT

Trend for mountain big sagebrush now appears slightly downward based on the high percentage of decadence (76%) and poor vigor (28%) in the population. The lack of sagebrush seedlings and the increase of competing oakbrush also are negative factors. The herbaceous understory remains in poor condition with a less than desirable composition and poor production. Sum of nested frequency of perennial species increased for both grasses and forbs so trend is slightly up. Trend for soil is also slightly up as bare soil decreased and perennial grasses and forbs increased.

#### TREND ASSESSMENT

soil - slightly up (4)

browse - slightly down (2)

herbaceous understory - slightly up (4)

### 1996 TREND ASSESSMENT

The soil trend is stable at this time. There is adequate vegetation and litter cover to reduce soil movement. Bare soil is low at 3%. The mountain big sagebrush population has shifted from a mostly decadent population to a vigorous mature population. Utilization of mature plants has declined since 1989 with vigor improving significantly. Recruitment by young sagebrush increased to 22% of the population. Other browse, such as true mountain mahogany and antelope bitterbrush, show heavy utilization and a slight clubbed appearance. Overall, the browse trend is slightly upward. Although the herbaceous understory does have a few valued species, it is dominated by cheatgrass. As reported in 1983, this amount of cheatgrass constitutes a fire hazard which could eliminate the valuable browse forage species now present. The herbaceous component is especially important if the area is to be considered spring range or fawning habitat. Herbaceous trend is slightly up with increases in sum of nested frequency values for perennial grasses and forbs.

#### TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - slightly up (4)

### 2002 TREND ASSESSMENT

Trend for soil is slightly down. With drought conditions in 2002, bare soil increased from 3% to 12%, with vegetation and litter cover both slightly declining. Total herbaceous cover declined from 23% to 18%. However, the ratio of protective cover to bare soil remains good at nearly 4:1. Erosion is minimal at the present time. Trend for browse is stable. Density of mountain big sagebrush slightly increased, but decadence and poor vigor did as well. Young plants declined to only 3% of the population and no seedlings were sampled. Use remains light to moderate. Serviceberry density increased from 120 plants/acre to 400 plants/acre due to an abundance of young in 2002 (260 plants/acre). However, utilization increased with 45% of the population displaying poor vigor. Trend for the herbaceous understory is slightly down. Sum of nested frequency values of perennial grasses and forbs decreased with the dry conditions in 2002. The composition remains poor with the abundance of annuals and weeds.

#### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 9

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron intermedium	-	-	16	12	-	-	4	3	.81	.76
G	Agropyron spicatum	<sub>a</sub> 8	<sub>b</sub> 15	<sub>b</sub> 64	<sub>b</sub> 51	3	8	19	17	3.34	3.95
G	Bromus inermis	-	2	3	6	-	1	1	2	.15	.33
G	Bromus japonicus (a)	-	-	<sub>a</sub> 2	<sub>b</sub> 8	-	-	1	3	.00	.16
G	Bromus tectorum (a)	-	-	<sub>b</sub> 298	<sub>a</sub> 240	-	-	84	81	13.48	7.15
G	Dactylis glomerata	-	3	1	-	-	2	1	-	.00	-
G	Poa bulbosa	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> 1	<sub>b</sub> 7	-	-	1	3	.03	.53
G	Poa fendleriana	1	8	9	5	1	3	3	2	.56	.18
G	Poa pratensis	<sub>ab</sub> 6	<sub>b</sub> 19	<sub>b</sub> 24	<sub>a</sub> -	4	7	8	-	.28	-
G	Poa secunda	<sub>a</sub> 10	<sub>b</sub> 48	<sub>ab</sub> 32	<sub>b</sub> 50	5	17	12	21	.62	1.14
G	Sitanion hystrix	-	-	1	3	-	-	1	1	.03	.15
Total for Annual Grasses		0	0	300	248	0	0	85	84	13.49	7.31
Total for Perennial Grasses		25	95	151	134	13	38	50	49	5.84	7.06
Total for Grasses		25	95	451	382	13	38	135	133	19.33	14.38
F	Agoseris glauca	-	1	-	-	-	1	-	-	-	-
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 163	<sub>a</sub> 102	-	-	54	37	1.13	.82
F	Arabis spp.	<sub>b</sub> 28	<sub>b</sub> 17	<sub>b</sub> 18	<sub>a</sub> -	14	8	7	-	.03	-
F	Aster spp.	-	7	7	6	-	3	2	2	.03	.03
F	Astragalus spp.	-	2	-	-	-	1	-	-	-	-
F	Balsamorhiza sagittata	-	7	5	9	-	2	3	5	.68	1.14
F	Castilleja chromosa	3	2	-	-	1	1	-	-	-	-
F	Camelina microcarpa (a)	-	-	-	4	-	-	-	4	-	.08
F	Calochortus nuttallii	-	3	-	2	-	2	-	1	-	.00
F	Chaenactis douglasii	-	-	4	-	-	-	3	-	.06	-
F	Cirsium spp.	-	-	6	-	-	-	4	-	.23	-
F	Collomia linearis (a)	<sub>a</sub> 5	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 29	3	-	1	13	.03	.06
F	Comandra pallida	-	-	6	3	-	-	2	1	.01	.00
F	Collinsia parviflora (a)	-	-	-	3	-	-	-	1	-	.00
F	Crepis acuminata	-	-	-	11	-	-	-	5	-	.30
F	Descurainia spp. (a)	-	-	3	-	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	-	2	-	-	-	1	-	.00	-
F	Erigeron spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 25	<sub>a</sub> -	-	-	10	-	.42	-
F	Galium spp.	-	-	-	3	-	-	-	2	-	.15
F	Grindelia squarrosa	-	-	3	-	-	-	1	-	.00	-
F	Hackelia patens	<sub>a</sub> 9	<sub>ab</sub> 26	<sub>b</sub> 37	<sub>a</sub> 9	5	13	19	6	.38	.09
F	Holosteum umbellatum (a)	-	-	<sub>a</sub> -	<sub>b</sub> 11	-	-	-	7	-	.06
F	Ipomopsis aggregata	-	6	3	-	-	3	1	-	.00	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	Lappula occidentalis (a)	-	-	-	4	-	-	-	2	-	.03
F	Lactuca serriola	-	7	1	-	-	3	1	-	.01	-
F	Machaeranthera canescens	<sub>a</sub> -	<sub>b</sub> 16	<sub>b</sub> 20	<sub>a</sub> -	-	9	10	-	.22	-
F	Microsteris gracilis (a)	-	-	<sub>a</sub> -	<sub>b</sub> 26	-	-	-	11	-	.27
F	Orthocarpus tolmiei (a)	-	-	3	12	-	-	1	5	.03	.02
F	Polygonum douglasii (a)	-	-	2	-	-	-	1	-	.00	-
F	Senecio multilobatus	<sub>b</sub> 25	<sub>b</sub> 25	<sub>a</sub> 3	<sub>a</sub> 2	14	14	3	1	.07	.00
F	Solidago sparsiflora	3	-	-	-	1	-	-	-	-	-
F	Tragopogon dubius	<sub>b</sub> 7	<sub>b</sub> 10	<sub>b</sub> 19	<sub>a</sub> -	5	4	9	-	.17	-
F	Viguiera multiflora	-	-	3	-	-	-	2	-	.01	-
Total for Annual Forbs		5	0	175	191	3	0	59	80	1.21	1.36
Total for Perennial Forbs		75	129	160	45	40	64	77	23	2.37	1.74
Total for Forbs		80	129	335	236	43	64	136	103	3.59	3.10

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Amelanchier alnifolia	4	5	1.93	2.29
B	Artemisia tridentata vaseyana	49	59	11.55	12.98
B	Gutierrezia sarothrae	5	0	.06	-
B	Mahonia repens	1	0	-	-
B	Opuntia spp.	7	6	.18	.03
B	Purshia tridentata	6	6	1.82	.68
B	Quercus gambelii	24	30	6.91	6.28
B	Symphoricarpos oreophilus	4	7	.06	.56
Total for Browse		100	113	22.52	22.85

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 9

Species	Percent Cover	
	'96	'02
Amelanchier utahensis	-	.83
Artemisia tridentata vaseyana	-	16.50
Opuntia spp.	-	.17
Purshia tridentata	-	1.75
Quercus gambelii	.8	8.58
Symphoricarpos oreophilus	-	.17



Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 9

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	1.9

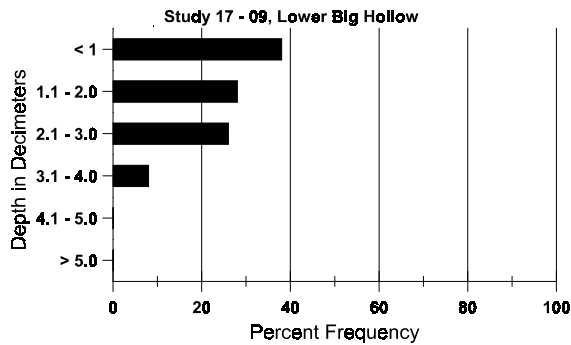
BASIC COVER --  
Herd unit 17 , Study no: 9

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	368	316	.50	5.50	43.07	38.29
Rock	207	215	7.75	13.75	10.48	13.89
Pavement	144	189	1.75	9.50	2.45	5.50
Litter	397	382	79.00	65.00	58.93	54.93
Cryptogams	21	6	1.50	.75	.15	.56
Bare Ground	131	181	9.50	5.50	3.63	12.10

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 09, Lower Big Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.5	49.5 (16.0)	7.1	49.8	19.4	30.7	3.0	13.2	128.0	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 9

Type	Quadrat Frequency		Pellet Transect	
	'96	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Rabbit	3	-	-	-
Elk	3	2	52	4 (10)
Deer	8	8	496	38 (94)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 9

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Amelanchier alnifolia																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	-	4	-	-	-	266		4	
	96	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	6	-	-	7	-	-	-	6	-	7	-	260		13	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	1	-	-	-	-	-	-	4	-	-	-	80	47	73	4
	02	-	-	2	-	-	-	2	-	4	-	-	-	80	29	24	4
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	2	-	1	-	-	2	60		3	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%											
'89		00%		00%		00%		-55%									
'96		17%		00%		00%		+70%									
'02		65%		15%		45%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	266		0%				
										'96	120		0%				
										'02	400		15%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Artemisia tridentata vaseyana</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	96	7	-	-	-	-	-	-	140		7
	02	-	-	-	-	-	-	-	0		0
Y	83	2	-	-	-	-	-	-	133		2
	89	3	-	-	-	-	-	-	200		3
	96	17	-	-	-	-	-	-	340		17
	02	3	-	-	-	-	-	-	60		3
M	83	13	4	-	-	-	-	-	1133	31 46	17
	89	1	3	-	-	-	-	-	266	28 30	4
	96	40	5	-	1	-	-	-	920	26 50	46
	02	59	10	1	-	-	-	-	1400	28 43	70
D	83	3	2	-	-	-	-	-	333		5
	89	6	16	-	-	-	-	-	1466		22
	96	3	11	-	-	-	-	-	280		14
	02	19	2	-	2	-	-	-	460		23
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	580		29
	02	-	-	-	-	-	-	-	780		39
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		25%		00%		04%		+17%			
'89		66%		00%		28%		-20%			
'96		22%		00%		01%		+20%			
'02		15%		01%		10%					
Total Plants/Acre (excluding Dead & Seedlings)											
								'83	1599	Dec:	21%
								'89	1932		76%
								'96	1540		18%
								'02	1920		24%
<i>Cercocarpus montanus</i>											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	1	-	-	-	-	-	66	45 39	1
	96	-	-	-	-	-	-	-	0	- -	0
	02	-	-	-	-	-	-	-	0	69 82	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		100%		00%		00%					
'96		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)											
								'83	0	Dec:	-
								'89	66		-
								'96	0		-
								'02	0		-

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	13	6	3
	89	25	-	-	-	-	-	-	-	-	25	-	-	-	1666	11	12	25
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	12	16	15
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	10	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+88%							
'89		00%			00%			00%			-78%							
'96		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	200	Dec:	-				
											'89	1666		-				
											'96	360		-				
											'02	0		-				
<i>Mahonia repens</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'96	20		-				
											'02	0		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Opuntia spp.																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	9	-	-	-	-	-	-	-	9	-	-	-	600		9	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	14	-	-	-	-	-	-	-	14	-	-	-	933	6	8	14
	89	9	-	-	-	-	-	-	-	9	-	-	-	600	6	14	9
	96	8	-	-	2	-	-	-	-	10	-	-	-	200	5	14	10
	02	4	-	-	-	-	-	-	-	4	-	-	-	80	4	11	4
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	4	-	-	-	-	-	-	-	1	-	-	3	80		4	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		+22%									
'89		00%		00%		00%		-83%									
'96		00%		00%		00%		-20%									
'02		00%		00%		38%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	933	Dec:	0%				
										'89	1200		0%				
										'96	200		0%				
										'02	160		50%				
Purshia tridentata																	
M	83	1	-	-	-	-	-	-	-	1	-	-	-	66	16	24	1
	89	-	2	-	-	-	-	-	-	2	-	-	-	133	12	18	2
	96	-	3	2	-	1	-	-	-	6	-	-	-	120	27	75	6
	02	-	-	2	-	-	-	-	1	3	-	-	-	60	26	66	3
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	2	-	-	1	-	-	2	-	-	1	60		3	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		+50%									
'89		100%		00%		00%		+ 5%									
'96		71%		29%		00%		-14%									
'02		00%		83%		17%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	0%				
										'89	133		0%				
										'96	140		14%				
										'02	120		50%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total					
		1	2	3	4								
Quercus gambelii													
Y	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	96	10	-	-	-	-	-	-	-	10		10	
	02	5	-	-	13	-	-	4	-	22		22	
M	83	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	0	-	0	
	96	49	-	-	-	-	-	-	-	49	36	35	49
	02	87	11	-	8	-	-	7	4	117	32	19	117
D	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	96	-	1	-	-	-	-	-	-	1		1	
	02	3	-	-	-	-	-	-	-	1		3	
X	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	620		31	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%							
'89		00%		00%		00%							
'96		02%		00%		02%		+58%					
'02		08%		00%		01%							
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	0%	
									'89	0		0%	
									'96	1200		2%	
									'02	2840		2%	
Symphoricarpos oreophilus													
Y	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	1	-	-	-	-	1		1	
	02	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	0	-	0	
	96	3	-	-	1	-	-	-	-	4	19	29	4
	02	3	-	-	4	-	1	-	-	8	25	29	8
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%							
'89		00%		00%		00%							
'96		00%		00%		00%		+38%					
'02		00%		13%		00%							
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	-	
									'89	0		-	
									'96	100		-	
									'02	160		-	

Trend Study 17-11-02

Study site name: Wallsburg Turn.

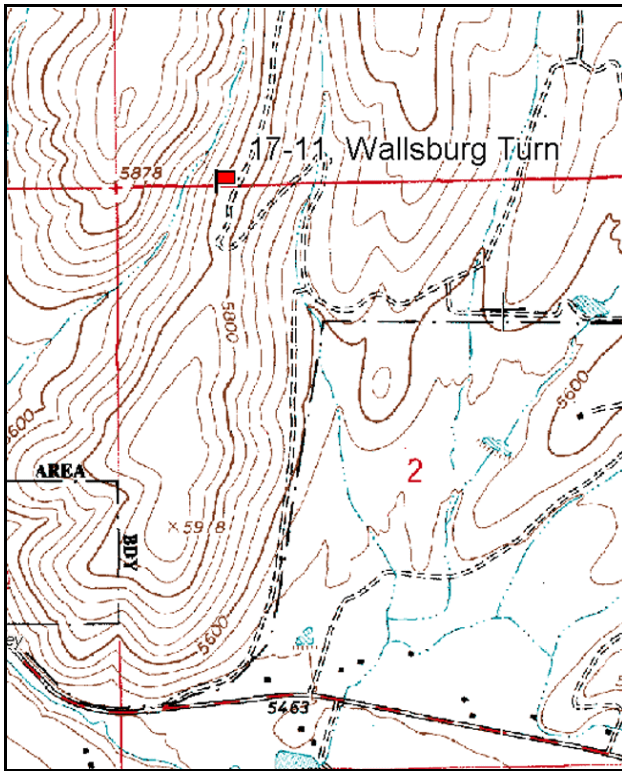
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 338 degrees magnetic.

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

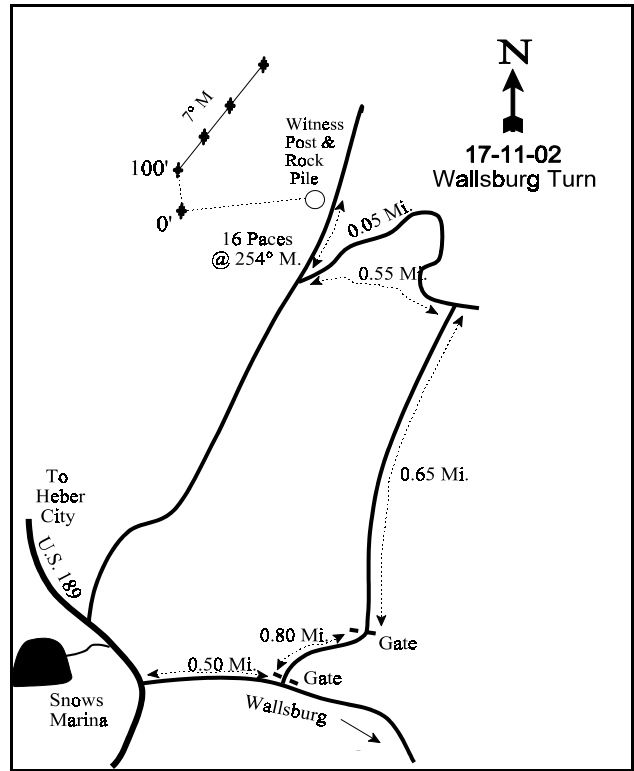
LOCATION DESCRIPTION

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for 0.8 miles passing through two DWR gates. Continue on this road for 0.65 miles to an intersection. Take a left at the intersection and go 0.55 miles to another intersection. Go right for 0.05 miles to a small rock pile on the left (east) side of the road. From the rock monument, walk 16 paces at an azimuth of 264 degrees magnetic to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Charleston

Township 5S, Range 4E, Section 2



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4474214 N 460333 E

## DISCUSSION

### Wallsburg Turn - Trend Study No. 17-11

This study is on critical deer winter range located approximately 3/4 mile northeast from the junction of highways US-189 and U-222. The study site is on land owned by the Utah Division of Wildlife Resources near a broad ridge top. The site has a moderate (25%), west facing slope at an elevation of approximately 5,700 feet. The vegetational type is seeded grass on what formerly was a uniform stand of mountain big sagebrush and scattered antelope bitterbrush. In August of 1976, an exceptionally hot and all consuming wildfire destroyed virtually all the vegetation. A seeding effort conducted immediately after the fire appears to have been successful, resulting in fair grass cover and a resurgent sagebrush population. Aside from terrain features, the area is devoid of thermal or escape cover. Use of the site by elk is light, while deer use is moderate. Pellet group transect data collected in 2002 estimated 17 elk days use/acre (43 edu/ha) and 54 deer days use/acre (134 ddu/ha).

Soils have a silty clay loam texture and a slightly alkaline reactivity (pH of 7.6). Average soil temperature was 52°F measured at 11 inches in depth in 1996. Considerable erosion occurred after the fire because of insufficient ground cover. In 1983, it was reported that as vegetation increased, a net decrease in erosion should follow. This appears to be the case as herbaceous vegetation and litter cover have been high in 1996 and 2002. Bare soil is low at only 9% in 2002. An erosion condition class assessment done in 2002 gave soils a stable to slightly erosion rating. Pedestalling at the base of sagebrush and bunchgrass stems is severe and provides the most evidence of past erosion. The nested frequency ratio of protective cover to bare soil is good at over 4:1 in 2002.

Photo and data comparisons show a definite increase in the prominence of mountain big sagebrush on the burned area since site establishment. Mountain big sagebrush cover was estimated at 10% in 1996, increasing to almost 13% in 2002. Age structure has shifted to a more mature population in 1996 and 2002. Percent decadency is moderate at 26% in 2002. Density appears to have stabilized with an estimated population of 2,320 plants/acre in 1996 and 2,160 plants/acre in 2002. The slight decline is due to an increase in the number of dead plants in 2002. Recruitment from the young age class was high in 1983 and 1989, but declined to 8% in 1996 and 2% in 2002. Biotic potential (# of seedlings) has been low in all readings. Use was light in 1983, moderate in 1989, and moderate to heavy in 1996 and 2002. Vigor was mostly normal during the first three readings, with 14% of the population displaying poor vigor in 2002. Sagebrush leader growth averaged 1.4 inches in 2002.

Broom snakeweed density was estimated at 2,600 plants/acre in 1996, declining to 400 plants/acre in 2002. Snakeweed often decreases during dry periods so the decline in 2002 is typical of a drought year. Low rabbitbrush is increasing on the site. Density increased by almost seven-fold between 1996 and 2002 to 1,360 plants/acre. Although antelope bitterbrush was sampled in past years, it was not encountered in the density strips in 1996 or 2002. Bitterbrush plants are scattered across the landscape in low numbers and have been severely hedged.

The herbaceous understory dominates the vegetative component on this site. Sum of nested frequency for perennial grasses decreased in 1996, but slightly increased in 2002. Three species, crested wheatgrass, intermediate wheatgrass, and Sandberg bluegrass, are the most abundant species. Crested wheatgrass and intermediate wheatgrass provided 82% of the grass cover in 1996, increasing to 86% in 2002. The annuals, cheatgrass and Japanese brome, are present on the site but in low frequencies. The abundance of perennials will help keep cheatgrass in check. The site had not been grazed by livestock in 2002.



Forbs provided one-third of the total cover on the site in 1996 and 2002. However, only two species were particularly abundant in 2002, alfalfa and little flower collinsia. Alfalfa has steadily increased in nested frequency since 1983. Like crested wheatgrass, these plants were grazed in 1996. Weedy milkvetch was encountered in 1996 and 2002, but not in the two previous years. This plant is resistant to fire and is known to cause death in livestock. Many of the more abundant forbs encountered are annual species that do not provide much soil protection or forage. Sum of nested frequency for perennial and annual forbs declined in 2002 with drought.

#### 1983 APPARENT TREND ASSESSMENT

Current soil condition is poor to fair but is probably improving. As the seeded vegetative community matures, erosion should become less of a problem. The coming years should see steady increases in productivity of browse and possibly even grasses. However, grass productivity will most likely level off or decrease first. Forb trend is more difficult to predict. Our best estimate is a stable situation that could easily go up or down. As a management objective, it would be desirable to have more diversity among palatable species of both shrubs and forbs.

#### 1989 TREND ASSESSMENT

While vegetation cover increased, the amount of litter decreased due to livestock grazing. Rock and pavement cover increased from 30% to 48%. The amount of bare soil exposed remained fairly constant. The soil trend is stable. The vegetative trend also continues to improve after the fire and seeding. Browse trend is slightly up as mountain big sagebrush increased in density and the number of young plants make up 30% of the population. Trend for the herbaceous understory is up as perennial grasses and forbs showed increased sum of nested frequency values.

##### TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - up (5)

#### 1996 TREND ASSESSMENT

Soil trend is slightly upward. Erosion is not as substantial as was reported in the past. Slightly more bare ground cover was reported in 1996, but herbaceous vegetation and litter are more abundant and are well distributed over the site. The browse trend is stable. The increased density of mountain big sagebrush may be due to the greatly increased sample size used in 1996. However, vigor is good and the individual plants have increased in height and crown measurements. The broom snakeweed density has increased to 2,600 plants/acre, but this could be due to the increased sample size as well. While perennial grass nested frequency has decreased, perennial forb nested frequency has increased. Alfalfa is still one of the dominant forbs present with a stable nested frequency since 1989. Crested wheatgrass nested frequency has increased slightly, but intermediate wheatgrass and Sandberg bluegrass nested frequencies have both declined. Annual grasses are scattered throughout and do not appear to be increasing at this time. Herbaceous understory trend is stable.

##### TREND ASSESSMENT

soil - slightly upward (4)

browse - stable (3)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Trend for soil is up slightly. Vegetation and litter cover slightly increased, and bare soil slightly decreased. The nested frequency ratio of protective cover to bare soil improved to over 4:1. Erosion remains slight on the site as evidenced by pedestalling around sagebrush and bunchgrass stems. Trend for browse is stable. Mountain big sagebrush density slightly decreased with a decline in the number of young in the population. Poor vigor and decadency both increased in 2002, but with drought, these increases are expected and are not unreasonable. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses increased while that of perennial forbs decreased. The most abundant perennial species, crested wheatgrass, intermediate wheatgrass, Sandberg bluegrass, and alfalfa all increased in frequency except for crested wheatgrass which slightly decreased.

TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 11

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron cristatum	<sub>a</sub> 169	<sub>ab</sub> 195	<sub>b</sub> 220	<sub>ab</sub> 196	73	73	75	73	8.60	11.37
G	Agropyron intermedium	<sub>a</sub> 84	<sub>d</sub> 260	<sub>b</sub> 138	<sub>c</sub> 191	36	91	48	71	4.97	7.65
G	Agropyron spicatum	<sub>b</sub> 53	<sub>c</sub> -	<sub>a</sub> 7	<sub>a</sub> 3	22	-	2	1	.53	.38
G	Bromus japonicus (a)	-	-	-	3	-	-	-	2	-	.01
G	Bromus tectorum (a)	-	-	28	36	-	-	9	13	.57	.62
G	Festuca ovina	3	-	-	-	2	-	-	-	-	-
G	Poa secunda	<sub>a</sub> 54	<sub>c</sub> 178	<sub>b</sub> 126	<sub>b</sub> 127	23	73	54	53	1.93	2.11
G	Vulpia octoflora (a)	-	-	-	2	-	-	-	1	-	.00
Total for Annual Grasses		0	0	28	41	0	0	9	16	0.56	0.63
Total for Perennial Grasses		363	633	491	517	156	237	179	198	16.04	21.52
Total for Grasses		363	633	519	558	156	237	188	214	16.61	22.16
F	Agoseris glauca	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 12	<sub>ab</sub> 8	-	-	6	3	.08	.04
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 124	<sub>a</sub> 11	-	-	46	6	.33	.03
F	Allium spp.	<sub>a</sub> 1	<sub>a</sub> 2	<sub>a</sub> 1	<sub>b</sub> 23	1	2	1	13	.00	.17
F	Artemisia ludoviciana	-	1	-	-	-	1	-	-	-	-
F	Astragalus miser	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 40	<sub>b</sub> 20	-	-	19	12	1.05	.16
F	Castilleja linariaefolia	-	-	8	8	-	-	3	5	.01	.22
F	Calochortus nuttallii	1	-	-	2	1	-	-	2	-	.01
F	Castilleja spp.	-	-	8	-	-	-	4	-	.04	-
F	Cirsium spp.	-	-	3	-	-	-	1	-	.00	-
F	Collomia linearis (a)	-	-	<sub>b</sub> 82	<sub>a</sub> 6	-	-	36	3	.18	.01

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	<i>Collinsia parviflora</i> (a)	-	-	<sub>a</sub> 146	<sub>b</sub> 245	-	-	56	74	1.02	8.10
F	<i>Cymopterus</i> spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 17	<sub>ab</sub> 8	-	-	7	4	.09	.07
F	<i>Delphinium nuttallianum</i>	-	-	1	-	-	-	1	-	.00	-
F	<i>Draba</i> spp. (a)	-	-	30	28	-	-	17	10	.22	.05
F	<i>Erigeron divergens</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 45	<sub>a</sub> -	-	-	21	-	.13	-
F	<i>Eriogonum racemosum</i>	8	16	22	15	6	10	11	8	.27	.18
F	<i>Gayophytum ramosissimum</i> (a)	-	-	3	-	-	-	3	-	.01	-
F	<i>Helianthus annuus</i> (a)	<sub>a</sub> 3	<sub>b</sub> 23	<sub>a</sub> -	<sub>a</sub> 3	2	12	-	1	-	.00
F	<i>Holosteum umbellatum</i> (a)	-	-	<sub>b</sub> 194	<sub>a</sub> 97	-	-	67	43	.53	.56
F	<i>Lactuca serriola</i>	<sub>b</sub> 16	<sub>a</sub> -	<sub>a</sub> 6	<sub>a</sub> -	9	-	2	-	.01	-
F	<i>Medicago sativa</i>	<sub>a</sub> 22	<sub>b</sub> 77	<sub>b</sub> 78	<sub>b</sub> 95	10	34	33	44	10.93	8.77
F	<i>Microsteris gracilis</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 11	-	-	-	5	-	.02
F	<i>Polygonum douglasii</i> (a)	-	-	2	2	-	-	2	1	.01	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	29	36	-	-	12	15	.06	.12
F	<i>Sanguisorba minor</i>	2	-	-	-	1	-	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	3	-	2	-	1	-	2	-	.03	-
F	<i>Tragopogon dubius</i>	-	-	2	-	-	-	2	-	.01	-
Total for Annual Forbs		3	23	610	439	2	12	239	158	2.38	8.92
Total for Perennial Forbs		53	96	245	179	29	47	113	91	12.69	9.63
Total for Forbs		56	119	855	618	31	59	352	249	15.08	18.55

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 11

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	<i>Artemisia tridentata vaseyana</i>	62	64	10.17	12.65
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	8	28	.52	.61
B	<i>Gutierrezia sarothrae</i>	42	10	1.18	.05
B	<i>Opuntia</i> spp.	6	5	.16	.30
Total for Browse		118	107	12.04	13.61

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 11

Species	Percent Cover	
	'96	'02
Artemisia tridentata vaseyana	-	13.67
Chrysothamnus viscidiflorus viscidiflorus	-	.67
Gutierrezia sarothrae	-	.05
Opuntia spp.	-	.17

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 11

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.4

BASIC COVER --

Herd unit 17 , Study no: 11

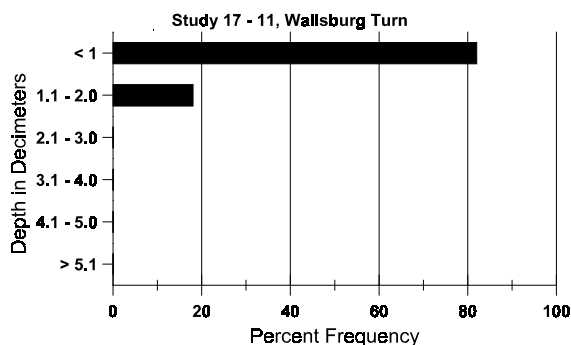
Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	368	364	5.75	18.75	44.34	48.84
Rock	277	219	10.75	15.50	11.94	8.77
Pavement	265	253	19.00	32.00	9.28	7.74
Litter	395	385	39.25	27.00	41.57	44.34
Cryptogams	158	71	18.50	1.50	2.24	1.72
Bare Ground	247	190	6.75	5.25	11.85	8.97

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 11, Wallsburg Turn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.9	52.4 (10.7)	7.6	18.9	53.0	28.0	3.1	16.3	156.8	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 11

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'02	'02	'02
Rabbit	2	5	-	-
Elk	7	6	226	17 (43)
Deer	12	20	705	54 (134)
Cattle	2	-	-	-

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 11

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
<i>Artemisia tridentata vaseyana</i>																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7	
	89	8	6	-	-	-	-	-	-	-	14	-	-	-	466		14	
	96	8	1	-	-	-	-	-	-	-	9	-	-	-	180		9	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	34	-	-	-	-	-	-	-	-	34	-	-	-	1133	14	13	34
	89	13	16	2	1	-	-	-	-	-	32	-	-	-	1066	18	19	32
	96	11	72	20	-	3	-	-	-	-	100	1	-	5	2120	20	36	106
	02	14	31	33	-	-	-	-	-	-	72	-	6	-	1560	25	35	78
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	1	13	14	-	-	-	-	-	-	19	-	2	7	560		28	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+11%							
'89		48%			04%			00%			+34%							
'96		66%			17%			04%			- 7%							
'02		41%			44%			14%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1366	Dec:	0%				
											'89	1532		0%				
											'96	2320		1%				
											'02	2160		26%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	5	-	-	1	-	-	-	-	-	6	-	-	-	200		6	
	'96	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	10	17	1
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	5	5	1
	'96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	10	17	6
	'02	59	-	-	2	-	-	-	-	-	61	-	-	-	1220	7	11	61
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+75%							
'89		00%			00%			00%			-25%							
'96		00%			00%			00%			+85%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%			
												'89	266		12%			
												'96	200		0%			
												'02	1360		9%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
<i>Gutierrezia sarothrae</i>																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	22	-	-	-	-	-	-	-	22	-	-	-	440		22			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	16	-	-	-	-	-	-	-	16	-	-	-	320		16			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
M	83	4	-	-	-	-	-	-	-	4	-	-	-	133	10 13	4			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0			
	96	114	-	-	-	-	-	-	-	114	-	-	-	2280	8 12	114			
	02	16	-	-	-	-	-	-	-	16	-	-	-	320	7 5	16			
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	02	4	-	-	-	-	-	-	-	4	-	-	-	80		4			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%													
'89		00%		00%		00%													
'96		00%		00%		00%		-85%											
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	133	Dec:	0%						
										'89	0		0%						
										'96	2600		0%						
										'02	400		20%						
<i>Opuntia spp.</i>																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	1	-	-	-	-	-	-	-	1	-	-	-	20		1			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
M	83	3	-	-	-	-	-	-	-	3	-	-	-	100	6 8	3			
	89	3	-	-	-	-	-	-	-	3	-	-	-	100	6 14	3			
	96	6	-	-	-	-	-	-	-	6	-	-	-	120	5 19	6			
	02	7	-	-	-	-	-	-	-	7	-	-	-	140	5 36	7			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		+ 0%											
'89		00%		00%		00%		+17%											
'96		00%		00%		00%		+14%											
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	100	Dec:	-						
										'89	100		-						
										'96	120		-						
										'02	140		-						

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	2	1	-	-	-	-	-	-	-	-	-	-	3	100		3	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	1	16	-	-	-	-	-	-	-	-	-	-	17	566	16	20	17
	'89	9	5	5	-	-	-	-	-	-	-	-	-	19	633	15	32	19
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	69	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		94%			00%			00%			+23%							
'89		27%			23%			00%										
'96		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	566	Dec:	-			
												'89	733		-			
												'96	0		-			
												'02	0		-			



Trend Study 17-12-02

Study site name: North Wallsburg Reseeding.

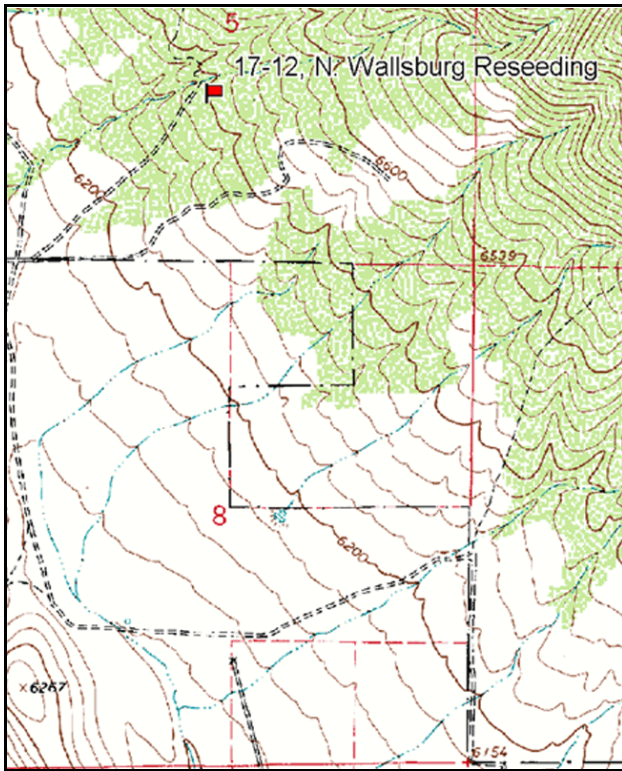
Vegetation type: Mixed Oak - Sage

Compass bearing: frequency baseline 172 degrees magnetic.

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

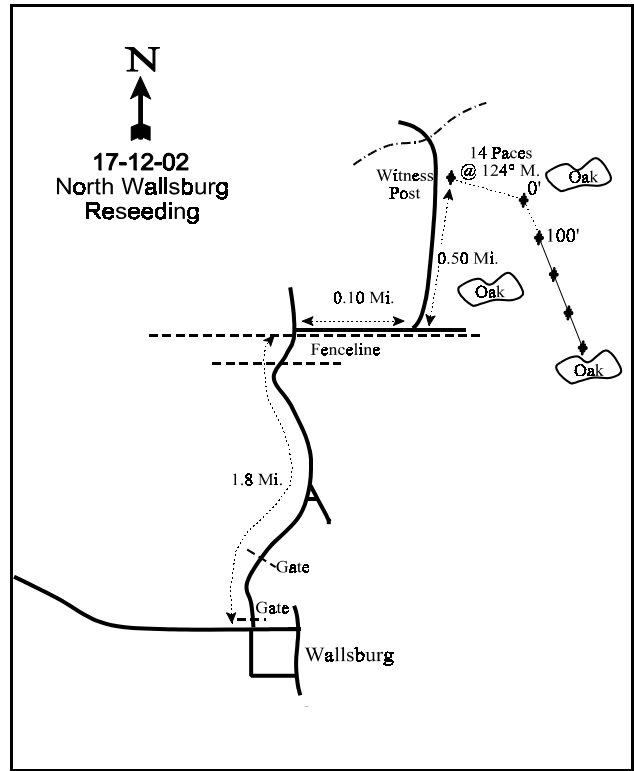
LOCATION DESCRIPTION

From the town of Wallsburg, take the road which runs northerly for 1.8 miles, staying on the main road until coming to a gate. Proceed through the gate and turn east immediately after passing through the gate. Proceed east traveling along the fenceline for 0.10 miles to another intersection. Turn left at the intersection and proceed north for 0.50 miles to a green steel “T” fencepost on the right (i.e., east) side of the road. From the fencepost the 0-foot baseline stake is 18 paces away at an azimuth of 159 degrees true. A red browse tag, number 3953, is attached to the 0-foot baseline stake.



Map Name: Charleston

Township 5S, Range 5E, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4473393 N 465514 E

## DISCUSSION

### North Wallsburg Seeding - Trend Study No. 17-12

This study is located on deer and elk winter range northeast of Wallsburg. The study is within the boundaries of the 1976 burn between Main Canyon and Daniels Canyon. The site is on a 10-15% southwest facing slope at an elevation of approximately 6,500 feet. Although burned and subsequently seeded in 1976, the intensity and scope of the fire on this site was not as severe as on the major part of the burned area lying to the west. The fire was more patchy in appearance with many of the mature shrubs from the original mixed oak-sage community surviving the burn. Except for the presence of seeded grasses and forbs, the area is vegetatively similar to adjacent, unburned oak-sagebrush communities. The area is an important winter concentration area for deer and elk as many deer pellet groups are present as well as a smaller numbers of elk pellets. Pellet group transect data collected in 2002 estimated 69 deer days use/acre (170 ddu/ha) and 10 elk days use/acre (25 edu/ha).

Textural and chemical analysis indicates the soil is a clay loam with a neutral reactivity (pH of 7.1). The average soil temperature is 46°F at a depth of 15 inches. The soil is moderately deep with many rocks and gravel on the surface and throughout the profile. Rocks are limestone with white deposits of calcium carbonate on their surface. Litter and vegetation cover are abundant and well disbursed over the site limiting erosion. Vegetation cover was estimated at 35% in 1996 and 33% in 2002. The majority fo the cover being contributed by grasses. Litter cover was estimated at 40% in 1996, increasing to 58% in 2002. Rock and pavement cover were estimated at 16% in 1989 and 1996, decreasing to 9% in 2002. It appears that the increase in bare soil in 2002 (20%) corresponds with a decline in rock and pavement cover. An erosion condition class assessment done in 2002 gave soils a stable rating.

The density of mountain big sagebrush was much lower in 1996 and 2002 (about 300 plants/acre) compared to the initial estimate of 1,433 plants/acre in 1983. Due to the low number of dead in the population, the difference in density is due to the greatly increased sample size giving a more accurate estimate in 1996 and 2002. Age structure has shifted from mostly young plants in 1983 and 1989, to a mostly mature population reported in 1996 and 2002. Recruitment from young plants was moderate in 1996 at 18%, but no young were sampled in 2002. A combination of drought and the increasing perennial grass component may explain the reason for the loss of the young age class. Decadence has been low in all years, currently ('02) at 13%. Vigor was normal throughout the population although use was moderate to heavy in 1996 and 2002. Leader growth on mountain big sagebrush averaged 2 inches in 2002. Bitterbrush had an estimated density of about 100 plants/acre on the site in 1996 and 2002. Mature plants make up the entire population and use was moderate to heavy in 1996 and 2002. Leader growth on bitterbrush plants averaged 2.2 inches in 2002.

The populations of stickyleaf low rabbitbrush and broom snakeweed appeared to be dense in the 1983 and 1989 readings. However, densities are much lower in 1996 and 2002 for both species. As with mountain big sagebrush, the greatly increased sample size used in 1996 and 2002 gives better estimates of shrub populations due to the clumped and/or discontinuous nature of their distributions. Both have largely mature populations and good vigor. The dense grass cover may be competing with these low growing shrubs, thereby suppressing growth and recruitment. Drought in 2002 is also likely playing a role in the decline of the snakeweed population. Most of the browse cover on the site is contributed by Gambel oak. Photograph comparisons between years reveal the oak are becoming more dense on the site. Oak clones are mostly 5-8 feet tall with smaller plants found around the edges of the taller clones. These smaller plants exhibited moderate hedging in 1989 and 1996, although use was light throughout the population in 2002. Poor vigor increased from 0% in 1996 to 30% in 2002 due to an apparent spring frost. Density increased from 2,840 stems/acre in 1996 to 4,400 stems/acre in 2002.

Perennial grasses are the dominant component of the community. Sheep fescue is the most abundant species in cover and frequency in 1996 and 2002, with intermediate wheatgrass being a close second. Crested wheatgrass and bulbous bluegrass are also fairly abundant. In 2002, many of the fescue plants had a wolfy appearance with a lot of dead thatch intermixed with the current years growth. The most abundant grasses either increased in nested frequency or remained relatively stable in 2002. Sum of nested frequency for perennial grasses has stayed nearly the same from 1989-2002. Cheatgrass is not very common and is held in check by the abundance of the perennials in the understory. As reported in 1989, forbs remain insignificant. Alfalfa was seeded following the burn, but is not very abundant. Forbs, both annual and perennial species, declined in sum of nested frequency in 2002 with the drought conditions.

#### 1983 APPARENT TREND ASSESSMENT

Soil trend appears to be slowly improving. Some sheet and gully erosion will continue but should moderate with the passage of time. Vegetative trend is more debatable. Gambel oak is not encroaching into interspaces to any great degree. However, the resprouting clones are becoming more dense and growing taller. Oak requires heavy use to keep it within reach, especially where no competitive grass understory is directly associated with it. As far as forage productivity is concerned, oak is currently at an optimum level. In the oak interspaces, shrub density of broom snakeweed, stickyleaf low rabbitbrush, and mountain big sagebrush appears to be increasing. The antelope bitterbrush population appears stable. The former two species are aggressive increasers that should be curtailed, while bitterbrush and big sagebrush should be encouraged. Forb cover and density, especially that of alfalfa, should at least be maintained.

#### 1989 TREND ASSESSMENT

The soil trend is stable. Grasses continue to increase on the old burn with ground cover characteristics remaining close to 1983 estimates. There is slight erosion in the open areas, but as long as sufficient litter remains after grazing, it should not be a management concern. Trend for browse is stable. Big sagebrush shows a decline in density, but vigor remains normal and there are many young plants. The main concern for the browse component is the increase in the density of stickyleaf low rabbitbrush and broom snakeweed. Trend for the herbaceous understory is up as perennial grasses continue to increase in abundance.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up (5)

#### 1996 TREND ASSESSMENT

Soil trend is stable as adequate vegetation and litter cover limit erosion. Browse trend is also stable. The mountain big sagebrush population is vigorous and the stickyleaf low rabbitbrush and broom snakeweed populations appear to be stable. The decline in density is mostly due to the much larger sample used in 1996 which gives a more accurate estimate of shrub populations. Hedging appears to be heaviest on the surrounding true mountain mahogany. The herbaceous understory is dominated by perennial grasses that compete well with annual species. Sum of nested frequency remained nearly identical to 1989 levels resulting in a stable trend.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Soil trend is stable. Although bare soil increased from 12% to 20%, litter cover also increased to 58%. The ratio of protective cover to bare soil remains good. Trend for browse is stable. Mountain big sagebrush has a stable density, normal vigor, and low decadency. Although no young plants were sampled in 2002, better precipitation should improve reproduction in the future. The increasers stickyleaf low rabbitbrush and broom snakeweed both decreased in density in 2002. They do not appear to be a threat to dominate the site as was the concern in 1983 and 1989. Gambel oak density increased, but does not appear to be negatively impacting other species at the present time. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial species remained similar to 1996 levels. Perennial grasses remain the most dominant component of the vegetative community.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 12

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron cristatum	a90	b148	a66	a56	42	56	26	23	2.41	1.25
G	Agropyron intermedium	a117	b192	a135	ab157	49	73	49	58	3.32	5.92
G	Bromus tectorum (a)	-	-	b16	a7	-	-	6	2	.10	.53
G	Dactylis glomerata	8	7	-	-	4	2	-	-	-	.00
G	Festuca ovina	a42	b96	c190	c171	22	42	68	69	14.72	8.35
G	Oryzopsis hymenoides	2	7	-	4	1	4	-	2	-	.18
G	Poa bulbosa	a-	a-	b32	c92	-	-	12	36	.62	2.79
G	Poa fendleriana	-	8	-	-	-	3	-	-	-	-
G	Poa pratensis	27	8	26	8	10	5	9	3	.41	.04
G	Poa secunda	a-	a3	b24	a7	-	2	11	3	.08	.06
G	Sitanion hystrix	-	6	1	1	-	4	1	1	.00	.00
G	Stipa comata	-	-	-	2	-	-	-	1	-	.03
Total for Annual Grasses		0	0	16	7	0	0	6	2	0.10	0.53
Total for Perennial Grasses		286	475	474	498	128	191	176	196	21.57	18.66
Total for Grasses		286	475	490	505	128	191	182	198	21.67	19.19
F	Agoseris glauca	-	-	2	1	-	-	1	1	.00	.00
F	Alyssum alyssoides (a)	-	-	b134	a22	-	-	42	11	.36	.08
F	Allium spp.	-	2	-	2	-	1	-	1	-	.00
F	Astragalus spp.	a-	ab2	ab1	b9	-	1	1	5	.03	.05
F	Astragalus utahensis	3	1	10	10	1	1	3	5	.33	.07
F	Calochortus nuttallii	5	-	-	2	2	-	-	1	-	.00
F	Chaenactis douglasii	-	2	3	-	-	2	1	-	.03	-
F	Cirsium spp.	2	-	6	-	1	-	3	-	.26	-

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	<i>Collomia linearis</i> (a)	-	-	-	5	-	-	-	2	-	.01
F	<i>Comandra pallida</i>	-	-	-	3	-	-	-	1	-	.00
F	<i>Descurainia pinnata</i> (a)	-	-	-	4	-	-	-	2	-	.01
F	<i>Epilobium brachycarpum</i> (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Erigeron</i> spp.	-	-	1	-	-	-	1	-	.03	-
F	<i>Eriogonum racemosum</i>	a-	a-	b7	ab3	-	-	5	3	.05	.04
F	<i>Grindelia squarrosa</i>	-	-	3	5	-	-	2	3	.06	.01
F	<i>Lactuca serriola</i>	8	-	-	-	3	-	-	-	-	-
F	<i>Linum lewisii</i>	-	-	3	1	-	-	1	1	.00	.03
F	<i>Lithospermum ruderale</i>	a-	a-	a1	b11	-	-	1	6	.15	.13
F	<i>Medicago sativa</i>	3	1	10	4	1	1	3	2	.33	.21
F	<i>Orthocarpus</i> spp. (a)	-	-	2	-	-	-	1	-	.00	-
F	<i>Phlox longifolia</i>	a-	a2	b23	ab11	-	1	12	6	.06	.03
F	<i>Polygonum douglasii</i> (a)	-	-	5	-	-	-	2	-	.01	-
F	<i>Sphaeralcea coccinea</i>	3	3	-	1	1	2	-	1	-	.00
F	<i>Tragopogon dubius</i>	b28	a7	a8	a2	13	3	3	2	.01	.01
F	<i>Viguiera multiflora</i>	b11	ab7	ab9	a-	6	4	4	-	.19	-
F	<i>Zigadenus paniculatus</i>	2	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	0	144	31	0	0	46	15	0.37	0.09
Total for Perennial Forbs		65	27	87	65	29	16	41	38	1.55	0.62
Total for Forbs		65	27	231	96	29	16	87	53	1.93	0.72

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 12

T y p e	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	<i>Amelanchier alnifolia</i>	0	2	-	.41
B	<i>Artemisia tridentata vaseyana</i>	12	11	1.62	3.91
B	<i>Cercocarpus montanus</i>	1	0	.03	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	35	13	.72	.04
B	<i>Gutierrezia sarothrae</i>	21	4	.47	.03
B	<i>Opuntia</i> spp.	6	4	.03	-
B	<i>Purshia tridentata</i>	5	4	1.59	1.69
B	<i>Quercus gambelii</i>	26	25	5.13	6.09
B	<i>Symphoricarpos oreophilus</i>	1	0	.15	-
B	<i>Tetradymia canescens</i>	7	8	.06	.51
Total for Browse		114	71	9.81	12.69

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 12

Species	Percent Cover	
	'96	'02
Amelanchier utahensis	-	.25
Artemisia tridentata vaseyana	-	4.58
Chrysothamnus viscidiflorus viscidiflorus	-	.25
Opuntia spp.	-	.020
Purshia tridentata	-	2.08
Quercus gambelii	3.8	11.25
Tetradymia canescens	-	.75

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 12

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.0
Purshia tridentata	2.2

BASIC COVER --

Herd unit 17 , Study no: 12

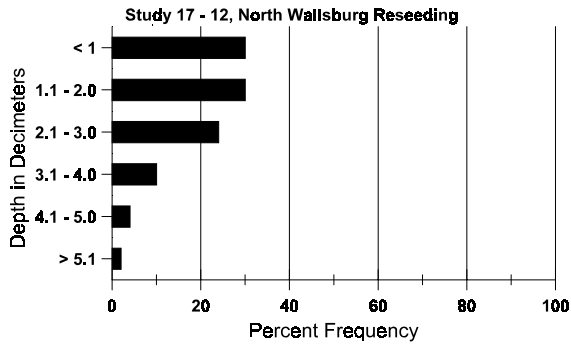
Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	344	317	1.50	4.25	35.09	33.00
Rock	216	150	5.75	5.50	6.78	5.06
Pavement	230	172	6.25	10.75	10.14	4.41
Litter	395	389	65.00	59.75	40.23	58.65
Cryptogams	48	5	1.50	.25	.81	.06
Bare Ground	206	196	20.00	19.50	12.07	20.63

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 12, North Wallsburg Reseeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.5	46.2 (14.8)	7.1	40.2	29.1	30.7	3.5	21.1	163.2	.7

## Stoniness Index



### PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 12

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'02	02	02
Rabbit	8	-	-	-
Elk	5	5	131	10 (25)
Deer	27	24	896	69 (170)
Cattle	5	-	-	-

### BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 12

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total			
		1	2	3	4		Ht.	Cr.				
<i>Amelanchier alnifolia</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	1	-	1	-	-	40	31	35	2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
	'83	00%		00%		00%						
	'89	00%		00%		00%						
	'96	00%		00%		00%						
	'02	50%		50%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:				
						'89	0					
						'96	0					
						'02	40					

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Artemisia tridentata vaseyana</i>																	
Y	83	36	-	-	-	-	-	-	-	33	3	-	-	1200		36	
	89	10	7	-	2	-	-	-	-	19	-	-	-	633		19	
	96	3	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	7	-	-	-	-	-	-	-	5	2	-	-	233	26	30	7
	89	2	3	-	-	-	-	-	-	5	-	-	-	166	28	36	5
	96	4	8	1	-	-	-	-	-	13	-	-	-	260	28	47	13
	02	-	7	7	-	-	-	-	-	14	-	-	-	280	27	40	14
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	1	-	-	-	-	-	-	3	-	-	1	133		4	
	96	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			-35%						
'89		39%			00%			04%			-64%						
'96		53%			06%			00%			-6%						
'02		44%			56%			00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	1433	Dec:	0%				
										'89	932		14%				
										'96	340		6%				
										'02	320		13%				
<i>Cercocarpus montanus</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	1	-	-	1	-	-	-	20	32	38	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	27	35	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'96		00%			100%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-				
										'89	0		-				
										'96	20		-				
										'02	0		-				



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	13	-	-	-	-	-	-	-	-	13	-	-	-	433		13	
	'89	6	-	-	1	-	-	-	-	-	7	-	-	-	233		7	
	'96	10	-	-	-	-	-	-	-	-	10	-	-	-	200		10	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	147	-	-	-	-	-	-	-	-	133	14	-	-	4900	8	7	147
	'89	205	-	-	3	-	-	-	-	-	173	-	35	-	6933	10	13	208
	'96	49	-	-	2	-	-	-	-	-	51	-	-	-	1020	11	20	51
	'02	22	-	-	-	-	-	-	-	-	22	-	-	-	440	7	13	22
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	18	-	-	-	-	-	-	-	-	12	-	6	-	600		18	
	'96	1	-	-	3	-	-	-	-	-	3	-	-	1	80		4	
	'02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+31%							
'89		00%			00%			18%			-83%							
'96		00%			00%			02%			-63%							
'02		00%			00%			04%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	5333	Dec:	0%			
												'89	7766		8%			
												'96	1300		6%			
												'02	480		4%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<i>Gutierrezia sarothrae</i>													
S	83	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	0		0		
	96	1	-	-	-	-	-	-	20		1		
	02	-	-	-	-	-	-	-	0		0		
Y	83	25	-	-	-	-	-	-	833		25		
	89	3	-	-	-	-	-	-	100		3		
	96	14	-	-	-	-	-	-	280		14		
	02	-	-	-	-	-	-	-	0		0		
M	83	123	-	-	-	-	-	-	4100	8	9	123	
	89	219	-	-	-	-	-	-	7300	9	9	219	
	96	28	-	-	-	-	-	-	560	8	10	28	
	02	5	-	-	-	-	-	-	100	7	9	5	
D	83	-	-	-	-	-	-	-	0		0		
	89	4	-	-	-	-	-	-	133		4		
	96	-	-	-	-	-	-	-	0		0		
	02	1	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%		+35%					
'89		00%		00%		15%		-89%					
'96		00%		00%		00%		-86%					
'02		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	4933	Dec:	0%
										'89	7533		2%
										'96	840		0%
										'02	120		17%
<i>Opuntia spp.</i>													
M	83	8	-	-	-	-	-	-	266	6	8	8	
	89	6	-	-	-	-	-	-	200	6	18	6	
	96	7	-	-	-	1	-	-	160	5	23	8	
	02	4	-	-	-	-	-	-	80	5	8	4	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%		-25%					
'89		00%		00%		33%		-20%					
'96		00%		13%		00%		-50%					
'02		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	266	Dec:	-
										'89	200		-
										'96	160		-
										'02	80		-

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	2	-	-	-	-	-	-	-	5	-	-	-	100	31	78	5
	02	2	-	2	-	-	-	-	-	-	4	-	-	-	80	36	77	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		40%			00%			00%			-20%							
'02		00%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	100		-			
												'02	80		-			
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	4	-	-	-	-	-	4	-	-	-	133		4	
	96	12	-	-	-	-	-	-	-	-	9	1	2	-	240		12	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	2	-	11	-	-	-	-	13	-	-	-	433		13	
	96	12	13	-	3	-	-	-	-	-	9	19	-	-	560		28	
	02	32	-	-	24	-	-	-	-	-	56	-	-	-	1160		58	
M	83	20	-	-	-	-	-	-	-	-	20	-	-	-	666	53	34	20
	89	-	6	-	-	8	-	-	-	-	14	-	-	-	466	89	37	14
	96	18	55	-	-	-	-	32	-	-	63	42	-	-	2100	50	32	105
	02	149	-	-	-	-	-	-	8	-	95	-	62	-	3140	47	26	157
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	4	5	-	-	-	-	-	-	-	8	1	-	180		9	
	02	5	-	-	-	-	-	-	-	-	-	-	-	5	100		5	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	240		12	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	440		22	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+26%							
'89		93%			07%			00%			+68%							
'96		51%			04%			.70%			+35%							
'02		00%			00%			30%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	666	Dec:	0%			
												'89	899		0%			
												'96	2840		6%			
												'02	4400		2%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	35	35	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	48	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%										
	'89	00%			00%			00%										
	'96	00%			00%			00%										
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	20		-			
												'02	0		-			
Tetradymia canescens																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320	9	15	16
	02	27	-	-	-	-	-	-	-	-	27	-	-	-	540	9	22	27
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%										
	'89	00%			00%			00%										
	'96	00%			00%			00%			+38%							
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	400		-			
												'02	640		-			

Trend Study 17-13-02

Study site name: North Wallsburg.

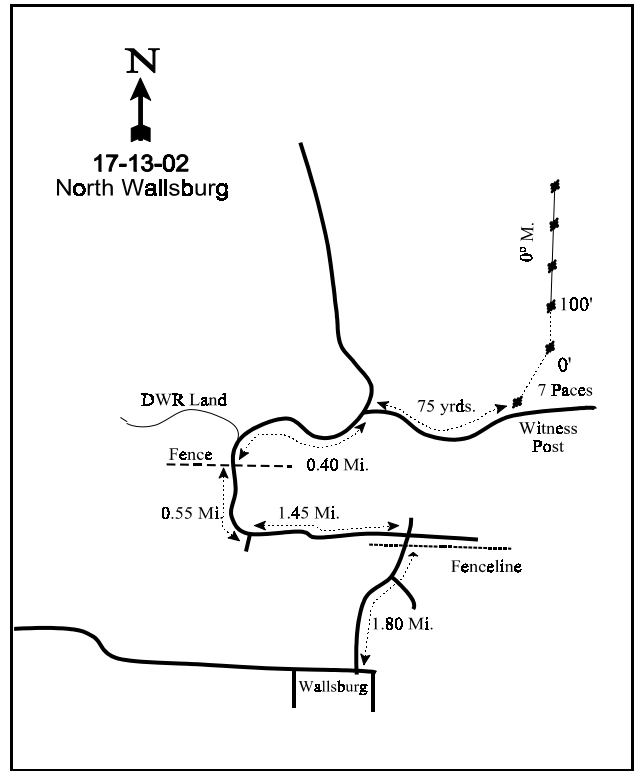
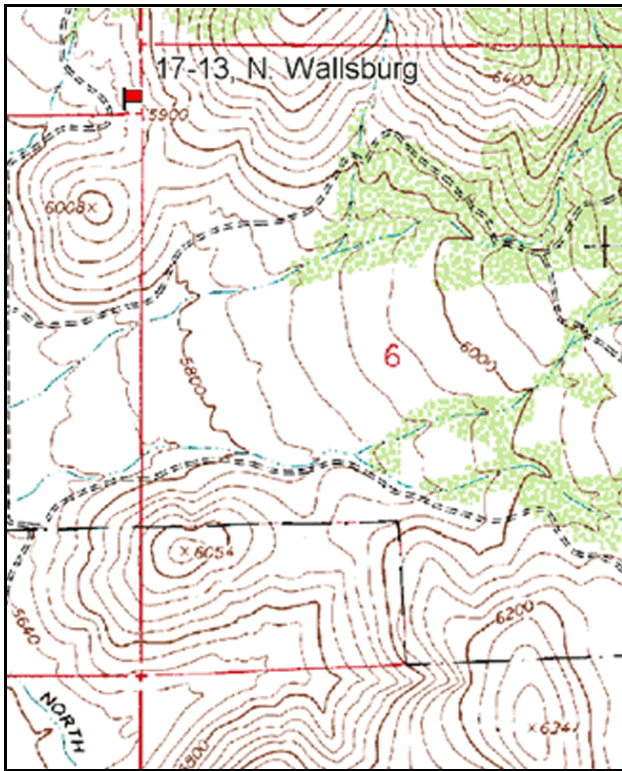
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the town of Wallsburg, proceed northerly for 1.80 miles staying on the main road. At 1.80 miles the road will come to a fence line and a gate, proceed through the gate and turn left. Proceed west for 1.45 miles to where the road bends northward at the DWR fence line. Continue on the same road northward for 0.55 additional miles to a cattle guard. Cross the fence and take the immediate right fork, then proceed 0.40 miles to another fork in the road. Walk 75 yards up the old road to a red steel fencepost and a full high witness post on the left side of the road and stop. From the fencepost, the 0-foot stake of the baseline is 7 paces to the northeast.



Map Name: Charleston

Diagrammatic Sketch

Township 4S, Range 4E, Section 36

GPS: NAD 27, UTM 12S 4474279 N 463256 E

## DISCUSSION

### North Wallsburg - Trend Study No. 17-13

This study is on Division of Wildlife Resources property located north of Wallsburg. The study site is typical of the sagebrush-grass communities that were prevalent in the Wallsburg area before a series of wildfires that burned much of the area in the 1960's and 1970's. This particular site is on a moderate (20%), southwest facing slope at an elevation of 6,000 feet. The area reportedly receives heavy deer and light to moderate elk use in winter. A pellet group transect read parallel to the sampling baseline in 2002 estimated 147 deer days use/acre (364 ddu/ha) and 9 elk days use/acre (21 edu/ha).

The soil is classified as a sandy clay loam with an average temperature of 50°F at a depth of 14 inches. Soil is moderately deep with some rocks on the surface and in the profile. Effective rooting depth was nearly 12 inches, and reactivity is neutral (pH of 7.1). Vegetation cover is high, estimated at 44% and 48% in 1996 and 2002 respectively. Most is contributed by perennial grasses. Litter cover is abundant providing 44% and 41% of the surface cover in 1996 and 2002. Cover for bare ground decreased to only 4% in 1996. With drought conditions in 2002, bare soil increased but remains moderately low at 12%. Rock and pavement combine to provide about 16% of the surface cover in 1996 and 2002. Although reported as ongoing in 1983, erosion does not appear to be a serious problem due to the abundant litter and vegetative cover. An erosion condition class assessment in 2002 gave soils a stable rating.

Mountain big sagebrush is the dominant browse with an estimated cover of 9% in 1996, increasing to 14% in 2002. This is mostly a mature population, with moderate decadence. The number of decadent plants in the population was stable in 1996 and 2002 at just over 30%. Although this is a big improvement from the 69% decadence rate in 1989, it is still higher than it should be. In 2002, density slightly increased from 2,240 plants/acre in 1996 to 2,540 plants/acre. Recruitment of the young age classes and seedlings have been moderately low in all years except for 1996. Use has been generally moderate in most years, while vigor has been normal on all but a small portion of the population. Heavy use was higher in both 1983 and 2002, but not at excessive levels. Sagebrush annual growth was poor, averaging only 1.2 inches in 2002. The only other palatable forage sampled on the transect is white-stemmed rubber rabbitbrush. Density of this species was estimated at about 300 plants/acre in 1996 and 2002. Use was light in 2002, but decadence was high (79%) and vigor rated as poor on 29% of the population.

Broom snakeweed increased in density between 1983 and 1996 to 4,500 plants/acre. With drought in 2002, snakeweed density declined to only 520 plants/acre. Decadence and poor vigor increased. Broom snakeweed often decreases during dry periods so this decline is expected. Prickly pear cactus and stickyleaf low rabbitbrush are also present on the site.

Grass cover is abundant, but consists primarily of two less desirable species, cheatgrass and bulbous bluegrass. Bulbous bluegrass is a short-lived perennial that has many of the characteristics of an annual. It dries out early in the summer and provides fine fuels for fire. In 1996, cheatgrass was the dominant species providing 58% of the grass cover and was sampled in 88% of the quadrats. Bulbous bluegrass provided 27% of the grass cover and was sampled in 52% of the quadrats in 1996. In 2002, cheatgrass declined in cover, quadrat frequency, and nested frequency due to the dry conditions. However, bulbous bluegrass increased in cover (7% to 22%), quadrat frequency (52% to 84%), and nested frequency (157 to 285) in 2002. Bulbous bluegrass has steadily increased with every reading since site establishment in 1983. The most desirable grasses on the site include Sandberg bluegrass, Indian ricegrass, bottlebrush squirreltail, crested wheatgrass, and intermediate wheatgrass. However, Sandberg bluegrass is the only one of these that are moderately abundant. The wheatgrasses, including bluebunch, are found in scattered patches throughout the area but are not sampled very well by this transect. Forbs, especially perennial species, have been insignificant on the site in all years and are especially so in 2002. Sum of nested frequency for perennial forbs has steadily declined since 1989.

## 1983 APPARENT TREND ASSESSMENT

This site appears to be stable. There is little evidence to suggest any great change in either soil condition or vegetative makeup.

## 1989 TREND ASSESSMENT

The browse component has taken a downward turn. Without treatment, there is little possibility of significant improvement in winter range values for browse. Sagebrush productivity and vigor may improve when the drought ends. Decadency is high and reproduction is low. Numerous winter-killed fawns were found on the site. The herbaceous component did improve with increased sum of nested frequency values for both perennial grasses and forbs. Trend for herbaceous species is up. Erosion pavement increased on the ground surface, while litter cover decreased. Bare soil remains stable at 18%, and erosion is slight. Soil trend is stable.

### TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - up (5)

## 1996 TREND ASSESSMENT

Soil trend is stable. Erosion is still slight and there is adequate vegetative and litter cover present to prevent or slow erosion. The mountain big sagebrush appears to be healthier than anytime reported in the past. More seedling and young plants were encountered this year, and better vigor and lighter hedging were reported as well. Broom snakeweed may be increasing in density and should be monitored. Browse trend is slightly upward. The herbaceous understory trend is slightly up. Although not included in the surveys in past years, cheatgrass dominates the herbaceous understory. However, both bulbous bluegrass and Sandberg bluegrass nested frequencies have significantly increased since 1983. Forbs are still scarce with most being annual species. It is no wonder why much of the surrounding area has burned in the past. The fine litter provided by cured cheatgrass and bulbous bluegrass provide ample fuel for a destructive fire to occur.

### TREND ASSESSMENT

soil - stable (3)

browse - slightly upward (4)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

Soil trend is stable. Bare soil increased to 12%, but vegetation and litter cover are abundant and appear to be stabilizing soils. An erosion assessment completed in 2002 showed stable soil conditions. Trend for browse is stable. Mountain big sagebrush slightly increased in density while decadence and poor vigor remain at 1996 estimates. Sagebrush recruitment is low at 5%, but may improve with better precipitation in the future. Broom snakeweed declined in density due to the drought in 2002. Trend for the herbaceous understory is up slightly but in poor condition. Cheatgrass and bulbous bluegrass remain the dominant species, although they switched places in abundance since 1996. Cheatgrass declined significantly in nested frequency, and cover fell from 16% to 5%. Bulbous bluegrass increased significantly in nested frequency and nearly tripled in cover. Bulbous bluegrass is a poor value perennial that dries out early in the summer and provides little forage. However, it is better than cheat grass. More desirable perennial grasses, bluebunch wheatgrass and Sandberg bluegrass, are present but in low abundance and will likely not increase under the current conditions. Forbs are rare.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly but in poor condition (4)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 13

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	<i>Agropyron cristatum</i>	-	-	-	2	-	-	-	2	-	.03
G	<i>Agropyron intermedium</i>	-	-	-	10	-	-	-	4	-	.68
G	<i>Agropyron smithii</i>	10	14	-	-	4	4	-	-	-	-
G	<i>Bromus tectorum</i> (a)	-	-	<sub>b</sub> 303	<sub>a</sub> 200	-	-	88	67	16.14	5.23
G	<i>Oryzopsis hymenoides</i>	10	13	6	17	5	8	4	10	.36	.74
G	<i>Poa bulbosa</i>	<sub>a</sub> 5	<sub>b</sub> 69	<sub>c</sub> 157	<sub>d</sub> 285	2	33	52	84	7.55	22.75
G	<i>Poa secunda</i>	<sub>a</sub> 2	<sub>b</sub> 53	<sub>c</sub> 166	<sub>c</sub> 140	2	22	54	53	3.73	2.66
G	<i>Sitanion hystrix</i>	-	-	9	3	-	-	4	1	.19	.03
G	<i>Stipa comata</i>	-	-	-	4	-	-	-	2	-	.18
Total for Annual Grasses		0	0	303	200	0	0	88	67	16.14	5.23
Total for Perennial Grasses		27	149	338	461	13	67	114	156	11.84	27.09
Total for Grasses		27	149	641	661	13	67	202	223	27.98	32.32
F	<i>Agoseris glauca</i>	-	-	4	-	-	-	2	-	.01	-
F	<i>Alyssum alyssoides</i> (a)	-	-	<sub>b</sub> 101	<sub>a</sub> 13	-	-	30	6	.69	.03
F	<i>Arabis</i> spp.	-	3	1	-	-	1	1	-	.03	-
F	<i>Astragalus eurekensis</i>	-	-	-	-	-	-	-	-	-	.00
F	<i>Astragalus</i> spp.	3	3	-	-	1	2	-	-	-	-
F	<i>Astragalus utahensis</i>	3	-	1	4	1	-	1	2	.03	.01
F	<i>Calochortus nuttallii</i>	<sub>b</sub> 25	<sub>c</sub> 112	<sub>a</sub> -	<sub>a</sub> 1	12	54	-	1	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	-	9	-	-	-	4	-	.02	-
F	<i>Erodium cicutarium</i> (a)	-	-	49	28	-	-	17	11	.23	.08
F	<i>Erigeron</i> spp.	-	-	6	-	-	-	3	-	.04	-
F	<i>Eriogonum racemosum</i>	2	6	5	3	1	3	3	1	.01	.00
F	<i>Helianthus annuus</i> (a)	-	-	-	2	-	-	-	1	-	.00
F	<i>Holosteum umbellatum</i> (a)	-	-	<sub>a</sub> -	<sub>b</sub> 34	-	-	-	14	-	.11
F	<i>Machaeranthera canescens</i>	2	-	-	-	1	-	-	-	-	-
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 21	<sub>a</sub> -	<sub>a</sub> 5	-	8	-	2	-	.01
F	<i>Polygonum douglasii</i> (a)	-	-	4	-	-	-	2	-	.01	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	5	-	-	-	3	-	.01
F	<i>Tragopogon dubius</i>	<sub>a</sub> 1	<sub>a</sub> 6	<sub>b</sub> 31	<sub>a</sub> -	1	5	18	-	.17	-
F	<i>Zigadenus paniculatus</i>	<sub>a</sub> 2	<sub>b</sub> 9	<sub>a</sub> -	<sub>a</sub> -	1	6	-	-	-	-
Total for Annual Forbs		0	0	163	82	0	0	53	35	0.95	0.25
Total for Perennial Forbs		38	160	48	13	18	79	28	6	0.29	0.03
Total for Forbs		38	160	211	95	18	79	81	41	1.25	0.28

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



BROWSE TRENDS --

Herd unit 17 , Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Artemisia tridentata vaseyana	74	71	9.16	13.57
B	Chrysothamnus nauseosus albicaulis	15	14	1.79	1.22
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	-	-
B	Gutierrezia sarothrae	39	14	1.99	.10
B	Opuntia spp.	19	15	.35	.18
Total for Browse		147	115	13.30	15.08

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 13

Species	Percent Cover	
	'96	'02
Artemisia tridentata vaseyana	-	16.08
Chrysothamnus nauseosus albicaulis	-	1.17
Gutierrezia sarothrae	-	.17

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 13

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.2

BASIC COVER --

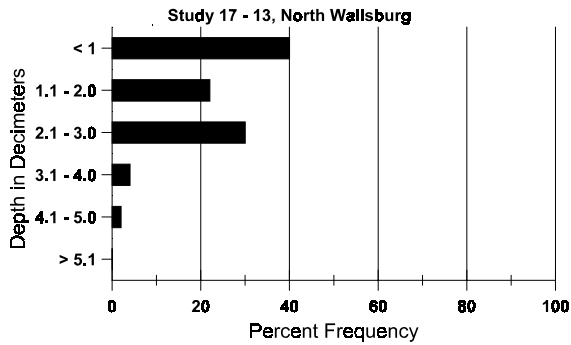
Herd unit 17 , Study no: 13

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	392	369	1.50	4.00	44.31	47.95
Rock	252	241	8.50	8.75	12.07	11.63
Pavement	209	232	3.75	14.00	3.82	4.53
Litter	386	368	64.75	53.25	44.58	41.18
Cryptogams	78	37	3.00	2.00	1.00	.87
Bare Ground	166	219	18.50	18.00	4.32	12.44

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 13, North Wallsburg

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.8	50.0 (14.0)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17 , Study no: 13

Type	Quadrat Frequency	
	'96	'02
Sheep	1	-
Rabbit	11	6
Elk	12	4
Deer	36	47

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
-	-
-	-
113	9 (21)
1914	147 (364)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 13

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4												
Artemisia tridentata vaseyana																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	19	-	-	-	-	-	-	-	19	-	-	-	380		19	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	3	-	-	-	-	-	-	-	3	-	-	-	200		3	
	89	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	96	17	1	-	-	-	-	-	-	18	-	-	-	360		18	
	02	6	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	83	11	6	12	-	-	-	-	-	29	-	-	-	1933	26	45	29
	89	3	4	-	-	-	-	-	-	7	-	-	-	466	22	22	7
	96	33	25	1	-	-	-	-	-	59	-	-	-	1180	23	44	59
	02	28	24	23	4	-	-	-	-	76	-	-	-	1580	21	30	79
D	83	5	1	5	-	-	-	-	-	4	-	7	-	733		11	
	89	4	14	-	-	-	-	-	-	15	-	-	3	1200		18	
	96	10	17	8	-	-	-	-	-	26	-	-	9	700		35	
	02	9	15	15	2	1	-	-	-	28	-	-	14	840		42	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	880		44	
	02	-	-	-	-	-	-	-	-	-	-	-	-	1180		59	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		16%		40%		16%		-40%									
'89		73%		00%		12%		+23%									
'96		38%		08%		08%		+12%									
'02		31%		30%		11%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	2866	Dec:	26%				
										'89	1732		69%				
										'96	2240		31%				
										'02	2540		33%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
Chrysothamnus nauseosus albicaulis											
S	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	6	-	-	-	-	-	-	120	-	6
	02	-	-	-	-	-	-	-	0	-	0
Y	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	2	-	-	-	-	-	-	40	-	2
	02	-	-	-	-	-	-	-	0	-	0
M	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	10	2	-	-	-	-	-	240	33	12
	02	3	-	-	-	-	-	-	60	20	3
D	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	3	-	1	-	-	-	-	80	-	4
	02	10	-	-	1	-	-	-	220	-	11
X	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	-	-	-	-	-	-	-	60	-	3
	02	-	-	-	-	-	-	-	0	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'96		11%		06%		11%		-22%			
'02		00%		00%		29%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%		
						'89	0		0%		
						'96	360		22%		
						'02	280		79%		
Chrysothamnus viscidiflorus viscidiflorus											
M	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	96	-	-	-	-	-	-	-	0	-	0
	02	1	-	-	-	-	-	-	20	8	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'96		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-		
						'89	0		-		
						'96	0		-		
						'02	20		-		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	26	-	-	-	-	-	-	-	-	26	-	-	-	520		26	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266	11 11	4	
	89	19	-	-	-	-	-	-	-	-	19	-	-	-	1266	10 15	19	
	96	199	-	-	-	-	-	-	-	-	199	-	-	-	3980	9 13	199	
	02	20	-	-	-	-	-	-	-	-	20	-	-	-	400	9 8	20	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	6	-	-	-	-	-	-	-	-	4	-	-	2	120		6	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	320		16	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+68%							
'89		00%			00%			00%			+72%							
'96		00%			00%			00%			-88%							
'02		00%			00%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	399	Dec:	0%			
												'89	1266		0%			
												'96	4500		0%			
												'02	520		23%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Opuntia spp.																	
Y	'83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2
	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2
	'96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
	'02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	'83	5	-	-	-	-	-	-	-	-	5	-	-	-	333	6 14	5
	'89	9	1	-	-	-	-	-	-	-	10	-	-	-	666	7 22	10
	'96	13	-	-	4	-	-	-	-	-	17	-	-	-	340	5 18	17
	'02	13	-	-	2	-	-	-	-	-	15	-	-	-	300	5 11	15
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
	'02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+42%						
'89		08%			00%			00%			-47%						
'96		00%			00%			00%			-10%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	466	Dec:	0%		
												'89	799		0%		
												'96	420		10%		
												'02	380		11%		

Trend Study 17-14-02

Study site name: Hoovers Hollow.

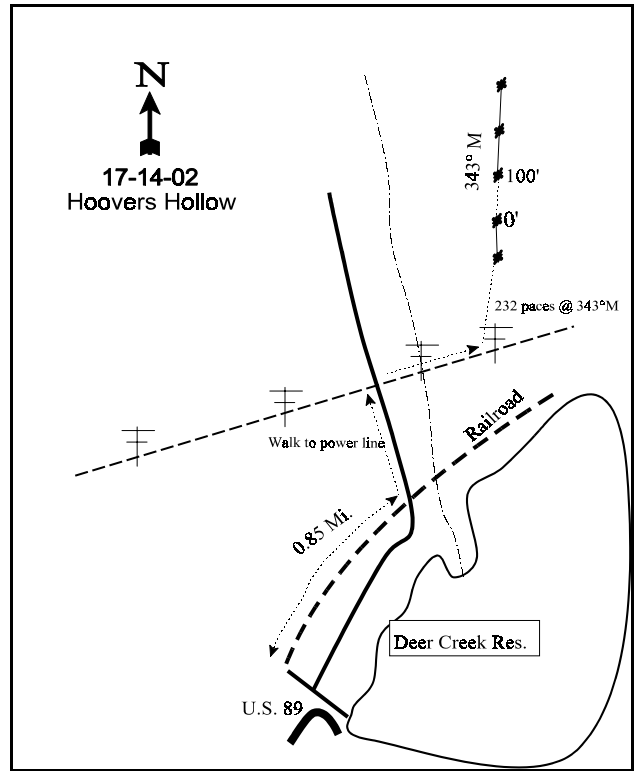
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 343 degrees magnetic.

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

LOCATION DESCRIPTION

From the locked gate at the southwest corner of Deer Creek Reservoir, proceed 0.85 miles along the northern edge of the reservoir. Stop where the road crosses the railroad tracks. From this point, walk up the road leading towards Hoovers Hollow to a faint road to the northeast following power lines. Walk to the second pole across a small drainage and partially up the hillside. From the power pole, walk 232 paces at an azimuth of 0 degrees true, to the 0-foot baseline stake. A red browse tag, number 3949, is attached to the 0-foot baseline stake.



Map Name: Aspen Grove

Diagrammatic Sketch

Township 4S, Range 4E, Section 32

GPS: NAD 27, UTM 12S 4474345 N 456033 E

## DISCUSSION

### Hoovers Hollow - Trend Study No. 17-14

This study is located near the mouth of Hoover Hollow on the west side of Deer Creek Reservoir. The study is near the ridge top on a moderately steep (30%), south to southwest facing slope at an elevation of 5,800 feet. The reservoir is approximately 3/4 mile downslope from the site. Winter deer use on the ridges and slopes such as this one, is extremely heavy throughout the entire area. Pellet group transect data collected in 2002 estimated 68 deer days use/acre (169 ddu/ha) and 21 elk days use/acre (51 edu/ha). Cattle use was low at only 1 cow day use/acre (3 cdu/ha). It was reported in 1989 that domestic sheep had made a significant impact on this site for many years.

Soil texture is a clay loam with an average temperature of 49°F at a depth of 7 inches. The soil is very rocky on the surface and throughout the profile. Effective rooting depth was estimated at just under 9 inches in 1996. Rock and pavement combined to provide 26% surface cover in both 1996 and 2002. Bare soil is moderate in all years ranging from 12-16%. Vegetation cover is moderately high, but the majority comes from annual grasses and forbs. Litter cover is low at 28% or less over the last 3 readings. The abundance of annuals has not allowed litter to build-up on the site. In past years, a high rate of erosion was reported and a loss of topsoil resulted. In 1996 and 2002, surface erosion was minimal, and a soil erosion condition assessment gave soils a stable rating in 2002.

As reported in 1989, browse forage remains very limited. Mountain big sagebrush had an estimated density of only 340 plants/acre in 1996 and 2002. Age structure has shifted from a young population in 1983 and 1989, to a more mature population in 1996 and 2002. No young plants were sampled in 2002 which is not surprising due to the very dry conditions, as well as the abundance of annual species in the understory. Utilization has been moderate to heavy in all readings, but decadence and poor vigor have declined with each reading. Seedheads were forming on about 75% of the population in 2002, and annual leaders averaged just over 3 inches. Other palatable browse on the site include white-stemmed rubber rabbitbrush, serviceberry, and a few scattered bitterbrush. These species all have low densities that are declining.

Broom snakeweed, a less desirable increaser, had an estimated density of 11,540 plants/acre in 1996. The population looked to be expanding with 59% of the population being young plants, and an astounding 21,280 seedlings/acre being sampled in 1996. In 2002, snakeweed numbered only 160 plants/acre. Snakeweed often declines during dry periods as was the case in 2002 with drought.

The herbaceous understory is dominated by annual species. Unlike many other sites around the state during the current drought, cheatgrass increased in average cover and retained nearly the same nested frequency value in 2002. Cheatgrass provided 44% of the grass cover in 1996, increasing to 73% in 2002. Japanese brome occurred in 44% of the quadrats in 2002, yet was not sampled in any of the previous readings. The most abundant annual forbs include pale alyssum, storksbill, little flower collinsia, sunflower, and bur buttercup. Sum of nested frequency of annual grasses increased in 2002, while sum of nested frequency for annual forbs declined. With drought in 2002, the decrease in annual forbs is expected, but as was reported earlier, the increase in annual grasses is somewhat surprising.

Only three perennial grass species were sampled in 2002, bluebunch wheatgrass, Sandberg bluegrass, and bulbous bluegrass. Bluebunch wheatgrass increased in nested frequency, while Sandberg bluegrass remained stable. Bulbous bluegrass was only sampled in two quadrats. Perennial forbs were moderately abundant in 1996, but with drought in 2002, they declined 69% in sum of nested frequency. The perennial forb composition has been composed of mostly less desirable species such as thistle, hairy goldaster, dalmatian toadflax, and houndstongue.



### 1983 APPARENT TREND ASSESSMENT

Overall trend appears to be declining, especially vegetatively. Soil, although eroded, is nonetheless capable of producing a more desirable mix of forage. However, to do so will require more than just rest from animal use. Some type of direct rehabilitation effort will be required if any meaningful short term improvement is to occur.

### 1989 TREND ASSESSMENT

While the site remains in poor condition, the vegetative trend is not as rapidly downward as predicted in 1983. Perennial grasses, although limited in production and desirability, increased in abundance. Trend for the herbaceous species is slightly up. Mountain big sagebrush also slightly increased in density although it remains limited. Sagebrush recruitment remains high with 42% of the population consisting of young plants. This may result in an increase in density in the future. Browse trend is stable. Soils have a stable trend. Cover of bare ground has remained similar to 1983 and basal vegetative cover has increased dramatically (2% to 9%). Litter cover has declined but it appears that much of the dried up cheatgrass was classified as litter in 1983.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly up (4)

### 1996 TREND ASSESSMENT

Soil trend is slightly improving with increasing litter cover and decreasing bare ground. Cryptogamic crust cover has increased to nearly 3% since 1989 when it was estimated at less than 1%. The mountain big sagebrush population has remained stable since 1983 with decadency decreasing over all years. Vigor has improved and utilization has decreased. One concern is the estimated density of broom snakeweed in 1996. At 11,540 plants/acre, an increase of over 9,000 plants/acre since 1989, this population should be carefully monitored. This great increase is likely due to a greatly increased sample size used in 1996. The browse trend is stable. The herbaceous understory is stable with poor composition. Native perennial grasses are still present but are greatly out numbered by annuals and other weedy species.

#### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

2002 TREND ASSESSMENT

Trend for soil is stable. Soils have continued erosion but it is currently low. Although litter cover slightly decreased and bare soil slightly increased, vegetation cover remains high even though the majority comes from annual species. Trend for browse is stable. Mountain big sagebrush has a stable but low density, while decadence and poor vigor declined. No young plants were sampled in 2002, but with a competitive annual understory and drought conditions, the lack of young and seedling plants is expected. The herbaceous understory has a slightly downward trend. Although perennial grasses slightly increased in nested frequency, cheatgrass still dominates the understory. Perennial forbs declined in sum of nested frequency by 69% with drought. The composition of the understory remains dominated by weeds and increasers. One positive change is the significant increase in the nested frequency of bluebunch wheatgrass.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 14

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron cristatum	-	1	-	-	-	1	-	-	-	-
G	Agropyron spicatum	<sub>a</sub> 18	<sub>ab</sub> 37	<sub>b</sub> 65	<sub>c</sub> 101	7	19	32	46	3.63	4.47
G	Bromus japonicus (a)	-	-	<sub>a</sub> -	<sub>b</sub> 92	-	-	-	44	-	.57
G	Bromus tectorum (a)	-	-	346	347	-	-	98	100	5.82	20.35
G	Poa bulbosa	-	-	-	2	-	-	-	2	-	.01
G	Poa secunda	<sub>a</sub> 35	<sub>b</sub> 180	<sub>b</sub> 159	<sub>b</sub> 155	18	65	61	60	3.69	2.52
G	Sporobolus cryptandrus	-	-	4	-	-	-	1	-	.03	-
Total for Annual Grasses		0	0	346	439	0	0	98	144	5.82	20.92
Total for Perennial Grasses		53	218	228	258	25	85	94	108	7.35	7.00
Total for Grasses		53	218	574	697	25	85	192	252	13.17	27.92
F	Agoseris glauca	-	-	<sub>b</sub> 32	<sub>a</sub> 1	-	-	15	1	.19	.00
F	Allium acuminatum	<sub>a</sub> -	<sub>a</sub> 3	<sub>b</sub> 18	<sub>b</sub> 31	-	1	10	15	.05	.13
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 302	<sub>a</sub> 198	-	-	94	73	1.58	2.08
F	Astragalus beckwithii	-	-	-	4	-	-	-	2	-	.15
F	Astragalus tenellus	-	-	4	-	-	-	2	-	.04	-
F	Astragalus utahensis	<sub>a</sub> 2	<sub>ab</sub> 2	<sub>b</sub> 13	<sub>ab</sub> 6	1	2	5	4	.08	.19
F	Castilleja linariaefolia	2	-	8	1	1	-	5	1	.10	.15
F	Calochortus nuttallii	<sub>a</sub> -	<sub>ab</sub> 6	<sub>b</sub> 12	<sub>b</sub> 13	-	4	6	8	.03	.04
F	Cirsium spp.	<sub>b</sub> 65	<sub>b</sub> 78	<sub>b</sub> 67	<sub>a</sub> 2	31	38	32	2	1.11	.01
F	Collomia linearis (a)	-	-	<sub>b</sub> 21	<sub>a</sub> 3	-	-	11	1	.05	.00
F	Collinsia parviflora (a)	-	-	182	147	-	-	64	58	1.11	1.20
F	Cymopterus spp.	-	-	31	32	-	-	15	18	.10	.39
F	Cynoglossum officinale	-	4	-	-	-	2	-	-	-	-

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	Draba spp. (a)	-	-	<sub>b</sub> 50	<sub>a</sub> -	-	-	16	-	.10	-
F	Epilobium brachycarpum (a)	-	-	-	5	-	-	-	2	-	.01
F	Erodium cicutarium (a)	-	-	<sub>b</sub> 312	<sub>a</sub> 81	-	-	100	34	6.44	.80
F	Eriogonum racemosum	<sub>a</sub> -	<sub>ab</sub> 1	<sub>b</sub> 11	<sub>ab</sub> 1	-	1	5	1	.02	.01
F	Galium aparine (a)	-	-	1	-	-	-	1	-	.00	-
F	Gilia spp. (a)	-	-	-	1	-	-	-	1	-	.00
F	Helianthus annuus (a)	<sub>a</sub> 6	<sub>c</sub> 173	<sub>a</sub> -	<sub>b</sub> 100	4	68	-	46	-	.27
F	Heterotheca villosa	<sub>a</sub> 5	<sub>a</sub> 18	<sub>b</sub> 88	<sub>a</sub> 31	3	7	35	14	1.67	.94
F	Holosteum umbellatum (a)	-	-	190	171	-	-	62	60	2.63	.94
F	Lappula occidentalis (a)	-	-	-	3	-	-	-	1	-	.00
F	Lactuca serriola	-	3	2	-	-	1	2	-	.01	-
F	Linaria dalmatica	-	-	4	1	-	-	2	1	.03	.03
F	Machaeranthera spp	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 44	<sub>a</sub> -	-	-	17	-	.08	-
F	Oenothera pallida	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 24	<sub>b</sub> 8	-	-	9	5	.04	.02
F	Polygonum douglasii (a)	-	-	3	-	-	-	1	-	.00	-
F	Ranunculus testiculatus (a)	-	-	58	66	-	-	20	28	.20	.23
F	Tragopogon dubius	<sub>b</sub> 64	<sub>a</sub> 10	<sub>b</sub> 73	<sub>a</sub> 3	34	6	34	1	.78	.00
F	Verbascum thapsus	-	-	4	-	-	-	2	-	.15	-
Total for Annual Forbs		6	173	1119	775	4	68	369	304	12.14	5.58
Total for Perennial Forbs		138	125	435	134	70	62	196	73	4.53	2.09
Total for Forbs		144	298	1554	909	74	130	565	377	16.68	7.67

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 14

T y p e	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Amelanchier alnifolia	2	1	.15	.38
B	Artemisia tridentata vaseyana	15	15	1.16	1.28
B	Chrysothamnus nauseosus albicaulis	18	9	.72	1.17
B	Gutierrezia sarothrae	73	6	1.55	-
B	Opuntia spp.	40	36	2.77	1.54
B	Symphoricarpos oreophilus	1	1	.15	.15
Total for Browse		149	68	6.51	4.54

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 14

Species	Percent Cover	
	'96	'02
Artemisia tridentata vaseyana	-	2.33
Chrysothamnus nauseosus albicaulis	-	1.33
Opuntia spp.	-	1.75

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 14

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	3.2

BASIC COVER --

Herd unit 17 , Study no: 14

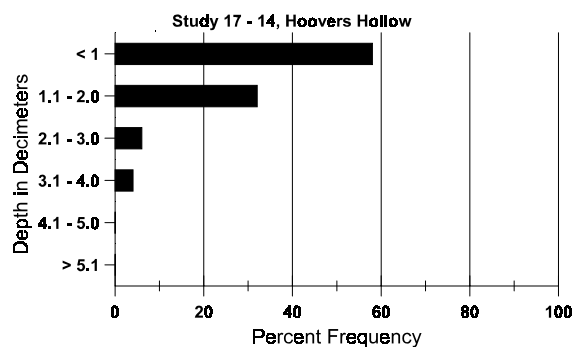
Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	386	368	2.00	9.25	36.09	45.96
Rock	307	309	9.25	13.50	18.57	17.48
Pavement	311	325	12.25	41.75	7.71	9.44
Litter	395	365	62.75	20.50	28.28	23.36
Cryptogams	111	100	.25	.75	2.79	1.22
Bare Ground	278	279	13.50	14.25	12.42	15.90

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 14, Hoovers Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.9	49.2 (7.2)	7.3	34.9	35.1	30.0	2.6	25.6	92.8	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 14

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'02	'02	'02
Rabbit	1	2	-	-
Elk	10	12	270	21 (51)
Deer	28	29	887	68 (169)
Cattle	-	-	17	2 (4)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 14

A Y G R E	Form Class (No. of Plants)	Vigor Class								Plants Per Acre	Average (inches)		Total			
		1	2	3	4	5	6	7	8		9	1		2	Ht. Cr.	
Amelanchier alnifolia																
M	83	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	-	-	20	13	21	1
	02	-	-	1	-	-	-	-	-	-	-	-	20	18	25	1
D	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	1	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%								
'89		00%			00%			00%								
'96		50%			50%			00%			-50%					
'02		00%			100%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%		
											'89	0		0%		
											'96	40		50%		
											'02	20		0%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Artemisia tridentata vaseyana																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	4	-	-	-	-	-	-	-	4	-	-	-	80		4
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	4	-	-	-	-	-	-	-	4	-	-	-	133		4
	89	1	2	2	-	-	-	-	-	5	-	-	-	166		5
	96	3	-	-	-	-	-	-	-	3	-	-	-	60		3
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	-	1	-	-	-	-	-	-	-	1	-	33	20 22	1
	89	1	1	2	-	-	-	-	-	3	1	-	-	133	15 18	4
	96	-	6	5	-	-	-	-	-	11	-	-	-	220	17 31	11
	02	4	10	1	-	-	-	-	-	15	-	-	-	300	19 32	15
D	83	-	-	3	-	-	-	-	-	2	-	1	-	100		3
	89	-	-	3	-	-	-	-	-	2	-	1	-	100		3
	96	1	2	-	-	-	-	-	-	2	-	-	1	60		3
	02	-	1	1	-	-	-	-	-	2	-	-	-	40		2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	-	-	-	-	-	180		9
	02	-	-	-	-	-	-	-	-	-	-	-	-	180		9
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			50%			25%			+33%					
'89		25%			58%			08%			-15%					
'96		47%			29%			06%			+ 0%					
'02		65%			12%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'83	266	Dec:	38%		
											'89	399		25%		
											'96	340		18%		
											'02	340		12%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'96	1	1	-	-	-	-	-	-	-	2	-	-	-	40		2	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	16	-	-	-	-	-	-	-	-	16	-	-	-	533	24 30	16	
	'89	2	2	-	-	-	-	-	-	-	4	-	-	-	133	18 20	4	
	'96	6	6	4	-	-	-	-	-	-	15	-	1	-	320	23 39	16	
	'02	4	-	-	-	-	-	-	-	-	4	-	-	-	80	31 39	4	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	2	3	1	-	-	-	-	-	-	2	2	-	2	200		6	
	'96	4	1	1	-	-	-	-	-	-	3	-	-	3	120		6	
	'02	3	1	1	-	-	-	-	-	-	3	-	-	2	100		5	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
		'83 00%			'83 00%			'83 00%			-31%							
		'89 45%			'89 09%			'89 18%			+24%							
		'96 33%			'96 21%			'96 17%			-63%							
		'02 11%			'02 11%			'02 22%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	0%			
												'89	366		55%			
												'96	480		25%			
												'02	180		56%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Gutierrezia sarothrae																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	100	-	-	-	-	-	-	-	100	-	-	-	3333		100
	96	1063	-	-	1	-	-	-	-	1064	-	-	-	21280		1064
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	3	-	-	-	-	-	-	-	3	-	-	-	100		3
	96	338	-	-	-	-	-	-	-	338	-	-	-	6760		338
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	98	-	-	-	-	-	-	-	98	-	-	-	3266	9 11	98
	89	51	-	-	-	-	-	-	-	50	-	1	-	1700	8 10	51
	96	234	-	-	3	-	-	-	-	237	-	-	-	4740	5 8	237
	02	6	-	-	-	-	-	-	-	6	-	-	-	120	5 8	6
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	20	-	-	-	-	-	-	-	7	-	7	6	666		20
	96	2	-	-	-	-	-	-	-	2	-	-	-	40		2
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	-	-	-	-	-	100		5
	02	-	-	-	-	-	-	-	-	-	-	-	-	1280		64
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%			-24%					
'89		00%			00%			19%			+79%					
'96		00%			00%			00%			-99%					
'02		00%			00%			13%								
Total Plants/Acre (excluding Dead & Seedlings)											'83	3266	Dec:	0%		
											'89	2466		27%		
											'96	11540		0%		
											'02	160		13%		



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
Opuntia spp.																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	3	-	-	-	-	-	-	-	2	-	1	-	100		3			
	96	1	-	-	-	-	-	-	-	1	-	-	-	20		1			
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	10	-	-	-	-	-	-	-	9	-	1	-	333		10			
	96	2	-	-	-	-	-	-	-	2	-	-	-	40		2			
	02	8	-	-	-	-	-	-	-	8	-	-	-	160		8			
M	83	183	-	-	-	-	-	-	-	183	-	-	-	6100	6	6	183		
	89	9	-	-	-	-	-	-	-	7	-	2	-	300	5	22	9		
	96	28	-	-	-	-	-	-	-	28	-	-	-	560	6	33	28		
	02	42	-	1	-	-	-	-	-	43	-	-	-	860	5	16	43		
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	3	-	-	-	-	-	-	-	-	-	2	1	100		3			
	96	20	-	-	-	-	-	-	-	11	-	1	8	400		20			
	02	18	-	-	-	-	1	-	-	10	-	-	9	380		19			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	96	-	-	-	-	-	-	-	-	-	-	-	-	20		1			
	02	-	-	-	-	-	-	-	-	-	-	-	-	100		5			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		-88%											
'89		00%		00%		27%		+27%											
'96		00%		00%		18%		+29%											
'02		00%		01%		13%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	6100	Dec:	0%						
										'89	733		14%						
										'96	1000		40%						
										'02	1400		27%						
Purshia tridentata																			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	96	-	-	-	-	-	-	-	-	-	-	-	-	0	7	28	0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%													
'89		00%		00%		00%													
'96		00%		00%		00%													
'02		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-						
										'89	0		-						
										'96	0		-						
										'02	0		-						

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	11	0
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	14	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	20		-			
												'02	20		-			

Trend Study 17-15-02

Study site name: Island Boat Camp.

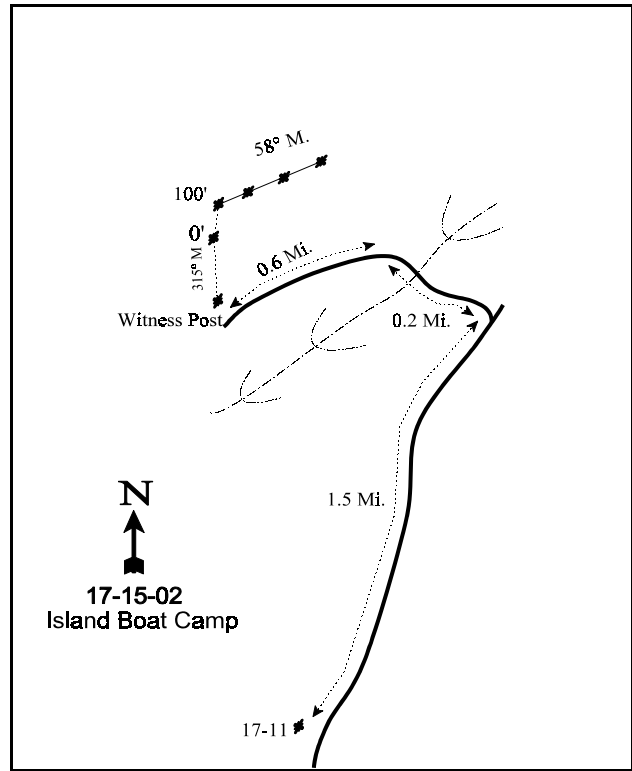
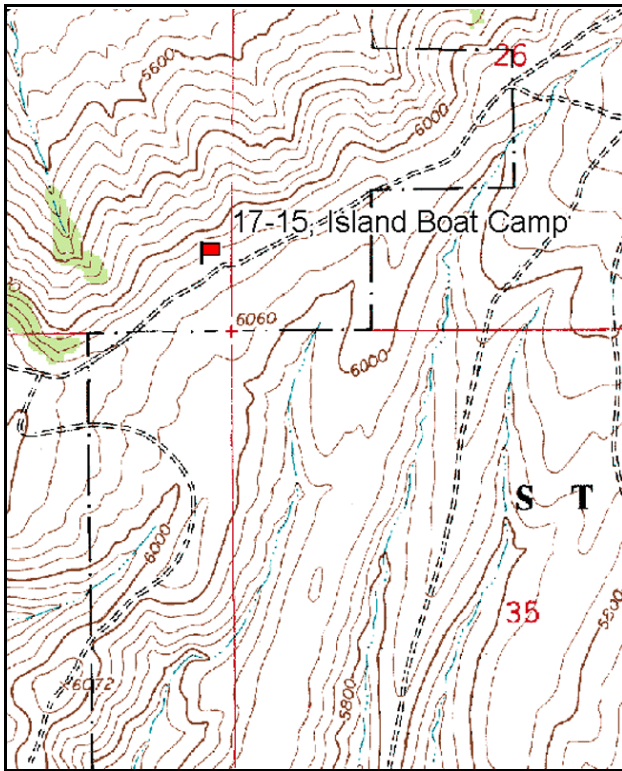
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 1 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile passing through two DWR gates to another intersection, and turn right. Proceed 0.05 miles to a small rock pile on the left(i.e., east) side of the road which marks study #17-11, Wallsburg Turn. Continue down the road traveling north passing a left fork for 1.5 miles to a fork. Bear left and go 0.2 miles thru a drainage to another ridge top and bear left. Drive along the ridge 0.6 miles to a witness post on the north side of the road. 0-foot stake marked with a browse tag #415.



Map Name: Charleston

Diagrammatic Sketch

Township 4S, Range 4E, Section 26

GPS: NAD 27, UTM 12S 4476050 N 459965 E

## DISCUSSION

### Island Boat Camp - Trend Study No. 17-15

This study is located on a ridge overlooking both Wallsburg and the Island Boat Camp. It is representative of the unburned mountain brush type that formerly was so prevalent on better quality sites in the western part of the Wallsburg-Deer Creek Reservoir winter range. Virtually all of the winter range to the north, east and south of this site was burned in 1976. The study begins on the ridge top and extends onto a slight (3-5%) northwest slope. Elevation is approximately 6,000 feet. Big game use, as evidenced by levels of hedging on the principal browse and frequency of deer and elk pellet groups, is moderately high. Pellet group transect data taken in 2002 estimated 125 deer days use/acre (309 ddu/ha) and 31 elk days use/acre (78 edu/ha). Most of the deer and elk pellet groups appear to be from winter use, but about 15% are from spring use. Cattle also use the area but not excessively.

Soils are deep and derived from limestone. Effective rooting depth is estimated at over 17 inches. The average soil temperature at 18 inches in depth was 50.2°F in 1996. Textural and chemical analysis indicates a clay loam that is slightly alkaline in reactivity (pH of 7.8). Rock cover is sparse on the surface and evenly distributed throughout the profile. Vegetation and litter cover are high and well distributed over the site, resulting in low soil erosion. Bare soil is low averaging about 8% in 1996 and 2002. A soil erosion assessment done in 2002 gave a stable condition rating.

The browse component is productive and diverse with several preferred species. Mountain big sagebrush, serviceberry, and antelope bitterbrush are the prominent forage species for big game. Mountain big sagebrush provides just over 10% canopy cover. Density data shows a slow but steady decline since 1983, with an estimated density of 1,740 plants/acre in 2002. Percent decadence has been moderate in most years. It increased from 27% in 1996 to 38% in 2002. Vigor was normal on all but about 10% of the population in 1996 and 2002. The highest level of poor vigor was in 1989 at 29%. The majority of the mountain big sagebrush were moderately hedged in 1983 and 1989, with heavy use slightly increasing in 1996 and 2002. Young plants occurred in moderately low numbers during the last three readings and numbered 100 plants/acre in 2002. Annual leader growth for sagebrush averaged 2.2 inches in 2002.

Antelope bitterbrush is a mature population with no seedling or young classified in 1996 or 2002. The rate of decadency has fluctuated from a high of 40% in 1989 to a low of 13% in 1996. Decadence was estimated at 29% in 2002, the same level as the initial sampling in 1983. Utilization has been moderate to heavy during all readings. Annual leader growth of bitterbrush averaged 2.4 inches in 2002.

The serviceberry population had an estimated density of 700 plants/acre in 2002, a 43% decrease since 1996. Most of the decline is due to fewer young plants being sampled in 2002. Decadence increased from 7% in 1996 to 29% in 2002. This level is still much lower than what was reported in both 1983 and 1989. Utilization has been moderate to heavy in all readings. Serviceberry vigor greatly improved in 1996 and 2002 compared to the first two readings.

The most abundant species is the unutilized stickyleaf low rabbitbrush. Population density was estimated at 6,060 plants/acre in 1996, decreasing to 4,760 plants/acre in 2002. Other browse species present on the site include snowberry, gray horsebrush, and broom snakeweed.

The herbaceous understory is abundant and diverse. Nine perennial grass species were sampled in 2002 with bluebunch wheatgrass, mutton bluegrass, and Sandberg bluegrass being the most abundant. Other important grasses sampled include Indian ricegrass, crested wheatgrass, and onion grass. Utilization on grasses was not apparent during the 2002 reading. Sum of nested frequency for perennial grasses has increased with every reading since 1983. Although present, cheatgrass is not very abundant on this site. An abundance of perennial grasses is the best tool to keep cheatgrass in check.

Perennial forbs are much more abundant and diverse on this site compared to others in the area. Sum of nested frequency for perennial forbs increased with every reading from 1983 to 1996, but decreased by 40% in 2002. A decline in forbs has been documented on most other studies in 2002 and is the result of the drought conditions. Even with the decrease in frequency, several important species are present including sulfur eriogonum, pale agoseris, sego lily, tapertip hawksbeard, spring parsley, redroot eriogonum, lobeleaf groundsel, and violet. Annual forbs also declined in sum of nested frequency in 2002 and include little flower collinsia, pale alyssum, and Douglas knotweed.

#### 1983 APPARENT TREND ASSESSMENT

Soil and vegetation both appear stable. This is a highly productive site which, when compared to similar burned areas, gives one an appreciation of what was lost from the 1976 fire. A possible use for this study might be as a "reference area" from which management objectives for the burned areas might be derived.

#### 1989 TREND ASSESSMENT

The soil trend is up slightly. Vegetation and litter cover remain abundant, and bare soil declined to 9%. Browse trend is stable. Big sagebrush declined in density and recruitment, and has increased decadence. However, serviceberry and bitterbrush both increased in density, and have high recruitment from young plants. There is ample browse forage available. The herbaceous understory has an upward trend as sum of nested frequency of perennial grasses and forbs increased. There is excellent production and diversity of forage. More sign of big game use was observed here than on any other study site around Wallsburg.

##### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up (5)

#### 1996 TREND ASSESSMENT

Soil trend is stable with litter and bare ground cover values remaining nearly constant. Rock and pavement cover declined since 1989 to values similar to those reported in 1983. The browse trend is also stable. The key species show improvements in vigor and lower decadence. Mountain big sagebrush density has slowly declined since 1983 and this trend should continue to be monitored in the future. The stickyleaf low rabbitbrush and broom snakeweed densities should also be monitored for possible displacement of the more palatable forage species. The sum of nested frequency for both grasses and forbs has increased since 1989. This indicates an upward trend with high diversity.

##### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up (5)

2002 TREND ASSESSMENT

Soil trend is stable. Bare soil slightly declined as did litter, but vegetation cover increased. Herbaceous vegetation is abundant and well distributed over the site effectively limiting erosion. Trend for browse is slightly down. The key species show slightly declining populations, inadequate or decreasing recruitment, and increased decadence. Changes in these key parameters since 1996 is due mostly to the drought experienced in 2002 and should improve with a return of normal precipitation. The herbaceous species have a slightly downward trend as well. Drought in 2002 especially effected the forbs which decreased in sum of nested frequency. Perennial grasses increased slightly in nested frequency, but these are not enough to offset the decline in forbs.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 15

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron cristatum	a-	bc8	ab8	c25	-	5	3	10	.06	1.82
G	Agropyron spicatum	a104	a119	b178	b205	42	48	60	74	6.32	10.72
G	Bromus tectorum (a)	-	-	b67	a7	-	-	22	4	.68	.02
G	Festuca ovina	b15	a-	a-	a-	7	-	-	-	-	-
G	Melica bulbosa	-	-	4	7	-	-	2	4	.06	.19
G	Oryzopsis hymenoides	19	46	24	32	11	22	11	14	.91	1.35
G	Poa spp.	-	-	-	15	-	-	-	4	-	1.52
G	Poa fendleriana	a103	b172	b198	b172	41	69	69	61	5.01	4.99
G	Poa pratensis	a-	b12	a5	a7	-	5	2	2	.06	.18
G	Poa secunda	a-	b30	b60	c125	-	16	27	47	1.27	2.52
G	Sitanion hystrix	-	-	-	-	-	-	-	-	-	.00
G	Stipa comata	3	5	-	-	1	2	-	-	-	-
Total for Annual Grasses		0	0	67	7	0	0	22	4	0.68	0.01
Total for Perennial Grasses		244	392	477	588	102	167	174	216	13.72	23.32
Total for Grasses		244	392	544	595	102	167	196	220	14.40	23.34
F	Agoseris glauca	a5	a-	c141	b36	2	-	57	16	.95	.23
F	Alyssum alyssoides (a)	-	-	b105	a19	-	-	38	9	.18	.04
F	Allium spp.	a9	b70	a31	b93	5	35	16	42	.08	.36
F	Antennaria rosea	a-	b21	b40	b32	-	10	18	12	.52	.64
F	Arabis spp.	5	-	-	-	3	-	-	-	-	-
F	Astragalus cibaricus	a-	a-	c93	b50	-	-	37	23	2.68	.66

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	<i>Astragalus convallarius</i>	13	9	3	11	6	5	3	6	.01	.05
F	<i>Balsamorhiza sagittata</i>	<sub>a</sub> 18	<sub>ab</sub> 33	<sub>c</sub> 85	<sub>bc</sub> 56	9	18	37	24	4.46	4.77
F	<i>Castilleja linariaefolia</i>	-	3	2	4	-	1	2	2	.03	.06
F	<i>Calochortus nuttallii</i>	<sub>ab</sub> 7	<sub>b</sub> 15	<sub>ab</sub> 13	<sub>a</sub> 3	5	9	6	1	.03	.00
F	<i>Castilleja</i> spp.	-	-	3	-	-	-	1	-	.03	-
F	<i>Chaenactis douglasii</i>	-	-	1	-	-	-	1	-	.03	-
F	<i>Cirsium</i> spp.	2	-	3	1	1	-	1	1	.00	.03
F	<i>Collomia linearis</i> (a)	-	-	<sub>b</sub> 30	<sub>a</sub> 3	-	-	17	2	.11	.01
F	<i>Comandra pallida</i>	<sub>ab</sub> 24	<sub>b</sub> 27	<sub>ab</sub> 22	<sub>a</sub> 3	10	15	10	3	.10	.01
F	<i>Collinsia parviflora</i> (a)	-	-	198	216	-	-	72	74	.70	1.07
F	<i>Crepis acuminata</i>	<sub>a</sub> -	<sub>bc</sub> 4	<sub>c</sub> 95	<sub>b</sub> 26	-	4	43	12	.84	.55
F	<i>Cryptantha</i> spp.	2	-	-	-	1	-	-	-	-	-
F	<i>Cymopterus longipes</i>	-	-	<sub>b</sub> 70	<sub>a</sub> 29	-	-	36	15	.33	.12
F	<i>Cynoglossum officinale</i>	-	-	3	-	-	-	1	-	.00	-
F	<i>Delphinium nuttallianum</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 41	<sub>a</sub> 3	-	-	18	1	.11	.03
F	<i>Erigeron divergens</i>	-	-	-	10	-	-	-	4	-	.24
F	<i>Eriogonum ovalifolium</i>	-	-	-	3	-	-	-	1	-	.00
F	<i>Erigeron pumilus</i>	<sub>a</sub> -	<sub>ab</sub> 6	<sub>b</sub> 23	<sub>b</sub> 18	-	3	10	8	.07	.14
F	<i>Eriogonum racemosum</i>	25	25	14	16	12	15	7	7	.06	.16
F	<i>Eriogonum umbellatum</i>	<sub>a</sub> 74	<sub>a</sub> 80	<sub>b</sub> 143	<sub>a</sub> 107	30	33	58	50	2.49	2.04
F	<i>Galium</i> spp.	-	-	3	-	-	-	2	-	.01	-
F	<i>Hackelia patens</i>	5	16	20	10	3	9	10	5	.07	.05
F	<i>Lactuca serriola</i>	2	-	-	-	1	-	-	-	-	-
F	<i>Linum lewisii</i>	<sub>a</sub> 3	<sub>a</sub> 3	<sub>b</sub> 21	<sub>a</sub> 13	2	2	11	5	.22	.13
F	<i>Lomatium triternatum</i>	<sub>a</sub> -	<sub>b</sub> 24	<sub>b</sub> 17	<sub>a</sub> -	-	11	9	-	.04	-
F	<i>Lupinus argenteus</i>	21	34	43	19	10	15	19	9	1.00	.43
F	<i>Machaeranthera canescens</i>	<sub>ab</sub> 11	<sub>b</sub> 22	<sub>a</sub> 3	<sub>a</sub> -	5	11	1	-	.00	-
F	<i>Machaeranthera</i> spp.	5	-	-	-	3	-	-	-	-	-
F	<i>Mertensia</i> spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 8	<sub>a</sub> -	-	-	5	-	.05	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	6	-	-	-	2	-	.01
F	<i>Orthocarpus</i> spp. (a)	-	-	<sub>b</sub> 9	<sub>a</sub> -	-	-	5	-	.05	-
F	<i>Penstemon humilis</i>	-	3	-	-	-	1	-	-	-	-
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 90	<sub>c</sub> 134	<sub>c</sub> 144	-	47	56	59	.30	.86
F	<i>Polygonum douglasii</i> (a)	-	-	<sub>b</sub> 19	<sub>a</sub> 3	-	-	7	1	.03	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	3	-	-	-	1	-	.00	-
F	<i>Senecio multilobatus</i>	<sub>b</sub> 23	<sub>a</sub> 6	<sub>ab</sub> 9	<sub>a</sub> 8	13	3	7	4	.04	.04
F	<i>Taraxacum officinale</i>	-	-	1	4	-	-	1	2	.00	.03
F	<i>Tragopogon dubius</i>	23	23	27	29	11	15	13	14	.09	.19
F	<i>Vicia americana</i>	-	6	-	-	-	2	-	-	-	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	Viola spp.	a-	a-	b <sup>103</sup>	a-	-	-	42	-	1.35	-
Total for Annual Forbs		0	0	364	247	0	0	140	88	1.09	1.13
Total for Perennial Forbs		277	520	1215	728	132	264	538	326	16.08	11.90
Total for Forbs		277	520	1579	975	132	264	678	414	17.18	13.04

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

BROWSE TRENDS --

Herd unit 17 , Study no: 15

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Amelanchier alnifolia	41	30	3.92	4.71
B	Artemisia tridentata vaseyana	62	56	10.25	10.47
B	Chrysothamnus viscidiflorus viscidiflorus	81	81	7.44	7.40
B	Gutierrezia sarothrae	10	6	.34	.45
B	Purshia tridentata	27	27	5.14	7.72
B	Symphoricarpos oreophilus	18	19	1.90	3.75
B	Tetradymia canescens	8	7	.03	.15
Total for Browse		247	226	29.05	34.68

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 15

Species	Percent Cover	
	'96	'02
Amelanchier utahensis	-	5.58
Artemisia tridentata vaseyana	-	10.25
Chrysothamnus viscidiflorus viscidiflorus	-	7.33
Gutierrezia sarothrae	-	.25
Purshia tridentata	-	7.92
Symphoricarpos oreophilus	-	2.08

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 15

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.2
Purshia tridentata	2.4



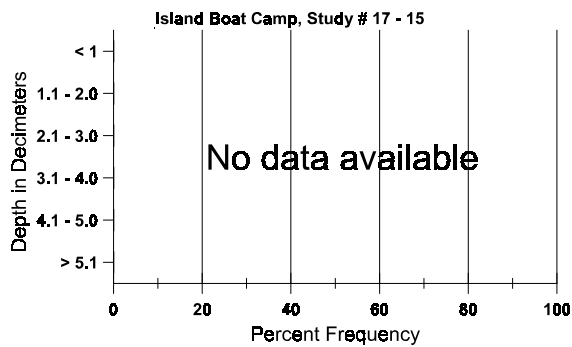
BASIC COVER --  
Herd unit 17 , Study no: 15

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	381	368	.50	12.00	54.79	60.15
Rock	84	36	1.00	1.25	1.50	.68
Pavement	123	159	2.75	17.25	2.71	4.29
Litter	400	387	75.75	58.75	61.57	55.50
Cryptogams	31	18	.75	1.25	.64	.98
Bare Ground	171	150	19.25	9.50	8.54	7.38

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 15, Island Boat Camp

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.6	50.2 (18.1)	7.6	32.9	33.1	34.0	4.8	12.8	160.0	07

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 15

Type	Quadrat Frequency		Pellet Transect	
	'96	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	5	1	-	-
Elk	19	17	409	31 (78)
Deer	35	52	1627	125 (309)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --  
Herd unit 17 , Study no: 15

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Amelanchier alnifolia																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	2	-	-	-	-	-	3	-	-	-	200		3	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	2	-	-	1	-	-	5	-	2	-	466		7	
	96	12	-	-	8	-	-	-	-	-	20	-	-	-	400		20	
	02	1	-	-	5	-	-	-	-	-	6	-	-	-	120		6	
M	83	1	3	-	-	-	-	-	-	-	3	1	-	-	266	26	18	4
	89	-	2	1	-	-	-	-	-	-	3	-	-	-	200	47	43	3
	96	5	9	2	12	6	3	-	-	-	37	-	-	-	740	31	40	37
	02	-	3	8	1	3	4	-	-	-	19	-	-	-	380	32	36	19
D	83	-	3	1	-	-	-	-	-	-	-	2	-	2	266		4	
	89	-	8	3	1	1	-	-	-	-	4	-	6	3	866		13	
	96	1	1	2	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	3	3	-	-	3	-	-	1	8	-	-	2	200		10	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		75%			13%			25%			+65%							
'89		48%			17%			48%			-20%							
'96		26%			11%			00%			-43%							
'02		26%			54%			06%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	532	Dec:	50%			
												'89	1532		57%			
												'96	1220		7%			
												'02	700		29%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata vaseyana																		
Y	'83	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	'89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	'96	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
	'02	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	'83	23	6	-	-	-	-	-	-	-	29	-	-	-	1933	24	26	29
	'89	13	5	-	1	-	-	-	-	-	16	-	3	-	1266	25	30	19
	'96	23	39	7	1	4	-	-	-	-	74	-	-	-	1480	27	43	74
	'02	26	12	8	1	2	-	-	-	-	48	1	-	-	980	29	35	49
D	'83	2	7	1	-	-	-	-	-	-	10	-	-	-	666			10
	'89	7	9	-	-	-	-	-	-	-	7	1	7	1	1066			16
	'96	8	13	5	-	2	-	-	-	-	18	-	1	9	560			28
	'02	7	16	7	2	-	-	1	-	-	23	-	-	10	660			33
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	780			39
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
		'83			27%			02%			00%			-21%				
		'89			37%			00%			29%			-18%				
		'96			56%			12%			10%			-16%				
		'02			34%			17%			11%							
Total Plants/Acre (excluding Dead & Seedlings)												'83	3199	Dec:	21%			
												'89	2532		42%			
												'96	2080		27%			
												'02	1740		38%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	1	-	1	-	133		2	
	96	31	-	-	1	-	-	-	-	-	32	-	-	-	640		32	
	02	10	-	-	-	-	-	-	-	-	10	-	-	-	200		10	
M	83	61	-	-	-	-	-	-	-	-	61	-	-	-	4066	9	9	61
	89	51	-	-	4	-	-	1	-	-	52	-	4	-	3733	13	16	56
	96	246	2	-	23	-	-	-	-	-	271	-	-	-	5420	12	21	271
	02	207	-	1	17	-	-	-	-	-	224	-	1	-	4500	11	17	225
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	9	-	-	-	-	-	-	-	-	7	1	1	-	600		9	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 9%							
'89		00%			00%			09%			+26%							
'96		.66%			00%			00%			-21%							
'02		00%			.42%			.42%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4066	Dec:	0%			
												'89	4466		13%			
												'96	6060		0%			
												'02	4760		1%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Gutierrezia sarothrae																	
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'96	27	-	-	1	-	-	-	-	-	28	-	-	-	560	8	10
	'02	21	-	1	5	-	-	-	-	-	27	-	-	-	540	6	6
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
	'02	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'96		00%			00%			00%			-37%						
'02		00%			03%			07%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%		
												'89	0		0%		
												'96	920		11%		
												'02	580		7%		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	'89	-	4	-	-	-	-	-	-	-	4	-	-	-	266		4	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	1	3	2	-	-	-	-	-	-	6	-	-	-	400	43	54	6
	'89	-	5	-	-	-	-	-	-	-	5	-	-	-	333	38	47	5
	'96	-	2	20	1	1	2	-	-	-	25	1	-	-	520	40	71	26
	'02	-	4	9	1	-	6	-	-	-	20	-	-	-	400	43	62	20
D	'83	-	4	-	-	-	-	-	-	-	4	-	-	-	266		4	
	'89	-	5	1	-	-	-	-	-	-	6	-	-	-	400		6	
	'96	-	2	-	-	1	1	-	-	-	1	-	-	3	80		4	
	'02	-	1	4	-	-	3	-	-	-	5	-	-	3	160		8	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			14%			00%			+ 7%							
'89		93%			07%			00%			-40%							
'96		20%			77%			10%			- 7%							
'02		18%			79%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	932	Dec:	29%			
												'89	999		40%			
												'96	600		13%			
												'02	560		29%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Symphoricarpos oreophilus																	
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1
	'96	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	5	-	-	4	-	-	-	-	-	9	-	-	-	180		9
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'96	5	1	-	13	-	-	-	-	-	19	-	-	-	380	23	29
	'02	10	-	-	13	-	-	3	-	-	26	-	-	-	520	27	31
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'96		04%			00%			00%			- 4%						
'02		00%			00%			04%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%			
											'89	0		0%			
											'96	560		0%			
											'02	540		4%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
Y	'83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	'89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	'96	4	-	-	1	-	-	-	-	-	5	-	-	-	100		5	
	'02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	'83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	12	12	3
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	10	1
	'96	2	-	-	-	1	-	-	-	-	3	-	-	-	60	8	12	3
	'02	5	1	-	-	-	-	-	-	-	6	-	-	-	120	8	16	6
D	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	'96	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	'02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-57%							
'89		00%			00%			00%			-20%							
'96		13%			00%			00%			+ 0%							
'02		13%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	466	Dec:	14%			
												'89	199		0%			
												'96	160		0%			
												'02	160		0%			



Trend Study 17-16-02

Study site name: Rainbow Bay.

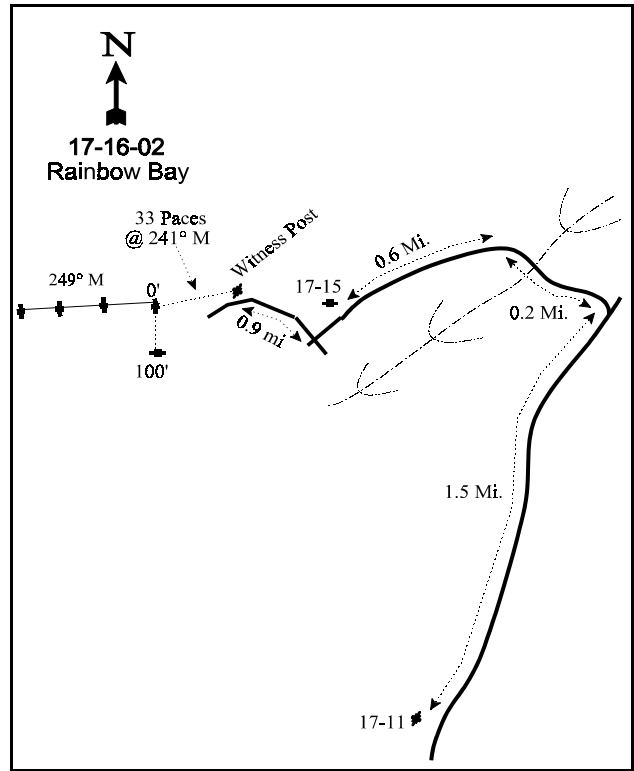
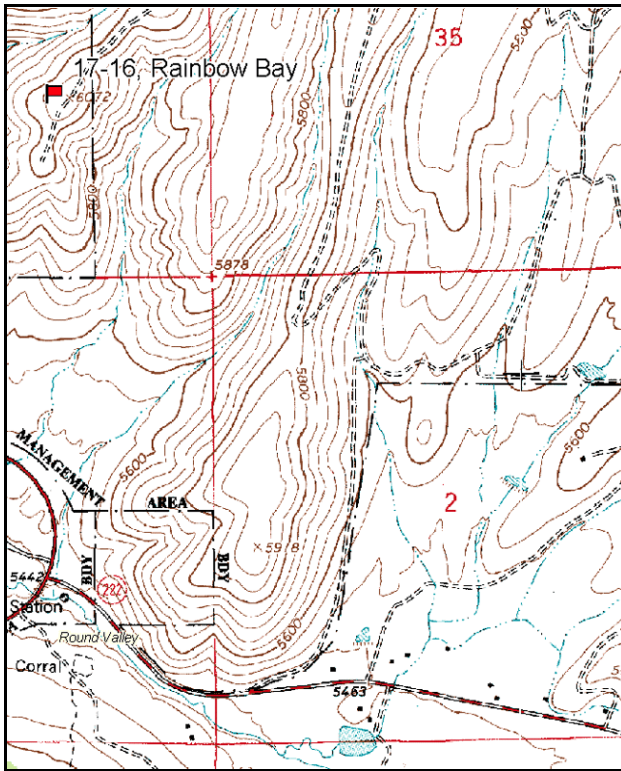
Vegetation type: Big Sagebrush-Grass.

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

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile passing through two DWR gates to another intersection, and turn right. Proceed 0.05 miles to a small rock pile on the left (east) side of the road which marks study #17-11, Wallsburg Turn. Continue down the road 1.5 miles from study 17-11 to a fork. Bear left and go 0.2 miles thru a drainage to another ridge top and bear left. Drive along the ridge 0.6 miles to a witness post on the north side of the road which marks study #17-15. Continue down this road to an intersection with a short telephone post and a Mountain Bell wire warning sign. Turn left and stay left for 0.9 miles to a witness post on the north side of the road. From the witness post, the 0-foot stake is 33 paces away at an azimuth of 241 degrees magnetic, marked with browse tag #3947.



Map Name: Charleston

Diagrammatic Sketch

Township 4S, Range 4E, Section 34

GPS: NAD 27, UTM 12S 4474831 N 459486 E

## DISCUSSION

### Rainbow Bay - Trend Study No. 17-16

This study is located on big sagebrush-grass rangeland near the top of the high knoll immediately east of Rainbow Bay on Deer Creek Reservoir. The site is relatively dry as it lies on a moderate sloping (15-20%) west to southwest facing hillside. Elevation is approximately 6,000 feet. This area, although within a few hundred meters of the 1976 burn, was spared from the fire. However, it does appear that the area did burn during one of the earlier fires in the late 1960's or early 1970's. The presence of numerous fire scarred sagebrush stumps provides evidence of a past fire on the site. Winter deer and elk use was reportedly heavy prior to 1989. Data and observations in 1989 showed only light to moderate levels of hedging and pellet group densities. In 1996 and 2002, deer use was high while elk use was light to moderate. Pellet group transect data collected in 2002 estimated 100 deer days use/acre (248 ddu/ha) and 26 elk days use/acre (64 edu/ha). Cattle were seen below the site in 1996, but use of site by livestock has been minimal.

Soils are derived from sedimentary limestone and have a clay loam texture. Average soil temperature at 11 inches was 51°F in 1996. Soil reactivity is neutral (pH of 7.2). There are more bare patches of soil with quite a bit of erosion pavement near the ridge top. In 1983, it was reported that there were no large gullies present but sheet erosion was obvious. Also, a large percentage of the ground surface was occupied either by erosion pavement, bare ground, or a thin cover of cheatgrass litter. Perennial plants were also reported to be pedestalled. Rock and pavement cover have declined since that time and erosion did not appear to be a problem in 1996 and 2002. Bare ground cover increased slightly in 1996 and 2002, but vegetation and litter cover are abundant and appear adequate to protect the soil at this time. A soil erosion assessment done in 2002 gave a stable condition rating.

The mountain big sagebrush population has steadily declined with each reading. Density was estimated at 1,520 plants/acre in 1996, decreasing to 1,060 plants/acre in 2002. Big sagebrush density was much higher in 1983 and 1989, but with the small sample size used in those years, the population was most likely overestimated. Decadency has been high during the last three readings with about one-half of the population being classified as such. Vigor has slowly declined with each successive reading as well. Utilization has been moderate in most years. Recruitment of young plants was moderate in 1983 and 1989, but has declined to low levels in 1996 and 2002. There are not enough young in the population to replace the decadent and dying plants that will likely be lost in the future. Annual leader growth on sagebrush averaged 2.8 inches in 2002. There was almost as many dead plants as live in 2002.

Antelope bitterbrush density was estimated at 340 plants/acre in 2002, a decrease from 480 plants/acre in 1996. Use was moderate to heavy in 1996 and 2002, but vigor was normal and decadency low. Bitterbrush annual leader growth averaged 3 inches in 2002.

The broom snakeweed density increased to an estimated 14,580 plants/acre in 1996, but declined to 3,500 plants/acre in 2002 with the drought. Snakeweed highly fluctuates with precipitation. Most of the broom snakeweed is located near the ridge top where open patches exist. Stickyleaf low rabbitbrush had an estimated density of 820 plants/acre in 2002, a slight increase from 640 in 1996. This species shows no use, good vigor, and virtually no decadency in all years. Other browse species include serviceberry, prickly pear, and gray horsebrush.

The herbaceous understory is abundant and diverse. Perennial grass sum of nested frequency has increased since 1989, due to increases in bluebunch wheatgrass, crested wheatgrass, and Sandberg bluegrass. Cheatgrass is abundant on the site as well. Between 1996 to 2002, cheatgrass more than doubled in average cover, but remained stable in both nested and quadrat frequencies. This was somewhat of a surprise with the drought conditions of 2002, as cheatgrass often declines during drought. Other grasses include Indian ricegrass, mutton bluegrass, and bulbous bluegrass.

Forbs are diverse with 28 species sampled on the site in 2002. Sum of nested frequency for perennial forbs steadily increased between 1983 and 1996. With drought in 2002, perennial forb sum of nested frequency declined by 57%. Some of the important perennial species include pale agoseris, silky milkvetch, paintbrush, spring parsley, and yellow salsify. Most of these species declined in frequency during the 2002 reading. The abundance of annual forbs also declined in 2002 with the dry conditions. Annuals are predominantly composed of low growing species such as holosteum, alyssum, and little flower collinsia. It was noted in 1996 that the parsley and arrowleaf balsamroot were being utilized.

#### 1983 APPARENT TREND ASSESSMENT

Soil trend appears stable to declining. Vegetative cover, especially from grasses and forbs, is inadequate to prevent rapid sheet erosion. Vegetative trend is less obvious. The browse component appears stable and could improve if antelope bitterbrush is able to increase in density. However, grasses and forbs are obviously deficient and show few signs of any rapid increase. An ominous sign is the abundance of cheatgrass brome. The potential for a destructive fire will be high as long as cheatgrass continues to be a major part of the composition.

#### 1989 TREND ASSESSMENT

Trend for soil is slightly up. Bare soil remains low at 4%. Perennial grasses and forbs increased in sum of nested frequency providing additional protection against erosion. Trend for browse is slightly down. Mountain big sagebrush density declined and decadence increased to 45%. Trend for the herbaceous understory is slightly up with sum of nested frequency values for perennial grasses and forbs both improving.

##### TREND ASSESSMENT

soil - slightly up (4)

browse - slightly down (2)

herbaceous understory - slightly up (4)

#### 1996 TREND ASSESSMENT

Soil trend is stable with litter and vegetation being adequate to protect against erosion. Although bare ground has increased since 1989, it is not excessive. The mountain big sagebrush and bitterbrush populations are slowly declining over time. Decadence and poor vigor increased in the sagebrush population. Broom snakeweed has greatly increased in density, but this may be due to the greatly increased sample size used in 1996. The browse trend is slightly downward. The herbaceous understory trend is slightly upward due to the increase in sum of nested frequency for grasses and forbs since 1989. Many of the species are perennials with some seeded grasses encountered. The herbaceous understory exhibits high diversity, but many of the species are in low abundance.

##### TREND ASSESSMENT

soil - stable (3)

browse - slightly downward (2)

herbaceous understory - slightly upward (4)

2002 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics are similar to 1996 estimates. Bare soil increased from 7% to 11%, but total herbaceous cover increased and soils still exhibit minimal erosion. Trend for browse remains slightly down, with the browse component was considered in poor condition. Mountain big sagebrush declined in density and vigor, and decadence remains high at 49%. Recruitment is low, while dead sagebrush plants are nearly as abundant as live ones. Bitterbrush also slightly declined in density and increased decadence. Trend for the herbaceous understory is slightly down due to a 57% decline in the sum of nested frequency for perennial forbs. Forb loss is due to the drought in 2002 and will likely improve with better precipitation in the future. Sum of nested frequency for perennial grasses increased slightly, but not enough to offset the loss of perennial forbs.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 16

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron cristatum	a6	a13	a18	b41	4	5	7	12	1.39	3.54
G	Agropyron intermedium	a-	ab2	b12	ab8	-	2	6	4	.22	.02
G	Agropyron spicatum	a70	b150	c222	bc182	30	56	75	64	10.96	10.41
G	Bromus japonicus (a)	-	-	a-	b43	-	-	-	21	-	.18
G	Bromus tectorum (a)	-	-	270	261	-	-	84	84	3.04	7.90
G	Oryzopsis hymenoides	a-	ab11	b11	ab4	-	4	5	1	.19	.18
G	Poa bulbosa	a-	a3	a-	b25	-	1	-	9	-	.58
G	Poa fendleriana	-	-	6	-	-	-	2	-	.06	-
G	Poa secunda	a5	ab26	b42	c89	2	14	16	36	.45	1.95
G	Sitanion hystrix	-	1	-	1	-	1	-	1	-	.03
Total for Annual Grasses		0	0	270	304	0	0	84	105	3.04	8.07
Total for Perennial Grasses		81	206	311	350	36	83	111	127	13.28	16.71
Total for Grasses		81	206	581	654	36	83	195	232	16.32	24.79
F	Agoseris glauca	a-	ab2	c91	b17	-	1	45	10	.82	.10
F	Allium acuminatum	a-	a-	b14	c41	-	-	8	18	.18	.17
F	Alyssum alyssoides (a)	-	-	b289	a83	-	-	91	37	1.41	.28
F	Arabis spp.	a-	b11	ab3	3	-	6	2	1	.01	.00
F	Artemisia ludoviciana	3	1	-	-	1	1	-	-	-	-
F	Astragalus cibarius	a-	a-	c123	b22	-	-	57	13	4.16	.11
F	Astragalus convallarius	-	-	2	-	-	-	1	-	.00	-
F	Astragalus utahensis	b19	b17	ab6	a1	7	8	2	1	.03	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	Balsamorhiza sagittata	a7	b44	c76	c67	4	20	38	33	4.84	5.31
F	Castilleja linariaefolia	a-	a-	c40	b11	-	-	24	5	.22	.36
F	Calochortus nuttallii	a1	b41	a12	a13	1	22	6	7	.03	.03
F	Chaenactis douglasii	-	3	-	-	-	1	-	-	-	-
F	Cirsium spp.	a3	a-	b8	a-	1	-	6	-	.05	-
F	Collomia linearis (a)	-	-	b101	a3	-	-	47	2	.28	.01
F	Comandra pallida	a8	b22	a-	a-	3	10	-	-	-	-
F	Collinsia parviflora (a)	-	-	a252	b328	-	-	84	97	2.10	5.61
F	Crepis acuminata	a4	b20	ab12	ab12	2	10	7	7	.08	.16
F	Cymopterus longipes	a-	a22	c101	b27	-	12	51	16	.80	.15
F	Delphinium nuttallianum	a-	a-	b11	ab5	-	-	5	2	.07	.01
F	Descurainia pinnata (a)	-	-	-	1	-	-	-	1	-	.00
F	Draba spp. (a)	-	-	b58	a34	-	-	23	12	.16	.08
F	Eriogonum brevicaulis	-	-	-	2	-	-	-	1	-	.00
F	Erigeron pumilus	-	-	9	-	-	-	3	-	.01	-
F	Eriogonum racemosum	12	37	22	30	8	19	15	15	.15	.26
F	Eriogonum umbellatum	-	-	4	-	-	-	2	-	.01	-
F	Gayophytum ramosissimum (a)	-	-	3	-	-	-	1	-	.00	-
F	Hackelia patens	-	-	3	8	-	-	1	4	.03	.02
F	Helianthus annuus (a)	a5	c83	a-	b24	3	40	-	10	-	.07
F	Holosteum umbellatum (a)	-	-	b179	a89	-	-	55	39	1.15	.29
F	Linaria dalmatica	-	-	-	4	-	-	-	2	-	.15
F	Lithospermum ruderales	a-	ab3	b8	ab8	-	1	5	2	.05	.06
F	Lupinus argenteus	3	4	5	1	1	2	4	1	.27	.15
F	Machaeranthera canescens	-	3	2	-	-	1	1	-	.00	-
F	Medicago sativa	3	-	-	-	1	-	-	-	-	-
F	Microsteris gracilis (a)	-	-	a-	b43	-	-	-	16	-	.18
F	Orthocarpus spp. (a)	-	-	3	-	-	-	1	-	.00	-
F	Penstemon spp.	a1	b66	a-	a-	1	34	-	-	-	-
F	Phlox longifolia	-	-	8	-	-	-	4	-	.02	-
F	Polygonum douglasii (a)	-	-	b103	a-	-	-	41	-	.22	-
F	Ranunculus testiculatus (a)	-	-	4	9	-	-	1	3	.00	.01
F	Sphaeralcea coccinea	-	-	-	1	-	-	-	1	-	.03
F	Sphaeralcea grossulariaefolia	-	-	-	2	-	-	-	1	-	.03
F	Taraxacum officinale	-	-	3	-	-	-	1	-	.00	-
F	Tragopogon dubius	a2	b31	c76	a-	2	15	34	-	.45	-
F	Unknown forb-perennial	-	7	-	-	-	4	-	-	-	-
F	Vicia americana	-	2	-	-	-	2	-	-	-	-
F	Viguiera multiflora	-	1	6	-	-	1	3	-	.04	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
	Total for Annual Forbs	5	83	992	614	3	40	344	217	5.38	6.56
	Total for Perennial Forbs	66	337	645	275	32	170	325	140	12.38	7.17
	Total for Forbs	71	420	1637	889	35	210	669	357	17.76	13.73

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 16

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Amelanchier alnifolia	3	3	-	.03
B	Artemisia tridentata vaseyana	57	41	9.22	6.10
B	Chrysothamnus viscidiflorus viscidiflorus	19	22	1.37	2.20
B	Gutierrezia sarothrae	91	58	3.22	2.12
B	Opuntia spp.	14	14	.12	.36
B	Purshia tridentata	20	16	3.81	6.55
B	Symphoricarpos oreophilus	0	1	-	.03
B	Tetradymia canescens	0	1	.15	.38
	Total for Browse	204	156	17.91	17.79

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 16

Species	Percent Cover	
	'96	'02
Amelanchier utahensis	-	.17
Artemisia tridentata vaseyana	-	6.00
Chrysothamnus viscidiflorus viscidiflorus	-	1.75
Gutierrezia sarothrae	-	.83
Opuntia spp.	-	.05
Purshia tridentata	-	6.25
Tetradymia canescens	-	.50

#### Key Browse Annual Leader Growth

Herd unit 17 , Study no: 16

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.8
Purshia tridentata	3.0

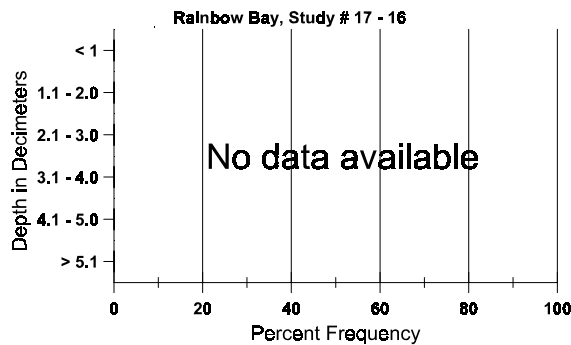
BASIC COVER --  
Herd unit 17 , Study no: 16

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	399	388	1.50	6.25	49.61	48.02
Rock	211	151	2.75	3.50	6.05	3.92
Pavement	262	278	33.25	36.75	6.51	10.85
Litter	398	393	57.75	46.25	49.93	48.27
Cryptogams	111	46	.25	3.25	1.35	.76
Bare Ground	192	227	4.50	4.00	7.23	11.08

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 16, Rainbow Bay

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.4	51.0 (10.9)	7.2	42.6	27.4	30.0	3.6	27.5	265.6	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 16

Type	Quadrat Frequency		Pellet Transect	
	'96	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	-	4	-	-
Elk	21	9	339	26 (64)
Deer	40	53	1305	100 (248)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 16

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	1	-	-	-	-	-	-	-	-	-	1	33		1	
	96	-	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	1	1	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	18	1
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	11	11	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			100%			100%			+45%							
'96		67%			00%			00%			+ 0%							
'02		33%			67%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	33		-			
												'96	60		-			
												'02	60		-			
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	1	-	-	-	-	-	5	-	-	-	166		5	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	24	-	-	-	-	-	-	-	-	24	-	-	-	800		24	
	89	13	-	-	1	-	-	-	-	-	14	-	-	-	466		14	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	60	29	6	-	-	-	-	-	-	95	-	-	-	3166	26	28	95
	89	22	24	1	1	-	-	-	-	-	48	-	-	-	1600	26	31	48
	96	13	17	1	4	1	-	-	-	-	36	-	-	-	720	23	43	36
	02	9	7	4	4	-	-	-	-	-	24	-	-	-	480	27	42	24
D	83	9	8	6	-	-	-	-	-	-	23	-	-	-	766		23	
	89	16	31	4	-	-	-	-	-	-	48	-	3	-	1700		51	
	96	11	27	-	1	-	-	-	-	-	30	-	-	9	780		39	
	02	11	13	2	-	-	-	-	-	-	12	1	-	13	520		26	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	500		25	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	800		40	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		26%			08%			00%			-20%							
'89		49%			04%			03%			-60%							
'96		59%			01%			12%			-30%							
'02		38%			11%			25%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4732	Dec:	16%			
												'89	3766		45%			
												'96	1520		51%			
												'02	1060		49%			



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4												
Chrysothamnus viscidiflorus viscidiflorus																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	16	-	-	8	-	-	-	-	24	-	-	-	800		24	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	53	-	-	-	-	-	-	-	53	-	-	-	1766	9	9	53
	89	59	-	-	11	-	-	-	-	69	-	1	-	2333	12	13	70
	96	30	-	-	2	-	-	-	-	32	-	-	-	640	12	23	32
	02	40	-	-	-	-	-	-	-	40	-	-	-	800	11	18	40
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+44%						
'89		00%			00%			01%			-80%						
'96		00%			00%			00%			+22%						
'02		00%			00%			02%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	1766	Dec:	0%				
										'89	3166		1%				
										'96	640		0%				
										'02	820		2%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Gutierrezia sarothrae																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	3	-	-	-	100		3	
	96	876	-	-	-	-	-	-	-	876	-	-	-	17520		876	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	17	-	-	-	-	-	-	-	17	-	-	-	566		17	
	96	225	-	-	-	-	-	-	-	225	-	-	-	4500		225	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	57	-	-	-	-	-	-	-	57	-	-	-	1900	10 13	57	
	89	117	-	-	1	-	-	-	-	118	-	-	-	3933	11 11	118	
	96	496	-	-	-	-	-	-	-	496	-	-	-	9920	7 10	496	
	02	126	-	-	-	-	-	-	-	121	5	-	-	2520	7 8	126	
D	83	1	-	-	-	-	-	-	-	-	-	1	-	33		1	
	89	7	-	-	-	-	-	-	-	7	-	-	-	233		7	
	96	8	-	-	-	-	-	-	-	7	-	-	1	160		8	
	02	48	-	-	1	-	-	-	-	25	-	-	24	980		49	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	220		11	
	02	-	-	-	-	-	-	-	-	-	-	-	-	5020		251	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			02%			+59%						
'89		00%			00%			00%			+68%						
'96		00%			00%			.13%			-76%						
'02		00%			00%			14%									
Total Plants/Acre (excluding Dead & Seedlings)										'83		1933		Dec:		2%	
										'89		4732				5%	
										'96		14580				1%	
										'02		3500				28%	

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total								
		1	2	3	4											
Opuntia spp.																
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	1	-	-	-	-	1	-	-	-	33		1
	96	2	-	-	2	-	-	-	-	4	-	-	-	80		4
	02	1	-	-	1	-	-	-	-	2	-	-	-	40		2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	96	7	-	-	1	-	-	-	-	8	-	-	-	160	5	13
	02	8	-	-	1	-	-	1	-	9	-	1	-	200	5	11
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	2	-	-	-	-	-	-	-	1	-	-	1	40		2
	02	3	-	-	-	-	-	-	-	3	-	-	-	60		3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%								
'89		00%			00%			00%			+88%					
'96		00%			00%			07%			+ 7%					
'02		00%			00%			07%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%			
										'89	33		0%			
										'96	280		14%			
										'02	300		20%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																																																																																										
	1	2	3	4	5	6	7	8	9	1	2	3	4																																																																																														
<b>Purshia tridentata</b>																																																																																																											
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	1	-	-	-	-	-	-	-	-	-	-	-	33			1																																																																																										
	96	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
Y	83	2	-	-	-	-	-	-	-	-	-	-	-	66			2																																																																																										
	89	8	-	-	-	-	-	-	-	-	-	-	-	266			8																																																																																										
	96	2	1	-	1	-	-	-	-	-	-	-	-	80			4																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
M	83	3	3	1	-	-	-	-	-	-	-	-	-	233	41	124	7																																																																																										
	89	8	4	1	-	-	-	-	-	-	-	-	-	433	41	81	13																																																																																										
	96	2	3	7	-	1	4	-	-	-	-	-	-	380	24	59	19																																																																																										
	02	-	1	9	-	-	5	-	-	-	-	-	-	300	30	62	15																																																																																										
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	96	-	-	-	-	-	1	-	-	-	-	-	-	20			1																																																																																										
	02	-	-	1	-	-	1	-	-	-	-	-	-	40			2																																																																																										
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	96	-	-	-	-	-	-	-	-	-	-	-	-	20			1																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	40			2																																																																																										
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> <td colspan="13"></td> </tr> <tr> <td>'83</td> <td>33%</td> <td>11%</td> <td>00%</td> <td>+57%</td> <td colspan="13"></td> </tr> <tr> <td>'89</td> <td>19%</td> <td>05%</td> <td>00%</td> <td>-31%</td> <td colspan="13"></td> </tr> <tr> <td>'96</td> <td>21%</td> <td>58%</td> <td>00%</td> <td>-29%</td> <td colspan="13"></td> </tr> <tr> <td>'02</td> <td>06%</td> <td>94%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>														'83	33%	11%	00%	+57%														'89	19%	05%	00%	-31%														'96	21%	58%	00%	-29%														'02	06%	94%	00%														
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																																																																																							
'83	33%	11%	00%	+57%																																																																																																							
'89	19%	05%	00%	-31%																																																																																																							
'96	21%	58%	00%	-29%																																																																																																							
'02	06%	94%	00%																																																																																																								
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead &amp; Seedlings)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'83</td> <td>299</td> <td>Dec:</td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'89</td> <td>699</td> <td></td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'96</td> <td>480</td> <td></td> <td>4%</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'02</td> <td>340</td> <td></td> <td>12%</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)																																'83	299	Dec:	0%															'89	699		0%															'96	480		4%															'02	340		12%
Total Plants/Acre (excluding Dead & Seedlings)																																																																																																											
														'83	299	Dec:	0%																																																																																										
														'89	699		0%																																																																																										
														'96	480		4%																																																																																										
														'02	340		12%																																																																																										
<b>Symphoricarpos oreophilus</b>																																																																																																											
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	96	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1																																																																																										
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> <td colspan="13"></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> <tr> <td>'96</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> <tr> <td>'02</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>														'83	00%	00%	00%															'89	00%	00%	00%															'96	00%	00%	00%															'02	00%	00%	00%														
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																																																																																							
'83	00%	00%	00%																																																																																																								
'89	00%	00%	00%																																																																																																								
'96	00%	00%	00%																																																																																																								
'02	00%	00%	00%																																																																																																								
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead &amp; Seedlings)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'83</td> <td>0</td> <td>Dec:</td> <td>-</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'89</td> <td>0</td> <td></td> <td>-</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'96</td> <td>0</td> <td></td> <td>-</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'02</td> <td>20</td> <td></td> <td>-</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)																																'83	0	Dec:	-															'89	0		-															'96	0		-															'02	20		-
Total Plants/Acre (excluding Dead & Seedlings)																																																																																																											
														'83	0	Dec:	-																																																																																										
														'89	0		-																																																																																										
														'96	0		-																																																																																										
														'02	20		-																																																																																										

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	23	0
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	24	1
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	0		-			
												'02	20		-			

Trend Study 17-17-02

Study site name: Dutch Canyon.

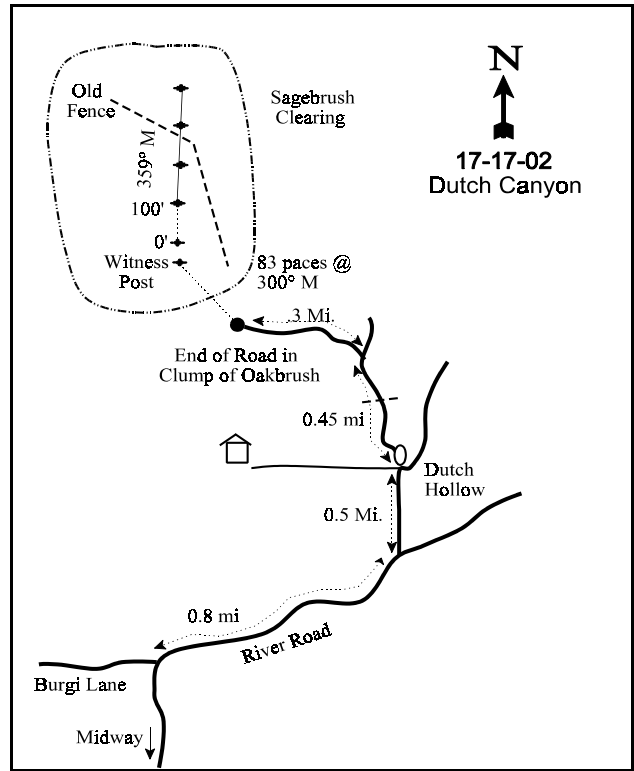
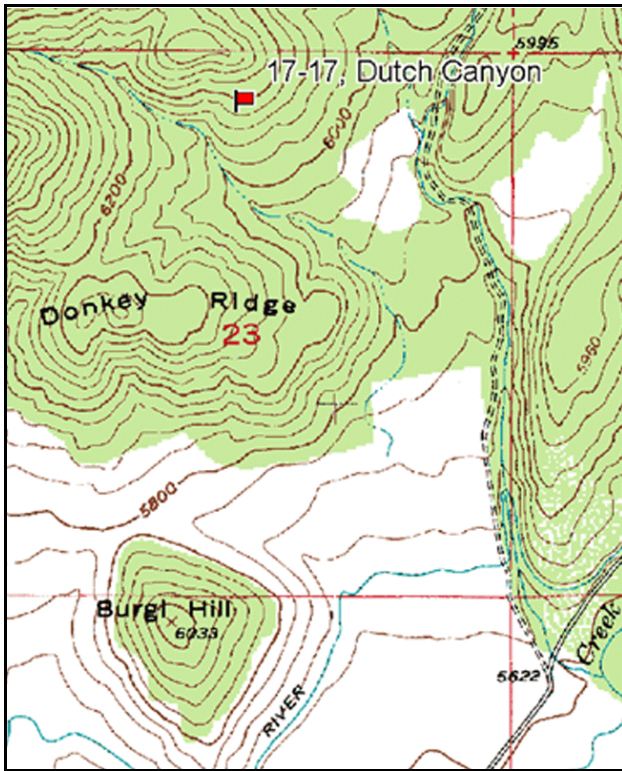
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 359 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the intersection of River Road and Burgi Lane (north of Midway), proceed northward on River Road for 0.80 miles to an intersection. Turn left and proceed 0.50 miles to a dead end. From the dead end, proceed northwest on a jeep trail leading through the gambel oak. Proceed 0.45 miles to a fork in the road. Take the left fork for 0.30 miles to where the road ends and stop. From the end of the road, the 0-foot baseline stake is 83 paces away at an azimuth of 300 degrees magnetic. The frequency baseline is marked by green steel "T" fenceposts, approximately 12 to 18 inches in height. A red browse tag, number 3952, is attached to the 0-foot baseline stake.



Map Name: Heber

Diagrammatic Sketch

Township 3S, Range 4E, Section 23

GPS: NAD 27, UTM 12S 4488634 N 460900 E

## DISCUSSION

### Dutch Canyon - Trend Study No. 17-17

This study is located within a small sagebrush-grass park surrounded by thick Gambel oak. The site is near the mouth of Dutch Hollow at an elevation of 6,200 feet. The site has moderately steep topography and a southerly aspect. Several of the baseline posts were missing in 2002 so the baseline was reset and is now only 300 feet in length. The site constitutes winter range for deer which exhibits moderate use. Elk and domestic livestock use is light on the site. Pellet group transect data taken in 2002 estimated 65 deer days use/acre (160 ddu/ha) and 9 elk days use/acre (23 edu/ha).

Soils are deep with an effective rooting depth of nearly 20 inches. The profile is rocky, but surface rock and pavement cover are low at about 5% in 1996 and 2002. Textural and chemical analysis reveals a sandy clay loam soil with neutral reactivity (pH = 6.9). Vegetation and litter cover are abundant and well distributed over the site. It provides effective protection from erosion. An erosion condition class assessment done in 2002 gave soils a slight erosion rating. Most evidence of erosion comes from the trails that traverse the site.

The key browse, mountain big sagebrush, had a density of about 1,400 plants/acre in 1989 and 1996. Density increased in 2002 to 2,380 plants/acre. With minimal young and about the same number of dead in the population, this increase in density is probably mostly due to the realignment of the baseline in 2002. The realignment of the baseline also resulted in sagebrush cover more than doubling between 1996 and 2002. Decadence was low in 1996 and 2002 at around 15%, a large improvement from 1989 when the decadent age class was estimated at 44% of the population. In 1996, there were almost as many dead sagebrush as live. That ratio was somewhat better in 2002. Poor vigor was estimated on 10% of the population in both 1996 and 2002, and use has been light to moderate during all readings. Sagebrush annual leader growth averaged 2.5 inches in 2002.

The bitterbrush population is composed mostly of mature plants. Density was estimated at 220 plants/acre in 2002, an increase from 80 plants/acre in 1996. Because there were no dead plants sampled in 2002 and no young plants sampled in 1996, this change in density is due to the baseline realignment in 2002. Use on bitterbrush has been moderate to heavy, but vigor has remained normal and no decadent plants were sampled in any reading. Bitterbrush annual leader growth averaged 3.4 inches in 2002.

Gambel oak clones surround the sagebrush opening sampled by the baseline. Oak density has remained fairly stable over the past three readings, estimated at 2,600 stems/acre in 2002. Utilization has been mostly light in all years and decadence low. Vigor was normal throughout the population in 1983-1996, but 16% were classified as having poor vigor in 2002 due to frost damage.

The herbaceous understory is dominated by annual species. Although cheatgrass declined in nested and quadrat frequencies in 2002, cover remained at just over 8% and continues to be the dominate grass. Perennial grasses are sparse and include Kentucky bluegrass, Sandberg bluegrass, and bulbous bluegrass. Smooth brome and mountain brome were sampled in 1996 with the previous baseline setup. Nearly all of the perennial grasses sampled on this site were found growing in or near oak clones. Forbs are diverse, but composition is poor. Leafy spurge is the most abundant perennial species, providing 65% of the forb cover in 2002. Annual forbs are abundant, especially pale alyssum. Sum of nested frequency for all perennial herbaceous species slightly declined between 1996 and 2002.

## 1983 APPARENT TREND ASSESSMENT

Soil trend appears to be stable to slightly declining. While erosion is not currently a significant problem, the relative lack of ground cover renders the area susceptible to soil loss when high intensity storms occur. Vegetatively, browse is overwhelmingly dominant and will continue to be so. There is the potential for an increase in the Gambel oak population accompanied by a decrease in the productivity of mountain big sagebrush.

## 1989 TREND ASSESSMENT

Trend for soils is slightly up. Bare soil decreased to 4%, and litter and vegetation cover increased. Slight soil movement is detectable in the shrub interspaces. Trend for browse is slightly down. Mountain big sagebrush declined in density, while decadence increased from 24% to 44%. Recruitment remains good. Gambel oak nearly doubled in density and further increases will likely be to the detriment of sagebrush. Trend for the herbaceous understory is slightly up. Perennial grasses remain sparse, but sum of nested frequency values for both grasses and forbs have increased since 1983.

### TREND ASSESSMENT

soil - slightly up (4)

browse - slightly down (2)

herbaceous understory - slightly up (4)

## 1996 TREND ASSESSMENT

Soil trend is slightly improving with a decrease in the combined cover of rock and pavement. Bare soil covers only 2% of the surface at the present time. No erosion is apparent and there is adequate vegetative and litter cover to protect the soil. Browse trend is stable. Decadence in the mountain big sagebrush population declined to 16%, but the number of dead plants nearly equals the number of living plants. Young recruitment is moderate at 16%. Use is light. Most other browse populations have similar densities as reported in 1989. Herbaceous understory trend is stable. Although there is an increase in sum of nested frequency for grasses and forbs since 1989, many of the species are annual increasers. A better composition is desired. Sum of nested frequency for perennials slightly increased.

### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soil is stable. Bare soil increased to 11%, but the ratio of protective cover to bare soil is still high at over 4:1. Erosion is slight because vegetation and litter cover are abundant and well disbursed. Trend for browse is stable. Density estimates for mountain big sagebrush and bitterbrush both increased, but these changes are due to the realignment of the baseline. The mountain big sagebrush population has stable decadency and vigor levels. Use is light to moderate. Recruitment from young plants is low, but this is to be expected with drought in 2002 and the abundance of a competitive weedy understory. Trend for herbaceous species is slightly down, while composition remains poor. Cheatgrass remains the dominant grass and the only abundant perennial forb is leafy spurge. Sum of nested frequency for all perennial species combined declined in 2002.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)



HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 17

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
G	Agropyron spicatum	-	-	-	-	-	-	-	-	-	.00
G	Bromus carinatus	-	-	2	-	-	-	1	-	.00	-
G	Bromus inermis	-	5	10	-	-	3	3	-	.33	-
G	Bromus japonicus (a)	-	-	a-	b81	-	-	-	34	-	.70
G	Bromus tectorum (a)	-	-	b336	a228	-	-	96	76	8.16	8.21
G	Poa bulbosa	a-	a-	a-	b17	-	-	-	5	-	.86
G	Poa fendleriana	-	7	-	-	-	2	-	-	-	-
G	Poa pratensis	a10	ab18	ab30	b36	5	8	12	15	1.11	.56
G	Poa secunda	-	1	-	7	-	1	-	4	-	.56
Total for Annual Grasses		0	0	336	309	0	0	96	110	8.16	8.91
Total for Perennial Grasses		10	31	42	60	5	14	16	24	1.44	1.98
Total for Grasses		10	31	378	369	5	14	112	134	9.61	10.90
F	Alyssum alyssoides (a)	-	-	245	198	-	-	75	68	2.12	2.73
F	Artemisia dracunculus	3	2	-	-	1	1	-	-	-	-
F	Artemisia ludoviciana	3	3	8	1	2	2	3	1	.33	.03
F	Astragalus spp.	-	-	-	1	-	-	-	1	-	.00
F	Camelina microcarpa (a)	-	-	-	3	-	-	-	1	-	.00
F	Calochortus nuttallii	a5	b21	a-	a4	3	10	-	3	-	.01
F	Chenopodium fremontii (a)	-	-	3	5	-	-	1	2	.00	.04
F	Cirsium spp.	-	-	9	2	-	-	4	2	.02	.04
F	Collomia linearis (a)	-	-	a16	b36	-	-	8	20	.04	.15
F	Collinsia parviflora (a)	-	-	-	3	-	-	-	1	-	.00
F	Cryptantha spp.	-	2	-	-	-	1	-	-	-	-
F	Draba spp. (a)	-	-	-	2	-	-	-	1	-	.00
F	Epilobium brachycarpum (a)	-	-	4	5	-	-	3	2	.04	.01
F	Eriogonum brevicaulis	-	-	-	1	-	-	-	1	-	.00
F	Erigeron spp.	a-	a-	b18	a-	-	-	7	-	.16	-
F	Eriogonum racemosum	a-	ab4	b10	ab3	-	4	5	3	.03	.06
F	Euphorbia esula	a-	a-	a-	b114	-	-	-	41	-	7.96
F	Gayophytum ramosissimum (a)	-	-	-	2	-	-	-	1	-	.00
F	Heterotheca villosa	-	-	-	-	-	-	-	-	.15	-
F	Holosteum umbellatum (a)	-	-	a-	b20	-	-	-	9	-	.14
F	Lactuca serriola	a3	ab14	b34	a-	1	8	14	-	.24	-
F	Lupinus argenteus	-	-	5	6	-	-	3	3	.21	.45
F	Polygonum douglasii (a)	-	-	b28	a8	-	-	11	5	.05	.02
F	Sisymbrium altissimum (a)	-	-	6	3	-	-	2	1	.07	.03
F	Taraxacum officinale	-	-	-	1	-	-	-	1	-	.03

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'96	'02	'83	'89	'96	'02	'96	'02
F	Tragopogon dubius	a <sub>2</sub>	ab <sub>17</sub>	c <sub>93</sub>	b <sub>31</sub>	1	9	46	15	.76	.36
F	Unknown forb-annual (a)	-	-	b <sub>96</sub>	a <sub>-</sub>	-	-	36	-	2.63	-
F	Verbascum thapsus	2	7	6	-	1	3	3	-	.39	-
F	Vicia americana	a <sub>-</sub>	b <sub>10</sub>	a <sub>-</sub>	a <sub>-</sub>	-	5	-	-	-	-
F	Viguiera multiflora	a <sub>6</sub>	c <sub>78</sub>	b <sub>31</sub>	a <sub>3</sub>	4	33	14	2	.36	.04
F	Zigadenus paniculatus	-	3	-	-	-	1	-	-	.00	-
Total for Annual Forbs		0	0	398	285	0	0	136	111	4.98	3.16
Total for Perennial Forbs		24	161	214	167	13	77	99	73	2.68	8.99
Total for Forbs		24	161	612	452	13	77	235	184	7.66	12.15

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 17

Type	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	Artemisia tridentata vaseyana	37	60	8.92	18.89
B	Chrysothamnus viscidiflorus viscidiflorus	1	2	-	.03
B	Gutierrezia sarothrae	44	31	2.31	1.21
B	Purshia tridentata	3	10	.45	2.61
B	Quercus gambelii	31	23	7.17	5.42
Total for Browse		116	126	18.86	28.18

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 17

Species	Percent Cover	
	'96	'02
Artemisia tridentata vaseyana	-	24.58
Chrysothamnus viscidiflorus viscidiflorus	-	.25
Gutierrezia sarothrae	-	1.92
Purshia tridentata	-	5.25
Quercus gambelii	14.0	8.08

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 17

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.6
Purshia tridentata	3.4

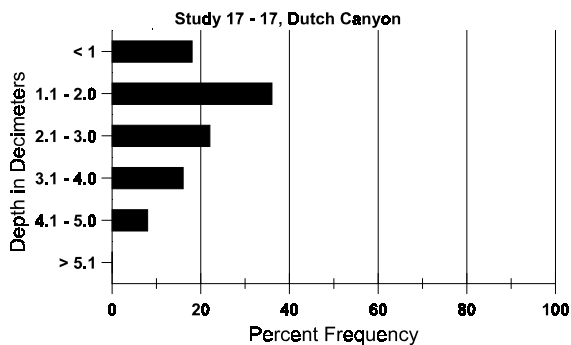
BASIC COVER --  
Herd unit 17 , Study no: 17

Cover Type	Nested Frequency		Average Cover %			
	'96	'02	'83	'89	'96	'02
Vegetation	383	329	0	3.25	34.90	50.00
Rock	130	87	5.00	2.25	2.64	2.45
Pavement	144	150	6.00	11.50	2.76	2.95
Litter	400	387	67.25	78.50	71.23	58.48
Cryptogams	24	16	.25	0	.10	.30
Bare Ground	130	165	21.50	4.50	2.18	11.38

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 17, Dutch Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
19.7	49.3 (17.5)	6.9	48.2	25.4	28.4	2.5	32.9	160.0	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 17

Type	Quadrat Frequency		Pellet Transect	
	'96	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Sheep	1	-	-	-
Rabbit	6	8	-	-
Elk	-	2	122	9 (23)
Deer	25	24	844	65 (160)
Cattle	-	1	-	-

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 17

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4							
<i>Amelanchier alnifolia</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	0	22	28	0
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>		<u>%Change</u>		
'83		00%			00%			00%				
'89		00%			00%			00%				
'96		00%			00%			00%				
'02		00%			00%			00%				
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'96	0		-			
						'02	0		-			
<i>Artemisia tridentata vaseyana</i>												
S	83	-	-	-	-	-	-	-	0			0
	89	2	-	-	1	-	-	-	3	-	-	3
	96	3	-	-	-	-	-	-	3	-	-	3
	02	-	-	-	-	-	-	-	-	-	-	0
Y	83	26	-	-	-	-	-	-	26	-	-	26
	89	9	-	-	-	-	-	-	9	-	-	9
	96	9	-	-	2	-	-	-	11	-	-	11
	02	2	1	-	-	-	-	-	2	-	1	3
M	83	27	11	-	-	-	-	-	38	-	-	1266
	89	10	3	-	-	1	-	-	14	-	-	466
	96	46	-	-	1	-	-	-	47	-	-	940
	02	79	15	2	2	-	-	-	90	3	5	1960
D	83	16	3	1	-	-	-	-	20	-	-	666
	89	11	6	1	-	-	-	-	17	-	-	600
	96	11	-	-	-	-	-	-	4	-	-	220
	02	15	2	-	1	-	-	-	12	-	3	360
X	83	-	-	-	-	-	-	-	-	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	1060
	02	-	-	-	-	-	-	-	-	-	-	940
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>		<u>%Change</u>		
'83		17%			01%			00%		-51%		
'89		22%			05%			02%		+ 1%		
'96		00%			00%			10%		+42%		
'02		15%			02%			10%				
Total Plants/Acre (excluding Dead & Seedlings)						'83	2798	Dec:	24%			
						'89	1366		44%			
						'96	1380		16%			
						'02	2380		15%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	20	19	40	1
	02	2	-	-	1	-	-	-	-	-	3	-	-	60	20	32	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'96		00%			00%			00%			+67%						
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'96	20		-		
												'02	60		-		
<i>Gutierrezia sarothrae</i>																	
S	83	11	-	-	-	-	-	-	-	-	11	-	-	366			11
	89	3	-	-	-	-	-	-	-	-	3	-	-	100			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	4	-	-	-	-	-	-	-	-	4	-	-	133			4
	89	1	-	-	-	-	-	-	-	-	1	-	-	33			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	11	-	-	-	-	-	-	-	-	11	-	-	366	9	11	11
	89	125	-	-	-	-	-	-	-	-	125	-	-	4166	11	13	125
	96	105	-	-	-	-	-	-	-	-	105	-	-	2100	8	13	105
	02	70	-	-	5	-	-	-	-	-	75	-	-	1500	9	11	75
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	11	-	-	-	-	-	-	-	-	11	-	-	366			11
	96	31	-	-	-	-	-	-	-	-	28	-	-	620			31
	02	8	-	-	-	-	-	-	-	-	3	-	-	160			8
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	500			25
	02	-	-	-	-	-	-	-	-	-	-	-	-	140			7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+89%						
'89		00%			00%			00%			-40%						
'96		00%			00%			02%			-39%						
'02		00%			00%			06%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	499	Dec:	0%		
												'89	4565		8%		
												'96	2740		23%		
												'02	1660		10%		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Purshia tridentata</b>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	-	20			1
M	83	-	-	2	-	-	-	-	-	-	2	-	-	66	13	25	2
	89	-	1	2	-	-	-	-	-	-	3	-	-	100	15	31	3
	96	-	2	1	-	1	-	-	-	-	4	-	-	80	19	87	4
	02	-	1	3	-	-	5	1	-	-	9	1	-	200	17	76	10
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			100%			00%			+34%						
'89		33%			67%			00%			-20%						
'96		75%			25%			00%			+64%						
'02		09%			73%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-		
												'89	100		-		
												'96	80		-		
												'02	220		-		
<b>Quercus gambelii</b>																	
S	83	16	-	-	-	-	-	-	-	-	16	-	-	533			16
	89	13	-	-	-	-	-	-	-	-	13	-	-	433			13
	96	3	8	-	1	-	-	-	-	-	12	-	-	240			12
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	28	12	-	-	-	-	-	-	-	40	-	-	1333			40
	89	43	7	-	-	-	-	-	-	-	50	-	-	1666			50
	96	40	-	-	2	-	-	-	-	-	31	11	-	840			42
	02	32	-	-	4	-	-	-	-	-	36	-	-	720			36
M	83	-	3	-	-	-	-	-	-	-	3	-	-	100	39	21	3
	89	5	19	-	-	-	-	-	-	-	24	-	-	800	30	13	24
	96	35	1	-	11	-	-	12	5	-	64	-	-	1280	58	50	64
	02	30	36	6	5	-	-	-	-	-	67	6	4	1540	34	25	77
D	83	1	2	-	-	-	-	-	-	-	3	-	-	100			3
	89	-	10	1	-	-	-	-	-	-	11	-	-	366			11
	96	3	1	-	-	-	-	-	-	-	4	-	-	80			4
	02	9	-	5	3	-	-	-	-	-	-	-	17	340			17
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	340			17
	02	-	-	-	-	-	-	-	-	-	-	-	-	380			19
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		37%			00%			00%			+46%						
'89		42%			01%			00%			-22%						
'96		02%			00%			00%			+15%						
'02		28%			08%			16%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	1533	Dec:	7%		
												'89	2832		13%		
												'96	2200		4%		
												'02	2600		13%		

Trend Study 17-19-02

Study site name: Coyote Canyon.

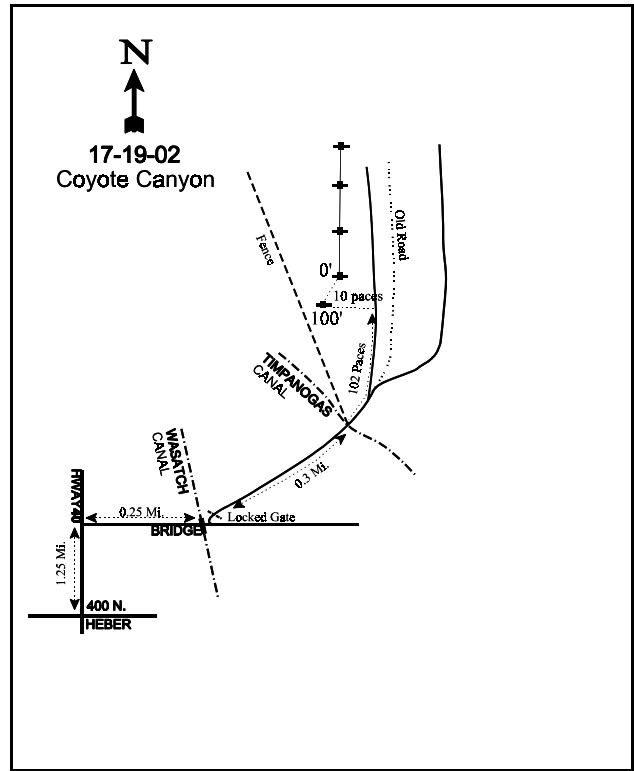
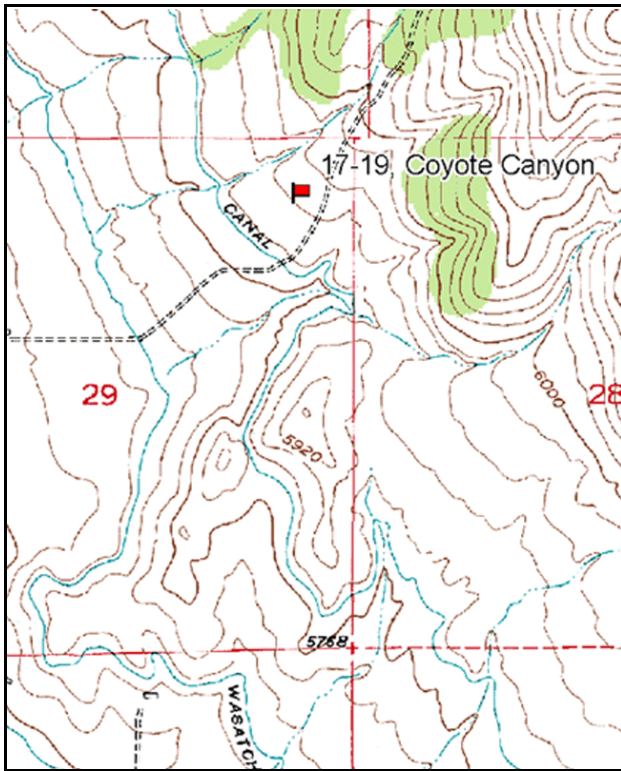
Vegetation type: Big Sagebrush.

Compass bearing: frequency baseline 187 degrees magnetic.

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

LOCATION DESCRIPTION

From 400 North and Highway 40 (Main) in Heber, travel north for 1.25 miles and turn right onto a paved road. Proceed east for 0.25 miles to a left turn just past the Wasatch Canal (will need a key or combination to pass thru locked gate). Follow this road 0.3 miles to a fork immediately past Timpanogos Canal (locked gate with two combo locks). From the canal, take a left and walk 102 paces up the road. From this point, walk 10 paces west from the edge of the road to the 100-foot baseline stake. The 0-foot baseline stake is marked by a red browse tag. The baseline runs 187 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake in a direction of 345 degrees magnetic.



Map Name: Heber

Diagrammatic Sketch

Township 3S, Range 5E, Section 29

GPS: NAD 27, UTM 12S 4486977 N 466391 E

## DISCUSSION

### Coyote Canyon - Trend Study No. 17-19

This site, formerly known as Northeast of Heber, is located on the northeast side of the Heber Valley. The site lies on a gentle south to southwest facing slope at an elevation of 6,000 feet. It samples a mountain big sagebrush community with smaller quantities of other shrubs. In order to avoid a new road built parallel to the baseline, the 100 foot stake had to be moved about 25 feet to the west. It was also noted in 1996, that new homes had been built about 300-400 yards to the south and west. Some seeded grasses and forbs, which were planted along the road, occur in several of the belts. Deer use on the site has been high with elk use being considerably less. Pellet group transect data collected in 2002 estimated 166 deer days use/acre (410 ddu/ha) and 21 elk days use/acre (53 edu/ha). Some domestic sheep use occurred during the spring of 2002.

The soil type is "Beyyant Very Cobbly Loam." This is an alluvial soil that is well drained and has a coarse texture. The Beyyant soil is also less permeable to water and potentially more erodible. Textural and chemical analysis indicates a sandy clay loam with a slightly acidic reactivity (pH of 6.4). The effective rooting depth of the soil was estimated at nearly 12 inches in 1996, while average soil temperature was 61°F at a depth of 13 inches. Bare ground was moderate in 1984 and 1996. With drought conditions in 2002 and a decline in vegetation and litter cover, bare soil increased to nearly 33%. With poor herbaceous cover and a high proportion of bare soil, the erosion potential is moderately high on this site. Even with low precipitation in 2002, an erosion condition class assessment rated soils as slightly eroding. The ratio of protective cover to bare soil declined from 4.4:1 in 1996, to 2.6:1 in 2002.

Mountain big sagebrush density was estimated at 6,866 plants/acre in 1984. At that time, the decadence rate was 42% and utilization was light to moderate. Sagebrush density was estimated at 3,820 plants/acre in 1996 and 4,180 plants/acre in 2002. Much of the change in density is due to the expansion of the baseline in 1996, which gives a better estimate of shrub populations. Decadence declined between 1984 and 1996 to 22%, but again increased to 38% in 2002. The proportion of the population displaying poor vigor increased from 2% in 1996 to 23% in 2002. Heavy use increased from 2% to 48% over the same time period. Drought conditions in 2002 appeared to be negatively impacting the big sagebrush population. Sagebrush annual leader growth averaged 2.4 inches 2002. Bitterbrush is scattered throughout the site at a density of only 80 plants/acre. Use has been moderate to heavy and decadence moderate in 1996 and 2002 at 25%. Prickly pear cactus had an estimated density of 560 plants/acre in 2002. No other species were encountered.

The composition of the herbaceous understory is poor with annual species being dominant. Cheatgrass dominated the grass component in both 1996 and 2002, although it declined in nested frequency and cover in 2002 with drought. Perennial grasses are sparsely scattered throughout the site with most being found underneath sagebrush plants. In 2002, crested wheatgrass was utilized by sheep. The forb component is also dominated by annual species with pale alyssum being the most abundant. Sum of nested frequency for all perennial forbs was only 17 in 2002. With drought in 2002, annual species declined in nested frequency as well. One species of concern after the 1996 reading was tarweed. It occurred in very low numbers, but it was noted that mismanagement or disturbance could lead to a quickly expanding population. Tarweed was not sampled in 2002 and does not currently appear to be a threat to this site.

### 1984 APPARENT TREND ASSESSMENT

This entire area is characterized by essentially stable soil and vegetative conditions. The former line-intercept study identified some improvement in grass composition, density, production and total ground cover, but the dominant big sagebrush population was essentially unchanged. Big sagebrush density is high and will likely decline in the future with high intraspecific competition and no seedling or young plants being sampled. The herbaceous understory has poor composition with perennial species being limited.



## 1996 TREND ASSESSMENT

Soil trend is stable with a decrease in bare ground cover. Litter cover has also decreased, but combined with vegetative cover, provides adequate soil protection. The browse trend is also stable. Although there was a decrease in the density of mountain big sagebrush since 1984, this is more a result of the greatly increased sample size giving a more accurate estimate in 1996 than the actual loss of plants. Decadency declined from 42% to 22%, and vigor has improved. The composition of the herbaceous understory is poor with annual species being dominant. A fire in this area would destroy the browse community and lead to a field of annual species. Trend for the herbaceous understory is slightly upward as the sum of nested frequency for perennial species increased.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly up (4)

## 2002 TREND ASSESSMENT

Trend for soil is down. Bare soil increased from 11% to 33%, while protective cover from vegetation and litter decreased. Erosion is only minimal because precipitation was low in 2002. The erosion hazard is moderately high on the site and erosion may become a problem when precipitation patterns return to normal. The ratio of protective cover (vegetation, litter, and cryptogams) to bare soil decreased from over 4:1 to 2.6:1. Trend for browse is slightly down. The density of mountain big sagebrush is relatively stable, but increases in decadence, poor vigor, and heavy use are causes for concern. Young recruitment also declined since 1996. The combination of high intraspecific competition and drought in 2002 are negatively impacting the sagebrush at the present time. Trend for the herbaceous understory is stable, but in poor condition. Composition remains poor as annual species are still dominant. Drought conditions in 2002 caused declines in nested frequency values of herbaceous species, especially annuals. Perennial species remain limited.

### TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - stable (3)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 19

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'84	'96	'02	'84	'96	'02	'96	'02
G	Agropyron cristatum	a-	b24	c40	-	11	16	1.26	1.95
G	Agropyron intermedium	a-	a-	b6	-	-	4	.06	.04
G	Agropyron spicatum	8	7	-	4	2	-	.06	-
G	Bromus japonicus (a)	-	2	8	-	1	3	.00	.04
G	Bromus tectorum (a)	-	b368	a236	-	100	89	21.32	2.78
G	Oryzopsis hymenoides	-	-	-	-	-	-	.03	-
G	Sitanion hystrix	33	31	32	16	14	15	.66	.17
G	Stipa comata	-	1	4	-	1	2	.03	.03
Total for Annual Grasses		0	370	244	0	101	92	21.33	2.82
Total for Perennial Grasses		41	63	82	20	28	37	2.12	2.21
Total for Grasses		41	433	326	20	129	129	23.45	5.03

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'84	'96	'02	'84	'96	'02	'96	'02
F	<i>Agoseris glauca</i>	-	6	-	-	2	-	.01	-
F	<i>Allium acuminatum</i>	6	11	6	4	7	3	.03	.01
F	<i>Alyssum alyssoides</i> (a)	-	<sub>a</sub> 92	<sub>b</sub> 133	-	35	52	.81	.64
F	<i>Collomia linearis</i> (a)	-	<sub>b</sub> 13	<sub>a</sub> -	-	8	-	.04	-
F	<i>Collinsia parviflora</i> (a)	-	2	3	-	2	2	.01	.01
F	<i>Epilobium brachycarpum</i> (a)	-	<sub>b</sub> 23	<sub>a</sub> -	-	13	-	.06	-
F	<i>Gayophytum ramosissimum</i> (a)	-	<sub>a</sub> -	<sub>b</sub> 29	-	-	13	-	.09
F	<i>Hedysarum boreale</i>	-	2	-	-	1	-	.00	-
F	<i>Lactuca serriola</i>	-	-	-	-	-	-	.00	-
F	<i>Linum lewisii</i>	<sub>a</sub> -	<sub>b</sub> 25	<sub>a</sub> -	-	11	-	.49	-
F	<i>Madia glomerata</i> (a)	-	<sub>b</sub> 9	<sub>a</sub> -	-	6	-	.03	-
F	<i>Medicago sativa</i>	-	1	1	-	1	1	.03	.00
F	<i>Microsteris gracilis</i> (a)	-	8	7	-	4	3	.02	.01
F	<i>Orthocarpus</i> spp. (a)	-	<sub>b</sub> 38	<sub>a</sub> -	-	19	-	1.05	-
F	<i>Phlox longifolia</i>	-	5	4	-	4	2	.02	.01
F	<i>Polygonum douglasii</i> (a)	-	<sub>b</sub> 46	<sub>a</sub> 5	-	19	2	.09	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	1	-	-	1	-	.00
F	<i>Schoenocrambe linifolia</i>	-	-	3	-	-	1	-	.00
F	<i>Sisymbrium altissimum</i> (a)	-	-	4	-	-	2	-	.01
F	<i>Tragopogon dubius</i>	-	2	3	-	2	1	.01	.00
Total for Annual Forbs		0	231	182	0	106	75	2.12	0.78
Total for Perennial Forbs		6	52	17	4	28	8	0.60	0.03
Total for Forbs		6	283	199	4	134	83	2.73	0.82

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 19

T y p e	Species	Strip Frequency		Average Cover %	
		'96	'02	'96	'02
B	<i>Artemisia tridentata vaseyana</i>	89	88	18.38	20.00
B	<i>Opuntia</i> spp.	30	19	1.27	.52
B	<i>Purshia tridentata</i>	4	4	.21	.30
Total for Browse		123	111	19.87	20.82

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 19

Species	Percent Cover	
	'96	'02
Artemisia tridentata vaseyana	-	21.50
Opuntia spp.	-	.58
Purshia tridentata	-	.08

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 19

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.4

BASIC COVER --

Herd unit 17 , Study no: 19

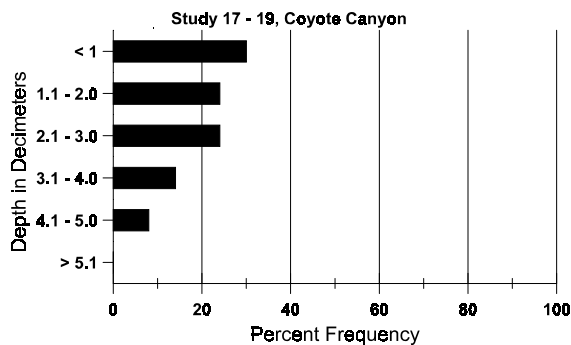
Cover Type	Nested Frequency		Average Cover %		
	'96	'02	'84	'96	'02
Vegetation	373	307	2.00	39.08	25.59
Rock	138	137	6.25	8.19	8.55
Pavement	71	76	3.50	.35	.54
Litter	395	374	71.00	56.29	48.02
Cryptogams	25	22	1.75	.43	.45
Bare Ground	181	276	15.50	11.37	32.95

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 19, Coyote Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.7	61.0 (12.7)	6.4	46.2	26.1	27.7	3.6	34.4	160.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 19

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'02	'02	'02
Sheep	-	12	269	21 (51)
Rabbit	11	14	-	-
Elk	5	3	278	21 (53)
Deer	47	58	2158	166 (410)
Cattle	-	1	-	-

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 19

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	20	-	-	-	-	-	-	-	-	-	-	-	-	400			20
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	33	1	-	-	-	-	-	-	-	-	-	-	-	680			34
	02	13	-	3	-	-	-	-	-	-	-	-	-	-	320			16
M	84	33	26	1	-	-	-	-	-	-	-	-	-	-	4000	26	32	60
	96	72	42	1	-	-	-	-	-	-	-	-	-	-	2300	23	41	115
	02	32	25	55	-	-	1	-	-	-	-	-	-	-	2260	20	31	113
D	84	30	10	3	-	-	-	-	-	-	-	-	-	-	2866			43
	96	15	23	3	-	1	-	-	-	-	-	-	-	-	840			42
	02	22	15	41	-	1	1	-	-	-	-	-	-	-	1600			80
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1440			72
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	1580			79
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		35%			04%			09%			-44%							
'96		35%			02%			02%			+ 9%							
'02		20%			48%			23%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	6866	Dec:	42%			
												'96	3820		22%			
												'02	4180		38%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333		5	
	96	2	-	-	2	-	-	-	-	-	4	-	-	-	80		4	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	84	12	-	-	-	-	-	-	-	-	12	-	-	-	800	5 12	12	
	96	43	-	-	1	-	-	-	-	-	42	-	2	-	880	5 13	44	
	02	22	-	1	1	-	-	-	-	-	24	-	-	-	480	6 12	24	
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60		3	
	02	3	-	-	-	-	-	-	-	-	-	-	-	3	60		3	
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		00%			00%			00%			-10%							
'96		00%			00%			08%			-45%							
'02		00%			04%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	1133	Dec:	0%			
												'96	1020		6%			
												'02	560		11%			
Purshia tridentata																		
M	84	-	2	-	-	-	-	-	-	-	1	-	1	-	133	17 22	2	
	96	-	3	-	-	-	-	-	-	-	3	-	-	-	60	15 31	3	
	02	-	-	3	-	-	-	-	-	-	3	-	-	-	60	14 41	3	
D	84	-	-	2	-	-	-	-	-	-	1	-	1	-	133		2	
	96	-	-	-	-	1	-	-	-	-	1	-	-	-	20		1	
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		50%			50%			50%			-70%							
'96		100%			00%			00%			+ 0%							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	266	Dec:	50%			
												'96	80		25%			
												'02	80		25%			

Trend Study 17-24-02

Study site name: Heisetts Hollow.

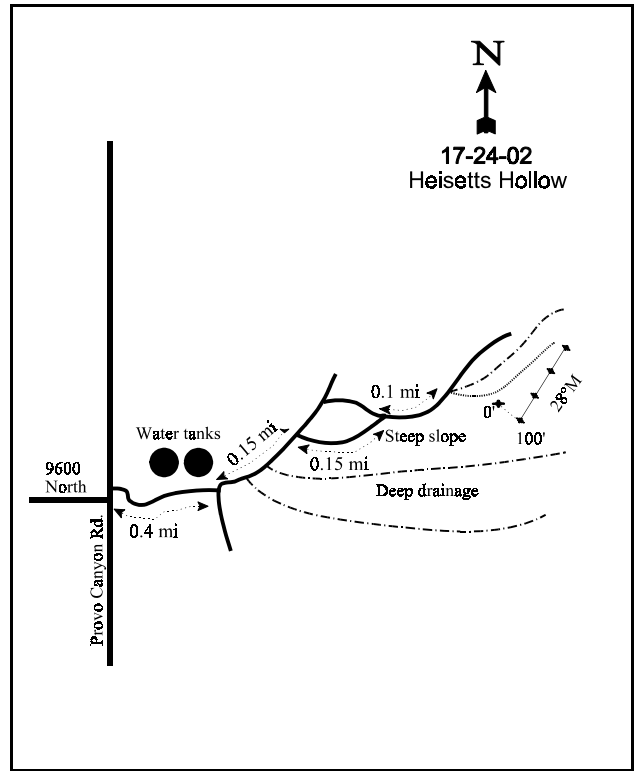
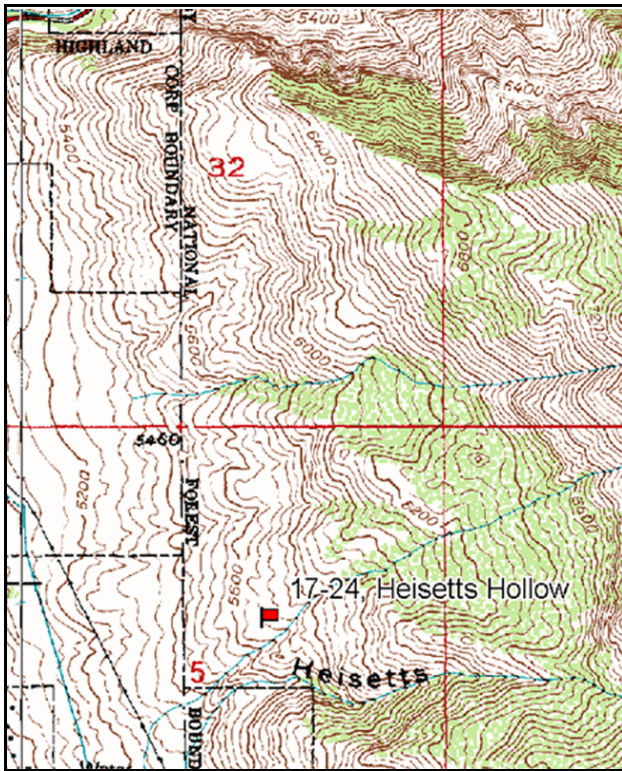
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 136 degrees magnetic (lines 2-4 @ 28°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 18 ft., belt 3 on 2ft.

LOCATION DESCRIPTION

North of Pleasant Grove, turn east off Canyon Road (Rt 146) opposite 9600 North, and go 0.4 miles towards the water tank on the hill. From the southeast side of the concrete tank, go northerly 0.15 miles to a fork. Bear right up the steep, easternmost road, and continue 0.15 miles to the Forest Service boundary. Go 0.1 miles to a fork, continue east 0.1 miles up a steep slope to a small level area. A deer trail goes southeast. Follow the trail 65 paces to the 0-foot baseline stake.



Map Name: Timpanogos Cave

Diagrammatic Sketch

Township 5S, Range 2E, Section 5

GPS: NAD 27, UTM 12S 4473918 N 437113 E

## DISCUSSION

### Heisetts Hollow - Trend Study No. 17-24

This study is located on the upper Lake Bonneville terrace near the mouth of Heisetts Hollow and uphill from the Salt Lake Aqueduct. This entire area is critical deer winter range. An old browse transect which samples the few Stansbury cliffrose plants is located in the immediate area. Slope varies from about 5% at the 0 foot baseline stake to nearly 22% at the end of the baseline. Aspect is southwest and elevation is 5,600 feet. The range type is sparse mountain big sagebrush interspersed with isolated oak clumps and large cliffrose plants. A moderately dense and vigorous perennial grass cover occupies the shrub interspaces. Quadrat frequency of deer pellet groups was moderately high in 1997 and 2002 at 43% and 46% respectively. A pellet group transect read on site in 2002 estimated 65 deer and 3 elk days use/acre (160 ddu/acre and 8 edu/ha). All of the deer pellet groups appeared to be from winter use.

Soil is a clay loam containing a moderate amount of rock in the profile. Texture is gravelly to sandy and typical of sedimentary lake deposits. Effective rooting depth is estimated at 24 inches, some of which is an unconsolidated "C" horizon. Phosphorous is low at only 5.7 ppm. Values less than 10 ppm may limit normal plant growth and development. The steeper slopes show signs of erosion problems in the past, leaving behind some steep terraces as well as some pedestalling of the plants. Some soil movement is evident on a foot trail located directly north of the site. There did not appear to be any significant erosion occurring on site in 1997 or 2002, and the erosion condition class was determined to be stable in 2002.

The key browse species is a sparse population of mountain big sagebrush. The greatly increased sample size used in 1997 estimated density at 1,120 plants/acre, a slight increase from the 866 plants/acre estimated in 1983 and 1989. Utilization was moderate to heavy. The number of heavily hedged plants declined in 1997 and vigor improved. Decadency also declined to 23% in 1997. Density was estimated at 920 plants/acre in 2002. Use was very heavy, similar to 1989 levels, and the number of decadent plants nearly doubled to 41% of the population. Half of the decadent plants were classified as dying in 2002. Young recruitment is marginal with young plants accounting for only 7% of the population. Annual leader growth on sagebrush averaged 1.9 inches in 2002.

Other preferred browse occur in small numbers and include true mountain mahogany, white rubber rabbitbrush, and cliffrose. The few cliffrose on the site are tall and mostly unavailable to browsing. They do not appear to be reproducing. One disturbing aspect of the browse composition was the high density of broom snakeweed in 1997 which was estimated at 10,300 plants/acre, an increase from 1,433 plants/acre in 1989. The number of seedlings encountered in 1997 was also high, but due to drought the population declined to only 120 plants/acre in 2002.

Perennial grasses are the dominant herbaceous understory component. With the exclusion of livestock grazing, bluebunch wheatgrass is becoming vigorous and abundant. It comprises a uniform but somewhat open cover that helps stabilize soil. Bulbous bluegrass is also abundant and accounted for 43% of the grass cover in 1997 and 55% in 2002. Cheatgrass is present but not very abundant.

The forb component is subject to grass competition. As a result, forbs are diverse but occur infrequently. The more common species include northern sweetvetch, longleaf phlox, ragweed, and scarlet globemallow. Little vegetative cover or forage is provided by forbs.

### 1983 APPARENT TREND ASSESSMENT

Soil at the site appears stable on a highly erodible and fragile site. Past erosion has been severe but is slowly being stabilized by an aggressive and increasing perennial grass cover. Browse for big game habitat purposes appears to be in a state of decline. All the available evidence points to a rapidly decreasing population of mountain big sagebrush, the key browse species. Other desirable browse species occur in small numbers. Broom snakeweed is abundant and appears to be increasing.

### 1989 TREND ASSESSMENT

This section of the hill is subject to slumping, and recent cracking and soil movement has occurred. It appears the site will slide down into the large gully below. Adjacent slopes are subject to severe gullyng. The site has adequate grass cover, however litter cover has decreased. Some of the decrease in litter cover is probably due to classifying cured bulbous bluegrass as litter in 1989. Pavement cover increased from 7 to 20%. The 12.5% cover of bare soil exposed is similar between years. The soil trend is stable. Density of the key browse species, mountain big sagebrush, is stable. Use is heavy and the number of decadent plants increased. The 1989 data demonstrate that the increaser subshrub broom snakeweed is not a good indicator of trend. Although it was apparently rapidly expanding in 1983, the snakeweed now has a largely decadent population. The short oakbrush on the site is heavily hedged and has expanded slightly. No changes are apparent in the heavily browsed cliffrose population and the infrequent shrubs were not adequately sampled. Trend for browse is considered stable. Perennial grasses still predominate in the understory. Trend for the herbaceous understory is up slightly. There appears to have been a problem differentiating Sandberg bluegrass and bulbous bluegrass. Sum of nested frequency of perennial grasses and forbs increased.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

### 1997 TREND ASSESSMENT

The soil trend is stable. Some past erosion has occurred as well as plant pedestalling. Current erosion does not appear to be accelerated and not more than would be suspected. The adjacent foot trail shows sign of erosion which could adversely effect the site. The mountain big sagebrush population is moderate to heavily hedged, but the percentage of the population with heavily hedged plants has declined since 1989. Seedling and young plants are sparse with 70% of the plants encountered classified as mature. The broom snakeweed population has exploded to over 10,000 plants/acre estimated in 1997. The browse trend is up slightly for the key browse species, mountain big sagebrush. Nested frequency for bluebunch wheatgrass continues to increase with only a sparse cover of cheatgrass. Bulbous bluegrass also has a high cover value with a very short growth form. Forbs are insignificant on the site at this time. It appears that much of the bulbous bluegrass was classified as Sandberg bluegrass in 1989. Herbaceous trend is up slightly.

#### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - up slightly (4)



## 2002 TREND ASSESSMENT

Trend for soil is down slightly. Cover of bare ground nearly doubled from 7.5% cover to 14.7%. Litter and vegetation cover also declined. There is still adequate protective ground cover to prevent most erosion. Trend for the key browse species, mountain big sagebrush, is down slightly. Density is similar to 1997, but use is heavier and the number of decadent plants has increased. In addition, 53% of the decadent plants sampled were classified as dying. Recruitment is marginal with 7% of the population consisting of young plants. Sagebrush is definitely feeling the effects of drought. Drought conditions have also caused a dramatic decline in the broom snakeweed population. The very high density of 10,300 plants/acre estimated in 1997 has declined to only 120 plants/acre in 2002. Trend for the herbaceous understory is stable. The composition of the herbaceous understory has changed slightly, but the sum of nested frequency for perennial grasses remained similar to 1997. Nested frequency of bluebunch wheatgrass declined, while the frequency of the poor value perennial, bulbous bluegrass, remained stable. Sum of nested frequency for perennial forbs declined slightly.

### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 24

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	b <sup>9</sup>	b <sup>7</sup>	a <sup>-</sup>	a <sup>-</sup>	5	5	-	-	-	-
G	Agropyron dasystachyum	b <sup>86</sup>	a <sup>8</sup>	a <sup>-</sup>	a <sup>2</sup>	33	4	-	1	-	.00
G	Agropyron spicatum	a <sup>196</sup>	a <sup>237</sup>	c <sup>289</sup>	b <sup>254</sup>	76	82	85	85	20.39	13.22
G	Bromus tectorum (a)	-	-	b <sup>133</sup>	a <sup>39</sup>	-	-	49	14	1.51	.19
G	Poa bulbosa	b <sup>284</sup>	a <sup>120</sup>	c <sup>307</sup>	c <sup>303</sup>	89	59	89	88	16.68	19.25
G	Poa pratensis	a <sup>-</sup>	a <sup>-</sup>	a <sup>-</sup>	b <sup>42</sup>	-	-	-	16	-	.59
G	Poa secunda	a <sup>-</sup>	c <sup>299</sup>	b <sup>28</sup>	b <sup>32</sup>	-	95	14	13	.17	1.48
Total for Annual Grasses		0	0	133	39	0	0	49	14	1.51	0.19
Total for Perennial Grasses		575	671	624	633	203	245	188	203	37.25	34.56
Total for Grasses		575	671	757	672	203	245	237	217	38.76	34.76
F	Alyssum alyssoides (a)	-	-	b <sup>128</sup>	a <sup>87</sup>	-	-	49	32	.49	.18
F	Allium spp.	-	-	3	-	-	-	1	-	.00	-
F	Ambrosia psilostachya	a <sup>-</sup>	c <sup>52</sup>	b <sup>35</sup>	a <sup>4</sup>	-	27	15	3	.18	.06
F	Artemisia ludoviciana	3	2	-	-	1	1	-	-	-	-
F	Arabis perennans	-	-	2	-	-	-	1	-	.03	-
F	Astragalus spp.	-	2	-	17	-	1	-	10	-	.35
F	Astragalus utahensis	-	-	3	6	-	-	1	3	.15	.06
F	Castilleja chromosa	7	1	2	5	3	1	1	3	.00	.04
F	Calochortus nuttallii	7	1	-	4	4	1	-	2	-	.01
F	Cirsium undulatum	a <sup>-</sup>	a <sup>2</sup>	b <sup>11</sup>	b <sup>12</sup>	-	1	8	7	.19	.09
F	Comandra pallida	4	8	3	-	2	3	3	-	.01	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Crepis acuminata</i>	-	-	5	7	-	-	2	3	.01	.04
F	<i>Descurainia pinnata</i> (a)	-	-	-	5	-	-	-	2	-	.01
F	<i>Erodium cicutarium</i> (a)	-	-	44	55	-	-	19	22	.26	1.37
F	<i>Helianthus annuus</i> (a)	a-	b17	a-	b14	-	7	-	7	-	.03
F	<i>Hedysarum boreale</i>	ab12	ab11	b26	a4	6	5	11	3	.71	.16
F	<i>Lappula occidentalis</i> (a)	-	-	a-	b23	-	-	-	10	-	.05
F	<i>Lactuca serriola</i>	-	-	1	5	-	-	1	2	.00	.01
F	<i>Lithospermum ruderales</i>	-	3	3	-	-	2	2	-	.01	-
F	<i>Lygodesmia</i> spp.	a-	a-	a-	b13	-	-	-	5	-	.12
F	<i>Oenothera</i> spp.	2	-	5	1	1	-	3	1	.33	.00
F	<i>Orobancha</i> spp.	5	-	-	-	2	-	-	-	-	-
F	<i>Phlox longifolia</i>	a3	ab6	c28	bc21	1	4	12	11	.08	.08
F	<i>Sedum lanceolatum</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Sphaeralcea coccinea</i>	8	7	6	13	4	2	2	7	.03	.03
F	<i>Tragopogon dubius</i>	ab2	a-	c31	b7	2	-	14	5	.24	.10
F	Unknown forb-perennial	-	3	-	-	-	1	-	-	-	-
Total for Annual Forbs		0	17	172	184	0	7	68	73	0.76	1.64
Total for Perennial Forbs		53	98	164	120	26	49	77	66	2.00	1.19
Total for Forbs		53	115	336	304	26	56	145	139	2.76	2.84

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 24

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Artemisia tridentata vaseyana</i>	35	32	8.28	6.99
B	<i>Atriplex confertifolia</i>	1	1	.03	.15
B	<i>Cercocarpus montanus</i>	1	1	.15	.41
B	<i>Chrysothamnus nauseosus albicaulis</i>	4	2	.15	.03
B	<i>Cowania mexicana stansburiana</i>	0	0	-	.15
B	<i>Gutierrezia sarothrae</i>	72	6	3.59	.01
Total for Browse		113	42	12.21	7.75

CANOPY COVER --

Herd unit 17 , Study no: 24

Species	Percent Cover	
	'97	'02
Artemisia tridentata vaseyana	-	2

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 24

Species	Average leader growth (in)
Artemisia tridentata vaseyana	'02 1.9

BASIC COVER --

Herd unit 17 , Study no: 24

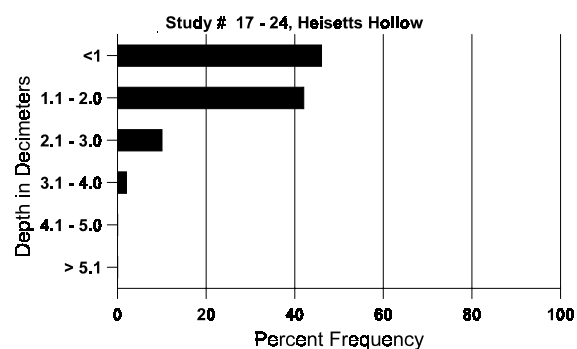
Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	381	367	7.00	22.25	53.82	49.99
Rock	172	211	3.00	4.50	4.96	7.68
Pavement	245	260	6.75	19.75	6.84	8.94
Litter	388	373	72.50	41.00	39.14	31.17
Cryptogams	43	18	.25	0	.59	.22
Bare Ground	190	224	10.50	12.50	7.46	14.68

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 24, Heisetts Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
24.3	49.6 (17.7)	7.1	32.0	35.4	32.6	3.8	5.7	105.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 24

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	'02	'02
Rabbit	1	3	-	-
Bighorn Sheep	-	1	-	-
Elk	1	1	44	3 (8)
Deer	43	46	844	65 (160)
Horse	-	-	9	N/A

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 24

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
Amelanchier alnifolia																		
M	83	-	-	1	-	-	-	-	-	-	-	-	1	-	33	30	35	1
	89	-	-	1	-	-	-	-	-	-	-	-	-	1	33	28	31	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			100%			+ 0%							
'89		00%			100%			100%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	33		-			
												'97	0		-			
												'02	0		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Artemisia tridentata vaseyana</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	60		3
	02	-	-	-	-	-	-	-	0		0
Y	83	-	-	1	-	-	-	-	33		1
	89	-	1	-	-	-	-	-	33		1
	97	4	-	-	-	-	-	-	80		4
	02	1	2	-	-	-	-	-	60		3
M	83	-	8	12	-	-	-	-	666	22 28	20
	89	-	1	12	-	-	-	-	433	24 29	13
	97	-	23	15	1	-	-	-	780	25 47	39
	02	-	2	21	-	1	-	-	480	22 35	24
D	83	-	1	1	3	-	-	-	166		5
	89	-	2	10	-	-	-	-	400		12
	97	4	7	2	-	-	-	-	260		13
	02	1	-	18	-	-	-	-	380		19
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	240		12
	02	-	-	-	-	-	-	-	300		15
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		35%		54%		35%		+ 0%			
'89		15%		85%		04%		+23%			
'97		54%		30%		13%		-18%			
'02		11%		85%		24%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	865	Dec:	19%		
						'89	866		46%		
						'97	1120		23%		
						'02	920		41%		
<i>Atriplex confertifolia</i>											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	1	-	-	-	-	-	20	15 27	1
	02	-	-	1	-	-	-	-	20	6 16	1
D	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	-	-	1	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'97		100%		00%		00%		+50%			
'02		00%		100%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%		
						'89	0		0%		
						'97	20		0%		
						'02	40		50%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<b>Cercocarpus montanus</b>												
S	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	1	-	-	-	-	-	-	20	-	1	
	02	-	-	-	-	-	-	-	0	-	0	
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	1	-	-	-	-	33	-	1	
	97	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	0	-	0	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	1	-	-	-	-	20	70	127	
	02	-	-	-	-	2	-	-	40	89	113	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		100%		00%		-39%				
'97		00%		100%		00%		+50%				
'02		100%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	0	Dec:	-		
							'89	33		-		
							'97	20		-		
							'02	40		-		
<b>Chrysothamnus nauseosus albicaulis</b>												
M	83	1	-	-	-	-	-	-	33	20	24	1
	89	2	-	-	-	-	-	-	66	26	26	2
	97	4	-	-	-	-	-	-	80	28	48	4
	02	-	1	-	-	-	-	-	20	27	44	1
D	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	1	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+50%				
'89		00%		00%		00%		+18%				
'97		00%		00%		00%		-50%				
'02		50%		50%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'83	33	Dec:	0%		
							'89	66		0%		
							'97	80		0%		
							'02	40		50%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cowania mexicana stansburiana</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	38	48	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	66	57	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			
<i>Gutierrezia sarothrae</i>																		
S	83	123	-	-	-	-	-	-	-	-	123	-	-	-	4100			123
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	445	-	-	-	-	-	-	-	-	445	-	-	-	8900			445
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	22	-	-	-	-	-	-	-	-	22	-	-	-	733			22
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	214	-	-	-	-	-	-	-	-	214	-	-	-	4280			214
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	83	15	-	-	-	-	-	-	-	-	15	-	-	-	500	11	8	15
	89	22	-	-	-	-	-	-	-	-	16	-	6	-	733	9	8	22
	97	299	-	-	-	-	-	-	-	-	299	-	-	-	5980	6	7	299
	02	4	-	-	-	-	-	-	-	-	3	-	1	-	80	7	7	4
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	21	-	-	-	-	-	-	-	-	8	-	10	3	700			21
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+14%							
'89		00%			00%			44%			+86%							
'97		00%			00%			00%			-99%							
'02		00%			00%			17%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1233	Dec:	0%			
												'89	1433		49%			
												'97	10300		0%			
												'02	120		0%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
Y	'83	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1	
	'89	-	-	5	1	-	-	-	-	-	-	-	2	4	200		6	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	-	1	2	-	-	-	-	-	-	-	2	-	1	100	33	35	3
	'89	-	-	4	-	-	1	-	-	-	-	5	-	-	166	59	33	5
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	52	43	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		25%			75%			50%			+64%							
'89		00%			91%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	-			
												'89	366		-			
												'97	0		-			
												'02	0		-			



Trend Study 17-25-02

Study site name: North Battle Creek.

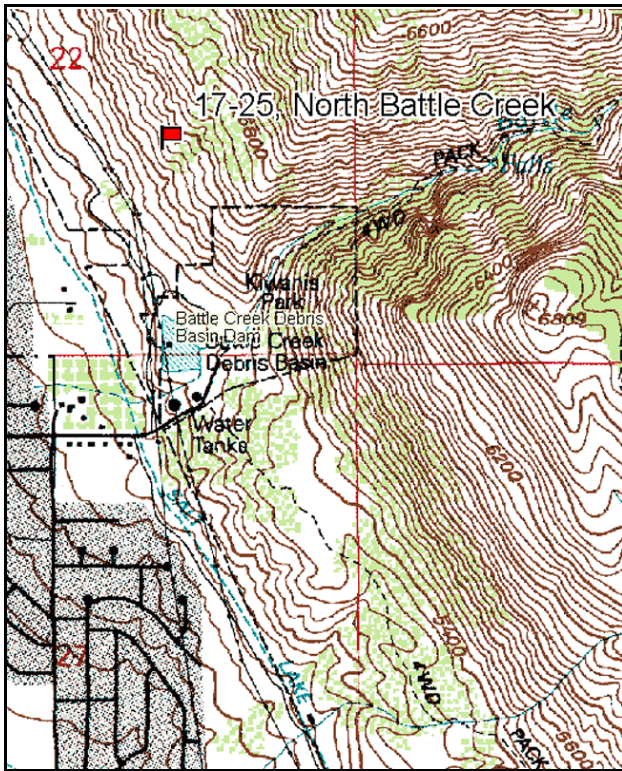
Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 192 degrees magnetic (lines 2 & 3 @ 274°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34 & 71ft). Rebar: None on site.

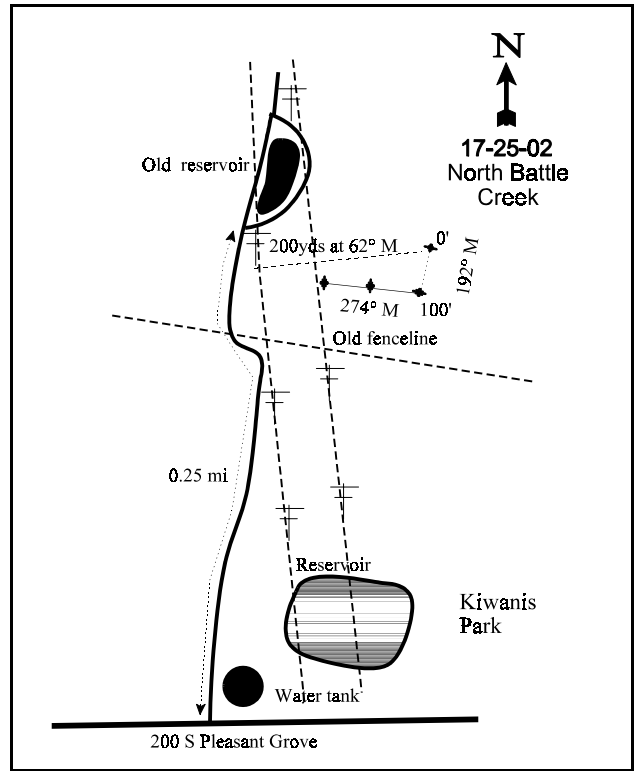
LOCATION DESCRIPTION

From Pleasant Grove, go up 200 South towards Battle Creek Canyon. The paved road ends at a water tank. Follow one of the many dirt roads north along the base of the foothill under the powerlines. From the water tank, go about 1/4 mile to a 2<sup>nd</sup> reservoir. Stop on the south end. From the powerline pole on the south end of the old reservoir, the 0-foot stake is about 200 yards at 62 degrees magnetic. The study samples the first face or slope below the second terrace, in a fairly dense cliffrose type, just north of a small drainage. A red browse tag, #3988, is attached to the 0-foot stake.



Map Name: Orem

Township 5S, Range 2E, Section 22



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4438640 N 440412 E

## DISCUSSION

### North Battle Creek - Trend Study No. 17-25

This study is found on a steep (65-70%) southwest facing hillside located just north of Battle Creek above Pleasant Grove. The site is typical of the severe winter range in this area. Elevation is about 5,600 feet which is between the upper and lower Bonneville lake terraces. The Battle Creek and Grove Creek debris basins, which act as small reservoirs in the spring, are located below the site to the north and south. Residential subdivisions have been constructed up to the base of the hill just below the site. The range type is tall cliffrose with sagebrush-grass in the understory. Above the study sight, Gambel oak becomes increasingly dominant. The area is moderately browsed by deer. A pellet group transect read on site in 2002 estimated 44 deer days use/acre (109 ddu/ha). Only one elk pellet group was encountered. All pellet groups appeared to be from winter use.

Soil is a well drained clay loam derived from limestone and quartzite. Soils in this area often have a lime-cemented hardpan at 12 to 20 inches depth, which can be a barrier to root and water penetration. (USDA-SCS, 1972). Soil at the site has an effective rooting depth is nearly 13 inches with a neutral soil reaction (pH of 7.1). Both phosphorous and potassium are low at only 6.4 ppm and 38.4 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium may limit normal plant growth and development. On steep slopes, such as this study site, the erosion hazard is severe. There is a moderate amount of exposed bare ground and some erosion is occurring. The erosion condition class was determined to be slight in 2002.

The key browse species is Stansbury cliffrose. It provided 86% of the browse cover in 2002. Use has consistently been moderate to heavy since the site was established in 1983. Density was estimated at 800 plants/acre in 1997 with the larger sample used that year. Vigor was generally good and only 10% of the population was classified as decadent. No recruitment was evident with no seedlings or young sampled between 1983 and 1997. Density declined slightly to 720 plants/acre in 2002. About one-third of the population was classified as decadent and 36% of the decadent plants appeared to be dying (>50% crown death). Recruitment and biotic potential remains poor with only 1 seedling sampled in 2002.

Mountain big sagebrush provides some additional forage. It had a low density of only of 220 plants/acre in 1997, declining to 120 in 2002. It displayed moderate to heavy use in 1997 and moderate use in 2002. Vigor was good on most plants and the number of decadent plants remains low. A small number bitterbrush provide additional preferred forage.

Perennial herbaceous plants are severely depleted. Occasional clumps of bluebunch wheatgrass and Sandberg bluegrass are the principal grasses. Cheatgrass is also abundant. Also numerous are annual forbs like: storksbill, bur buttercup, and pale alyssum. The most desirable forb on the site was Utah sweetvetch, but it was not sampled in 1997. It is possible that this was misidentified in 1997 as *Lathyrus brachycalyx*. Another forb of interest is desert princes plume, a species normally regarded as a selenium indicator.

### 1983 APPARENT TREND ASSESSMENT

This site is located on a highly erodible and very steep slope. Litter and vegetation cover primarily result from annual plants. Because of these facts, the rate of erosion is high. The area has the appearance of a declining sagebrush population that is being replaced by annual grasses and weeds. However, the collected data appears to contradict this and is more indicative of a stable browse stand. The density plot sample is a small one and there is some question as to validity. It is more likely that big sagebrush is declining in abundance much as it is elsewhere along the Wasatch Front.

### 1989 TREND ASSESSMENT

Trend for soil is stable. The lower amount of litter cover calculated in 1989 may be a reflection of the dry conditions. More rock and pavement is exposed, 29% in 1983 compared to 46.5% in 1989. However, vegetation cover increased and cover of bare ground declined slightly. Trend for browse is stable with similar population densities for cliffrose and sagebrush estimated in 1989. Utilization is moderate for both species but vigor is good on most plants and rates of decadence are within acceptable limits. Trend for the herbaceous understory is also stable. Herbaceous vegetation is limited but sum of nested frequency for perennial grasses and forbs has remained similar.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

### 1997 TREND ASSESSMENT

Soil trend is stable. Past erosion is apparent with some terracing and plant pedestalling. Erosion does not appear to be very active now. Vegetation and litter provide some soil protection, but a bulk of the basic ground cover is provided by rock and pavement. The browse trend is stable as well. Populations appear to be relatively stable and not expanding. A greatly increased sample size was used in 1997 which accounts for some of the shifts in densities. Utilization has increased on cliffrose and mountain big sagebrush. The herbaceous understory is depleted with a bulk of the cover coming from annual species. Bluebunch wheatgrass nested frequency has significantly declined since 1989. Herbaceous understory trend is slightly downward.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly downward (2)

### 2002 TREND ASSESSMENT

Trend for soil is slightly down. Vegetation and litter cover declined and cover of bare ground increased. There is some erosion occurring but is not severe. The erosion condition class was determined to be slight. Trend for browse is down slightly. Cliffrose has declined slightly in density. Utilization is not as heavy but the number of decadent plants has increased from 10% to 31%. In addition, 36% of the decadent cliffrose sampled were classified as dying. No young plants occur on the site and only one seedling was encountered within the sample. Mountain big sagebrush occurs in low densities. Sagebrush density has declined 45% to only 120 plants/acre. Use is moderate but vigor is normal. Trend for the herbaceous understory is stable but poor. Sum of nested frequency of perennial grasses has remained stable. Cheatgrass was common in 1997 but has since declined significantly in nested frequency due to drought. The forb composition is still dominated by annual weeds but the sum of nested frequency for perennial forbs has remained stable.

#### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - stable but poor (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 25

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	-	-	1	7	-	-	1	2	.00	.18
G	Agropyron spicatum	<sub>b</sub> 128	<sub>b</sub> 117	<sub>a</sub> 65	<sub>a</sub> 71	46	44	26	30	3.48	3.71
G	Bromus tectorum (a)	-	-	<sub>b</sub> 159	<sub>a</sub> 38	-	-	59	18	2.51	.24
G	Poa bulbosa	-	-	-	2	-	-	-	1	-	.00
G	Poa secunda	<sub>b</sub> 15	<sub>b</sub> 13	<sub>ab</sub> 6	<sub>a</sub> -	5	5	2	-	.18	-
G	Secale cereale (a)	-	-	2	-	-	-	1	-	.00	-
G	Unknown grass - perennial	-	3	3	-	-	2	1	-	.03	-
Total for Annual Grasses		0	0	161	38	0	0	60	18	2.51	0.24
Total for Perennial Grasses		143	133	75	80	51	51	30	33	3.70	3.90
Total for Grasses		143	133	236	118	51	51	90	51	6.22	4.14
F	Alyssum alyssoides (a)	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 81	<sub>b</sub> 60	-	-	35	25	.30	.30
F	Allium spp.	<sub>a</sub> 20	<sub>a</sub> 6	<sub>a</sub> 16	<sub>b</sub> 121	9	4	10	50	.08	.86
F	Ambrosia psilostachya	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 13	<sub>a</sub> 1	-	-	7	1	.21	.00
F	Artemisia ludoviciana	-	-	5	-	-	-	3	-	.30	-
F	Astragalus spp.	-	-	-	1	-	-	-	1	-	.03
F	Cirsium undulatum	-	-	1	2	-	-	1	1	.00	.03
F	Convolvulus arvensis	<sub>a</sub> -	<sub>a</sub> -	<sub>ab</sub> 11	<sub>b</sub> 14	-	-	4	6	.36	.49
F	Epilobium brachycarpum (a)	-	-	4	7	-	-	2	5	.01	.02
F	Erodium cicutarium (a)	-	-	<sub>b</sub> 213	<sub>a</sub> 91	-	-	71	43	6.43	1.01
F	Galium aparine (a)	-	-	<sub>a</sub> 59	<sub>b</sub> 99	-	-	27	36	.84	2.61
F	Hackelia patens	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 14	<sub>b</sub> 10	-	-	5	5	.05	.07
F	Hedysarum boreale	<sub>b</sub> 57	<sub>b</sub> 52	<sub>a</sub> -	<sub>a</sub> 7	25	21	-	3	-	.01
F	Lathyrus brachycalyx	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 111	<sub>b</sub> 58	-	-	42	27	4.23	2.51
F	Lactuca serriola	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 17	<sub>a</sub> 1	-	-	11	1	.16	.00
F	Machaeranthera canescens	2	1	-	-	1	1	-	-	-	-
F	Medicago sativa	-	-	3	-	-	-	1	-	.03	-
F	Oenothera latifolia	2	-	-	-	1	-	-	-	-	-
F	Phlox longifolia	6	13	11	9	3	9	5	5	.05	.05
F	Ranunculus testiculatus (a)	-	-	<sub>b</sub> 166	<sub>a</sub> 124	-	-	60	47	1.64	.95
F	Sisymbrium altissimum (a)	-	-	3	4	-	-	1	2	.00	.01
F	Stanleya pinnata	<sub>b</sub> 24	<sub>b</sub> 12	<sub>a</sub> -	<sub>a</sub> -	10	9	-	-	-	-
F	Taraxacum officinale	-	-	6	2	-	-	4	1	.07	.03
F	Tragopogon dubius	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 18	<sub>b</sub> 16	-	-	8	7	.11	.08
F	Unknown forb-annual (a)	-	-	<sub>a</sub> 1	<sub>b</sub> 44	-	-	1	19	.15	1.33
Total for Annual Forbs		0	0	527	429	0	0	197	177	9.38	6.26
Total for Perennial Forbs		111	84	226	242	49	44	101	108	5.66	4.19
Total for Forbs		111	84	753	671	49	44	298	285	15.05	10.46

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

BROWSE TRENDS --

Herd unit 17 , Study no: 25

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	8	5	.83	.36
B	Chrysothamnus nauseosus albicaulis	2	2	.78	.38
B	Cowania mexicana stansburiana	32	26	7.41	8.80
B	Gutierrezia sarothrae	12	6	.56	.39
B	Purshia tridentata	0	4	-	.30
Total for Browse		54	43	9.59	10.23

CANOPY COVER --

Herd unit 17 , Study no: 25

Species	Percent Cover	
	'97	'02
Artemisia tridentata vaseyana	-	3
Cowania mexicana stansburiana	2	2

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 25

Species	Average leader growth (in)
	'02
Cowania mexicana stansburiana	1.1

BASIC COVER --

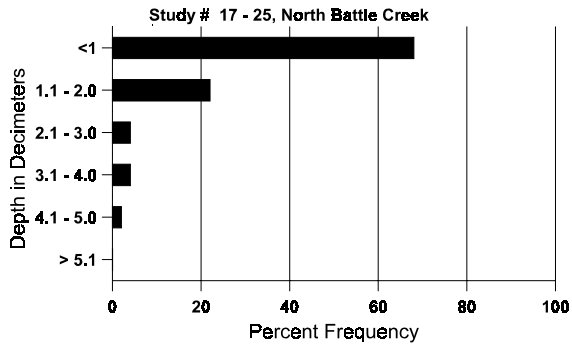
Herd unit 17 , Study no: 25

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	342	289	3.50	7.00	30.84	26.16
Rock	318	340	8.75	20.50	28.40	32.22
Pavement	286	311	20.25	26.00	11.94	9.89
Litter	371	333	48.75	30.50	19.88	15.82
Cryptogams	5	5	.75	.25	.01	.04
Bare Ground	248	277	18.00	15.75	16.89	27.09

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 25, North Battle Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	52.3 (15.4)	7.1	28.0	33.4	38.6	2.9	6.4	38.4	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17, Study no: 25

Type	Quadrat Frequency	
	'97	'02
Elk	-	1
Deer	47	18

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
9	1 (2)
574	44 (109)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 25

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4							
Artemisia tridentata vaseyana												
Y	83	3	-	-	-	-	-	-	3	0	3	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	0		0	
M	83	13	-	-	-	-	-	-	866	20	35	13
	89	-	12	-	-	-	-	-	800	22	26	12
	97	-	3	5	-	1	-	-	180	26	40	9
	02	-	5	-	-	-	-	-	100	28	46	5
D	83	-	-	-	-	-	-	-	0		0	
	89	-	3	-	-	-	-	-	200		3	
	97	1	-	1	-	-	-	-	40		2	
	02	-	1	-	-	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	80		4	
	02	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		- 6%				
'89		100%		00%		07%		-78%				
'97		36%		55%		18%		-45%				
'02		100%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	1066	Dec:	0%			
						'89	1000		20%			
						'97	220		18%			
						'02	120		17%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Chrysothamnus nauseosus albicaulis																
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	1	-	-	-	-	-	-	-	1	-	-	-	66	23 30	1
	89	-	1	-	-	-	-	-	-	1	-	-	-	66	20 37	1
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	22 30	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	18 33	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	-	-	2	40		2
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%			+ 0%					
'89		100%			00%			00%			- 9%					
'97		00%			00%			67%			-33%					
'02		00%			00%			50%								
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	0%		
											'89	66		0%		
											'97	60		67%		
											'02	40		50%		



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cowania mexicana stansburiana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	3	-	-	-	1	-	-	-	3	-	1	-	266	50 60	4	
	89	-	4	-	-	-	-	-	-	-	4	-	-	-	266	58 59	4	
	97	-	4	14	-	-	18	-	-	-	36	-	-	-	720	50 57	36	
	02	-	-	13	-	4	4	4	-	-	25	-	-	-	500	54 63	25	
D	83	-	-	1	-	-	-	-	-	-	-	-	1	-	66		1	
	89	-	1	1	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	3	-	-	1	-	-	-	3	-	-	1	80		4	
	02	-	-	3	-	-	1	7	-	-	7	-	-	4	220		11	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		60%			40%			40%			+17%							
'89		83%			17%			00%			+50%							
'97		10%			90%			03%			-10%							
'02		11%			58%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	332	Dec:	20%			
												'89	399		33%			
												'97	800		10%			
												'02	720		31%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Gutierrezia sarothrae</i>											
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	6	-	-	-	-	-	-	6		6
	02	-	-	-	-	-	-	-	0		0
M	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	97	37	-	-	-	-	-	-	740	9 11	37
	02	3	-	-	-	-	-	-	60	7 15	3
D	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	3	-	80		4
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	200		10
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'97		00%		00%		00%		-84%			
'02		00%		00%		43%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%		
						'89	0		0%		
						'97	860		0%		
						'02	140		57%		
<i>Purshia tridentata</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	2	-	-	-	-	-	-	40		2
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	20		1
M	83	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	-	-	-	-	0	-	0
	02	-	-	2	-	1	-	-	60	13 8	3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'97		00%		00%		00%					
'02		25%		50%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-		
						'89	0		-		
						'97	0		-		
						'02	80		-		

Trend Study 17-26-02

Study site name: Orem Water Tank.

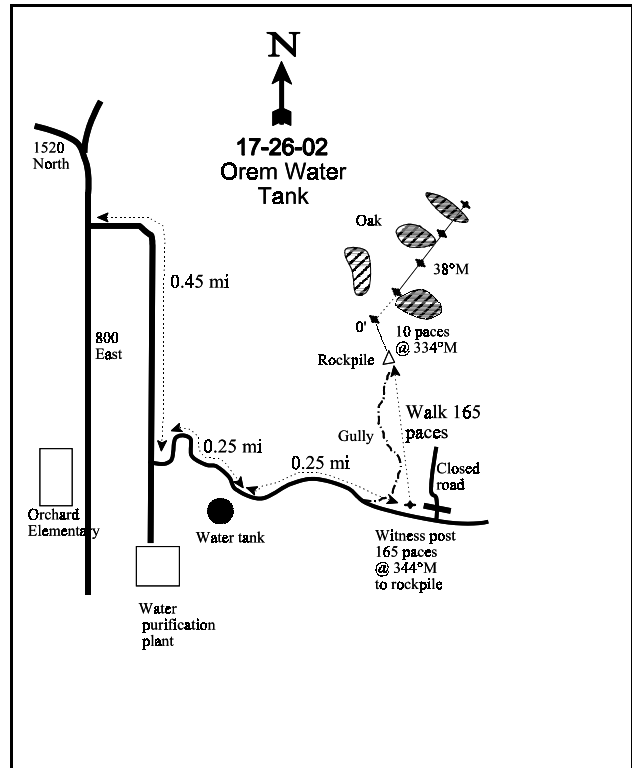
Vegetation type: Oak/Seeding.

Compass bearing: frequency baseline 38 degrees magnetic.

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

LOCATION DESCRIPTION

You will need a key from Orem City to access this site. On the north side of Orem, go east up 1600 North (which turns into 1520 North) to 800 East. Just south of this intersection on 800 East, turn up the road towards the water purification plant. Go 0.45 miles, turn left and go 0.25 miles to a water tank. Continue on this road 0.25 miles and park. The old road towards the study site is closed, but a witness post should mark the junction. From there, walk about 165 paces (275 yards) to a rock pile at the head of a small drainage or gully. From the rockpile, walk north 10 paces at 334 degrees magnetic to the 0-foot baseline stake at the edge of the oakbrush. It is marked by a red browse tag #3913.



Map Name: Orem

Diagrammatic Sketch

Township 6S, Range 2E, Section 1

GPS: NAD 27, UTM 12S 4464115 N 443686 E

## DISCUSSION

### Orem Water Tank - Trend Study No. 17-26

This study was established in 1983 on a burned and seeded oakbrush community immediately north of the Orem Water Treatment Plant. Slope is moderately steep ranging from about 8% at the base of the slope to 30% near the top. Aspect is south to southwest at an elevation of 5,260 feet. In the summer of 1996, a fire burned through the area again wiping out what browse had come back from the previous fire. Resprouting Gambel oak is the exception. Deer use has been heavy in the past, but only light hedging is noted in 1997. Deer pellet groups were frequent with some scattered elk pellet groups. Livestock are excluded to protect watershed quality. In 1983, grasshopper damage was apparent on the oak, but not enough to impact vigor. Data from a pellet group transect read on site in 2002 estimated 49 deer and 60 elk days use/acre (121 ddu/ha and 147 edu/ha). Most of the deer and elk use appeared to be from winter and spring.

Soil at the site is moderately deep with an effective rooting depth estimated at 13 inches. Textural analysis indicates a clay loam soil with a neutral soil reaction (pH at 6.7). The average soil temperature was 58.2°F at 14 inches in depth. A dense cover of seeded grasses and litter provides adequate soil protection.

Gambel oakbrush has been the dominant browse species on the site since the study was established in 1983. It had a density of between 15,000 and 14,000 stems/acre in 1983 and 1989. Mature plants averaged between 3 and 4 feet in height. The fire that swept through the area in 1996 burned all of the oak clones on the site. Estimated density of resprouting oakbrush was estimated at 10,560 stems/acre in 1997. Unlike other browse species, it is likely that many of the plants classified as seedling on this site will survive to maturity. During the 2002 reading, density of oak was estimated at nearly 19,000 stems/acre. Average height has increased from 13 inches in 1997 to 31 inches in 2002, while cover has more than doubled. Use of oak was light.

Mountain big sagebrush had a low density of only 333 plants/acre in 1989. All sagebrush plants were consumed by the 1996 fire. None were sampled in 1997 or 2002. Fourwing saltbush was seeded but not encountered in the density strips in any reading.

Seeded perennial grasses have established well and dominate the herbaceous understory. Smooth brome is the dominant grass in the Gambel oak understory, while intermediate wheatgrass and crested wheatgrass are dominant in the interspaces. Low amounts of annual grass species, cheatgrass, Japanese brome, and six weeks fescue are present but the density of perennial grasses should suppress these annuals from becoming abundant. Alfalfa is the dominant forb. It is healthy and robust, while showing signs of utilization. Other perennial forbs were seldom encountered.

### 1983 APPARENT TREND ASSESSMENT

The soil is stable with abundant protective ground cover. Gambel oak and seeded perennial grasses are dominant. From a management point of view, the area provides an abundant, but low diversity diet for deer. Any management action that could increase browse diversity would be welcome.

## 1989 TREND ASSESSMENT

Vegetation cover increased slightly while litter cover declined slightly. Perennial grasses contribute significant amounts of litter cover. Along with leaf litter from oak brush, litter provide 95% of the ground cover. The soil trend is stable. The browse trend is down and poor. Gambel oak is the only common species, but provides poor winter forage. Mountain big sagebrush remains at a low density and all plants sampled were classified as decadent. Drought conditions combined with intense competition with perennial grasses make seedling establishment difficult. Trend for the herbaceous understory is stable. Sum of nested frequency for the most abundant perennial grasses, intermediate wheatgrass and smooth brome, has remained stable.

### TREND ASSESSMENT

soil - stable (3)

browse - down and poor (1)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

The soil trend is stable. Although bare ground cover has increased because of the recent fire event, there is still adequate vegetative and litter cover to protect the soil from erosion. Gambel oak will continue to grow and provide additional protection as well. At this time it is difficult to assess the browse trend. All mountain big sagebrush plants were destroyed by the fire, but the most recent reading estimated only 333 plants/acre. Gambel oak is the key forage species at this time and it will continue to grow in height. Browse trend is stable, although the establishment of other forage species should be encouraged. Herbaceous understory trend is stable with many of the same species present now that were present prior to the fire. Smooth brome will continue to dominate the understory and protect the watershed. Forb diversity is high, although many of the species are sparse.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soil is up. Vegetation and litter cover have increased substantially while cover of bare ground has declined to a very low level. Protective ground cover is abundant and there is no soil erosion occurring on this site. There are no shrubs on the site except for Gambel oak which resprouted after the 1996 fire. Oak provides some cover but it is deciduous and poor winter forage. Most use on oak occurs in the spring and fall. Oakbrush has more than doubled in cover and nearly doubled in density. Average height has increased from 13 inches to 31 inches. Deer and elk do not appear to be browsing the oak but this area is good elk winter range due to the abundance of perennial grasses. The browse trend is considered stable but lacking in diversity. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses and forbs is similar to 1997. Smooth brome and intermediate wheatgrass continue to dominate the understory. The annuals, cheatgrass and Japanese brome, did increase in nested frequency which is a surprise considering the drought conditions which have occurred for the past few years. Cheatgrass now provides 26% of the grass cover.

### TREND ASSESSMENT

soil - up (5)

browse - stable but poor (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 26

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 8	<sub>a</sub> 1	<sub>b</sub> 41	<sub>ab</sub> 18	5	1	14	7	1.68	.45
G	Agropyron intermedium	173	166	103	121	68	60	35	42	4.96	6.98
G	Bromus inermis	235	268	232	224	76	83	74	67	13.45	18.14
G	Bromus japonicus (a)	-	-	<sub>a</sub> 37	<sub>b</sub> 60	-	-	12	25	.86	1.03
G	Bromus tectorum (a)	-	-	<sub>a</sub> 105	<sub>b</sub> 161	-	-	38	51	2.49	9.32
G	Poa bulbosa	-	-	-	3	-	-	-	2	-	.18
G	Poa pratensis	-	3	-	1	-	1	-	1	-	.00
G	Poa secunda	3	7	10	6	1	3	3	3	.06	.04
G	Vulpia octoflora (a)	-	-	2	3	-	-	1	1	.00	.00
Total for Annual Grasses		0	0	144	224	0	0	51	77	3.36	10.36
Total for Perennial Grasses		419	445	386	373	150	148	126	122	20.17	25.80
Total for Grasses		419	445	530	597	150	148	177	199	23.54	36.16
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 101	<sub>a</sub> 79	-	-	43	34	.73	.46
F	Astragalus spp.	-	2	-	-	-	2	-	-	-	-
F	Calochortus nuttallii	<sub>b</sub> 20	<sub>a</sub> 1	<sub>b</sub> 14	<sub>a</sub> 1	11	1	8	1	.04	.00
F	Collomia linearis (a)	-	-	-	1	-	-	-	1	-	.00
F	Descurainia pinnata (a)	-	-	10	5	-	-	5	3	.02	.01
F	Epipactis gigantea	-	-	2	-	-	-	1	-	.00	-
F	Erodium cicutarium (a)	-	-	<sub>b</sub> 28	<sub>a</sub> 16	-	-	12	5	.21	.51
F	Eriogonum racemosum	5	3	5	-	4	1	2	-	.03	-
F	Galium aparine (a)	-	-	6	4	-	-	2	2	.04	.01
F	Hedysarum boreale	<sub>b</sub> 22	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	9	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	<sub>a</sub> 2	<sub>b</sub> 14	-	-	1	9	.00	.04
F	Lappula occidentalis (a)	-	-	7	-	-	-	4	-	.02	-
F	Lactuca serriola	-	-	2	-	-	-	2	-	.18	-
F	Linaria dalmatica	-	-	3	4	-	-	1	2	.03	.01
F	Medicago sativa	<sub>a</sub> 14	<sub>a</sub> 22	<sub>b</sub> 99	<sub>c</sub> 140	7	10	37	50	12.19	7.60
F	Polygonum douglasii (a)	-	-	2	-	-	-	1	-	.00	-
F	Sphaeralcea coccinea	6	8	6	-	4	3	3	-	.04	.00
F	Tragopogon dubius	1	-	5	-	1	-	2	-	.06	-
F	Zigadenus paniculatus	1	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	0	156	119	0	0	68	54	1.04	1.04
Total for Perennial Forbs		69	36	136	145	37	17	56	53	12.59	7.62
Total for Forbs		69	36	292	264	37	17	124	107	13.64	8.67

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 26

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Chrysothamnus nauseosus albicaulis	1	0	-	-
B	Quercus gambelii	57	59	7.65	16.63
Total for Browse		58	59	7.65	16.63

CANOPY COVER -- LINE INTERCEPT  
Herd unit 17 , Study no: 26

Species	Percent Cover	
	'97	'02
Quercus gambelii	-	24.83

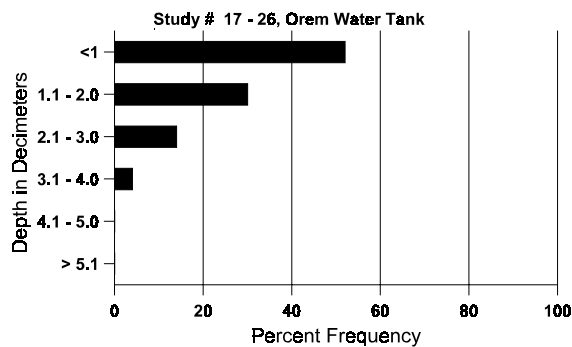
BASIC COVER --  
Herd unit 17 , Study no: 26

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	349	368	1.50	3.00	42.85	59.75
Rock	206	57	.50	1.00	3.87	.69
Pavement	239	36	.75	1.00	1.99	.11
Litter	385	388	95.50	91.50	34.48	72.68
Cryptogams	1	2	.25	0	.00	.00
Bare Ground	307	30	1.50	3.50	23.51	1.08

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 26, Orem Water Tank

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.0	58.2 (14.3)	6.7	33.8	38.4	27.8	2.9	15.9	198.4	.7

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 26

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Elk	7	15	02	02
Deer	36	11	774	60 (147)
			635	49 (121)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 26

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
<i>Artemisia tridentata vaseyana</i>																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	-	2	-	-	-	-	-	-	2	-	-	-	133	31	26	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	-	-	4	-	-	-	-	-	-	4	-	-	-	266			4
	89	-	1	3	-	1	-	-	-	-	2	-	3	-	333			5
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			00%			-17%							
'89		40%			60%			60%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	399	Dec:	67%				
											'89	333		100%				
											'97	0		0%				
											'02	0		0%				
<i>Atriplex canescens</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	13	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				
											'02	0		-				



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Chrysothamnus nauseosus albicaulis</i>																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	1	-	-	-	-	-	-	-	-	-	1	20		1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
	'83	00%			00%			00%									
	'89	00%			00%			00%									
	'97	00%			100%			00%									
	'02	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	20		-		
												'02	0		-		
<i>Gutierrezia sarothrae</i>																	
D	'83	2	-	-	-	-	-	-	-	-	-	-	-	2	133		2
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
	'83	00%			00%			00%									
	'89	00%			00%			00%									
	'97	00%			00%			00%									
	'02	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	100%		
												'89	0		0%		
												'97	0		0%		
												'02	0		0%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	21	-	-	-	-	-	-	-	-	21	-	-	-	1400		21	
	89	26	2	-	12	-	-	-	-	-	32	2	2	4	2666		40	
	97	229	-	-	-	-	-	-	-	-	229	-	-	-	4580		229	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	15	48	-	-	-	-	-	-	-	63	-	-	-	4200		63	
	89	117	9	-	9	-	-	-	-	-	132	-	3	-	9000		135	
	97	363	-	-	45	-	-	-	-	-	326	74	-	8	8160		408	
	02	116	-	-	7	-	-	24	-	-	147	-	-	-	2940		147	
M	83	-	124	-	-	40	-	-	-	-	164	-	-	-	10933	40 15	164	
	89	43	7	-	2	1	-	-	-	-	53	-	-	-	3533	46 19	53	
	97	120	-	-	-	-	-	-	-	-	104	16	-	-	2400	13 10	120	
	02	527	55	-	106	-	-	105	-	-	793	-	-	-	15860	31 16	793	
D	83	-	-	3	-	-	-	-	-	-	-	3	-	-	200		3	
	89	14	11	-	1	-	-	1	-	-	13	1	11	2	1800		27	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	8280		414	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	1320		66	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		92%			01%			00%			- 7%							
'89		13%			00%			07%			-26%							
'97		00%			00%			02%			+44%							
'02		06%			00%			.10%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	15333	Dec:	1%			
												'89	14333		13%			
												'97	10560		0%			
												'02	18820		0%			

Trend Study 17-30-02

Study site name: Spring Canyon.

Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 348 degrees magnetic (line 2-3 @ 311°M).

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

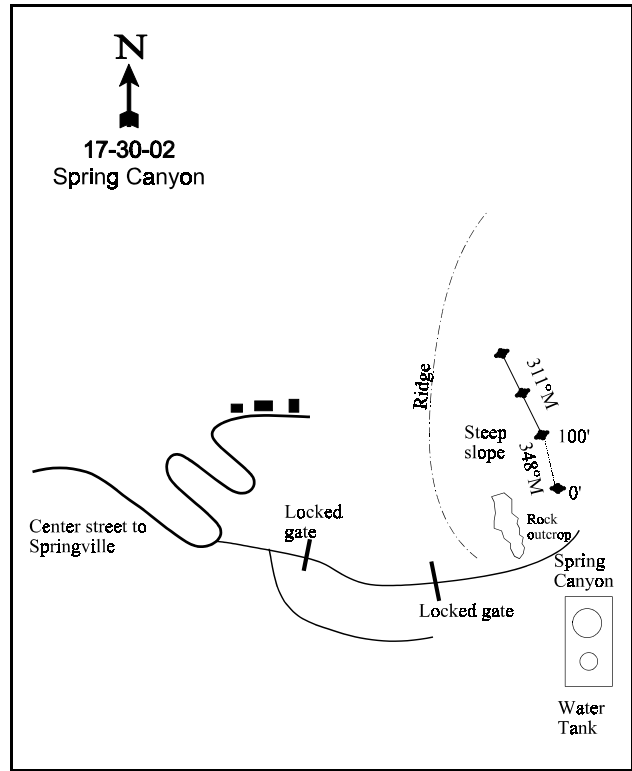
LOCATION DESCRIPTION

Follow Center Street in Springville easterly toward the mountain. From the first switchback where the main road goes up to houses on the bench north of Spring Canyon, continue towards the canyon mouth to the first gate. Continued development may alter the approach to the canyon. In 1989, you could walk 1/2 mile from the first locked gate to another gate up in the canyon. From this gate, continue 119 paces east up Spring Canyon. Uphill to the northwest (azimuth 271 degrees) there is a conspicuous group of rock outcroppings. Walk up the side hill to the uppermost rock near the top of the ridge. The 0-foot baseline stake, marked with a red browse tag #177, is north of the rock.



Map Name: Springville

Township 7S, Range 3E, Section 35



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4445799 N 451528 E

## DISCUSSION

### Spring Canyon - Trend Study No. 17-30

The Spring Canyon study typifies severe winter range on much of herd unit 17, especially that portion located north of Hobble Creek Canyon. This is an area of critical importance but also one which is seriously depleted. This study samples a sparse Stansbury cliffrose community located near the mouth of Spring Canyon. The site lies on a steep (60-65%) south to southwest facing slope at an elevation of 5,200 feet. During the winter, the area is intensively used by deer and increasingly so by elk. Quadrat frequency of deer and elk pellet groups was moderately high at 38% and 22% in 1997 respectively. Frequency of deer pellet groups was similar in 2002 at 32%. Data from a pellet group transect read on site in 2002 estimated 42 deer days use/acre and 3 elk days use/acre (104 ddu/ha and 8 edu/ha). All pellet groups appeared to be from winter use.

Soil condition is poor. The soil is exceptionally loose, rocky, and easily moved down the steep slope. Moisture holding capability would be very low. Soil textural analysis indicates a sandy loam with a neutral soil reaction (pH of 7.0). Both phosphorous and potassium levels are low at 5.9 ppm and 57.6 ppm respectively. Levels less than 10 ppm for phosphorus and 70 ppm for potassium can limit normal plant growth and development. Effective rooting depth was estimated at almost 11 inches with an average temperature of 55.8° F at 12 inches in depth in 1997. Surface rock is variable in size and appears to be limestone. No soil profile or horizon development was detectable. Erosion is unavoidable but little serious erosion is occurring due to the nearly complete cover of rock and vegetation. Most perennial plants are pedestaled. The soil erosion condition class was determined as in 2002.

There is little browse on the site with total shrub cover averaging only about 6% in 1997 and 2002. Stansbury cliffrose is the key browse species. It provided 47% of the meager browse cover in 1997, increasing to 60% in 2002. Cliffrose comprises a scattered population of mostly mature plants. Density was estimated at only 240 plants/acre in 2002. Mature cliffrose averaged about 6 feet in height with a few individuals in excess of 10 feet. Utilization or hedging of the available portions has been heavy since the site was established in 1983. However, vigor has remained good since 1989 and the number of decadent plants was low at 8% in 2002. Due to drought conditions in 2002, annual leader growth for cliffrose was poor averaging less than 1 inch.

Broom snakeweed was abundant and had an estimated density of 2,760 plants/acre in 1997. The population appeared to be expanding with many seedling and young plants encountered. However, due to drought conditions, density declined to only 580 plants/acre in 2002, and just over one-third of the surviving plants displayed poor vigor. A short distance up the canyon, there are a few patches of Gambel oak, netleaf hackberry, and Rocky Mountain smooth sumac.

The perennial grass composition is depleted. Bulbous bluegrass dominates the herbaceous understory as it provided 70% of the total herbaceous understory cover in 1997 and 64% in 2002. Bulbous bluegrass is a poor value, short-lived perennial grass which is a low growing and dries out completely in early summer. Only minimal forage or soil protection is afforded by bulbous bluegrass. Bluebunch wheatgrass is the most desirable grass on the site. Although, it provided only 12% of the total grass cover in 1997, increasing to 15% in 2002. Nested frequency has increased since 1989 to numbers similar to 1983. Cheatgrass, an annual, was encountered in nearly every quadrat in 1997 and 2002. Cover values are low however.

Forb composition is only slightly more diverse than that of grasses. The most abundant species is shortstem wild buckwheat. This plant still exhibits pedestalling with no apparent utilization. Other forbs include Louisiana sage, wavyleaf thistle, and yellow salsify.

### 1983 APPARENT TREND ASSESSMENT

Range condition is poor and appears to be in a state of decline. The soil, already seriously depleted, suffers from a lack of effective ground cover and is unlikely to stabilize without some form of direct intervention (i.e., terracing, reseeding etc.). Vegetative trend also appears to be in a state of decline. Although the key browse species, Stansbury cliffrose, is long-lived, reproduction is lacking and use is heavy. When this species is gone, nothing with any real value will remain. The site is currently dominated by cheatgrass and bulbous bluegrass, a low value perennial. Drastic remedial action is needed, but not very practical.

### 1989 TREND ASSESSMENT

In the five years since the study was established, there have been no significant changes in condition on this critical winter range. The data between years is similar. Forage for big game is still limited, and the rehabilitation potential is very low due to the shallow, rocky and dry soil on the very steep 65% slope. The ground cover measurements indicate an increase in rock and pavement cover to 69%. Soil and rock movement is continuous. Trend for soil is stable but in poor condition. Cliffrose displays improved vigor, reproduction, and a 27% increase in density. Trend for browse is considered slightly up. Herbaceous composition is still poor and dominated by the low value perennial, bulbous bluegrass. Trend is down slightly due to a significant decline in the nested frequency of bluebunch wheatgrass. Perennial forbs are still limited and have declined slightly in frequency.

#### TREND ASSESSMENT

soil - stable (3)

browse - up slightly but limited (4)

herbaceous understory - down slightly (2)

### 1997 TREND ASSESSMENT

The soil trend is stable, although poor. Erosion will always occur on this slope due to the steepness. Vegetative cover will help slow erosion and there is currently little exposed bare soil. Rock and pavement cover is high, although they may increase erosion potential. Browse trend is stable with Stansbury cliffrose being the key species. Some of the decline in density may be due to the much larger sample used in 1997. Plants are heavily hedged but still exhibit good vigor. Percent decadency has increased, but more seedlings were encountered in 1997. Broom snakeweed could be increasing on the site. Although this species can fluctuate highly between years, it should still be monitored for further increase. The herbaceous trend is up slightly due to a significant increase in the nested frequency of bluebunch wheatgrass and bulbous bluegrass. Species composition remains poor and totally dominated by the low value perennial, bulbous bluegrass.

#### TREND ASSESSMENT

soil - stable but poor (3)

browse - stable but limited (3)

herbaceous understory - up slightly but poor (4)

2002 TREND ASSESSMENT

Trend for soil remains stable but in poor condition. Rock and pavement provide nearly half of the ground cover on the site. However, vegetation and litter cover, made up mostly of bulbous bluegrass, is abundant leaving little exposed bare ground. Trend for the key browse species, cliffrose, is stable. Density remains similar to 1997 estimates. Utilization is still heavy but vigor remains good and the number of decadent plants has declined from 22% to 8% of the population. Another positive change is the dramatic decline in the invasive broom snakeweed (2,760 plants/acre down to 580). About one-third of the remaining plants display poor vigor. Trend for the herbaceous understory is stable with similar nested frequency values for perennial grasses and forbs. Composition is still poor and dominated by the low value perennial, bulbous bluegrass which provides 69% of the total grass cover or 64% of the total herbaceous cover.

TREND ASSESSMENT

soil - stable but poor (3)

browse - stable but limited (3)

herbaceous understory - stable but poor (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 30

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	<sub>b</sub> 157	<sub>a</sub> 97	<sub>b</sub> 162	<sub>b</sub> 148	64	45	68	71	3.85	5.75
G	Bromus tectorum (a)	-	-	288	295	-	-	97	94	3.47	6.02
G	Poa bulbosa	<sub>a</sub> 294	<sub>a</sub> 320	<sub>b</sub> 348	<sub>b</sub> 345	96	98	98	98	24.68	26.57
G	Poa secunda	-	-	6	1	-	-	3	1	.18	.00
Total for Annual Grasses		0	0	288	295	0	0	97	94	3.47	6.02
Total for Perennial Grasses		451	417	516	494	160	143	169	170	28.73	32.32
Total for Grasses		451	417	804	789	160	143	266	264	32.20	38.35
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 53	<sub>a</sub> 17	-	-	24	8	.14	.04
F	Artemisia ludoviciana	39	28	27	29	17	11	13	13	.28	.39
F	Aster spp.	-	-	-	3	-	-	-	1	-	.03
F	Astragalus utahensis	-	-	6	2	-	-	3	1	.06	.03
F	Cirsium undulatum	<sub>ab</sub> 8	<sub>b</sub> 15	<sub>b</sub> 16	<sub>a</sub> -	3	9	8	-	.59	-
F	Cryptantha spp.	-	-	-	3	-	-	-	1	-	.00
F	Eriogonum brevicaulae	89	64	52	72	36	32	24	31	1.88	2.33
F	Erodium cicutarium (a)	-	-	<sub>a</sub> 4	<sub>b</sub> 30	-	-	2	15	.01	.17
F	Eriogonum racemosum	-	-	-	1	-	-	-	1	-	.03
F	Gilia spp. (a)	-	-	<sub>a</sub> -	<sub>b</sub> 14	-	-	-	7	-	.03
F	Heterotheca villosa	-	-	2	-	-	-	1	-	.03	.00
F	Lappula occidentalis (a)	-	-	<sub>a</sub> -	<sub>b</sub> 17	-	-	-	9	-	.04
F	Lomatium spp.	-	-	2	-	-	-	1	-	.00	-
F	Machaeranthera canescens	-	1	3	-	-	1	2	-	.04	-
F	Penstemon spp.	-	-	3	-	-	-	2	-	.03	-
F	Tragopogon dubius	1	-	1	2	1	-	1	1	.03	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
	Total for Annual Forbs	0	0	57	78	0	0	26	39	0.15	0.29
	Total for Perennial Forbs	137	108	112	112	57	53	55	49	2.97	2.83
	Total for Forbs	137	108	169	190	57	53	81	88	3.12	3.13

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

BROWSE TRENDS --

Herd unit 17 , Study no: 30

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Celtis reticulata</i>	0	0	.03	.53
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	1	.00	.38
B	<i>Cowania mexicana stansburiana</i>	9	10	2.66	3.34
B	<i>Gutierrezia sarothrae</i>	48	22	1.89	.09
B	<i>Purshia tridentata</i>	0	4	-	.03
B	<i>Quercus gambelii</i>	1	1	1.03	1.23
	Total for Browse	59	38	5.63	5.61

CANOPY COVER --

Herd unit 17 , Study no: 30

Species	Percent Cover	
	'97	'02
<i>Cowania mexicana stansburiana</i>	1.8	3
<i>Quercus gambelii</i>	-	2

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 30

Species	Average leader growth (in)
	'02
<i>Cowania mexicana stansburiana</i>	0.8

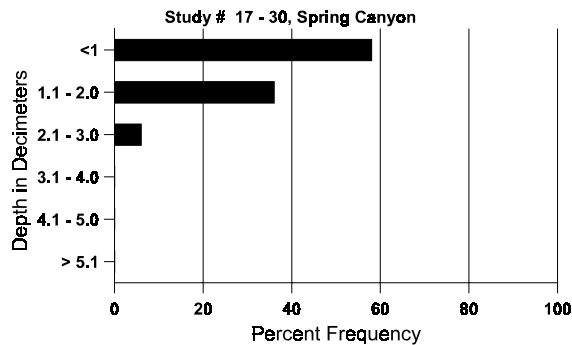
BASIC COVER --  
Herd unit 17 , Study no: 30

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	369	364	4.50	8.25	39.04	48.04
Rock	311	317	14.00	12.50	13.13	16.63
Pavement	362	356	45.00	56.25	28.82	28.96
Litter	386	348	31.00	14.25	17.02	15.57
Cryptogams	83	-	.75	0	.43	0
Bare Ground	238	176	4.75	8.75	10.95	2.64

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 30, Spring Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.6	55.8 (12.6)	7.0	61.8	22.4	15.8	2.0	5.87	57.6	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 30

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Rabbit	-	1	0	0
Elk	22	2	44	3 (8)
Deer	38	32	548	42 (104)



BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 30

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Celtis reticulata																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	1	-	-	-	-	-	-	-	-	1	-	-	33	46	67	1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	104	0
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	103	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		100%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	33		-			
												'97	0		-			
												'02	0		-			
Chrysothamnus nauseosus albicaulis																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	1	-	-	-	1	-	-	-	20	17	41	1
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	31	0
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'02	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			100%			00%			+ 0%							
'02		100%			00%			100%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	20		0%			
												'02	20		100%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Cowania mexicana stansburiana																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	4	-	-	-	-	-	-	-	4	-	-	-	80		4
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	1	-	-	-	-	-	-	1	-	-	-	33		1
	89	-	-	2	-	-	-	-	-	2	-	-	-	66		2
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	-	2	3	-	-	2	-	-	2	-	5	-	233	52 81	7
	89	-	2	6	-	-	-	-	-	8	-	-	-	266	55 64	8
	97	-	-	3	-	-	4	-	-	7	-	-	-	140	76 83	7
	02	-	-	3	-	1	3	3	-	10	-	-	-	200	65 87	10
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	1	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	1	-	-	1	-	-	2	-	-	-	40		2
	02	-	-	-	-	-	1	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		38%			63%			63%			+27%					
'89		18%			82%			00%			-51%					
'97		00%			100%			00%			+25%					
'02		08%			58%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'83	266	Dec:	0%		
											'89	365		9%		
											'97	180		22%		
											'02	240		8%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<b>Gutierrezia sarothrae</b>												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	15	-	-	-	-	-	-	300		15	
	02	1	-	-	-	-	-	-	20		1	
Y	83	16	-	-	-	-	-	-	533		16	
	89	3	-	-	-	-	-	-	100		3	
	97	40	-	-	-	-	-	-	800		40	
	02	8	-	-	-	-	-	-	160		8	
M	83	11	-	-	-	-	-	-	366	11	14	11
	89	19	-	-	-	-	-	-	633	6	5	19
	97	98	-	-	-	-	-	-	1960	8	11	98
	02	12	-	-	-	-	-	-	240	5	7	12
D	83	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	133		4	
	97	-	-	-	-	-	-	-	0		0	
	02	8	1	-	-	-	-	-	180		9	
X	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	520		26	
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>							
'83		00%	00%	00%	- 4%							
'89		00%	00%	15%	+69%							
'97		00%	00%	00%	-79%							
'02		03%	00%	10%								
Total Plants/Acre (excluding Dead & Seedlings)				'83	899	Dec:	0%					
				'89	866		15%					
				'97	2760		0%					
				'02	580		31%					
<b>Purshia tridentata</b>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	0		0	
	02	-	1	-	-	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	3	-	1	-	-	-	80	38	9
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>							
'83		00%	00%	00%								
'89		00%	00%	00%								
'97		00%	00%	00%								
'02		40%	60%	00%								
Total Plants/Acre (excluding Dead & Seedlings)				'83	0	Dec:	-					
				'89	0		-					
				'97	0		-					
				'02	100		-					

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	94	114	1
	'02	-	-	-	-	-	-	3	-	-	3	-	-	-	60	65	76	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%			+67%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
												'02	60		-			

Trend Study 17-31-02

Study site name: Round Peak

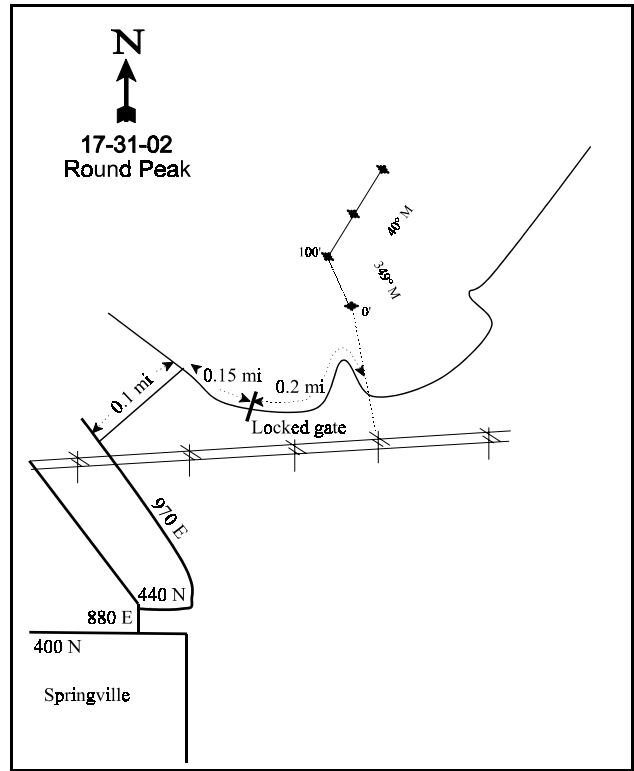
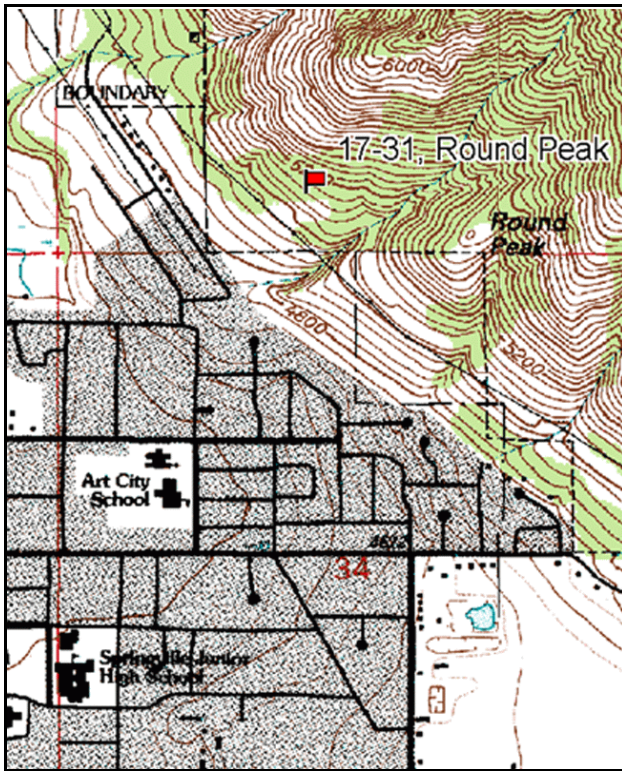
Vegetation type: Smooth Sumac

Compass bearing: frequency baseline 349 degrees magnetic (line 2-3 @ 40°M).

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

LOCATION DESCRIPTION

From the town of Springville, take 440 North and 970 East to an intersection at the end of the paved road. Turn right and proceed 0.1 miles to an intersection. Turn right and go southeast along the foothills for 0.15 miles to a locked gate. Walk 0.2 miles along the road and stop even with 2 power poles which are 50 yards south of the road. From the power poles, the 0-foot baseline stake is 95 paces north (343 degrees) marked with browse tag #419.



Map Name: Springville

Diagrammatic Sketch

Township 75, Range 3E, Section 27

GPS: NAD 27, UTM 12S 4447186 N 449811 E

## DISCUSSION

### Round Peak - Trend Study No. 17-31

The Round Peak study samples a severe winter range site located on national forest land just east of the state fish hatchery in Springville. Like the Spring Canyon study (17-30), this site is typical of the depleted foothills north of Hobble Creek. The study is on a moderately steep (25%-45%), south to southwest facing slope at an elevation of 5,100 feet. Vegetative composition consists of grasses, annual forbs and isolated patches of Gambel oak, Rocky Mountain smooth sumac, and netleaf hackberry. In the summer of 1989, several fawn carcasses were found, most likely winter-killed from the deep snows of the 1988-89 winter. Pellet group quadrat frequency in 1997 showed that elk and deer both had moderate frequencies of 22% and 19% respectively. Quadrat frequency of deer pellet groups was similar in 2002 at 20% but elk pellet groups were less frequent at 8%. A pellet group transect read on site in 2002 estimated 44 deer and 9 elk days use/acre (107 ddu/ha and 23 edu/ha). All pellet groups appeared to be from winter use.

Soils are rocky and highly eroded leaving little exposed bare soil. Parent material appears to be limestone and there are large rock outcrops in the surrounding area. Protective cover is abundant and well dispersed due to bulbous bluegrass and bluebunch wheatgrass. Rock and erosion pavement are abundant and accounted for 35% of the ground cover in 1997 and 37% in 2002. Erosion and soil compaction are especially evident on the many trails interconnecting the area. The erosion condition class was determined as stable in 2002.

Few shrubs are found on the site and combine to produce only about 5% cover. The dominant browse is Rocky Mountain smooth sumac which provided 39% of the browse cover in 1997 and 22% in 2002. Smooth sumac is an invader and/or increaser on disturbed or depleted sites such as this one. Use of this species by deer has been moderate to heavy due to the lack of more preferred shrubs since the site was established in 1983. Estimated population density was about 1,100 stems/acre in 1997 and 2002.

The most numerous shrub is broom snakeweed, an undesirable subshrub that is a known invader and increaser. This plant numbered 3,280 plants/acre in 1997 with numerous seedlings and young plants encountered. Utilization was almost nonexistent and age structure indicated a rapidly expanding population. Drought conditions caused a 57% decline in the density of broom snakeweed in 2002. Other shrubs found on the site include netleaf hackberry, skunkbush sumac, and Gambel oak.

Perennial grass cover is abundant with a cover value of 24% in 1997 and 30% in 2002. Most of the grass cover consists of bluebunch wheatgrass and bulbous bluegrass. Bluebunch wheatgrass provided 46% of the total grass cover in 1997 and 39% in 2002. Bulbous bluegrass, which is a low value short-lived perennial, provided about half of the grass cover in 1997 and 2002. It dries out completely early in the summer and provides fine fuels for wildfire. Annual grasses are present and are represented by several species including cheatgrass, rattlesnake brome, and Japanese brome. Combined they produce little cover.

Forb composition consists of three relatively common perennials and a number of annual weeds. Among the perennial forbs, Louisiana sage, peavine (*Lathyrus brachycalyx*), and yellow salsify are most conspicuous. Annual forbs are represented by storksbill, common ragweed, catchweed bedstraw, and pale alyssum.

### 1983 APPARENT TREND ASSESSMENT

Apparent trend for both soil and vegetation is declining. The combination of steep slope, poor quality vegetative cover and intense deer use will continue to result in excessive rates of erosion and soil loss. Vegetative composition, with the exception of bluebunch wheatgrass, consists largely of undesirable species typical of disturbed sites. Virtually all shrub species of at least moderate palatability are heavily hedged. In addition, deer pellet groups are very abundant and four carcasses of winter killed deer from the 1982-83 winter were observed in the immediate area.

### 1989 TREND ASSESSMENT

The soil is rocky and erodible, but stabilized except on the trails. Ground cover percentages are unchanged. Change on this critical winter range site is limited to an increase in sumac. Vigor is generally good with apparently less heavy use than in 1983. Although considered an increaser, sumac provides the bulk of the winter forage on this site. Trend is considered up slightly. Trend for the herbaceous understory is up due to an increase in nested frequency of perennial grasses. Bluebunch wheatgrass has remained stable in frequency, while the poor value perennial, bulbous bluegrass, which was not sampled in 1983 has increased dramatically. Sum of nested frequency for perennial forbs has also increased slightly.

#### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - up (5)

### 1997 TREND ASSESSMENT

The soil trend is stable but poor. Erosion appears to be minimal due to the abundant vegetative and litter cover. Browse trend is slightly downward. Broom snakeweed density has nearly tripled since 1989. Vigor is still good for the key forage species, sumac. It shows increased utilization and the number of decadent plants has increased. Herbaceous understory trend is stable. Very little change has occurred in the herbaceous understory. Many annual forbs are present and a better composition is desirable.

#### TREND ASSESSMENT

soil - stable (3)

browse - slightly downward (2)

herbaceous understory - stable (3)

### 2002 TREND ASSESSMENT

Trend for soil continues to be stable with very little bare ground exposed. Rock and pavement cover is abundant and combined with vegetation and litter, provides adequate protection from most erosion. Trend for browse is stable. Density of sumac has remained similar to 1997. Utilization continues to be moderate to heavy with similar numbers of decadent plants. One positive change in the browse trend is the decline in the density of broom snakeweed (3,280 to 1,400 plants/acre). Trend for the herbaceous understory is slightly down and composition is poor. Nested frequency of bluebunch wheatgrass declined significantly while the frequency of the poor value bulbous bluegrass increased. In addition, the sum of nested frequency for perennial forbs declined substantially. However, most of the decline in nested frequency is due to the drop in frequency of weedy forbs, thistle and ragweed.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 31

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	<sub>b</sub> 214	<sub>b</sub> 223	<sub>b</sub> 247	<sub>a</sub> 184	83	84	88	80	11.68	12.51
G	Avena fatua (a)	<sub>a</sub> -	<sub>b</sub> 119	<sub>a</sub> -	<sub>c</sub> 139	-	49	-	55	-	.85
G	Bromus brizaeformis (a)	-	<sub>a</sub> 1	<sub>b</sub> 23	<sub>a</sub> -	-	1	9	-	.12	-
G	Bromus japonicus (a)	-	-	21	9	-	-	8	4	.09	.02
G	Bromus tectorum (a)	-	-	<sub>a</sub> 121	<sub>b</sub> 128	-	-	44	47	.59	.76
G	Poa bulbosa	<sub>a</sub> -	<sub>b</sub> 304	<sub>b</sub> 257	<sub>b</sub> 307	-	94	75	89	12.75	17.63
Total for Annual Grasses		0	120	165	276	0	50	61	106	0.80	1.63
Total for Perennial Grasses		214	527	504	491	83	178	163	169	24.43	30.15
Total for Grasses		214	647	669	767	83	228	224	275	25.23	31.78
F	Alyssum alyssoides (a)	-	-	<sub>b</sub> 132	<sub>a</sub> 28	-	-	51	13	.35	.06
F	Allium spp.	-	-	4	1	-	-	1	1	.00	.00
F	Ambrosia psilostachya	-	-	<sub>b</sub> 126	<sub>a</sub> 2	-	-	56	2	2.98	.06
F	Artemisia ludoviciana	<sub>c</sub> 54	<sub>bc</sub> 36	<sub>ab</sub> 20	<sub>a</sub> 17	21	19	11	6	.15	.15
F	Astragalus beckwithii	-	-	2	2	-	-	1	1	.15	.38
F	Aster spp.	-	-	3	4	-	-	1	2	.38	.01
F	Calochortus nuttallii	-	-	-	1	-	-	-	1	-	.00
F	Cirsium undulatum	<sub>a</sub> 1	<sub>ab</sub> 11	<sub>b</sub> 28	<sub>a</sub> 5	1	6	13	3	.58	.04
F	Cryptantha nana	1	-	-	-	1	-	-	-	-	-
F	Cruciferae	<sub>a</sub> -	<sub>b</sub> 10	<sub>a</sub> -	<sub>a</sub> -	-	6	-	-	-	-
F	Cymopterus spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 17	<sub>ab</sub> 6	-	-	7	2	.49	.33
F	Epilobium brachycarpum (a)	-	-	5	-	-	-	3	-	.01	-
F	Erodium cicutarium (a)	-	-	<sub>a</sub> 13	<sub>b</sub> 56	-	-	4	19	.05	.41
F	Erigeron divergens	1	-	-	-	1	-	-	-	.00	-
F	Eriogonum racemosum	-	-	-	3	-	-	-	3	-	.01
F	Galium aparine (a)	-	-	<sub>b</sub> 37	<sub>a</sub> 15	-	-	16	9	.18	.04
F	Grindelia squarrosa	-	-	<sub>a</sub> -	<sub>b</sub> 14	-	-	-	6	-	.25
F	Helianthus annuus (a)	<sub>a</sub> -	<sub>b</sub> 19	<sub>a</sub> 3	<sub>a</sub> -	-	9	2	-	.01	-
F	Holosteum umbellatum (a)	-	-	32	26	-	-	14	11	.07	.05
F	Lathyrus brachycalyx	54	62	57	54	19	26	21	20	3.20	3.63
F	Lappula occidentalis (a)	-	-	<sub>a</sub> 1	<sub>b</sub> 25	-	-	1	10	.00	.05
F	Lithospermum incisum	<sub>a</sub> 18	<sub>b</sub> 105	<sub>a</sub> 8	<sub>a</sub> 6	6	48	4	2	.22	.01
F	Lithospermum ruderales	<sub>a</sub> 5	<sub>b</sub> 16	<sub>a</sub> 10	<sub>a</sub> -	2	8	3	-	.01	-
F	Macheranthera commixta	3	-	-	-	1	-	-	-	-	-
F	Phlox longifolia	4	5	11	2	1	4	5	2	.02	.06
F	Taraxacum officinale	-	-	-	2	-	-	-	1	-	.00
F	Tragopogon dubius	<sub>b</sub> 29	<sub>a</sub> -	<sub>a</sub> 5	<sub>a</sub> 3	14	-	2	2	.04	.01



Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
	Total for Annual Forbs	0	19	223	150	0	9	91	62	0.68	0.63
	Total for Perennial Forbs	170	245	291	122	67	117	125	54	8.25	4.98
	Total for Forbs	170	264	514	272	67	126	216	116	8.94	5.61

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

**BROWSE TRENDS --**

Herd unit 17 , Study no: 31

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Celtis reticulata	3	2	1.88	2.36
B	Gutierrezia sarothrae	31	24	1.57	1.61
B	Rhus glabra cismontana	35	30	2.25	1.10
	Total for Browse	69	56	5.71	5.08

**BASIC COVER --**

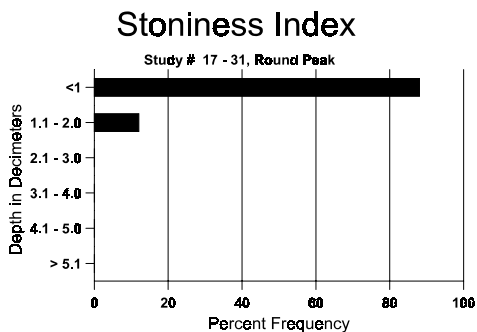
Herd unit 17 , Study no: 31

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	343	344	.75	9.00	39.23	46.85
Rock	316	319	30.25	26.50	22.02	22.23
Pavement	269	275	22.00	24.50	12.78	14.84
Litter	385	373	44.00	37.50	29.04	24.94
Cryptogams	51	12	.50	0	.37	.02
Bare Ground	146	73	2.50	2.50	3.45	.62

**SOIL ANALYSIS DATA --**

Herd Unit 17, Study no: 31, Round Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.1	53.8 (17.7)	7.3	36.9	38.4	24.7	2.0	14.2	256.0	1.0



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 31

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	3	-	-	-
Elk	22	8	122	9 (23)
Deer	19	20	566	44 (107)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 31

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Celtis reticulata</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	1	-	-	6	-	-	7	-	-	-	140		7	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	-	-	1	-	33		1	
	97	1	-	-	-	-	-	-	-	-	-	1	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	39 26	1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	80 225	2	
	02	-	-	-	1	-	-	-	-	-	1	-	-	-	20	28 53	1	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	1	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			100%			+45%							
'97		00%			00%			00%			-33%							
'02		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	0%			
												'89	33		0%			
												'97	60		0%			
												'02	40		50%			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Gutierrezia sarothrae</b>																		
S	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	44	-	-	-	-	-	-	-	-	44	-	-	-	880			44
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	30	-	-	-	-	-	-	-	-	30	-	-	-	1000			30
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	97	67	-	-	-	-	-	-	-	-	54	-	13	-	1340			67
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	24	-	-	-	-	-	-	-	-	24	-	-	-	800	7	4	24
	89	22	-	-	-	-	-	-	-	-	17	1	4	-	733	8	10	22
	97	97	-	-	-	-	-	-	-	-	97	-	-	-	1940	9	15	97
	02	63	-	-	-	-	-	-	-	-	63	-	-	-	1260	9	11	63
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	-	-	-	-	-	-	1	1	2	-	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-43%							
'89		00%			00%			19%			+69%							
'97		00%			00%			08%			-57%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1800	Dec:	0%				
											'89	1032		13%				
											'97	3280		0%				
											'02	1400		9%				
<b>Mahonia repens</b>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	4	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				
											'02	0		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	0		-			
Rhus glabra cismontana																		
S	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	1	1	1	-	-	-	-	-	-	3	-	-	-	100		3	
	'89	6	7	2	-	-	-	-	-	-	12	3	-	-	500		15	
	'97	4	2	2	-	-	-	-	-	-	8	-	-	-	160		8	
	'02	2	-	7	-	-	-	-	-	-	9	-	-	-	180		9	
M	'83	-	7	33	-	-	-	-	-	-	40	-	-	-	1333	50 34	40	
	'89	19	23	8	-	-	-	-	-	-	38	12	-	-	1666	66 41	50	
	'97	1	24	8	-	-	-	-	1	-	34	-	-	-	680	49 37	34	
	'02	12	4	11	-	2	-	7	1	-	37	-	-	-	740	31 23	37	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	2	1	1	-	-	-	-	-	-	4	-	-	-	133		4	
	'97	-	7	4	-	-	2	-	-	-	11	-	-	2	260		13	
	'02	2	-	5	-	-	-	2	-	2	5	-	-	6	220		11	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	200		10	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	300		15	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		19%			79%			00%			+38%							
'89		45%			16%			00%			-52%							
'97		60%			29%			04%			+ 4%							
'02		11%			44%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1433	Dec:	0%			
												'89	2299		6%			
												'97	1100		24%			
												'02	1140		19%			

Trend Study 17-34-02

Study site name: Maple Mountain Face.

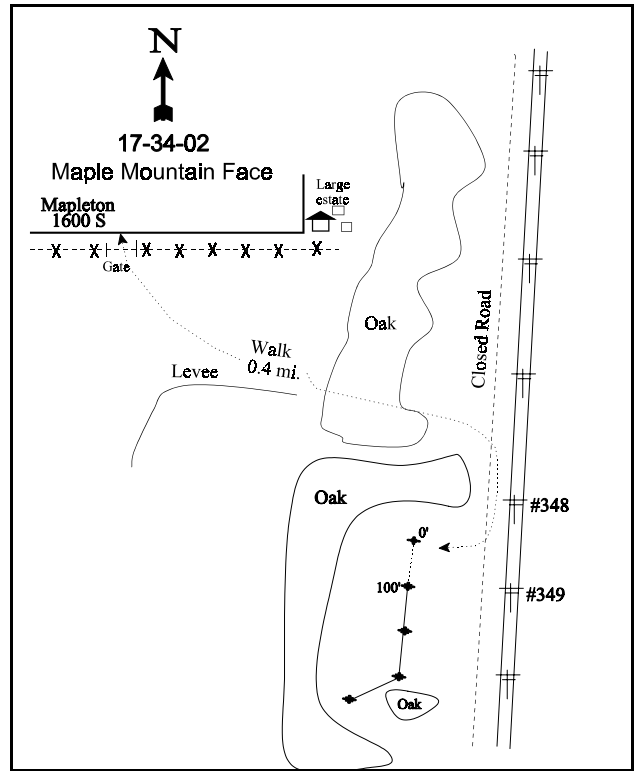
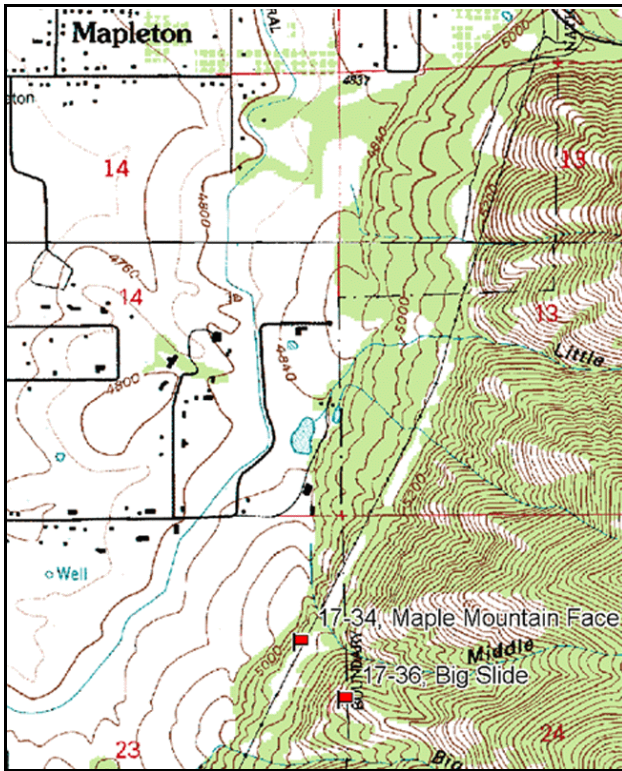
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 192 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (87ft).

LOCATION DESCRIPTION

Drive up 1600 South in Mapleton to the end of road. Park and hike east for 0.4 miles to the old road that runs parallel to power lines. A small sagebrush clearing west of the road is where the site is located. The 0-foot baseline stake is in the north end of the clearing, 33 paces from power pole #349 at an azimuth of 342 degrees magnetic. The 0-foot stake has browse tag #442 attached. The study stakes are 12-18" tall green fenceposts.



Map Name: Spanish Fork Peak

Diagrammatic Sketch

Township 8S, Range 3E, Section 23

GPS: NAD 27, UTM 12S 4440080 N 452199 E

## DISCUSSION

### Maple Mountain Face - Trend Study No. 17-34

The Maple Mountain Face study samples one of the few remaining sagebrush-grass range types on the severe winter range located on the upper lake terrace southeast of Mapleton. A fire burned through the site prior to the 1997 reading. Slope on the site is 1-2% with a south aspect. Elevation is approximately 5,100 feet. The site is used by wintering big game and in the spring by cattle. Data from a pellet group transect read along the study baseline in 2002 estimated light wildlife use at 4 deer and 2 elk days use/acre (10 ddu/ha and 5 edu/ha). Cattle use was estimated at 19 days use/acre. They had been grazing on the site prior to the June 7<sup>th</sup>, 2002 reading. Cattle had also used the area in 2001.

Soil on this lake terrace is a loam with an effective rooting depth of over 27 inches. The pH is slightly acidic (pH 6.3), with an average soil temperature of 51.2° F at nearly 18 inches in depth in 1997. Parent material appears to be limestone. Very little rock or pavement was encountered on the soil surface or throughout the profile, but the upper soil layer was conspicuously compacted. Due to the gentle terrain and high vegetative cover, mostly from bulbous bluegrass, there was no noticeable erosion apparent in 1997 or 2002.

Four shrub species occur in the immediate area. The most prominent preferred species is mountain big sagebrush. Surrounding the sagebrush openings and occasionally occurring as isolated clumps within the sagebrush is Gambel oak. Density of mountain big sagebrush was estimated at 500 plants/acre in 1983 and 432 plants/acre in 1989. Density declined 50% in 1997 due to the fire that burned the area prior to the 1997 reading. All the plants sampled in 1997 were classified as young. Utilization was light, vigor excellent, and no plants were classified as decadent. Density of sagebrush increased to 440 plants/acre in 2002. All plants were classified as mature. Bitterbrush was planted on the site after the fire. Density was estimated at 120 mostly young plants/acre in 1997. Hedging was moderate with good vigor. Density of bitterbrush increased slightly to 140 plants/acre in 2002, with all plants sampled classified as mature. Utilization was moderate to heavy but vigor was good. Resprouting Gambel oak clones surround the study site. They do not exhibit signs of any hedging. There was also some curlleaf mountain mahogany planted after the burn but it was not sampled in the density strips.

Grass composition is dominated by bulbous bluegrass with much smaller quantities of Sandberg bluegrass, cheatgrass, orchard grass, and intermediate wheatgrass. Annual grasses were reported to be very abundant in the past and included three species of bromes and six weeks fescue. During the 1997 reading, annual grasses made up only 1% of the grass cover. Bulbous bluegrass continues to totally dominate the herbaceous understory by providing 89% of the grass cover in 1997 and 96% in 2002. Several of the taller growing perennial species showed signs of utilization in 2002 due to cattle grazing.

Forb composition in the past was badly depleted. Seeding after the fire has changed the composition of the herbaceous understory since 1989. The most conspicuous and most abundant forb is arrowleaf balsamroot. This species was lightly used and had suffered considerable grasshopper depredation in the past. The seeded species, alfalfa and small burnet, have established and provide some limited forage. Heavy use of alfalfa and yellow salsify was noted in 2002.

### 1983 APPARENT TREND ASSESSMENT

Soil appears stable although soil is not very fertile and is excessively well-drained which leads to early depletion of soil moisture. Vegetative condition is poor. Mountain big sagebrush appears to be in a state of decline and slowly being replaced by undesirable annual and perennial grasses and forbs.

### 1989 TREND ASSESSMENT

Trend for soil is down slightly. The percentage of bare soil increased from 1% to 13% of the ground cover, while litter cover declined. Photo and data comparisons from this site conclusively illustrate a disappearing mountain big sagebrush stand. From photos it is evident that there is much less sagebrush production now than 1983. Trend for browse is down slightly due to an increase in the number of decadent sagebrush. The forb composition is similar except for the occurrence of a new pestiferous weed, bindweed or morning glory. As also observed in the 1983 report, the herbaceous vegetation is suffering the effects of grasshopper defoliation. Arrowleaf balsamroot is the most important forb, receiving some spring deer use, yet it continues to have a stable population.

#### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - stable but poor (3)

### 1997 TREND ASSESSMENT

Soil trend is stable. There is no evidence of noticeable erosion and it is unlikely any will occur in the near future. Vegetative cover is abundant and there is only a slight slope. Browse density and cover has declined due to fire, but seeding has introduced bitterbrush which was not previously sampled. Utilization is light on all species except bitterbrush which has moderate utilization. The mostly decadent mountain big sagebrush has been replaced with 200 seedling and 220 young plants/acre. Browse trend is up slightly. Herbaceous understory trend is upward with many palatable species now present. Arrowleaf balsamroot nested frequency has greatly increased with alfalfa and small burnet now present.

#### TREND ASSESSMENT

soil - stable (3)

browse - up slightly but limited (4)

herbaceous understory - up (5)

### 2002 TREND ASSESSMENT

Trend for soil is up slightly. Cover of bare ground has declined to only 3% and vegetation and litter cover have increased. Trend for browse is also up slightly. Density of mountain big sagebrush as increased to 440 plants/acre. Use is mostly light and vigor good. Planted bitterbrush density has remained similar to 1997. Use is moderate to heavy but vigor is good. Annual leader growth for sagebrush and bitterbrush is excellent averaging 4 inches for both species. Due to drought conditions for the past few years, trend for the herbaceous understory is down slightly. The site is totally dominated by the low value bulbous bluegrass which provides 96% of the grass cover or 64% of the total herbaceous cover. Sum of nested frequency for perennial grasses has declined slightly, while frequency of perennial forbs declined considerably. The dominant forb is arrowleaf balsamroot which declined significantly in nested frequency. Alfalfa remained stable whereas small burnet declined significantly. Many of the more preferred perennial grasses and forbs displayed heavy use from spring livestock grazing. In order to improve the composition of the herbaceous understory, spring grazing should be eliminated.

#### TREND ASSESSMENT

soil - up slightly (4)

browse - up slightly (4)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 34

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	a-	a-	a-	b15	-	-	-	7	-	.11
G	Agropyron intermedium	-	-	4	-	-	-	2	-	.03	-
G	Agropyron spicatum	a-	a-	a-	b21	-	-	-	10	-	.17
G	Aristida purpurea	-	-	-	-	-	-	-	-	-	.00
G	Bromus brizaeformis (a)	-	-	-	3	-	-	-	1	-	.00
G	Bromus japonicus (a)	-	-	a-	b12	-	-	-	6	-	.05
G	Bromus tectorum (a)	-	-	83	48	-	-	31	26	.55	.15
G	Dactylis glomerata	-	-	66	22	-	-	28	10	.75	.64
G	Elymus glaucus	2	-	-	2	1	-	-	1	-	.03
G	Melica bulbosa	a-	a-	a-	b17	-	-	-	7	-	.11
G	Poa bulbosa	a360	b395	b372	b387	100	100	97	99	41.55	58.08
G	Poa pratensis	b61	a-	a-	a5	26	-	-	2	-	.03
G	Poa secunda	b24	a-	d124	c62	11	-	48	28	3.67	.78
G	Sporobolus cryptandrus	a-	a-	a-	b13	-	-	-	7	-	.21
Total for Annual Grasses		0	0	83	63	0	0	31	33	0.55	0.21
Total for Perennial Grasses		447	395	566	544	138	100	175	171	46.02	60.18
Total for Grasses		447	395	649	607	138	100	206	204	46.56	60.39
F	Allium spp.	-	-	1	-	-	-	1	-	.00	-
F	Astragalus spp.	-	-	5	-	-	-	3	-	.04	.00
F	Balsamorhiza sagittata	a103	a99	c248	b156	52	44	92	72	34.34	28.52
F	Calochortus nuttallii	ab5	a-	b15	ab2	2	-	6	2	.03	.01
F	Cirsium spp.	-	-	3	2	-	-	1	1	.00	.00
F	Convolvulus arvensis	-	1	3	7	-	1	2	3	.18	.09
F	Collinsia parviflora (a)	-	-	3	-	-	-	1	-	.00	-
F	Cruciferae	-	-	3	-	-	-	1	-	.03	-
F	Epilobium brachycarpum (a)	-	-	3	-	-	-	1	-	.00	-
F	Eriogonum brevicaulle	-	-	-	1	-	-	-	1	-	.00
F	Erodium cicutarium (a)	-	-	3	9	-	-	1	5	.00	.02
F	Erigeron divergens	a7	a1	b59	a-	2	1	27	-	1.50	-
F	Galium aparine (a)	-	-	3	4	-	-	1	2	.00	.01
F	Helianthus annuus (a)	-	5	-	7	-	2	-	4	-	.02
F	Lathyrus brachycalyx	ab4	ab6	b8	a1	2	2	3	1	.09	.01
F	Lactuca serriola	a-	b15	ab10	a-	-	8	4	-	.04	.00
F	Linum lewisii	a-	a-	b8	a-	-	-	5	-	.02	-
F	Medicago sativa	a-	a-	b28	b29	-	-	14	15	.67	.64
F	Phlox longifolia	a-	a-	ab9	b13	-	-	4	6	.04	.05
F	Polygonum douglasii (a)	-	-	-	4	-	-	-	3	-	.01



Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Sanguisorba minor	a-	a-	c98	b21	-	-	40	12	2.21	.48
F	Sisymbrium altissimum (a)	-	-	b15	a-	-	-	6	-	.10	-
F	Sphaeralcea coccinea	-	-	-	-	-	-	-	-	-	.00
F	Taraxacum officinale	-	-	3	-	-	-	1	-	.03	-
F	Tragopogon dubius	b18	a-	ab4	b12	8	-	3	6	.06	.09
F	Unknown forb-perennial	1	-	-	-	1	-	-	-	-	-
F	Verbascum thapsus	-	-	1	-	-	-	1	-	.15	-
Total for Annual Forbs		0	5	27	24	0	2	10	14	0.12	0.07
Total for Perennial Forbs		138	122	506	244	67	56	208	119	39.47	29.92
Total for Forbs		138	127	533	268	67	58	218	133	39.60	29.99

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 34

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	6	15	.18	1.69
B	Purshia tridentata	6	7	.00	.93
B	Quercus gambelii	2	1	1.48	1.48
B	Rhus trilobata	2	2	.06	.15
Total for Browse		16	25	1.73	4.26

#### CANOPY COVER --

Herd unit 17 , Study no: 34

Species	Percent Cover	
	'97	'02
Quercus gambelii	-	1

#### Key Browse Annual Leader Growth

Herd unit 17 , Study no: 34

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	4.0
Purshia tridentata	4.0

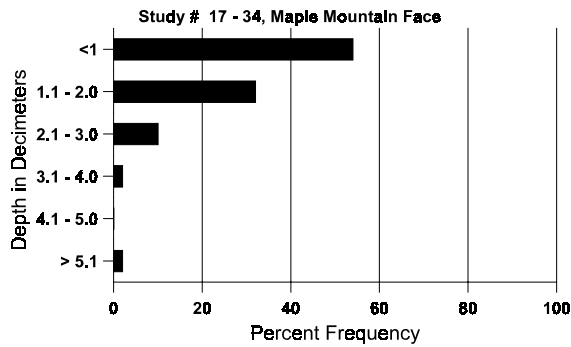
BASIC COVER --  
Herd unit 17 , Study no: 34

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	395	393	4.00	50.75	68.12	80.30
Rock	71	46	.75	.75	1.31	.59
Pavement	215	127	3.00	6.75	6.49	2.96
Litter	374	334	91.00	28.75	18.82	24.19
Cryptogams	132	52	0	0	3.25	1.59
Bare Ground	272	155	1.25	13.00	9.97	2.82

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 34, Maple Mountain Face

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
27.4	51.2 (17.7)	6.3	45.8	30.4	23.8	2.2	13.6	188.8	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 34

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Elk	4	-	26	2 (5)
Deer	1	2	52	4 (10)
Cattle	9	12	226	19 (47)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 34

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Artemisia tridentata vaseyana</i>											
S	83	-	-	-	-	-	-	-	0	0	
	89	-	-	-	-	-	-	-	0	0	
	97	10	-	-	-	-	-	-	200	10	
	02	1	-	-	-	-	-	-	20	1	
Y	83	-	-	-	-	-	-	-	0	0	
	89	-	-	-	-	-	-	-	0	0	
	97	10	-	-	1	-	-	-	220	11	
	02	-	-	-	-	-	-	-	0	0	
M	83	-	7	2	-	-	-	-	300	23 32	9
	89	2	-	-	-	-	-	-	66	13 16	2
	97	-	-	-	-	-	-	-	0	13 18	0
	02	21	1	-	-	-	-	-	440	20 27	22
D	83	3	2	1	-	-	-	-	200		6
	89	9	-	2	-	-	-	-	366		11
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	60		3
	02	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		60%		20%		00%		-14%			
'89		00%		15%		15%		-49%			
'97		00%		00%		00%		+50%			
'02		05%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	500	Dec:	40%		
						'89	432		85%		
						'97	220		0%		
						'02	440		0%		
<i>Cercocarpus ledifolius</i>											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	0	- -	0
	02	-	-	-	-	-	-	-	0	10 16	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'97		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-		
						'89	0		-		
						'97	0		-		
						'02	0		-		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Gutierrezia sarothrae</i>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	33		1	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	0		0	
M	83	1	-	-	-	-	-	-	33	14	28	1
	89	1	-	-	-	-	-	-	33	14	15	1
	97	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	0	13	19	0
D	83	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	100		3	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%	00%	00%			+80%					
'89		00%	00%	00%								
'97		00%	00%	00%								
'02		00%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)					'83	33	Dec:	0%				
					'89	166		60%				
					'97	0		0%				
					'02	0		0%				
<i>Purshia tridentata</i>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	1	4	-	-	-	-	-	100		5	
	02	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	20	10	11	1
	02	-	4	3	-	-	-	-	140	17	38	7
X	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	60		3	
	02	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%	00%	00%								
'89		00%	00%	00%								
'97		83%	00%	00%			+14%					
'02		57%	43%	00%								
Total Plants/Acre (excluding Dead & Seedlings)					'83	0	Dec:	-				
					'89	0		-				
					'97	120		-				
					'02	140		-				

A Y G R E	Form Class (No. of Plants)	1				2				3				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3		4		
Quercus gambelii																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	14	-	-	-	-	-	-	-	-	-	-	-	280			14
	02	-	-	-	-	-	-	6	-	-	-	-	-	120			6
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	12	-	-	-	-	-	-	-	-	-	-	-	240	45	40	12
% Plants Showing		<u>Moderate Use</u>				<u>Heavy Use</u>				<u>Poor Vigor</u>				<u>%Change</u>			
'83		00%				00%				00%							
'89		00%				00%				00%							
'97		00%				00%				00%				+22%			
'02		00%				00%				00%							
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	280		-		
												'02	360		-		
Rhus trilobata																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	1	-	-	-	-	-	-	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	-	-	-	40	-	-	2
	02	-	1	-	-	-	-	-	-	-	-	-	-	20	14	30	1
% Plants Showing		<u>Moderate Use</u>				<u>Heavy Use</u>				<u>Poor Vigor</u>				<u>%Change</u>			
'83		00%				00%				00%							
'89		00%				00%				00%							
'97		00%				00%				00%				+ 0%			
'02		50%				50%				00%							
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	40		-		
												'02	40		-		

Trend Study 17-39-02

Study site name: Little Diamond Fork.

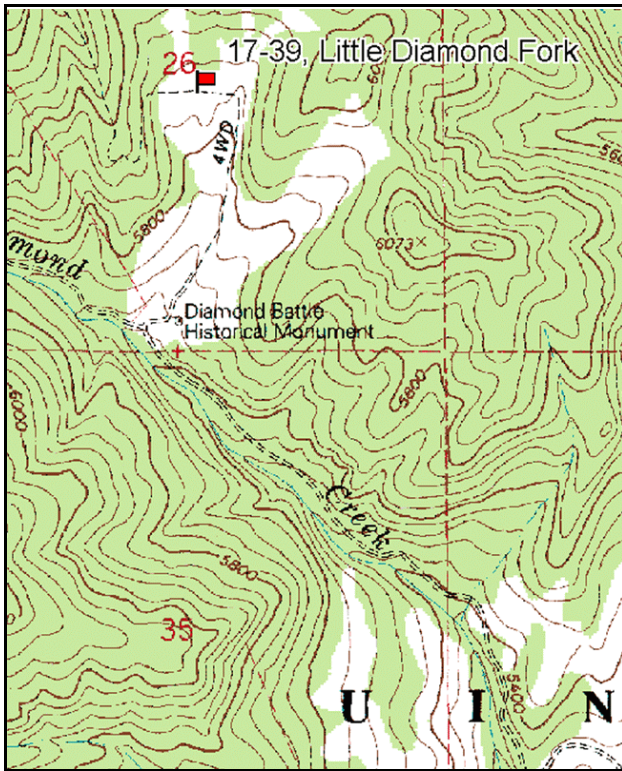
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 154 degrees magnetic (line 2-4 @ 201°M).

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

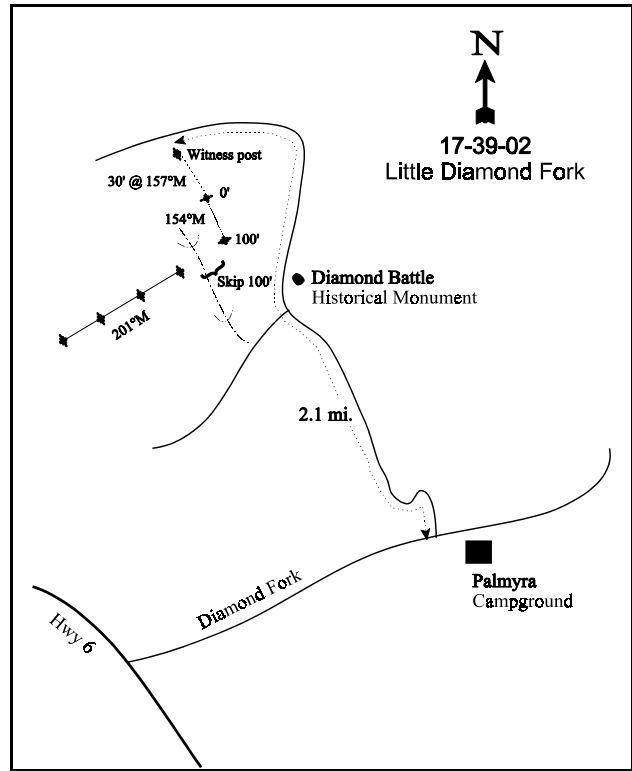
LOCATION DESCRIPTION

From the intersection of Highway 6 and Diamond Fork Canyon proceed northeasterly up Diamond Fork to Palmyra Campground. From Palmyra Campground take the road to the northwest 2.10 miles up Little Diamond Creek to a distinct sagebrush-grass plateau, and a witness post. From the witness post road, walk 30 feet at 157 degrees magnetic to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3923, is attached to the 0-foot baseline stake.



Map Name: Billies Mountain

Township 9S , Range 4E, Section 26



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4437507 N 461579 E

## DISCUSSION

### Little Diamond Fork - Trend Study No. 17-39

This study samples a broad mountain big sagebrush-grass swale located approximately one-half mile north of the "Diamond Battle Historical Monument" in Little Diamond Creek drainage. Aspect is to the south with a slope of 5-10% and an elevation of 5,850 feet. This area is considered important deer and elk winter range. This was part of the Forest Service's 1,500 acre Lower Diamond Revegetation Project. Oak and sagebrush on the study site was chained, then the area was aerially seeded in 1969. The seed mixture included western wheatgrass, smooth brome, intermediate wheatgrass, and orchard grass. There are some differences in grass identification between readings, due in large part to heavy utilization by cattle making identification difficult. When the study was established in 1983, the principal forage users on the area were domestic cattle, which were on the site in late June and early July, that were heavily utilizing the grasses. Some deer and elk pellet groups were present with little utilization visible in 1997. Data from a pellet group transect read on site in 2002 estimated 29 deer and 16 elk days use/acre (73 ddu/ha and 40 edu/ha). Most of the deer and elk pellet groups appeared to be from winter use. There was also abundant cattle pats from the summer of 2001, estimated at 41 cow days use/acre (100 cdu/ha). No livestock were seen on site in early July of 2002, but cattle may graze the area later in the summer.

Soil textural analysis indicates a sandy clay loam with a moderately acidic soil reaction (pH of 5.9). The effective rooting depth was estimated at more than 18 inches in 1997, with an average temperature of 51° F at an average depth of 18 inches. An ephemeral channel runs through the middle of the valley cutting a 10-15 foot deep gully through the sagebrush flat. There is no accelerated erosion apparent. Nearby gullies are healing with vegetation in their bottoms. Heavy grazing, trampling damage, and the presence of numerous roads and ORV trails in the area are the principal disturbances and the most obvious point erosion sources.

Mountain big sagebrush is the key preferred browse species. Density for sagebrush was estimated at 1,200 plants/acre in 1997 with 43% classified as decadent. Density increased slightly to 1,520 plants/acre in 2002 and decadence decreased to 16%. Utilization has been light to moderate during most readings with more light use reported in 1997. Vigor has been generally good, but 25% of the population displayed poor vigor in 1997 and a large number of dead plants were sampled. It was reported in 1997 that the death of the sagebrush did not appear to be from livestock or big game over utilization, but rather from rodent damage. The ground below many of the shrubs appeared disturbed by rodents. Broom snakeweed density is highly variable over all years with no recognized utilization and good vigor. Other species include rabbitbrush, prickly pear cactus, and Wood's rose.

Grass composition continues to be dominated by bulbous bluegrass, a cool season increaser with fair forage value for a short time in spring. However, it is nearly worthless as forage by mid-summer. Western wheatgrass is also an important grass which can be found in scattered patches throughout the area. As a group, grasses provide a vigorous ground cover that offers intense competition to shrub seedling establishment. The nested frequencies of smooth brome and bulbous bluegrass have increased with each reading since 1989. The principal species of forbs are increasers such as Pacific aster, spreading fleabane, and silky lupine. These have fair forage value, yet are indicative of the heavy grazing intensity by cattle.

### 1983 APPARENT TREND ASSESSMENT

The area currently has relatively stable soil, although it is susceptible to gully erosion. Careful management of livestock grazing as well as gully, road, and ORV trail stabilization will be necessary to help preserve the site. Vegetative trend is not immediately apparent from the data. However, our impression is that mountain big sagebrush is slowly increasing and broom snakeweed is increasing rapidly. Grass cover is uniform and competitive, yet subject to heavy livestock use. It may become less important if the apparent browse trend continues.

## 1989 TREND ASSESSMENT

Ground cover estimations show a significant increase in the percent vegetative basal cover since 1983, from 3% to 16%. However, a decline in litter cover from 83% to 67% resulted in no change in total protective ground cover. Soil trend remains stable. The thick grass understory, which tillers aggressively under the heavy grazing pressure, offers harsh competition to the sagebrush seedlings. Broom snakeweed has increased since 1983, but the population now has a more stable age class structure. There have been only small changes since the 1983 reading. Density of sagebrush has increased 29%, use is light to moderate and vigor normal. On the down side, the number of decadent plants has increased from 20% to 57%. Trend for browse is considered stable. Overall big game use of the site is light, with some deer use in summer in addition to winter. The large gully through the study site is partially vegetated. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses increased slightly with the frequency of perennial forbs declining slightly.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

Percent bare ground has declined since 1989 with adequate vegetative and litter cover to guard against significant erosion. Soil trend is up slightly. Browse trend is stable. Mountain big sagebrush density has increased slightly and the decadency rate has declined, but there are a large number of dead plants that were inventoried (660 plants/acre). More seedling and young plants were encountered this year than anytime in the past. The broom snakeweed density is constantly changing and the height and crown of this species is similar over all years. The herbaceous understory is stable with bulbous bluegrass still dominant. Grass sum of nested frequency has declined since 1989, although it is very similar to that of 1983. Sum of nested frequency for perennial forbs has increased.

### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Trend for soil is stable with abundant protective ground cover and minimal exposed bare ground. Trend for the key browse species, mountain big sagebrush, is stable. Density remains similar to 1997 estimates, while utilization remains mostly light. Average vigor has improved and the number of decadent plants has declined from 43% to 16%. Annual leader growth of sagebrush is good averaging nearly 2½ inches. Seed production is also good. Many sagebrush are covered with ants and aphids but still have normal vigor. The abundant broom snakeweed has remained stable with a mostly mature population. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses has increased slightly while frequency of perennial forbs has declined. Bulbous bluegrass totally dominates the herbaceous understory by providing 71% of the total grass cover or 52% of the total herbaceous cover. Smooth brome has increased significantly in nested frequency and is currently the second most abundant grass. The forb component is dominated by low growing Pacific aster which provides 62% of the total forb cover. The only other common forb species are lupine and yellow salsify. Spreading fleabane, which was abundant in 1997, has declined significantly in nested frequency. It was sampled in 60 quadrats in 1997 and only 1 in 2002.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)



HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 39

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron intermedium	a-	c267	b57	b64	-	89	17	25	2.35	4.18
G	Agropyron spp.	-	-	7	-	-	-	2	-	.41	-
G	Agropyron smithii	c227	a-	b105	b99	87	-	36	42	.89	1.46
G	Bromus inermis	a3	a13	b89	c127	1	5	30	44	5.55	8.04
G	Poa bulbosa	c364	a240	b321	bc351	97	84	91	98	28.03	34.79
G	Poa fendleriana	2	7	2	8	1	2	1	3	.00	.01
G	Poa pratensis	b49	ab25	b58	a15	18	8	20	6	.95	.22
G	Poa secunda	a-	c189	b12	b25	-	55	6	11	.47	.30
G	Stipa lettermani	-	10	-	-	-	4	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		645	751	651	689	204	247	203	229	38.69	49.03
Total for Grasses		645	751	651	689	204	247	203	229	38.69	49.03
F	Agoseris grandiflora	a8	a3	b23	b22	3	1	10	12	.24	.11
F	Antennaria rosea	-	4	-	-	-	2	-	-	-	-
F	Arabis spp.	-	1	3	-	-	1	1	-	.03	-
F	Artemisia ludoviciana	-	-	3	8	-	-	1	3	.85	.33
F	Aster chilensis	185	198	165	160	58	66	52	50	9.25	10.82
F	Astragalus convallarius	a9	a6	a15	b37	4	2	7	16	.75	.60
F	Astragalus spp.	-	-	1	2	-	-	1	1	.00	.03
F	Brodiaea douglasii	2	-	-	-	1	-	-	-	-	-
F	Carduus nutans (a)	-	-	-	5	-	-	-	2	-	.38
F	Cirsium undulatum	a10	a4	b32	a12	4	2	16	5	.93	.26
F	Collomia linearis (a)	-	-	10	13	-	-	5	6	.02	.03
F	Collinsia parviflora (a)	-	-	15	5	-	-	5	2	.02	.01
F	Crepis acuminata	-	-	-	1	-	-	-	1	-	.00
F	Cynoglossum officinale	a-	a6	b24	a-	-	4	11	-	.27	-
F	Descurainia pinnata (a)	-	-	3	-	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	-	3	14	-	-	2	7	.01	.03
F	Erodium cicutarium (a)	-	-	1	-	-	-	1	-	.00	-
F	Erigeron divergens	b49	b44	c143	a1	24	23	60	1	2.08	.03
F	Eriogonum racemosum	7	4	3	-	4	2	1	-	.00	-
F	Eriogonum umbellatum	-	-	4	3	-	-	1	1	.03	.03
F	Galium aparine (a)	-	-	2	-	-	-	1	-	.00	-
F	Gilia spp. (a)	-	-	-	2	-	-	-	1	-	.00
F	Holosteum umbellatum (a)	-	-	-	3	-	-	-	1	-	.00
F	Lactuca serriola	-	-	7	3	-	-	4	1	.07	.00
F	Lupinus argenteus	b100	a42	b115	a61	48	22	51	25	5.40	3.80

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Medicago sativa</i>	-	-	3	-	-	-	1	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	1	-	-	-	1	-	.00
F	<i>Oenothera</i> spp.	a-	a-	b16	b20	-	-	7	7	.11	.13
F	<i>Polygonum douglasii</i> (a)	a-	a-	b42	a5	-	-	19	2	.12	.01
F	<i>Taraxacum officinale</i>	a-	a-	c27	b8	-	-	10	5	.27	.05
F	<i>Tragopogon dubius</i>	ab62	a41	b78	ab60	27	18	34	30	.71	.51
F	Unknown forb-annual (a)	-	-	1	-	-	-	1	-	.00	-
F	Unknown forb-perennial	-	2	-	-	-	1	-	-	-	-
F	<i>Verbascum thapsus</i>	4	2	-	3	2	1	-	1	-	.03
F	<i>Vicia americana</i>	c50	a-	b18	b23	23	-	7	10	.16	.32
F	<i>Zigadenus paniculatus</i>	3	1	5	-	1	1	2	-	.03	-
Total for Annual Forbs		0	0	77	48	0	0	35	22	0.20	0.48
Total for Perennial Forbs		489	358	685	424	199	146	277	169	21.23	17.07
Total for Forbs		489	358	762	472	199	146	312	191	21.44	17.56

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 39

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	<i>Amelanchier alnifolia</i>	0	1	-	-
B	<i>Artemisia tridentata vaseyana</i>	48	45	6.21	8.78
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	1	-	.03
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	2	.00	-
B	<i>Gutierrezia sarothrae</i>	15	19	.96	.49
B	<i>Opuntia</i> spp.	3	4	-	.16
B	<i>Rosa woodsii</i>	4	4	.15	.44
Total for Browse		73	76	7.33	9.90

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 39

Species	Percent Cover	
	'97	'02
<i>Artemisia tridentata vaseyana</i>	-	8.17
<i>Gutierrezia sarothrae</i>	-	.92
<i>Opuntia</i> spp.	-	.08

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 39

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.5

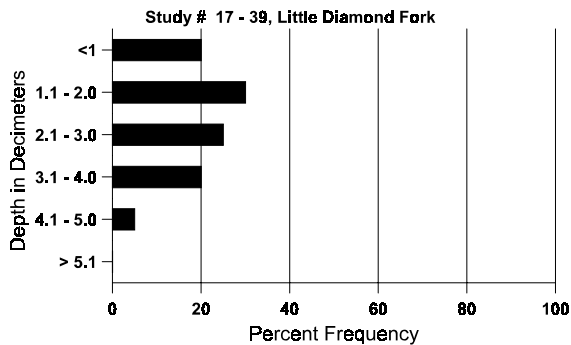
BASIC COVER --  
Herd unit 17 , Study no: 39

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	377	383	2.50	16.00	56.77	69.70
Rock	25	59	0	.25	.25	.50
Pavement	150	184	0	.75	.84	1.20
Litter	395	366	82.50	66.50	36.25	37.31
Cryptogams	43	13	.25	.25	.78	.22
Bare Ground	267	263	14.75	16.25	8.65	11.30

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 39, Little Diamond Fork

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.8	51.0 (16.2)	5.9	55.4	24.7	19.8	2.4	25.7	579.2	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 39

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Sheep	-	1	-	-
Elk	3	-	209	16 (40)
Deer	3	12	383	29 (73)
Cattle	2	14	487	41 (100)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 39

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Amelanchier alnifolia</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	22	27	0
	02	-	1	-	-	-	-	-	20	24	23	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
	'83	00%		00%		00%						
	'89	00%		00%		00%						
	'97	00%		00%		00%						
	'02	100%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'97	0		-			
						'02	20		-			
<i>Artemisia tridentata vaseyana</i>												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	3	-	-	1	-	-	-	80		4	
	02	1	-	-	-	-	-	-	20		1	
Y	83	1	-	-	-	-	-	-	66		1	
	89	-	-	-	-	-	-	-	0		0	
	97	9	-	-	-	-	-	-	180		9	
	02	5	-	-	-	-	-	-	100		5	
M	83	2	5	-	-	-	-	-	466	30	41	7
	89	4	2	-	-	-	-	-	400	22	25	6
	97	22	3	-	-	-	-	-	500	25	37	25
	02	49	10	-	-	-	-	-	1180	22	32	59
D	83	1	1	-	-	-	-	-	133			2
	89	7	1	-	-	-	-	-	533			8
	97	19	1	-	6	-	-	-	520			26
	02	8	4	-	-	-	-	-	240			12
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	660			33
	02	-	-	-	-	-	-	-	400			20
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
	'83	60%		00%		00%		+29%				
	'89	21%		00%		00%		+22%				
	'97	07%		00%		25%		+21%				
	'02	18%		00%		03%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	665	Dec:	20%			
						'89	933		57%			
						'97	1200		43%			
						'02	1520		16%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	42	59	1
	02	-	-	1	-	-	-	-	-	-	1	-	-	-	20	26	36	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%										
	'89	00%			00%			00%										
	'97	100%			00%			00%			+ 0%							
	'02	00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
												'02	20		-			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	12	14	3
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60	15	26	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%										
	'89	00%			00%			00%										
	'97	00%			00%			00%			+ 0%							
	'02	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	60		-			
												'02	60		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Gutierrezia sarothrae																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	9	-	-	-	-	-	-	-	9	-	-	-	180		9
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	17	-	-	-	-	-	-	-	17	-	-	-	1133		17
	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2
	97	25	-	-	-	-	-	-	-	25	-	-	-	500		25
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	4	-	-	-	-	-	-	-	4	-	-	-	266	11 13	4
	89	39	-	-	-	-	-	-	-	39	-	-	-	2600	10 7	39
	97	54	-	-	-	-	-	-	-	54	-	-	-	1080	10 11	54
	02	90	-	-	-	-	-	-	-	90	-	-	-	1800	8 11	90
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	5	-	-	-	-	-	-	-	5	-	-	-	333		5
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		00%			00%			00%			+54%					
'89		00%			00%			00%			-48%					
'97		00%			00%			00%			+13%					
'02		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	1399	Dec:	0%			
										'89	3066		11%			
										'97	1580		0%			
										'02	1820		1%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
Opuntia spp.											
S	83	-	-	-	-	-	-	-	0		0
	89	3	-	-	-	-	-	-	200		3
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	0		0
Y	83	-	-	-	-	-	-	-	0		0
	89	6	-	-	-	-	-	-	400		6
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	-	-	-	-	0		0
M	83	7	-	-	-	-	-	-	466	7 16	7
	89	3	-	-	-	-	-	-	200	7 23	3
	97	22	-	-	-	-	-	-	440	7 13	22
	02	2	-	-	-	-	-	-	40	6 19	2
D	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	13	-	-	-	-	-	-	260		13
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%		+22%			
'89		00%		00%		00%		-27%			
'97		00%		00%		00%		-32%			
'02		00%		00%		80%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	466	Dec:	0%		
						'89	600		0%		
						'97	440		0%		
						'02	300		87%		
Quercus gambelii											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	0	- -	0
	02	-	-	-	-	-	-	-	0	37 14	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%					
'89		00%		00%		00%					
'97		00%		00%		00%					
'02		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-		
						'89	0		-		
						'97	0		-		
						'02	0		-		

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rosa woodsii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	23	21	
	02	14	-	-	-	-	-	-	-	-	14	-	-	-	280	9	14	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	280		-				
											'02	280		-				
Symphoricarpos oreophilus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	19	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				
											'02	0		-				



Trend Study 17-40-02

Study site name: Long Hollow

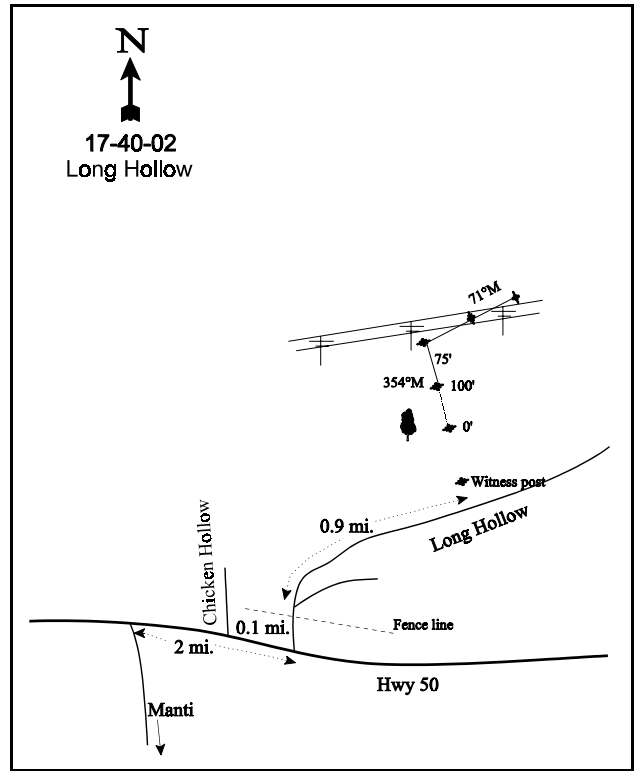
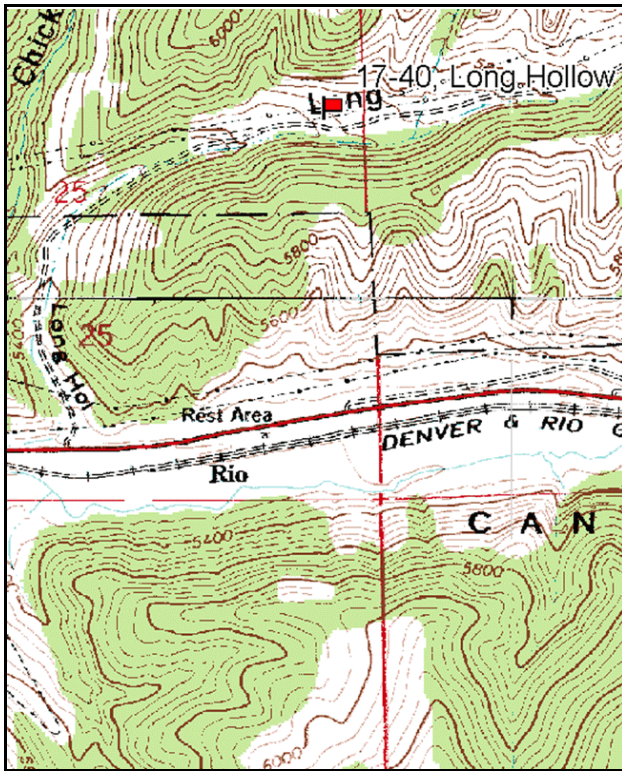
Vegetation type: Big Sagebrush-Grass

Compass bearing: frequency baseline 354 degrees magnetic (line 3-4 @ 71°M).

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

LOCATION DESCRIPTION

Beginning at the intersection of Highway 50 and Long Hollow Road, proceed northerly up Long Hollow for 0.10 miles to a fork. At the fork, stay to the left and proceed an additional 0.90 miles up Long Hollow, to a green steel "T" fencepost on the left side of the road. From the stake, the 0-foot marker of the baseline is 15 feet to the north, near a juniper. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3946, is attached to the 0-foot baseline stake. High tension power lines run above the study site.



Map Name: Billies Mountain

Diagrammatic Sketch

Township 9S, Range 5E, Section 25

GPS: NAD 27, UTM 12S 4428135 N 436904 E

## DISCUSSION

### Long Hollow - Trend Study No. 17-40

This trend study samples critical deer and elk winter range located in Long Hollow, a narrow canyon draining directly into the Spanish Fork River. The study is located close to the valley floor on a gentle (5-10%) south slope at an elevation of 5,760 feet. The transect samples a sagebrush-grass community that has been impacted by activities associated with power line construction. Animal use was initially determined as being heavy by deer and elk. Cattle and sheep use was reported moderate in the past, but there was no evidence of use by either in 1997. Long Hollow is obviously an important wintering area for big game as evidenced by the number of pellet groups. Pellet group quadrat frequency was high for elk (63%) and moderate for deer (32%) in 1997. Quadrat frequency of deer pellet groups was more abundant in 2002 at 51%, while elk was only 15%. Three winter-killed deer were found on the site in 1983. Data from a pellet group transect read along the study baseline in 2002 estimated 87 deer and 23 elk days use/acre (215 ddu/ha and 58 edu/ha). Cattle use was estimated at 10 days use/acre (25 cdu/ha) in 2002. Most wildlife use was from winter and early spring, while cattle use was from the summer of 2001.

Soil is alluvially and colluvially deposited from the surrounding "North Horn" formation, a coarse and well-drained conglomerate. Numerous variable sized cobblestones are distributed throughout the soil profile and on the surface. Soil textural analysis indicates a sandy clay loam with a neutral soil reaction (pH 7.2). Effective rooting depth is almost 13 inches. Soil temperature averaged about 50° F at 14 inches in depth in 1997. Vegetation and litter cover are adequate to prevent serious erosion. Percent bare soil accounts for only 2% of the basic ground cover in 1997 and 2002.

The dominant overstory is a mixed population of basin big sagebrush and mountain big sagebrush, with the latter being the most prevalent. In 1983 and 1989, all sagebrush was classified as mountain big sagebrush. In 1997 and 2002, sagebrush were split into the two subspecies based upon morphological characteristics and reported separately in the data tables. The level of hedging between individual shrubs varies greatly. Mountain big sagebrush are not as large as the basin big sagebrush, measuring 26 inches in height compared to 59 inches for basin big sagebrush. The new methodology used to estimate density in 1997 shows a reduced combined density of 1,320 plants/acre compared to 4,732 estimated in 1989. Mountain big sagebrush showed mostly moderate hedging in 1997 with all plants displaying good vigor. It showed fairly good biotic potential in 1997 with several seedlings and young plants being sampled. Mountain big sagebrush was moderately to heavily hedged in 2002 and showed the effects of drought. The number of decadent plants increased from 7% to 47%. Thirty-one percent of the decadent plants sampled were classified as dying (>50% crown death). However, recruitment is good with adequate young to maintain the population. Annual leader growth averaged 2.4 inches in 2002.

Basin big sagebrush showed little utilization with a slightly higher rate of decadency than mountain big sagebrush in 1997. This would be expected with the moderately shallow soils on the site as this is a species that requires deeper soils to tolerate drought. All basin big sagebrush sampled in 2002 were decadent and 89% were classified as dying. Invader and increaser shrubs are also prominent. The past disturbance associated with power line construction and grazing has resulted in substantial populations of broom snakeweed and rubber rabbitbrush. The white rubber rabbitbrush showed moderate utilization in 1997 and 2002 with a population density of around 1,000 plants/acre. Broom snakeweed density was estimated at 3,840 plants/acre in 1997 increasing to 4,620 in 2002. Other browse include fourwing saltbush, prickly pear cactus, and stickleaf low rabbitbrush.

Grass composition is diverse and abundant but consisted chiefly of cheatgrass and bulbous bluegrass in 1997. Together they provided 72% of the grass cover. Drought conditions in 2001 and 2002 have caused cheatgrass to decline significantly in nested frequency. Cheatgrass cover also dropped from 8% in 1997 to less than 1% in 2002. Bulbous bluegrass, while scarcely present in 1983, significantly increased in nested frequency in 1997 and 2002 and now provides the bulk of the grass cover. Some seeded grasses remain in the community

and include intermediate wheatgrass and crested wheatgrass. Seeded grasses occur primarily around power poles which were seeded after construction. The nested frequency of bluebunch wheatgrass has slowly increased over all years, however it is not very abundant contributing to only 7% of the grass cover in 2002. Sand dropseed nested frequency has remained relatively stable over all years. Other perennial grasses include bottlebrush squirreltail, Indian ricegrass, Kentucky and Sandberg bluegrass, and an occasional patch of Great Basin wildrye.

Forb composition is diverse and moderately abundant. It has changed little through the years and contains several weedy species including stickseed, pale alyssum, storksbill, Louisiana sage, and white top. Forage value and productivity of the forb component is poor even though it provided 31% of the herbaceous cover in 1997 and 21% in 2002.

#### 1983 APPARENT TREND ASSESSMENT

Soil condition is good with little exposed bare ground. The extremely rocky and permeable nature of this soil, along with improving vegetation cover, limits erosion. Deposition of rocks and soil particles from the upper slopes probably exceeds the erosion rate. The most obvious vegetative trend is an apparent thickening stand of sagebrush which may become increasingly dominated by basin big sagebrush. Differential grazing pressure is allowing it to reproduce faster than mountain big sagebrush. Other shrub species are present but increasing at a slower rate than basin big sagebrush. Grass and forb cover as well as composition are fair to poor and relatively stable.

#### 1989 TREND ASSESSMENT

Although extremely rocky and subject to alluvial deposition, the soil on the site has a stable trend. Due to the amount of combined cover (28% rock and pavement cover), there is little bare soil and the overall ground cover is almost unchanged since 1983. Sagebrush shows good recruitment and the age class structure indicates an expanding population. Use of sagebrush is mostly light while vigor is good. Conversely, density of the invasive broom snakeweed has increased from about 3,000 plants/acre to nearly 5,000 plants/acre. Trend for browse is considered up slightly. The forbs provide a fairly diverse understory and valuable spring forage for big game. The herbaceous trend appears stable.

##### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - stable (3)

#### 1997 TREND ASSESSMENT

Percent bare soil has declined steadily since 1983 to less than 2%. At the same time, rock and pavement cover are declining. Vegetation and litter cover are abundant and will prevent serious erosion. Trend for soil is considered up slightly. Browse trend is stable. Density appears to be lower than reported in the past, but this is a more accurate estimate of the population with a much larger sample size being used. In addition, the relatively small number of dead plants cannot explain the decline. Mountain big sagebrush is more highly preferred than basin big sagebrush, therefore it exhibits more utilization. Broom snakeweed and white rubber rabbitbrush have the highest densities at this time. Herbaceous understory trend is up. Sum nested frequency for grasses has nearly doubled since 1989, with a significant increase in bulbous bluegrass and intermediate wheatgrass. Forb composition is unchanged.

##### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - up but poor composition (5)

## 2002 TREND ASSESSMENT

Trend for soil continues to be stable. There is abundant protective ground cover and there is little bare soil. Trend for basin big sagebrush is down with all individuals sampled in 2002 classified as decadent. This is obviously a marginal site for basin big sagebrush. Mountain big sagebrush has increased slightly in density but it is also showing the effects of drought. Utilization remains moderate to heavy, and the number of decadent plants has increased from 7% to 47% of the population. About 31% of the decadent plants sampled were classified as dying (>50% crown death). However, young recruitment is good and appears adequate to maintain the current population. Other shrubs on the site are also showing increased decadence including fourwing saltbush, white-stemmed rubber rabbitbrush, stickyleaf low rabbitbrush, and broom snakeweed. Trend for the key browse species, mountain big sagebrush, is considered stable. A return to normal precipitation patterns will do much to improve the vigor of sagebrush on this site. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has increased slightly while nested frequency of perennial forbs has decreased. However, the herbaceous understory is dominated by bulbous bluegrass which increased significantly since 1997. It currently provides 71% of the total grass cover or 56% of the herbaceous cover. Drought conditions did cause a significant decline in the frequency and cover of cheatgrass.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable but poor composition (3)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 40

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	a <sup>27</sup>	b <sup>50</sup>	ab <sup>26</sup>	ab <sup>35</sup>	12	20	9	12	2.00	1.41
G	Agropyron intermedium	a <sup>-</sup>	a <sup>-</sup>	b <sup>36</sup>	b <sup>50</sup>	-	-	11	16	2.80	3.67
G	Agropyron spicatum	a <sup>18</sup>	a <sup>21</sup>	ab <sup>35</sup>	b <sup>36</sup>	6	9	13	15	1.68	2.25
G	Bromus japonicus (a)	-	-	-	6	-	-	-	3	-	.04
G	Bromus tectorum (a)	-	-	b <sup>285</sup>	a <sup>96</sup>	-	-	86	37	7.91	.67
G	Festuca spp.	-	-	12	-	-	-	4	-	.02	-
G	Oryzopsis hymenoides	-	3	-	-	-	1	-	-	-	-
G	Poa bulbosa	a <sup>6</sup>	a <sup>16</sup>	b <sup>229</sup>	c <sup>306</sup>	2	8	66	90	14.18	23.46
G	Poa pratensis	a <sup>1</sup>	a <sup>2</sup>	ab <sup>16</sup>	b <sup>21</sup>	1	1	7	8	.25	.11
G	Poa secunda	a <sup>1</sup>	b <sup>40</sup>	a <sup>6</sup>	b <sup>35</sup>	1	16	2	13	.01	.39
G	Sitanion hystrix	3	8	-	3	2	3	-	1	-	.15
G	Sporobolus cryptandrus	76	91	67	81	32	36	29	35	1.89	.87
Total for Annual Grasses		0	0	285	102	0	0	86	40	7.91	0.71
Total for Perennial Grasses		132	231	427	567	56	94	141	190	22.87	32.32
Total for Grasses		132	231	712	669	56	94	227	230	30.79	33.04
F	Alyssum alyssoides (a)	-	-	b <sup>69</sup>	a <sup>-</sup>	-	-	29	-	.22	-
F	Allium spp.	a <sup>-</sup>	a <sup>-</sup>	b <sup>11</sup>	a <sup>-</sup>	-	-	6	-	.03	-
F	Arabis spp.	-	1	-	2	-	1	-	1	-	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Artemisia dracunculus</i>	7	5	3	4	4	2	1	2	.00	.01
F	<i>Artemisia ludoviciana</i>	<sub>a</sub> 101	<sub>b</sub> 140	<sub>a</sub> 86	<sub>a</sub> 76	39	55	38	31	2.83	2.37
F	<i>Aster</i> spp.	-	8	-	-	-	2	-	-	-	-
F	<i>Astragalus</i> spp.	-	-	4	-	-	-	2	-	.01	-
F	<i>Astragalus utahensis</i>	4	6	3	-	1	3	1	-	.15	-
F	<i>Cardaria draba</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 24	<sub>b</sub> 31	-	-	7	10	2.36	1.01
F	<i>Castilleja linariaefolia</i>	-	-	1	1	-	-	1	1	.03	.00
F	<i>Calochortus nuttallii</i>	<sub>ab</sub> 10	<sub>a</sub> 1	<sub>b</sub> 18	<sub>a</sub> 1	6	1	9	1	.06	.00
F	<i>Cirsium</i> spp.	14	26	10	15	7	12	5	6	.46	.50
F	<i>Cymopterus</i> spp.	-	-	2	2	-	-	1	2	.00	.01
F	<i>Cynoglossum officinale</i>	-	-	1	-	-	-	1	-	.15	-
F	<i>Draba</i> spp. (a)	-	-	2	-	-	-	1	-	.00	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	1	-	-	-	1	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	-	<sub>b</sub> 64	<sub>a</sub> 7	-	-	24	3	.63	.04
F	<i>Erigeron divergens</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 16	<sub>a</sub> 2	-	-	7	2	.37	.01
F	<i>Eriogonum racemosum</i>	3	5	2	3	3	3	1	3	.03	.04
F	<i>Hackelia patens</i>	<sub>a</sub> 20	<sub>b</sub> 51	<sub>c</sub> 105	<sub>ab</sub> 44	9	27	49	23	2.51	.77
F	<i>Helianthus annuus</i> (a)	<sub>a</sub> -	<sub>b</sub> 26	<sub>a</sub> 2	<sub>a</sub> 1	-	16	1	1	.00	.00
F	<i>Lactuca pulchella</i>	<sub>c</sub> 50	<sub>ab</sub> 8	<sub>b</sub> 20	<sub>a</sub> -	-	4	9	-	.07	-
F	<i>Lithospermum ruderales</i>	-	4	-	-	-	3	-	-	.03	.03
F	<i>Medicago sativa</i>	-	-	2	5	-	-	1	2	.45	.79
F	<i>Oenothera</i> spp.	-	-	-	-	-	-	-	-	.00	-
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 15	<sub>ab</sub> 9	<sub>b</sub> 8	-	9	4	5	.02	.02
F	<i>Polygonum douglasii</i> (a)	-	-	9	-	-	-	3	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	5	3	-	-	2	1	.03	.00
F	<i>Sisymbrium altissimum</i> (a)	-	-	3	-	-	-	1	-	.03	-
F	<i>Solidago</i> spp.	<sub>b</sub> 16	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 44	<sub>a</sub> 69	<sub>b</sub> 106	<sub>b</sub> 109	19	30	41	42	3.06	2.75
F	<i>Tragopogon dubius</i>	<sub>ab</sub> 68	<sub>b</sub> 1	<sub>c</sub> 40	<sub>b</sub> 3	38	1	18	2	.36	.15
F	<i>Vicia americana</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Zigadenus paniculatus</i>	1	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	26	155	11	0	16	62	5	0.95	0.04
Total for Perennial Forbs		338	340	463	307	156	153	202	134	13.04	8.50
Total for Forbs		338	366	618	318	156	169	264	139	14.00	8.55

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 40

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata tridentata	15	6	3.11	1.21
B	Artemisia tridentata vaseyana	25	34	4.18	7.35
B	Atriplex canescens	7	6	.19	.21
B	Chrysothamnus nauseosus albicaulis	30	27	3.86	1.90
B	Chrysothamnus viscidiflorus viscidiflorus	1	2	-	-
B	Gutierrezia sarothrae	45	57	.97	1.93
B	Juniperus osteosperma	0	1	1.00	2.67
B	Opuntia spp.	6	9	.04	.06
Total for Browse		129	142	13.37	15.36

CANOPY COVER --  
Herd unit 17 , Study no: 40

Species	Percent Cover	
	'97	'02
Juniperus osteosperma	-	4

BASIC COVER --  
Herd unit 17 , Study no: 40

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	383	367	.50	7.25	48.81	57.68
Rock	259	289	25.50	24.00	17.10	17.57
Pavement	141	119	1.50	4.25	2.41	1.37
Litter	394	366	64.25	59.00	49.95	37.77
Cryptogams	150	113	1.00	1.00	3.50	2.16
Bare Ground	94	82	7.25	4.50	1.49	2.09

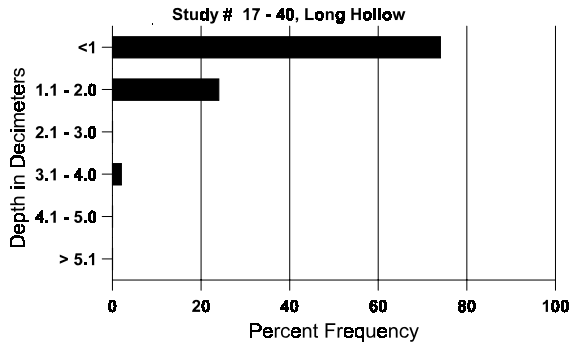
Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 40

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.4

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 40, Long Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	49.2 (14.3)	7.2	51.4	26.7	21.8	2.8	10.6	166.4	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17 , Study no: 40

Type	Quadrat Frequency	
	'97	'02
Elk	63	15
Deer	32	51
Cattle	-	2

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
305	23 (58)
1131	87 (215)
122	10 (25)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 40

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	15	2	-	-	-	-	-	-	-	17	-	-	-	340	34	42	17
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	59	45	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	1	-	-	-	-	-	-	-	2	-	-	2	80		4	
	02	5	4	-	-	-	-	-	-	-	1	-	-	8	180		9	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		13%			00%			09%			-61%							
'02		44%			00%			89%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	0		0%				
											'97	460		17%				
											'02	180		100%				



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
Artemisia tridentata vaseyana											
S	83	-	-	-	-	-	-	-	0		0
	89	8	-	-	-	-	-	-	533		8
	97	4	-	-	-	-	-	-	80		4
	02	-	-	-	-	-	-	-	0		0
Y	83	35	-	-	-	-	-	-	2333		35
	89	28	1	-	-	-	-	-	1933		29
	97	4	-	-	-	-	-	-	80		4
	02	3	1	4	-	-	-	-	160		8
M	83	18	8	-	-	-	-	-	1733	26 15	26
	89	27	-	-	2	-	-	-	1933	23 18	29
	97	13	24	-	-	-	-	-	740	26 42	37
	02	14	5	5	1	-	-	-	500	26 35	25
D	83	2	3	3	-	-	-	-	533		8
	89	8	3	2	-	-	-	-	866		13
	97	1	2	-	-	-	-	-	60		3
	02	13	15	1	-	-	-	-	580		29
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	100		5
	02	-	-	-	-	-	-	-	260		13
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		16%		04%		00%		+ 3%			
'89		06%		03%		03%		-81%			
'97		59%		00%		00%		+29%			
'02		34%		16%		15%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	4599	Dec:		12%	
						'89	4732			18%	
						'97	880			7%	
						'02	1240			47%	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Atriplex canescens</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	20			1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	9	-	-	-	-	-	-	9	-	-	180	31	33	9	
	02	7	-	-	-	-	-	-	-	-	-	-	-	140	18	22	7	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	02	-	1	1	-	3	-	2	-	-	4	-	-	140			7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			90%			00%			+29%							
'02		29%			07%			21%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	0		0%				
											'97	200		0%				
											'02	280		50%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	5	-	-	-	-	-	-	-	-	5	-	-	100			5	
	02	4	-	-	-	-	-	-	-	-	4	-	-	80			4	
M	83	10	-	-	-	-	-	-	-	10	-	-	-	666	25	21	10	
	89	6	-	-	-	-	-	-	-	6	-	-	-	400	27	31	6	
	97	17	18	5	-	1	-	-	-	40	-	1	-	820	34	35	41	
	02	10	6	-	-	-	-	-	-	16	-	-	-	320	19	22	16	
D	83	13	-	-	-	-	-	-	-	13	-	-	-	866			13	
	89	8	1	-	-	-	-	-	-	8	-	1	-	600			9	
	97	2	-	4	-	-	-	-	-	2	-	-	5	140			7	
	02	11	11	1	2	-	-	-	-	10	-	-	15	500			25	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	160			8	
	02	-	-	-	-	-	-	-	-	-	-	-	-	200			10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-35%							
'89		07%			00%			07%			+ 6%							
'97		36%			19%			11%			-15%							
'02		38%			02%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1532	Dec:	57%				
											'89	1000		60%				
											'97	1060		13%				
											'02	900		56%				

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	20	26	3
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200	13	14	3
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	14	19	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	14	17	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	2	-	1	-	200			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+50%							
'89		00%			00%			17%			-95%							
'97		00%			00%			00%			+50%							
'02		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	200	Dec:	0%			
												'89	400		50%			
												'97	20		0%			
												'02	40		50%			
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	97	104	-	-	-	-	-	-	-	-	104	-	-	-	2080			104
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	83	44	-	-	-	-	-	-	-	-	44	-	-	-	2933	13	9	44
	89	67	-	-	-	-	-	-	-	-	67	-	-	-	4466	13	13	67
	97	82	-	-	-	-	-	-	-	-	82	-	-	-	1640	11	10	82
	02	184	-	-	2	-	-	-	-	-	180	6	-	-	3720	8	9	186
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	97	6	-	-	-	-	-	-	-	-	5	-	-	1	120			6
	02	40	-	-	-	-	-	-	-	-	28	-	-	12	800			40
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	520			26
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+40%							
'89		00%			00%			00%			-23%							
'97		00%			00%			.52%			+17%							
'02		00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2999	Dec:	0%			
												'89	4999		3%			
												'97	3840		3%			
												'02	4620		17%			

A Y G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	1	-	-	-	-	1	-	-	-	20	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
												'02	40		-			
Opuntia spp.																		
Y	83	4	-	-	-	-	-	-	-	-	2	-	2	-	266		4	
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	7	-	-	-	-	-	-	-	-	5	-	2	-	466	6 10	7	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	7 10	7	
	02	10	-	-	1	-	-	-	-	-	11	-	-	-	220	5 14	11	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			36%			-27%							
'89		00%			00%			00%			-66%							
'97		00%			00%			00%			+25%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	732	Dec:	-			
												'89	533		-			
												'97	180		-			
												'02	240		-			

Trend Study 17-41-02

Study site name: Upper Sheep Creek.

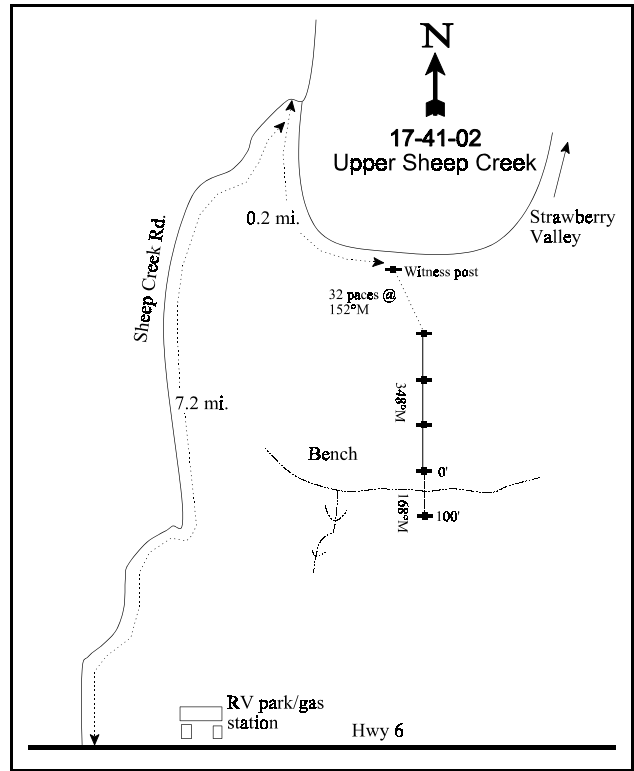
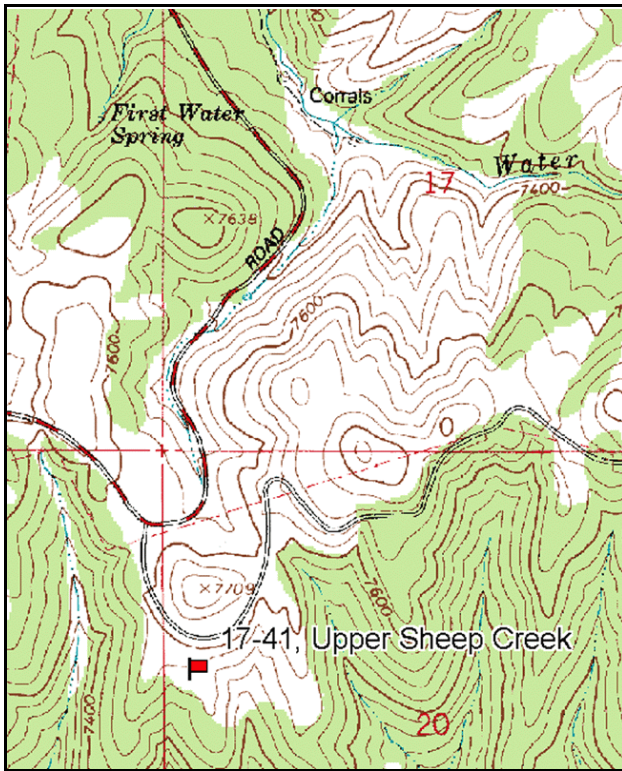
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the intersection of Sheep Creek Road and Rays Valley, proceed northerly up Rays Valley Road for 2.40 miles to an intersection (0.20 miles past a cattle guard). Turn right at the intersection and proceed easterly for 0.60 miles to another intersection. Turn right at the intersection and proceed 0.10 miles to a "Y" in the road. Take the left side of the "Y" and proceed another 0.10 miles to a faint road to the right. Turn right on the faint road and proceed 0.10 miles to a green steel "T" fencepost to the left. From the stake, the 0-foot stake of the baseline is 32 paces away at an azimuth of 152 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Ray's Valley

Diagrammatic Sketch

Township 9S, Range 5E, Section 20

GPS: NAD 27, UTM 12S 4430389 N 476201 E

## DISCUSSION

### Upper Sheep Creek - Trend Study No. 17-41

The Upper Sheep Creek study is located near the upper limit of deer and elk winter range at 7,500 feet in elevation. The elevation makes it unlikely in most winters that any big game are on site after mid-November. Some early spring use probably occurs as the snow melts. Wildlife are likely more concentrated near the edge of the ridge where the sun and wind can help keep the snow at a more shallow depth. The study area drains into Sheep Creek, but is near the divide with First Water Creek. Slope varies from nearly level to 15% with a south aspect. The site supports a mountain brush community with mountain big sagebrush and bitterbrush being dominant. In 1997, deer pellet groups were moderately abundant, with light use by elk and cattle. A pellet group transect read along the study baseline in 2002 estimated 46 deer, 3 elk, and 13 cow days use/acre (114 ddu/ha, 7 edu/ha, and 32 cdu/ha). Deer and elk pellet groups appear to be from fall and spring use, while all cattle pats are from the summer of 2001. Cattle will likely graze this site later this summer (2002).

Soil textural analysis indicates a clay soil derived from limestone or shale. Soil pH was neutral (7.2) with an effective rooting depth of almost 13 inches. Many similar sites in the Sheep Creek drainage exhibit considerable erosion. The Sheep Creek drainage is also prone to large land "slumps" or slides. The study area appears fairly stable with good vegetation and litter cover. There is currently no erosion apparent and the erosion condition class was determined to be stable in 2002.

Browse composition is mixed with excellent production. Mountain big sagebrush and bitterbrush provide most of the shrub cover. They combined to account for 54% of the total shrub cover in 1997, increasing to 57% in 2002. Other preferred shrubs include serviceberry, sticky leaf low rabbitbrush, Wyeth eriogonum, Woods rose and snowberry.

Mountain big sagebrush density was estimated at about 2,200 plants/acre in 1997 and 2002. Utilization was light to moderate, with most plants showing good vigor. Annual leader growth averaged 1.6 inches in 2002. As reported in 1983, bitterbrush has a prostrate growth form with a strong layering growth habit. Density is stable at about 1,600 plants/acre. Utilization was moderate to heavy in 1997 and 2002, yet vigor has remained good. The population has maintained a mostly mature age structure since 1983. Although annual leader growth was poor in 2002 averaging only about 1 inch, many of the plants were flowering.

Saskatoon serviceberry provides some additional preferred browse forage. It had an estimated density of 800 plants/acre in 2002. Utilization was moderate to heavy but vigor was good and young recruitment was excellent. Density was slightly lower than that estimated in 1983 due to the much larger sample used 1997 and 2002. Annual leaders were difficult to find on serviceberry plants in 2002. Snowberry provided 15% and 13% of the total shrub cover in 1997 and 2002 respectively. It showed little use with a density of 5,420 plants/acre in 2002.

The herbaceous understory is diverse yet does not produce a lot of forage due to the abundant shrub cover. Sum of nested frequency for grasses has increased since 1983 with significant increases in bluebunch wheatgrass, muttongrass, smooth brome, Kentucky bluegrass, and Letterman's needlegrass between 1983 and 1997. The principal species are all perennials with cheatgrass occurring only occasionally. No significant utilization was noted in 1997 or 2002, but the site was read before cattle used the site. Nested frequency for forbs increased greatly between 1983 and 1997. More important forbs on the site include arrowleaf balsamroot, penstemon species, and Pacific aster. Overall forage quality of the forb component is good. With drought conditions during the 2002 reading, sum of nested frequency for perennial grasses and forbs decreased.

## 1983 APPARENT TREND ASSESSMENT

Overall soil conditions appear stable. Although some sheet erosion and gullyng is occurring on the steeper slopes, it is of manageable proportions. Vegetative composition is dominated by a lightly used and vigorous mixture of browse species. Grasses and forbs are subordinate to shrubs, but are still important for the additional forage diversity and soil protection they provide.

## 1997 TREND ASSESSMENT

Soil trend is stable with abundant vegetative and litter cover to prevent erosion. Browse trend is stable with several palatable species present. Age structure for browse species appear stable with little decadency apparent. Both grass and forb nested frequency values have increased greatly since 1983. This leads to an upward herbaceous understory trend.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Trend for soil is stable even with a slight decline in litter cover and a slight increase in bare soil. There is still more than adequate protective ground cover to prevent most erosion and the erosion condition class was determined to be stable. Trend for browse is stable for the key species, mountain big sagebrush and antelope bitterbrush. Density of both species has remained stable since 1997. Utilization continues to be moderate to heavy yet vigor is still good on most plants. Drought conditions combined with competition have caused an increase in the number of decadent sagebrush (13% to 30%). Drought conditions in 2001 and 2002 have also effected the herbaceous understory. Sum of nested frequency for perennial grasses have declined slightly, although the sum of nested frequency for perennial forbs has declined more sharply. Trend for the herbaceous understory is considered down slightly.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 41

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'83	'97	'02	'83	'97	'02	'97	'02
G	Agropyron spicatum	<sub>a</sub> 84	<sub>b</sub> 164	178	41	56	62	5.03	5.61
G	Bromus inermis	<sub>a</sub> -	<sub>b</sub> 45	<sub>b</sub> 50	-	14	17	1.74	2.26
G	Bromus tectorum (a)	-	6	3	-	2	1	.01	.03
G	Carex spp.	2	1	-	2	1	-	.03	-
G	Koeleria cristata	-	2	4	-	1	2	.03	.03
G	Melica bulbosa	<sub>a</sub> -	<sub>b</sub> 12	<sub>a</sub> -	-	6	-	.15	-
G	Oryzopsis hymenoides	2	4	4	1	2	3	.16	.05
G	Phleum pratense	-	9	-	-	3	-	.16	-
G	Poa fendleriana	<sub>a</sub> -	<sub>c</sub> 107	<sub>b</sub> 53	-	43	27	3.47	.88

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'83	'97	'02	'83	'97	'02	'97	'02
G	<i>Poa pratensis</i>	a-	b13	c26	-	5	12	.45	.75
G	<i>Poa secunda</i>	b19	a1	a3	9	1	1	.00	.03
G	<i>Sitanion hystrix</i>	1	-	-	1	-	-	-	-
G	<i>Stipa comata</i>	-	9	-	-	4	-	.36	-
G	<i>Stipa lettermani</i>	a-	b15	b24	-	6	12	.22	.62
Total for Annual Grasses		0	6	3	0	2	1	0.00	0.03
Total for Perennial Grasses		108	382	342	54	142	136	11.82	10.25
Total for Grasses		108	388	345	54	144	137	11.83	10.28
F	<i>Achillea millefolium</i>	-	5	3	-	2	1	.04	.00
F	<i>Agoseris glauca</i>	a-	b32	a6	-	12	3	.16	.04
F	<i>Alyssum alyssoides</i> (a)	-	-	11	-	-	4	-	.04
F	<i>Allium</i> spp.	a1	c107	b49	1	43	19	1.06	.14
F	<i>Androsace septentrionalis</i> (a)	-	2	-	-	1	-	.00	-
F	<i>Arabis</i> spp.	-	-	3	-	-	2	-	.06
F	<i>Astragalus beckwithii</i>	a-	b10	c31	-	5	16	.22	.63
F	<i>Aster chilensis</i>	9	19	34	6	7	13	.63	1.17
F	<i>Astragalus convallarius</i>	-	-	1	-	-	1	-	.03
F	<i>Aster</i> spp.	-	8	-	-	3	-	.04	-
F	<i>Astragalus</i> spp.	a-	b48	a-	-	19	-	1.56	-
F	<i>Balsamorhiza sagittata</i>	7	14	8	4	8	5	1.12	1.13
F	<i>Castilleja linariaefolia</i>	-	2	-	-	1	-	.15	-
F	<i>Calochortus nuttallii</i>	a-	b18	a-	-	7	-	.08	-
F	<i>Chaenactis douglasii</i>	b13	a-	a3	7	-	1	-	.00
F	<i>Cirsium</i> spp.	3	9	4	1	4	2	.16	.04
F	<i>Comandra pallida</i>	a16	b37	a15	8	16	7	.22	.08
F	<i>Collinsia parviflora</i> (a)	-	87	92	-	34	34	.27	.39
F	<i>Cynoglossum officinale</i>	-	-	1	-	-	1	-	.00
F	<i>Eriogonum ovalifolium</i>	-	-	6	-	-	2	-	.01
F	<i>Eriogonum umbellatum</i>	9	3	1	4	1	1	.15	.03
F	<i>Galium aparine</i> (a)	-	17	7	-	7	3	.08	.01
F	<i>Hackelia patens</i>	3	14	5	1	7	3	.37	.04
F	<i>Lappula occidentalis</i> (a)	-	-	5	-	-	2	-	.03
F	<i>Lygodesmia</i> spp.	-	-	4	-	-	2	-	.03
F	<i>Machaeranthera canescens</i>	6	4	2	2	3	2	.01	.01
F	<i>Orobanche fasciculata</i>	a-	b30	a-	-	11	-	.64	-
F	<i>Orthocarpus tolmiei</i> (a)	a12	b55	b57	6	22	26	1.28	.37
F	<i>Penstemon humilis</i>	a7	a7	b28	3	3	15	.09	.59
F	<i>Penstemon</i> spp.	a21	ab43	b62	11	19	26	1.00	1.81



T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'83	'97	'02	'83	'97	'02	'97	'02
F	Phlox longifolia	a-	b38	b58	-	15	21	.15	.30
F	Polygonum douglasii (a)	-	b49	a-	-	18	-	.16	-
F	Senecio integerrimus	a-	c58	b23	-	29	10	.48	.25
F	Sphaeralcea coccinea	-	-	3	-	-	1	-	.15
F	Streptanthus cordatus	1	-	4	1	-	3	-	.06
F	Stanleya pinnata	-	1	-	-	1	-	.00	-
F	Viola spp.	a-	b41	a7	-	17	4	.13	.04
F	Zigadenus paniculatus	a-	b14	a2	-	7	1	.08	.03
Total for Annual Forbs		12	210	172	6	82	69	1.81	0.86
Total for Perennial Forbs		96	562	363	49	240	162	8.61	6.75
Total for Forbs		108	772	535	55	322	231	10.43	7.61

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 41

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	23	24	1.68	2.04
B	Artemisia tridentata vaseyana	72	64	12.18	17.21
B	Chrysothamnus depressus	0	1	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	73	74	7.76	9.29
B	Eriogonum heracleoides	26	27	1.19	1.06
B	Juniperus osteosperma	1	3	.00	1.63
B	Mahonia repens	31	41	1.91	1.44
B	Purshia tridentata	53	54	12.17	14.23
B	Rosa woodsii	14	19	.99	.69
B	Symphoricarpos oreophilus	68	78	6.60	7.40
Total for Browse		361	385	44.53	55.04

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 41

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	2.42
Artemisia tridentata vaseyana	-	17.33
Chrysothamnus viscidiflorus viscidiflorus	-	9.50
Eriogonum heracleoides	-	.58
Juniperus osteosperma	-	2.25
Mahonia repens	-	1.75
Purshia tridentata	-	18.75
Rosa woodsii	-	.58
Symphoricarpos oreophilus	-	7.42

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 41

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	1.6
Purshia tridentata	0.9

BASIC COVER --

Herd unit 17 , Study no: 41

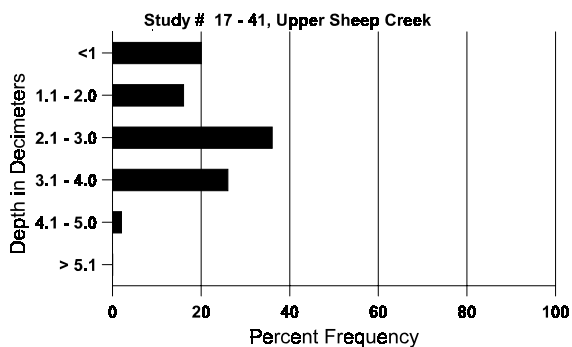
Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'83	'97	'02
Vegetation	356	325	4.25	55.15	59.53
Rock	96	106	7.50	2.80	4.45
Pavement	142	119	16.50	4.88	2.00
Litter	396	384	53.50	54.82	47.53
Cryptogams	5	5	0	.18	.04
Bare Ground	180	201	18.25	10.18	13.63

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 41, Upper Sheep Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.8	41.6 (16.0)	6.6	31.4	22.7	45.8	4.3	17.6	384.0	.5

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 41

Type	Quadrat Frequency	
	'97	'02
Rabbit	-	2
Elk	5	3
Deer	33	23
Cattle	6	2

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
-	-
35	3 (7)
600	46 (114)
157	13 (32)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 41

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Amelanchier alnifolia</i>											
S	83	-	-	-	-	-	-	-	0		0
	97	3	-	-	4	-	-	-	7	-	7
	02	-	-	-	-	-	-	-	0		0
Y	83	2	-	-	-	-	-	-	2	-	2
	97	3	-	-	1	-	-	-	4	-	4
	02	8	3	-	2	-	-	1	14	-	14
M	83	-	17	3	-	-	-	-	17	-	20
	97	11	2	-	2	6	1	-	23	-	23
	02	2	7	2	2	7	-	2	22	-	22
D	83	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	-	-	3	1	-	-	-	2	-	4
X	83	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	40		2
	02	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		77%		14%		14%		-63%			
'97		30%		04%		00%		+33%			
'02		43%		13%		05%					
Total Plants/Acre (excluding Dead & Seedlings)								'83	1466	Dec:	0%
								'97	540		0%
								'02	800		10%
<i>Artemisia tridentata vaseyana</i>											
S	83	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
	02	-	-	-	1	-	-	-	1	-	1
Y	83	-	-	-	-	-	-	-	0		0
	97	10	-	-	1	-	-	-	11	-	11
	02	3	-	-	-	-	-	-	3	-	3
M	83	13	2	-	-	-	-	-	8	-	15
	97	59	14	5	1	4	-	-	83	-	83
	02	52	14	4	4	-	-	-	73	-	74
D	83	1	1	-	-	-	-	-	2	-	2
	97	7	5	-	1	1	-	-	6	-	14
	02	21	9	-	3	-	-	-	23	-	33
X	83	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	200		10
	02	-	-	-	-	-	-	-	160		8
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		18%		00%		41%		+48%			
'97		22%		05%		07%		+ 2%			
'02		21%		04%		10%					
Total Plants/Acre (excluding Dead & Seedlings)								'83	1133	Dec:	12%
								'97	2160		13%
								'02	2200		30%

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Cercocarpus montanus</b>																		
M	83	-	1	-	-	-	-	-	-	-	1	-	-	-	66	67	77	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		100%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'97	0		-			
												'02	0		-			
<b>Chrysothamnus depressus</b>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	15	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'97	0		-			
												'02	20		-			
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
	02	7	-	-	1	-	-	-	-	-	8	-	-	-	160			8
M	83	45	-	-	-	-	-	-	-	-	45	-	-	-	3000	18	18	45
	97	197	-	-	48	-	-	-	-	-	245	-	-	-	4900	13	19	245
	02	314	4	-	59	-	-	28	-	-	405	-	-	-	8100	12	15	405
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	19	-	-	4	-	-	-	-	-	16	-	-	7	460			23
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+40%							
'97		00%			00%			00%			+43%							
'02		.91%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	3000	Dec:	0%			
												'97	5000		0%			
												'02	8720		5%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Eriogonum heracleoides																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	38	-	-	1	-	-	-	-	-	39	-	-	-	780	6	11	
	02	64	-	-	12	-	-	-	-	-	77	-	-	-	1540	8	11	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'97		00%			00%			00%			+48%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'97	840		-			
												'02	1620		-			
Juniperus osteosperma																		
Y	83	1	-	-	-	-	-	-	-	-	-	1	-	-	66		1	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	2	-	-	-	-	-	-	-	-	-	2	-	-	133	55	41	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	115	105	
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-90%							
'97		00%			00%			00%			+67%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	199	Dec:	-			
												'97	20		-			
												'02	60		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Mahonia repens</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	24	-	-	5	-	-	-	-	-	29	-	-	-	580		29	
	02	2	-	-	2	-	-	-	-	-	4	-	-	-	80		4	
M	83	13	-	-	-	-	-	-	-	-	13	-	-	-	866	4	6	13
	97	111	-	-	42	-	-	-	-	-	153	-	-	-	3060	4	6	153
	02	176	-	-	50	-	-	39	-	-	241	17	7	-	5300	3	5	265
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	4	-	-	-	-	-	1	-	-	3	-	-	2	100		5	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+74%							
'97		00%			00%			00%			+34%							
'02		00%			00%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	932	Dec:	0%				
											'97	3640		0%				
											'02	5480		2%				
<b>Purshia tridentata</b>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	2	-	-	5	-	-	-	100		5	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	1	-	-	1	-	-	-	-	3	-	-	-	60		3	
	02	7	-	-	1	-	-	1	-	-	9	-	-	-	180		9	
M	83	8	8	-	-	-	-	-	-	-	16	-	-	-	1066	19	26	16
	97	24	19	20	3	6	3	-	-	-	73	2	-	-	1500	20	43	75
	02	2	45	22	1	-	1	1	-	-	73	-	-	-	1460	23	52	73
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			00%			00%			+33%							
'97		34%			30%			00%			+ 2%							
'02		55%			28%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1066	Dec:	0%				
											'97	1600		3%				
											'02	1640		0%				

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rosa woodsii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	52	-	-	-	-	-	-	-	-	42	-	10	-	3466		52	
	97	8	-	-	6	-	-	-	-	-	13	-	-	1	280		14	
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266	30 10	4	
	97	16	-	-	11	-	-	-	-	-	26	-	-	1	540	11 12	27	
	02	27	-	-	2	-	-	-	-	-	29	-	-	-	580	14 15	29	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			18%			-77%							
'97		00%			00%			05%			-17%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	3732	Dec:	0%			
												'97	840		2%			
												'02	700		0%			
Symphoricarpos oreophilus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	14	-	-	-	-	-	-	-	-	14	-	-	-	933		14	
	97	21	-	-	7	-	-	-	-	-	28	-	-	-	560		28	
	02	31	-	-	3	-	-	1	-	-	35	-	-	-	700		35	
M	83	64	13	-	-	-	-	-	-	-	74	-	3	-	5133	19 17	77	
	97	141	-	-	49	-	-	-	-	-	190	-	-	-	3800	15 23	190	
	02	149	-	-	69	3	-	11	-	-	232	-	-	-	4640	14 20	232	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	1	-	-	-	-	-	-	-	-	-	1	20		1	
	02	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		14%			00%			03%			-28%							
'97		00%			.45%			.45%			+19%							
'02		01%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6066	Dec:	0%			
												'97	4380		0%			
												'02	5420		1%			



Trend Study 17-42-02

Study site name: Tank Hollow.

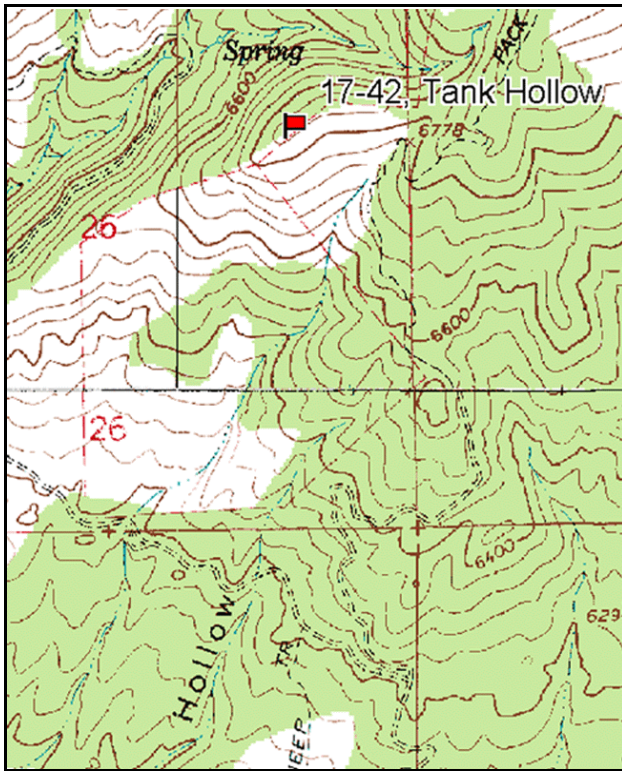
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 191 degrees magnetic.

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

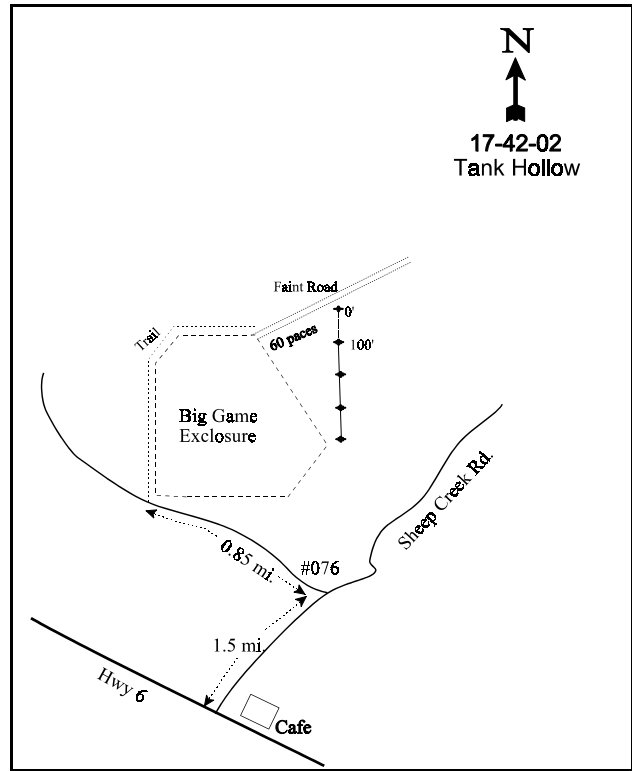
LOCATION DESCRIPTION

Turn north off of Highway US-6 (near mile post 195) onto the new Sheep Creek Road. Go 1.5 miles on the paved road to an intersection with Forest Service road #076. Turn left and go west 0.8 miles to a fence. Continue 0.05 miles on the road to the southwest corner of a large enclosure. Park here, and follow the trail along the outside of the enclosure to the northeast corner. Continue 60 paces northeast along an old road, the 0-foot stake is 3 paces off the right side of the road. The study runs south. The 0-foot stake is marked by browse tag #176.



Map Name: Ray's Valley

Township 9S, Range 5E, Section 26



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4428252 N 471835 E

## DISCUSSION

### Tank Hollow - Trend Study No. 17-42

This trend study is on the south side of a small knoll located immediately north of the large big game enclosure in Tank Hollow. Much of the surrounding area is dense oakbrush and north facing mahogany slopes. Below the study area, mixed juniper-pinyon and big sagebrush have been chained and seeded to help improve forage conditions. The study site itself is a mountain brush type on a moderate (20%), south to southeast slope at an elevation of 6,800 feet. This area is a known deer wintering area which in recent years, has experienced increasing elk use. Pellet groups of both species were abundant in 1997 and 2002. A pellet group transect read along the study baseline in 2002 estimated 155 deer days use/acre (384 ddu/ha) and 49 elk days use/acre (121 edu/ha). Most of the deer and elk pellet groups were from winter use. It appears that big game have used this site heavily for the past few years due in part to mild winters. The nearby enclosure fence is compromised in several areas and big game have used the area inside the large enclosure heavily also.

Soil on the site is relatively deep with little rock or pavement on the surface. Soil texture is a clay loam with a neutral reactivity (pH 7.1). There are rocks throughout the profile with a B horizon located about 30 inches below the surface. Effective rooting depth is almost 17 inches and soil temperature is a cool 46° F. The soil is limiting for both phosphorous and potassium as values are below minimum thresholds. These low values could be restrictive to plant development and growth. Although the site is potentially erodible, it appears to be relatively stable. A combination of abundant vegetation and litter cover, with the moderate slope helps limit erosion. Some slight soil movement was reported in the past, but the erosion condition class was determined as stable in 2002.

The site supports several preferred browse species which includes: serviceberry, mountain big sagebrush, true mountain mahogany, and antelope bitterbrush. Mountain big sagebrush and bitterbrush are the most abundant and combined they produce 68% of the total browse cover in 1997. Although, this declined to 54% in 2002. Mountain big sagebrush density was estimated at about 1,700 plants/acre in 1997 and 2002. Percent decadency was high at 56% in 1989, dropping to 31% in 1997. Drought conditions combined with heavy use have caused the number of decadent sagebrush to climb to 65% in 2002. Utilization has been consistently moderate to heavy from 1983 to 1997. It was classified as mostly heavy in 2002. The number of plants displaying poor vigor has steadily increased with each reading. No seedling sagebrush have been encountered on site and young recruitment continues to be poor. Annual leader growth on sagebrush averaged 2 inches in 2002.

The bitterbrush population has had a stable population of about 2,000 plants/acre since the site was established in 1983. It also has displayed consistent moderate to heavy use from 1983 to 1997 with very heavy use reported in 2002. Drought conditions combined with heavy use have dramatically effected this population. The number of plants displaying poor vigor has increased from 0% in 1997 to 48% in 2002. In addition, 85% of the population was classified as decadent in 2002, with half of these plants appearing to be dying due to excessive crown death. Recruitment is poor and the population appears primed for a die-off, especially if precipitation patterns do not return to normal. Bitterbrush leaders averaged only 1.7 inches of annual growth in 2002. True mountain mahogany density has remained stable since 1997 at about 350 plants/acre, but it too is showing the effects of drought and heavy use. Over half of the population displayed poor vigor in 2002 and 68% are decadent. Serviceberry have a population of about 200 plants/acre. They show identical trends of extremely heavy use, increased poor vigor, and decadence.

The most abundant shrub on the site is broom snakeweed with an estimated density of 5,420 plants/acre in 1997. Young plants were common and it appeared that the population was expanding. Drought conditions have caused this population to decline to 3,840 plants/acre and the number of decadent plants to increase from 0% to 27%.

Photos from all years show an obvious increase in the size of Utah juniper. Point-center quarter data from 2002 estimated Utah juniper density at a relatively low 40 trees/acre with an average diameter of 5.6 inches. A few scattered pinyon pine trees are also found on the site. Other scattered species include stickleaf low rabbitbrush, snowberry, Gambel oakbrush, Oregon grape, and prickly pear cactus.

Grass composition is moderately diverse with crested wheatgrass providing about two-thirds of the total grass cover in 2002. Other common grasses include intermediate wheatgrass, bluebunch wheatgrass, and Sandberg bluegrass. Cheatgrass is scattered throughout the site but is not abundant. Overall grass utilization is light and vigor is good.

As reported in 1983, forbs are more abundant and certainly more diverse than grasses. Species composition is a mixture that generally is of fair forage value. Common forbs include thistle, tapertip hawksbeard, stickseed, longleaf phlox, Lewis flax, and American vetch. Drought conditions in 2001 and 2002 have caused a dramatic decline in perennial forb frequency and cover. Utilization of forbs has been light.

#### 1983 APPARENT TREND ASSESSMENT

According to the apparent trend evaluation rating, soil trend appears stable for all nine graded categories. Vegetative trend is less certain. Mountain big sagebrush may be declining and Utah juniper shows evidence of a slow increase. Other browse species are vigorous but rather heavily hedged. Herbaceous plants are stable and of good quality. The principle threat to this area is increased activity associated with oil and gas exploration and road building activity.

#### 1989 TREND ASSESSMENT

An increase in the percent vegetative basal cover from 1% to 14%, with the concurrent decrease in bare soil from 30% to 23%, indicate an improving trend. The rocky, clay loam soil shows evidence of slight erosion and compaction. On the study site itself, the mountain big sagebrush, bitterbrush, serviceberry, and mountain mahogany tend to be heavily hedged, more so than in 1983. However, densities of these species have remained stable and vigor is generally good. The herbaceous understory is still moderately dense and diverse. The data indicate a fairly stable population.

##### TREND ASSESSMENT

soil - up slightly (4)

browse -stable (3)

herbaceous understory - stable (3)

#### 1997 TREND ASSESSMENT

Soil trend is slightly upward. Vegetative and litter cover are abundant and there is little erosion apparent. Percent bare ground has declined through all years. Browse trend is stable with only slightly less utilization than reported in the past. Seedling recruitment is low for nearly all species. The herbaceous understory trend is stable. The sum of nested frequency for perennial grasses and forbs has changed only slightly over the years.

##### TREND ASSESSMENT

soil - slightly upward (4)

browse - stable (3)

herbaceous understory - stable (3)

## 2002 TREND ASSESSMENT

Soil trend is down slightly due to drought conditions for the past few years. Vegetative cover has declined from 53% in 1997 to 38% in 2002. Litter cover has declined slightly while cover of bare ground has nearly doubled (12% to 23%). In addition, cover of herbaceous vegetation has declined from 30% in 1997 to 15% in 2002. The soil erosion condition class was determined as stable in 2002. Trend for the key browse species, mountain big sagebrush and bitterbrush, is down slightly. It appears that these and other preferred browse forage on this site have sustained extremely heavy use for the past few years, likely due to mild winters. This heavy use combined with drought have caused an increase in the number of plants displaying poor vigor and decadence. Population densities remain at similar levels as 1997 estimates, but a large number of sagebrush and bitterbrush appear to be dying with little young recruitment to replace them. It appears that these populations will decline in the near future if drought conditions persist. Less abundant preferred browse species, serviceberry and true mountain mahogany also show extremely heavy use, poor vigor, and increased decadence. Unbrowsed annual leaders were hard to find on bitterbrush and mahogany. Leaders averaged 1.7 inches for bitterbrush and 2 inches for mahogany. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses increased slightly while frequency of perennial forbs declined dramatically. Cover of perennial forbs was estimated at 16% in 1997 declining to only 3% in 2002. Lewis flax was common in 1997 with a quadrat frequency of 61% and a cover value of 6%. It accounted for 36% of the forb cover and 21% of the total herbaceous cover in 1997. Due to drought conditions, it was not sampled in any quadrats in 2002. Several other perennial forbs declined significantly.

### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - down (1)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 42

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 29	<sub>ab</sub> 62	<sub>b</sub> 80	<sub>c</sub> 126	11	23	27	45	5.39	7.13
G	Agropyron intermedium	<sub>a</sub> 37	<sub>b</sub> 52	<sub>ab</sub> 49	<sub>ab</sub> 45	17	18	16	19	2.48	1.44
G	Agropyron spicatum	48	51	27	24	20	17	11	11	1.02	1.70
G	Bromus carinatus	6	3	5	6	2	1	2	2	.06	.53
G	Bromus tectorum (a)	-	-	<sub>b</sub> 70	<sub>a</sub> 38	-	-	27	19	.93	.17
G	Oryzopsis hymenoides	6	5	6	9	4	3	2	4	.06	.21
G	Poa bulbosa	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 11	-	-	-	5	-	.12
G	Poa fendleriana	14	13	3	10	8	5	2	3	.01	.06
G	Poa pratensis	<sub>a</sub> -	<sub>a</sub> -	<sub>ab</sub> 5	<sub>b</sub> 11	-	-	2	5	.66	.10
G	Poa secunda	<sub>a</sub> -	<sub>a</sub> 4	<sub>b</sub> 43	<sub>b</sub> 30	-	2	17	14	1.38	.63
G	Sitanion hystrix	3	-	-	-	1	-	-	-	-	-
Total for Annual Grasses		0	0	70	38	0	0	27	19	0.93	0.17
Total for Perennial Grasses		143	190	218	272	63	69	79	108	11.08	11.94
Total for Grasses		143	190	288	310	63	69	106	127	12.02	12.11
F	Agoseris glauca	-	-	-	12	-	-	-	4	.01	.02
F	Alyssum alyssoides (a)	-	-	-	3	-	-	-	2	-	.01

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
		F	Allium spp.	<sub>a</sub> 10	<sub>b</sub> 83	<sub>a</sub> 19	<sub>a</sub> 18	6	38	12	10
F	Arabis spp.	<sub>b</sub> 29	<sub>a</sub> 4	<sub>a</sub> 8	<sub>a</sub> 3	14	2	3	1	.04	.00
F	Artemisia dracunculus	3	-	-	-	1	-	-	-	-	-
F	Astragalus beckwithii	-	-	4	-	-	-	3	-	.21	-
F	Aster chilensis	23	17	24	13	8	6	8	5	.93	.15
F	Astragalus convallarius	-	-	10	-	-	-	4	-	.04	-
F	Astragalus spp.	-	-	2	-	-	-	1	-	.00	-
F	Balsamorhiza sagittata	-	-	1	3	-	-	1	1	.15	.15
F	Castilleja linariaefolia	-	-	4	-	-	-	2	-	.03	-
F	Camelina microcarpa (a)	-	-	14	17	-	-	6	10	.05	.25
F	Chenopodium album (a)	-	-	2	-	-	-	1	-	.00	-
F	Chaenactis douglasii	<sub>b</sub> 62	<sub>a</sub> 7	<sub>a</sub> -	<sub>a</sub> -	31	3	-	-	-	-
F	Cirsium spp.	<sub>b</sub> 55	<sub>b</sub> 36	<sub>b</sub> 50	<sub>a</sub> 2	29	18	25	2	1.75	.01
F	Collomia linearis (a)	-	-	8	-	-	-	4	-	.02	-
F	Comandra pallida	<sub>bc</sub> 19	<sub>c</sub> 27	<sub>ab</sub> 3	<sub>a</sub> -	8	12	2	-	.02	-
F	Collinsia parviflora (a)	-	-	<sub>b</sub> 23	<sub>a</sub> 11	-	-	8	5	.04	.02
F	Crepis acuminata	<sub>a</sub> 7	<sub>b</sub> 45	<sub>b</sub> 56	<sub>a</sub> 10	4	23	26	6	.57	.23
F	Cryptantha spp.	7	-	-	-	4	-	-	-	-	-
F	Cymopterus spp.	<sub>a</sub> -	<sub>b</sub> 44	<sub>b</sub> 33	<sub>a</sub> -	-	22	18	-	.24	-
F	Descurainia pinnata (a)	-	-	7	8	-	-	3	3	.01	.06
F	Eriogonum brevicaule	<sub>ab</sub> 8	<sub>b</sub> 9	<sub>a</sub> -	<sub>ab</sub> 3	3	5	-	1	-	.06
F	Erigeron pumilus	-	-	1	-	-	-	1	-	.00	.00
F	Hackelia patens	58	69	79	56	26	35	36	23	3.04	.76
F	Lappula occidentalis (a)	-	-	5	-	-	-	2	-	.01	-
F	Linum lewisii	<sub>b</sub> 42	<sub>b</sub> 27	<sub>c</sub> 161	<sub>a</sub> -	20	16	61	-	6.36	-
F	Lithospermum ruderales	6	16	5	6	5	6	2	2	.33	.56
F	Machaeranthera canescens	<sub>b</sub> 75	<sub>a</sub> 3	<sub>a</sub> 7	<sub>a</sub> 1	39	2	3	1	.06	.03
F	Microsteris gracilis (a)	-	-	5	38	-	-	2	15	.01	.10
F	Penstemon humilis	<sub>b</sub> 19	<sub>ab</sub> 11	<sub>ab</sub> 8	<sub>a</sub> 3	8	7	3	1	.06	.03
F	Phlox longifolia	<sub>b</sub> 86	<sub>b</sub> 102	<sub>a</sub> 45	<sub>a</sub> 40	38	39	20	18	.29	.14
F	Polygonum douglasii (a)	-	-	1	-	-	-	1	-	.00	-
F	Senecio multilobatus	3	4	7	-	1	2	4	-	.09	-
F	Streptanthus cordatus	6	4	9	8	2	2	3	4	.16	.04
F	Taraxacum officinale	-	3	-	-	-	2	-	-	-	-
F	Tragopogon dubius	<sub>c</sub> 30	<sub>ab</sub> 4	<sub>b</sub> 17	<sub>a</sub> -	19	2	7	-	.06	-
F	Trifolium spp.	-	-	-	2	-	-	-	1	-	.03
F	Veronica biloba (a)	-	-	<sub>b</sub> 155	<sub>a</sub> -	-	-	49	-	1.44	-
F	Vicia americana	<sub>a</sub> 21	<sub>a</sub> 23	<sub>b</sub> 74	<sub>b</sub> 58	10	12	31	28	1.54	.44
F	Viola spp.	-	-	3	-	-	-	1	-	.00	-

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	Zigadenus paniculatus	<sub>ab</sub> 2	<sub>b</sub> 9	<sub>a-</sub>	<sub>a-</sub>	2	5	-	-	-	-
	Total for Annual Forbs	0	0	220	77	0	0	76	35	1.60	0.44
	Total for Perennial Forbs	571	547	630	238	278	259	277	108	16.13	2.74
	Total for Forbs	571	547	850	315	278	259	353	143	17.74	3.19

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 42

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	8	9	.56	.57
B	Artemisia tridentata vaseyana	63	62	13.34	8.41
B	Cercocarpus montanus	12	12	1.14	1.60
B	Chrysothamnus viscidiflorus viscidiflorus	23	25	1.96	2.03
B	Gutierrezia sarothrae	53	56	1.99	1.87
B	Juniperus osteosperma	4	3	2.49	2.99
B	Mahonia repens	1	0	.03	-
B	Opuntia spp.	1	2	-	.01
B	Purshia tridentata	55	51	9.88	4.64
B	Quercus gambelii	3	4	.41	.15
B	Symphoricarpos oreophilus	25	30	2.11	1.64
	Total for Browse	248	254	33.94	23.95

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 42

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.17
Artemisia tridentata vaseyana	-	5.92
Cercocarpus montanus	-	.83
Chrysothamnus viscidiflorus viscidiflorus	-	1.92
Gutierrezia sarothrae	-	.58
Juniperus osteosperma	2.0	.83
Purshia tridentata	-	2.67
Quercus gambelii	-	.17
Symphoricarpos oreophilus	-	1.83

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 42

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.0
Cercocarpus montanus	2.0
Purshia tridentata	1.7

Point-Quarter Tree Data  
Herd unit 17, Study no: 42

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	22	33	4.8	5.6

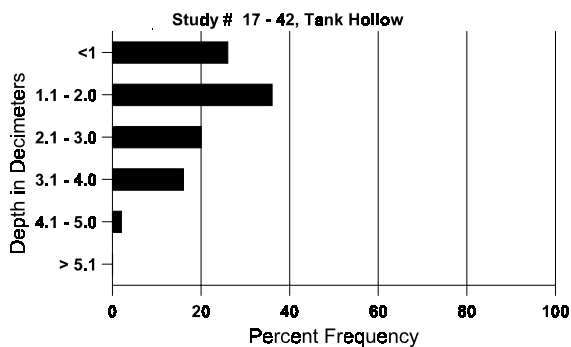
BASIC COVER --  
Herd unit 17 , Study no: 42

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	358	305	1.25	14.00	52.99	38.21
Rock	155	130	4.50	5.75	4.18	3.29
Pavement	155	142	3.25	6.25	1.67	.88
Litter	396	382	61.00	51.25	53.51	50.02
Cryptogams	26	20	0	0	.31	.68
Bare Ground	234	260	30.00	22.75	11.94	23.39

SOIL ANALYSIS DATA --  
Herd Unit 17 Study no: 42, Tank Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.5	46.4 (17.3)	7.1	25.4	34.7	39.8	3.4	6.9	64.0	.7

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 42

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	1	6	-	-
Elk	36	20	635	49 (121)
Deer	38	52	2018	155 (384)
Cattle	-	4	61	5 (13)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 42

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Amelanchier alnifolia																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	1	-	-	1	-	-	2	-	-	-	40			2
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	2	-	-	-	-	-	-	-	4	-	-	-	80			4
	02	-	-	2	-	1	-	1	-	-	4	-	-	-	80			4
M	83	-	1	-	-	-	-	-	-	-	1	-	-	-	66	25	17	1
	89	-	-	-	-	1	-	-	-	-	1	-	-	-	66	23	15	1
	97	2	-	1	2	-	1	-	-	-	6	-	-	-	120	32	33	6
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	21	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	3	-	-	2	-	-	-	3	-	-	2	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		100%			00%			00%			+50%							
'89		50%			00%			00%			+34%							
'97		20%			20%			00%			-10%							
'02		11%			78%			22%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	0%				
											'89	132		50%				
											'97	200		0%				
											'02	180		56%				



A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	1	-	-	-	-	-	-	-	-	-	-	133			2
	97	2	-	-	2	-	-	-	-	-	-	-	-	80			4
	02	-	-	2	-	-	-	-	-	-	-	-	-	40			2
M	83	4	12	10	-	-	-	-	-	-	-	-	-	1733	31	37	26
	89	1	5	11	-	1	-	-	-	-	-	-	-	1200	24	43	18
	97	14	29	8	2	2	-	-	-	-	-	-	-	1100	30	46	55
	02	-	5	21	-	-	2	1	-	-	-	-	-	580	26	33	29
D	83	1	6	3	-	-	-	-	-	-	-	-	-	666			10
	89	6	5	13	-	-	1	-	-	-	-	-	-	1666			25
	97	3	16	3	3	2	-	-	-	-	-	-	-	540			27
	02	-	9	30	-	-	16	2	-	1	-	-	-	1160			58
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	360			18
	02	-	-	-	-	-	-	-	-	-	-	-	-	480			24
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		50%			36%			00%			+20%						
'89		27%			56%			13%			-43%						
'97		57%			13%			23%			+ 3%						
'02		16%			81%			44%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	2399	Dec:	28%		
												'89	2999		56%		
												'97	1720		31%		
												'02	1780		65%		
<i>Cercocarpus montanus</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	1	-	-	-	1	-	-	-	-	-	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	3	10	-	-	2	-	-	-	-	-	-	300	33	40	15
	02	-	-	4	-	-	-	-	-	-	-	-	-	80	33	32	4
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	11	-	-	2	-	-	-	-	-	-	260			13
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		19%			75%			00%			+16%						
'02		00%			95%			58%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%		
												'89	0		0%		
												'97	320		0%		
												'02	380		68%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Chrysothamnus viscidiflorus viscidiflorus																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	3	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	6	-	-	-	-	-	-	-	6	-	-	-	400	10	17	6
	89	8	-	-	-	-	1	-	-	9	-	-	-	600	11	13	9
	97	68	-	-	-	-	-	-	-	68	-	-	-	1360	12	17	68
	02	77	3	-	1	-	-	-	-	80	-	-	-	1620	9	13	81
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+33%						
'89		00%			00%			00%			+59%						
'97		00%			00%			00%			+14%						
'02		04%			01%			00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	400	Dec:	0%				
										'89	600		0%				
										'97	1460		0%				
										'02	1700		1%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<b>Gutierrezia sarothrae</b>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	20	-	-	-	-	-	-	-	20	-	-	-	400		20	
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	60	-	-	-	-	-	-	-	60	-	-	-	1200		60	
	02	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	36	-	-	-	-	-	-	-	36	-	-	-	2400	12	8	36
	89	42	-	-	5	-	-	1	-	48	-	-	-	3200	10	10	48
	97	210	-	-	-	-	-	-	-	210	-	-	-	4200	10	10	210
	02	138	-	-	2	-	-	-	-	138	2	-	-	2800	8	8	140
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	8	-	-	-	-	-	-	-	4	-	-	4	533		8	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	50	-	-	1	-	-	-	-	34	-	-	17	1020		51	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	1300		65	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		+36%									
'89		00%		00%		07%		+31%									
'97		00%		00%		00%		-29%									
'02		00%		00%		09%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	2400	Dec:	0%				
										'89	3733		14%				
										'97	5420		0%				
										'02	3840		27%				
<b>Juniperus osteosperma</b>																	
M	83	1	-	1	-	-	-	-	-	2	-	-	-	133	67	12	2
	89	-	-	-	1	-	-	-	-	1	-	-	-	66	106	79	1
	97	4	-	-	-	-	-	-	-	4	-	-	-	80	82	79	4
	02	2	-	-	-	-	1	-	-	2	1	-	-	60	-	-	3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		50%		00%		-50%									
'89		00%		00%		00%		+18%									
'97		00%		00%		00%		-25%									
'02		00%		33%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	133	Dec:	-				
										'89	66		-				
										'97	80		-				
										'02	60		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Mahonia repens																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	3	-	-	3	-	-	-	60	3	6	3
	02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%									
'02		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-				
										'89	0		-				
										'97	80		-				
										'02	0		-				
Opuntia spp.																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	4	5	1
	02	1	-	-	-	-	-	-	-	1	-	-	-	20	3	7	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%			+67%						
'02		00%			00%			67%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	0		0%				
										'97	20		0%				
										'02	60		33%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	'83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	'89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	'97	6	7	1	-	-	-	-	-	-	14	-	-	-	280		14	
	'02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	20	4	4	-	-	-	-	-	-	27	1	-	-	1866	16	19	28
	'89	-	7	12	-	3	1	-	-	-	23	-	-	-	1533	15	24	23
	'97	4	22	19	2	22	15	-	-	-	84	-	-	-	1680	29	49	84
	'02	-	2	12	-	-	1	-	-	-	15	-	-	-	300	12	26	15
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	5	1	-	-	-	-	-	-	7	-	-	-	466		7	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	6	55	3	-	26	-	-	1	40	-	-	51	1820		91	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'02	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		13%			13%			00%			- 0%							
'89		48%			45%			00%			- 5%							
'97		52%			36%			00%			+ 8%							
'02		07%			89%			48%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2066	Dec:	0%			
												'89	2065		23%			
												'97	1960		0%			
												'02	2140		85%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
Quercus gambelii												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	1	-	1		1	
	02	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	5		5	
	02	4	-	-	-	-	-	-	4		4	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	2	-	-	-	-	-	-	40	51 35	2	
	02	-	-	-	-	-	-	-	0	26 27	0	
D	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	3	1	-	4		4	
X	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'97		00%		00%		00%		+13%				
'02		00%		38%		50%						
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	0%
									'89	0		0%
									'97	140		0%
									'02	160		50%
Ribes spp.												
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	0	-	0	
	02	-	-	-	-	-	-	-	0	19 70	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%						
'89		00%		00%		00%						
'97		00%		00%		00%						
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'83	0	Dec:	-
									'89	0		-
									'97	0		-
									'02	0		-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	8	2	-	-	-	-	-	-	-	10	-	-	-	200		10	
M	83	27	-	-	-	-	-	-	-	-	27	-	-	-	1800	19 14	27	
	89	3	6	-	6	1	-	13	-	-	13	-	-	16	1933	15 14	29	
	97	17	-	-	28	-	-	-	-	-	45	-	-	-	900	18 36	45	
	02	21	4	1	3	2	-	-	-	-	31	-	-	-	620	12 24	31	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	2	3	1	-	-	-	-	-	6	-	-	1	140		7	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			- 6%							
'89		22%			00%			50%			-53%							
'97		00%			00%			00%			- 4%							
'02		21%			08%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	2266	Dec:	0%				
											'89	2133		0%				
											'97	1000		0%				
											'02	960		15%				

Trend Study 17-44-02

Study site name: Billies Mountain.

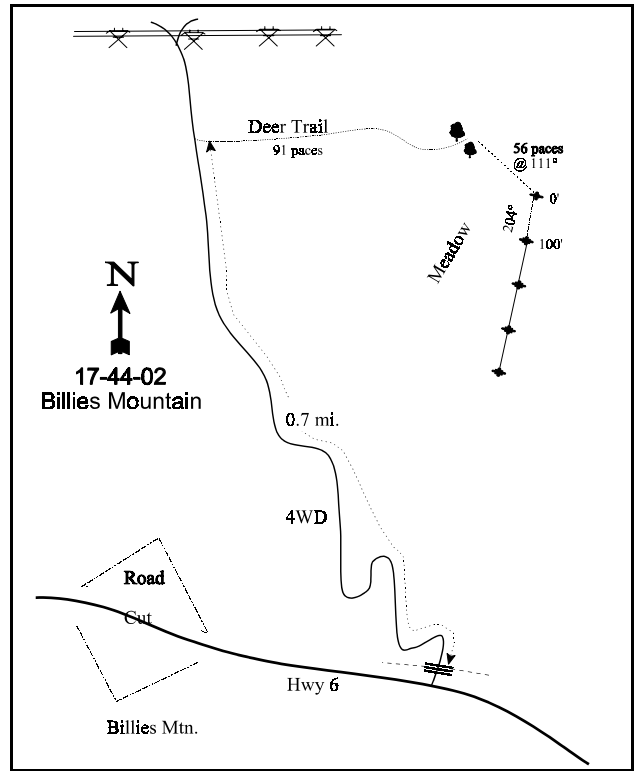
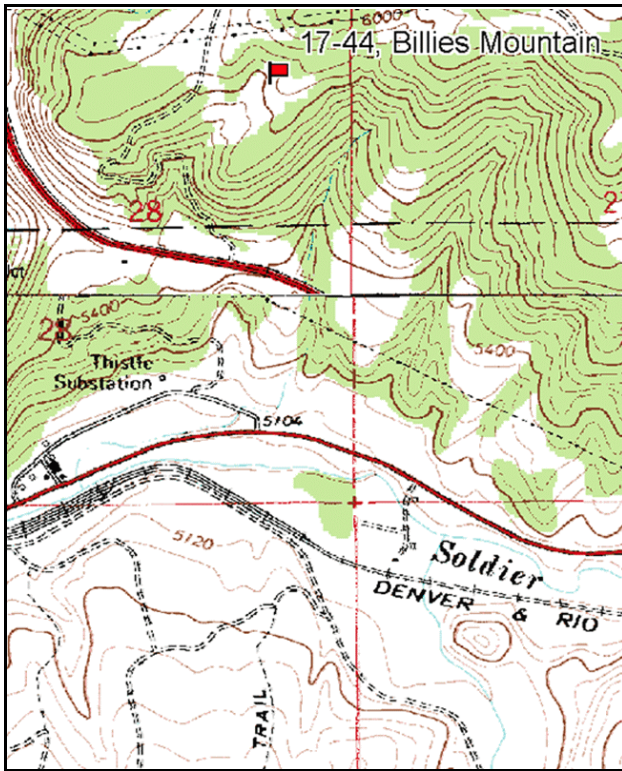
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 204 degrees magnetic.

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

LOCATION DESCRIPTION

On Highway 6 and 89 in Spanish Fork Canyon, east of the new road cut through Billies Mountain and 0.9 miles west of the junction of Route 89 south to Manti and US 6, turn north onto a dirt road. Cross a cattle guard and follow the road up 0.7 miles to where it breaks out into a sagebrush/grass flat. On the right, at the head of a small drainage, a game trail heads east towards a small meadow. Follow this trail approximately 150 yards to 2 large junipers at the edge of the meadow. From the junipers, walk up the near slope 56 paces bearing 111 degrees to the 0-foot baseline stake. This fencepost is marked by browse tag number 3951.



Map Name: Billies Mountain

Diagrammatic Sketch

Township 9S, Range 4E, Section 28

GPS: NAD 27, UTM 12S 4428270 N 458871 E



## DISCUSSION

### Billies Mountain - Trend Study No. 17-44

The Billies Mountain study is located east of the deep road cut constructed in 1983 due to the Billie's Mountain mudslide. The study samples deer winter range at 5,800 feet elevation. Slope varies from 5 to 20% with a south to southwest aspect. The range type is big sagebrush-grass with a variety of other shrubs interspersed throughout. In 1983, deer use was moderate to heavy while elk and cattle use was light. In 1989, it was reported that deer were using the site year round with little elk sign evident. The allotment was rested in 1989 from livestock use. During the 1997 reading, deer and elk use appeared moderate to heavy with little cattle use. A pellet group transect read along the study baseline in 2002 estimated 36 deer and 11 elk days use/acre (89 ddu/ha and 28 edu/ha). Cattle were on site when the site was read (6/5/02) and had utilized many of the grasses. At the time the study was read, cattle use was estimated at 15 days use/acre (38 cdu/ha). Most of the big game pellet groups appear to be from winter use.

Soil is relatively deep, grey in color, with little rock. Textural analysis indicates a clay soil with an effective rooting depth of 21 inches. Temperature, measured at 18 inches in depth, was estimated at 49°F in 1997. Soil phosphorous is quite low at only 4.6 ppm. Values less than 10 ppm have been found to limit plant growth and development. The study is located near the head of a small swale where sedimentation is common. Ground cover from vegetation is good with no erosion apparent. The erosion condition class was determined to be stable in 2002.

The site supports a variety of shrubs with a thick perennial grass understory. An old stand of mountain big sagebrush is the key browse species. It contributes over one-third of the total shrub cover. This population appears to have some basin big sagebrush characteristics but was identified as mountain big sagebrush. Density was estimated at about 2,400 plants/acre in 1983 and 1989. Plants appeared to be moderately to heavily hedged with poor vigor and high decadence. A much larger sample was used in 1997 which estimated 1,260 sagebrush per acre. Use was more moderate but vigor was still poor and over half of the population consisted of decadent plants. The population remained stable in 2002 at nearly 1,200 plants/acre, but it appears that the population is still receiving heavy use. Over half of the population was decadent and 52% of the decadent sagebrush sampled were classified as dying (>50% crown death). Young recruitment has improved however. Annual leader growth was good averaging 2 inches in 2002. It appears that the thick perennial grass understory combined with heavy winter use are keeping sagebrush in a static condition. Most sagebrush on site are overly mature and recruitment is difficult. Continued livestock use in the spring and early summer could help to improve the sagebrush stand. However, this should be monitored closely to ensure that in dry years the livestock would not be over utilizing the sagebrush.

A small stand of bitterbrush provides some additional preferred winter forage. Density was estimated at 380 plants/acre in 2002. Bitterbrush displayed heavy use in 1997 and 2002, but vigor remained good. Annual leader growth was marginal in 2002 averaging 1.7 inches. Other browse species include gray horsebrush, snowberry, Wood's rose, broom snakeweed, chokecherry, white rubber rabbitbrush, stickyleaf low rabbitbrush, dwarf rabbitbrush, and Saskatoon serviceberry. These populations have changed very little since 1983.

The herbaceous understory is abundant and exceptionally diverse. Grasses provided a cover value of nearly 25% in 1997, declining slightly to 19% in 2002. A diverse forb composition produced a cover value of 21% during the 1997 reading, while dry conditions in 2002 caused a decline in forb cover to 18%. A total of 14 grass species were found on the site in 1997 and 2002. Bluebunch wheatgrass is the most abundant perennial grass. It provided 37% of the total grass cover in 1997 increasing to 49% in 2002. Other common grasses include crested wheatgrass, bulbous bluegrass, and Kentucky bluegrass. Cheatgrass is present but will likely not increase due to competition with other species.

The forb composition is dominated by Pacific aster which is an increaser under heavy grazing pressure. It provided 39% of the forb cover in 1997 increasing to 56% in 2002. Other less common forbs include Louisiana sage, western yarrow, thistle, rock goldenrod, longleaf phlox, and American vetch.

## 1983 APPARENT TREND ASSESSMENT

The soil appears stable. Ground cover, in the form of vegetation and litter, is good to excellent and only minimal erosion is occurring. Browse trend appears to be declining. Mountain big sagebrush is in poor health and not adequately reproducing. In contrast, grasses, forbs and to a lesser extent mountain snowberry appear to all be expanding. Intense spring livestock grazing might be a viable management option to encourage reproduction of shrubs.

## 1989 TREND ASSESSMENT

The soil trend is stable. Although disturbed soil has a high erosion hazard, the protective cover maintains minimal erosion. The browse trend is slightly downward. Although the causes are not clear at this time, the sagebrush appears to be continuing its decline through increased decadence and lack of recruitment. As with several other studies on this herd unit, the data shows an increased percentage of vegetative ground cover. The herbaceous understory, still very diverse and productive, does not appear to have expanded significantly. Grass frequency is the same, while forb frequency only slightly increased.

### TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

The soil trend is slightly upward. Erosion was noticeable in the past but it does not appear to be occurring at this time. Percent bare soil has declined and there is adequate vegetative and litter cover to protect the soil. The browse trend is slightly upward as well. Utilization of the key species, mountain big sagebrush, has declined as well as percent decadency. Past heavy utilization and the growing competition of the herbaceous understory are likely the cause of this decadent mountain big sagebrush stand which has only marginal recruitment (seedlings 2% and 5% young plants). Other species, with the exception of bitterbrush, are only lightly utilized and do not appear to be expanding at this time. The herbaceous understory trend is slightly upward with an increase in nested frequency for grasses and forbs.

### TREND ASSESSMENT

soil - up slightly (4)

browse - up slightly (4)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

Trend for soil is slightly down due to an increase in bare soil and a decline in litter. There is still adequate protective ground cover to prevent most erosion and the soil erosion condition class was determined to be stable. Trend for browse is stable for the key species, mountain big sagebrush. The population is still in poor condition with 57% of the shrubs sampled classified as decadent. Utilization remains heavy and recruitment marginal. Bitterbrush displays heavier use than reported in 1997. Vigor remains good on most plants but the number of decadent plants increased. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses and forbs declined slightly but not enough to warrant a downward trend. The key grass, bluebunch wheatgrass, and the most abundant forb, Pacific aster, remained stable in nested frequency. There was some difficulty in identifying some grasses due to use and lack of seed heads. The abundant herbaceous understory is partly responsible for the poor condition of the mountain big sagebrush stand. Continued spring livestock grazing may improve the shrub component but the composition of the herbaceous understory already contains several weedy increasers. The herbaceous composition could easily worsen with heavy grazing.

### TREND ASSESSMENT

soil - slightly down (2)

browse - stable but poor (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 44

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron cristatum	a-	a-	c11	55	-	-	5	22	.48	1.99
G	Agropyron smithii	a-	ab6	b13	b21	-	2	5	7	.05	.58
G	Agropyron spicatum	a149	ab182	b202	ab175	55	69	66	54	8.94	9.46
G	Agropyron trachycaulum	ab9	c22	a-	bc13	3	10	-	5	-	.19
G	Bromus inermis	-	-	7	10	-	-	2	3	.30	.79
G	Bromus tectorum (a)	-	-	b60	a4	-	-	21	2	.87	.01
G	Carex spp.	6	-	-	-	2	-	-	-	-	-
G	Elymus glaucus	9	-	3	-	4	-	1	-	.63	-
G	Elymus junceus	-	-	-	4	-	-	-	1	-	.63
G	Koeleria cristata	24	4	26	7	9	3	9	3	.70	.09
G	Melica bulbosa	14	24	38	13	6	12	13	6	1.52	.13
G	Oryzopsis hymenoides	4	2	-	-	2	1	-	-	-	-
G	Poa bulbosa	a5	a7	b58	c82	2	3	19	28	1.60	2.79
G	Poa fendleriana	b37	a16	a13	ab31	17	6	6	11	.66	.66
G	Poa pratensis	a99	b156	ab126	a97	39	61	41	34	6.76	1.46
G	Poa secunda	a-	a1	c69	b34	-	1	30	17	1.58	.35
G	Sitanion hystrix	bc16	c23	ab7	a-	9	10	2	-	.06	-
G	Stipa lettermani	b44	a22	a10	a8	21	9	5	3	.31	.07
Total for Annual Grasses		0	0	60	4	0	0	21	2	0.87	0.00
Total for Perennial Grasses		416	465	583	550	169	187	204	194	23.62	19.21
Total for Grasses		416	465	643	554	169	187	225	196	24.50	19.22
F	Achillea millefolium	b89	a32	a33	a41	37	17	16	16	1.06	.91
F	Alyssum alyssoides (a)	-	-	2	-	-	-	1	-	.00	-
F	Allium spp.	a3	b15	b22	ab12	1	10	10	4	.05	.39
F	Antennaria rosea	10	-	-	-	3	-	-	-	-	-
F	Artemisia ludoviciana	37	55	42	45	15	21	17	20	1.49	1.05
F	Aster chilensis	b301	b310	a225	a248	97	97	74	81	8.27	10.07
F	Astragalus convallarius	b68	b82	b58	a24	30	36	24	13	.78	.34
F	Astragalus spp.	3	7	-	-	1	4	-	-	-	-
F	Astragalus utahensis	12	14	14	10	5	7	6	4	.25	.33
F	Camelina microcarpa (a)	-	-	b16	a1	-	-	6	1	.13	.00
F	Calochortus nuttallii	11	19	21	19	7	13	11	10	.05	.07
F	Cirsium spp.	a7	ab21	c47	bc36	6	11	23	17	1.50	.39
F	Collomia linearis (a)	-	-	7	-	-	-	4	-	.02	-
F	Comandra pallida	a-	a-	b11	a1	-	-	6	1	.03	.00
F	Crepis acuminata	-	-	6	8	-	-	3	4	.02	.09
F	Cymopterus spp.	a-	a-	b9	b12	-	-	5	6	.07	.37

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Cynoglossum officinale</i>	-	-	5	2	-	-	3	2	.01	.01
F	<i>Epilobium brachycarpum</i> (a)	-	-	<sub>b</sub> 81	<sub>a</sub> 33	-	-	33	13	.51	.06
F	<i>Eriogonum brevicaule</i>	4	6	11	3	2	3	5	3	.10	.04
F	<i>Eriogonum racemosum</i>	-	-	-	1	-	-	-	1	-	.00
F	<i>Eriogonum umbellatum</i>	-	3	5	3	-	1	2	2	.01	.03
F	<i>Galium aparine</i> (a)	-	-	29	22	-	-	11	10	.56	.19
F	<i>Hackelia patens</i>	11	2	12	4	5	1	6	1	.03	.00
F	<i>Helianthus annuus</i> (a)	1	-	-	-	1	-	-	-	-	-
F	<i>Lactuca serriola</i>	<sub>a</sub> -	<sub>b</sub> 12	<sub>c</sub> 33	<sub>a</sub> -	-	6	14	-	.24	-
F	<i>Lithospermum ruderale</i>	-	-	1	1	-	-	1	1	.03	.15
F	<i>Medicago sativa</i>	<sub>c</sub> 113	<sub>ab</sub> 10	<sub>b</sub> 18	<sub>a</sub> -	33	4	7	-	.35	-
F	<i>Petrorhiza pumila</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 25	<sub>c</sub> 32	-	-	11	13	1.05	1.81
F	<i>Phlox longifolia</i>	<sub>a</sub> 4	<sub>c</sub> 128	<sub>b</sub> 67	<sub>b</sub> 88	2	56	27	39	.21	.66
F	<i>Polygonum douglasii</i> (a)	-	-	2	1	-	-	1	1	.00	.00
F	<i>Sphaeralcea coccinea</i>	-	-	-	3	-	-	-	1	-	.00
F	<i>Taraxacum officinale</i>	1	1	-	-	1	1	-	-	-	-
F	<i>Tragopogon dubius</i>	12	16	31	9	7	10	12	7	.90	.06
F	<i>Veronica biloba</i> (a)	-	-	-	3	-	-	-	1	-	.00
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>c</sub> 131	<sub>b</sub> 98	-	-	48	48	2.65	.89
F	<i>Viguiera multiflora</i>	17	22	30	10	12	11	14	4	.56	.04
Total for Annual Forbs		1	0	137	60	1	0	56	26	1.23	0.27
Total for Perennial Forbs		703	755	857	710	264	309	345	298	19.77	17.76
Total for Forbs		704	755	994	770	265	309	401	324	21.01	18.04

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 44

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	2	3	.03	-
B	Artemisia tridentata vaseyana	50	48	4.69	4.34
B	Chrysothamnus depressus	7	6	.03	.03
B	Chrysothamnus nauseosus albicaulis	21	16	.48	.54
B	Chrysothamnus viscidiflorus viscidiflorus	24	25	1.67	1.21
B	Eriogonum heracleoides	-	-	-	.00
B	Gutierrezia sarothrae	17	20	.31	.16
B	Juniperus osteosperma	2	2	1.78	1.78
B	Prunus virginiana	1	2	.15	-
B	Purshia tridentata	14	12	1.89	2.50
B	Rosa woodsii	3	3	.15	.15
B	Symphoricarpos oreophilus	9	10	1.16	1.82
B	Tetradymia canescens	9	9	.30	.09
Total for Browse		159	156	12.67	12.66

CANOPY COVER --  
Herd unit 17 , Study no: 44

Species	Percent Cover	
	'97	'02
Juniperus osteosperma	3	4

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 44

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	2.1

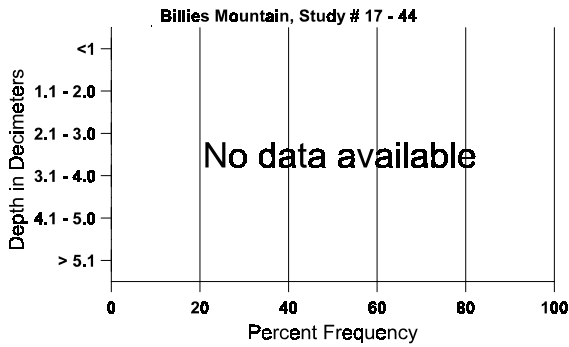
BASIC COVER --  
Herd unit 17 , Study no: 44

Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	377	359	5.25	12.50	46.86	54.50
Rock	56	64	.50	.75	.68	.42
Pavement	197	224	1.25	4.75	1.09	1.27
Litter	398	373	64.00	58.25	54.79	38.76
Cryptogams	52	19	0	0	1.70	.42
Bare Ground	251	287	29.00	23.75	14.87	19.72

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 44, Billies Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.1	49.0 (17.7)	7.4	23.4	20.7	55.8	2.2	4.6	323.2	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17 , Study no: 44

Type	Quadrat Frequency	
	'97	'02
Sheep	-	1
Rabbit	-	1
Elk	25	18
Deer	37	15
Cattle	2	9

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
02	02
9	1 (2)
-	-
148	11 (28)
470	36 (89)
183	15 (38)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 44

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	83	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	2	-	-	-	-	-	-	-	2	-	-	66	34	40	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40	21	25	2
	02	-	1	1	-	-	-	-	-	-	2	-	-	-	40	23	34	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		33%			67%			00%										
'89		00%			00%			00%										
'97		50%			00%			00%			+33%							
'02		33%			33%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	99	Dec:	-				
											'89	0		-				
											'97	40		-				
											'02	60		-				
<i>Artemisia tridentata vaseyana</i>																		
S	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	2	1	-	3	-	-	-	-	-	6	-	-	-	120		6	
M	83	4	19	10	-	-	-	-	-	-	25	-	8	-	1100	22	34	33
	89	3	3	4	-	-	-	-	-	-	9	1	-	-	333	24	20	10
	97	8	18	-	-	-	-	-	-	-	26	-	-	-	520	27	37	26
	02	2	5	12	-	-	-	-	-	-	19	-	-	-	380	27	31	19
D	83	5	19	13	-	-	-	-	-	-	1	-	36	-	1233		37	
	89	10	38	15	-	-	-	-	-	-	51	3	1	8	2100		63	
	97	17	15	1	1	-	-	-	-	-	9	-	-	25	680		34	
	02	4	9	20	-	-	-	-	-	-	16	-	-	17	660		33	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	860		43	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	600		30	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		54%			33%			63%			+ 4%							
'89		56%			26%			12%			-48%							
'97		52%			02%			40%			- 8%							
'02		26%			55%			29%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	2333	Dec:	53%				
											'89	2433		86%				
											'97	1260		54%				
											'02	1160		57%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<b>Chrysothamnus depressus</b>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	4	-	-	-	-	-	-	-	-	4	-	-	133	9 11	4	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	22	-	-	-	-	-	-	-	-	22	-	-	440	8 11	22	
	02	7	1	-	-	-	-	-	-	-	8	-	-	160	7 10	8	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'97		00%			00%			00%			-61%						
'02		11%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	133	Dec:	0%			
											'89	0		0%			
											'97	460		0%			
											'02	180		11%			
<b>Chrysothamnus nauseosus albicaulis</b>																	
Y	83	1	1	-	-	-	-	-	-	-	2	-	-	66		2	
	89	5	-	-	-	-	-	-	-	-	5	-	-	166		5	
	97	3	-	-	-	-	-	-	-	-	3	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	6	3	-	-	-	-	-	-	-	9	-	-	300	18 13	9	
	89	9	-	-	1	-	-	-	-	-	10	-	-	333	20 17	10	
	97	29	1	-	-	-	-	-	-	-	30	-	-	600	19 19	30	
	02	11	3	-	-	-	-	-	-	-	14	-	-	280	22 30	14	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	6	1	-	-	-	-	-	-	-	6	1	-	233		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	4	1	1	-	-	-	1	-	-	7	-	-	140		7	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		36%			00%			00%			+50%						
'89		05%			00%			00%			-10%						
'97		03%			00%			00%			-36%						
'02		19%			05%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	366	Dec:	0%			
											'89	732		32%			
											'97	660		0%			
											'02	420		33%			



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
Y	83	3	-	-	-	-	-	-	3		3	
	89	10	-	-	1	-	-	-	11		11	
	97	1	-	-	-	-	-	-	1		1	
	02	3	-	-	-	-	-	-	3		3	
M	83	22	-	-	-	-	-	-	22	16	13	22
	89	35	-	-	-	-	-	-	35	14	16	35
	97	33	-	-	-	-	-	-	33	15	18	33
	02	32	-	-	1	-	-	-	32	11	17	33
D	83	-	-	-	-	-	-	-	0			0
	89	5	-	-	-	-	-	-	4		1	5
	97	1	-	-	-	-	-	-	1			1
	02	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+51%				
'89		00%		00%		02%		-59%				
'97		00%		00%		00%		+ 3%				
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	833	Dec:	0%			
						'89	1698		10%			
						'97	700		3%			
						'02	720		0%			
<i>Gutierrezia sarothrae</i>												
Y	83	2	-	-	-	-	-	-	2			2
	89	-	-	-	-	-	-	-	0			0
	97	14	-	-	-	-	-	-	14			14
	02	-	-	-	-	-	-	-	0			0
M	83	10	-	-	-	-	-	-	10	9	8	10
	89	19	-	-	-	-	-	-	19	9	10	19
	97	30	-	-	-	-	-	-	30	9	8	30
	02	46	-	-	-	-	-	-	46	8	6	46
D	83	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	1			1
	97	2	-	-	-	-	-	-	2			2
	02	1	-	-	-	-	-	-	1			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+40%				
'89		00%		00%		05%		+28%				
'97		00%		00%		00%		+ 2%				
'02		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	399	Dec:	0%			
						'89	666		5%			
						'97	920		4%			
						'02	940		2%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																																																																																										
	1	2	3	4	5	6	7	8	9	1	2	3	4																																																																																														
<b>Juniperus osteosperma</b>																																																																																																											
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																																										
	97	2	-	-	-	-	-	-	-	-	-	-	-	40	-	-	2																																																																																										
	02	3	-	-	-	-	-	-	-	-	-	-	-	60	-	-	3																																																																																										
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<b>Prunus virginiana</b>																																																																																																											
S	83	1	-	-	-	-	-	-	-	-	-	-	-	33			1																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
Y	83	-	4	-	-	-	-	-	-	-	-	-	-	133			4																																																																																										
	89	6	-	-	-	-	-	-	-	-	-	-	-	200			6																																																																																										
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	02	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																																										
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	02	1	-	-	-	-	-	-	-	-	-	-	-	20	27	23	1																																																																																										
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0																																																																																										
	02	-	-	1	-	-	-	-	-	-	-	-	-	20			1																																																																																										
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Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	0%																																																																																												
												'89	200		0%																																																																																												
												'97	60		0%																																																																																												
												'02	40		50%																																																																																												

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Purshia tridentata													
Y	83	1	-	-	-	-	-	-	1	33		1	
	89	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	1	20		1	
	02	-	-	-	-	-	-	-	-	0		0	
M	83	2	3	2	-	-	-	-	7	233	16 33	7	
	89	8	1	-	-	-	-	-	9	300	16 29	9	
	97	1	6	14	-	3	-	-	24	480	20 37	24	
	02	1	3	9	-	-	2	-	15	300	15 34	15	
D	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	97	-	1	1	-	-	-	-	-	40		2	
	02	-	-	3	-	-	1	-	3	80		4	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		38%		25%		00%		+11%					
'89		11%		00%		00%		+44%					
'97		37%		56%		07%		-30%					
'02		16%		79%		05%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	266	Dec:	0%
										'89	300		0%
										'97	540		7%
										'02	380		21%
Rosa woodsii													
Y	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	2	40		2	
	02	5	-	-	-	-	-	-	5	100		5	
M	83	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	0	- -	0	
	97	3	-	-	-	-	-	-	3	60	10 13	3	
	02	3	-	-	-	-	-	-	3	60	7 10	3	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%							
'89		00%		00%		00%							
'97		00%		00%		00%		+38%					
'02		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-
										'89	0		-
										'97	100		-
										'02	160		-

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total						
		1	2	3	4									
<b>Symphoricarpos oreophilus</b>														
S	83	1	-	-	-	-	-	-	1	-	-	33		1
	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	20		1
	02	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	25	1	-	-	-	-	-	-	22	4	-	-	26
	89	17	-	-	-	-	-	-	-	17	-	-	-	17
	97	11	-	-	-	-	-	-	-	11	-	-	-	11
	02	9	-	-	-	-	-	-	-	9	-	-	-	9
M	83	6	6	1	-	-	-	-	-	8	4	1	-	13
	89	14	-	-	9	-	-	-	-	23	-	-	-	23
	97	4	-	-	1	-	-	-	-	5	-	-	-	5
	02	23	2	-	-	-	-	-	-	21	4	-	-	25
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'83		18%		03%		03%		+ 2%						
'89		00%		00%		00%		-76%						
'97		00%		00%		00%		+53%						
'02		06%		00%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	1299	Dec:	-	
										'89	1332		-	
										'97	320		-	
										'02	680		-	
<b>Tetradymia canescens</b>														
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0
	02	3	-	-	-	-	-	-	-	3	-	-	-	60
Y	83	2	-	-	-	-	-	-	-	2	-	-	-	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	0
	97	5	-	-	1	-	-	-	-	6	-	-	-	6
	02	4	-	-	-	-	-	-	-	4	-	-	-	4
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0
	97	20	-	-	-	-	-	-	-	20	-	-	-	20
	02	23	1	-	-	-	-	-	-	23	1	-	-	24
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'83		00%		00%		00%								
'89		00%		00%		00%								
'97		00%		00%		00%		+ 7%						
'02		04%		00%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	-	
										'89	0		-	
										'97	520		-	
										'02	560		-	

Trend Study 17-45-02

Study site name: North Bench.

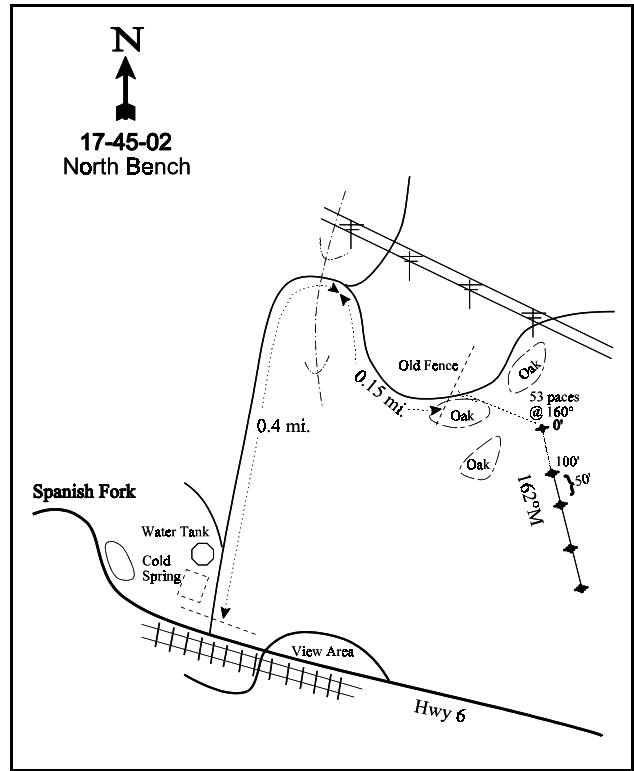
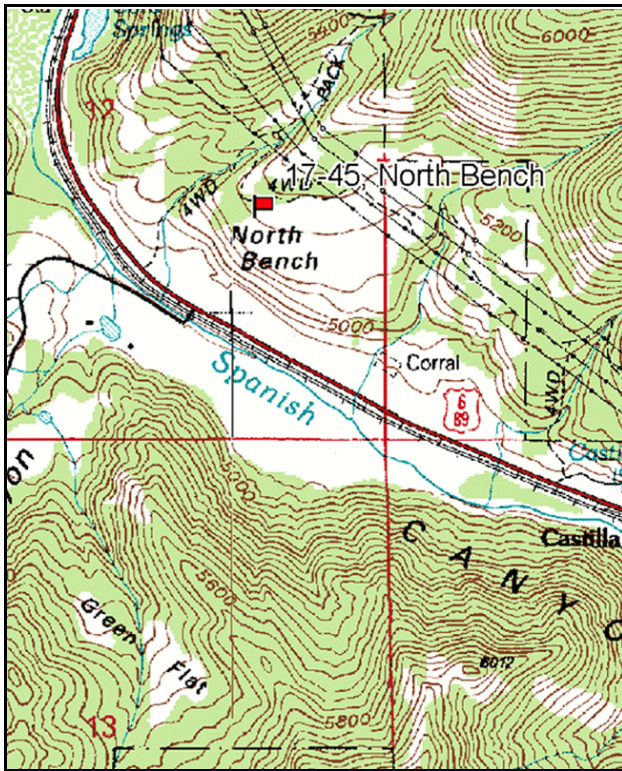
Vegetation type: Big Sagebrush.

Compass bearing: frequency baseline 162 degrees magnetic.

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

LOCATION DESCRIPTION

From the west side of the view area in lower Spanish Fork Canyon (about 3.5 miles up from the mouth) look for a dirt road going up through a gate and by an old corral. Take this rough road for 0.4 miles to an intersection. Turn right and go 0.15 miles to the top of the bench and an old fence line. From the wood post near the left hand side of the road, walk 53 paces bearing 160 degrees into the sage flat. The first stake marks the 0-foot end of the baseline. The remainder of the study stakes are south at 100 foot intervals.



Map Name: Spanish Fork Peak

Diagrammatic Sketch

Township 9S, Range 3E, Section 12

GPS: NAD 27, UTM 12S 4432578 N 453862 E

## DISCUSSION

### North Bench - Trend Study No. 17-45

The North Bench trend study was established in 1989 and is located on a 40 acre piece of private land in lower Spanish Fork Canyon. The study samples a sagebrush/grass bench above Highway 6. These type of communities are limited in the bottom of the oakbrush dominated canyon and should be the first areas to reflect the pressures of increasing deer use. Deer sign was reportedly light in both 1989 and 1997. The bench has a south to southeast aspect, gentle slope (3-5%), and an elevation of 5,100 feet. Wildlife use remained low in 2002. A pellet group transect read on site in 2002 estimated only 8 deer days use/acre (20 ddu/ha) and 6 cow days use/acre (14 cdu/ha). Cattle pats were from 2001 and deer pellet groups appear to be from fall and winter use. Grasshoppers were abundant in 2002 and some utilization on herbaceous plants was apparent.

Soil textural analysis indicates a loamy soil with a slightly acidic soil reaction (pH 6.1). Effective rooting depth was estimated to be 20 inches with an average temperature of 44.6°F at about 18 inches. Few rocks were encountered in the soil profile and there is a clay horizon about 10 inches below the soil surface. There are currently no erosion problems due to abundant and well dispersed vegetative cover in conjunction with the gentle slope. The erosion condition class was determined to be stable in 2002.

Mountain big sagebrush is the obvious key species. It provided 88% of the shrub cover in 1997 and 85% in 2002. It had an estimated density of about 5,000 plants/acre in 1997 and 2002. Utilization has been mostly light since the site was established in 1989. Vigor has been normal on most plants but the number of decadent plants has fluctuated considerably. In 1989, a dry year, over half of the sagebrush sampled were classified as decadent. In 1997, the number of decadent plants dropped to only 9% then increased to 21% in 2002. Recruitment was exceptional in 1997, yet the population did not show an increase in 2002. Seedling survival appears to be limited by drought and the abundant herbaceous understory which is dominated by bulbous bluegrass.

The broom snakeweed population was abundant and healthy in 1997 and 2002. It has increased from 400 plants/acre in 1989 to 4,800 plants/acre in 2002. Clumps of large mature oak occur on the slopes near the bench and dominate the hillsides above, providing escape and thermal cover until leaf drop.

The herbaceous understory is abundant and dominated by the low value perennial, bulbous bluegrass. It provides almost continuous ground cover with a cover value of 32% in 1997 and 33% in 2002. Crested wheatgrass and Kentucky bluegrass are also fairly abundant.

The forb composition is diverse but contains several weedy species including yellow salsify, autumn willoweed, hairy goldaster, curlycup gumweed, and common dandelion. Most of these species indicate past excessive grazing, even with rest they will persist a long time on the site. The noxious weed, whitetop, was encountered on site in 2002 as well.

### 1989 APPARENT TREND ASSESSMENT

The soil appears stable. There is adequate protective ground cover to limit most erosion. As with several other studies on this herd unit, trend indicators point to a declining big sagebrush population. It is an older, decadent stand with only fair vigor and many dying plants. The sagebrush are not overused, there is just no reproduction. A year favorable to seedling establishment could quickly change the direction of long-term trend.

## 1997 TREND ASSESSMENT

The soil trend continues to be stable. Dense vegetative cover provided by bulbous bluegrass will help prevent erosion as well as the gentle slope. Browse trend is upward with a more healthy stand of mountain big sagebrush after some self thinning. The population is still relatively dense. Many young and seedling plants were encountered indicating an expanding population. Broom snakeweed also has a healthy population with a age class distribution indicating it will likely expand. The herbaceous understory trend is upward. Many new species were encountered in 1997, greatly raising the nested frequency for forbs. However, a better species composition is desired.

### TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - up but composition poor (5)

## 2002 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in cover of bare ground and an increase in vegetation cover. There is little bare ground exposed and erosion is minimal. Trend for the key browse species, mountain big sagebrush, is stable. Density remains similar to 1997 levels. The abundance of seedlings and young sampled in 1997 did not cause an increase in the already dense sagebrush population. Utilization remains light but the number of decadent plants increased to 21%. It appears that sagebrush seedling survival is somewhat limited by the abundant and weedy herbaceous understory. Trend for the herbaceous understory is stable. The low value perennial, bulbous bluegrass, still totally dominates the herbaceous understory by providing 65% of the total grass cover or 49% of the total herbaceous cover. It forms a nearly continuous cover in some areas. Sum of nested frequency for perennial grasses has increased slightly while frequency of perennial forbs declined. Nested frequency of the most common perennial grasses remained stable.

### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 45

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	202	198	221	73	67	70	9.33	12.38
G	Bromus tectorum (a)	-	14	-	-	4	-	.07	-
G	Dactylis glomerata	<sub>a</sub> 5	<sub>ab</sub> 12	<sub>b</sub> 17	2	6	8	.70	.74
G	Poa bulbosa	<sub>a</sub> 144	<sub>b</sub> 358	<sub>b</sub> 368	55	96	99	31.65	33.20
G	Poa pratensis	<sub>a</sub> 43	<sub>b</sub> 135	<sub>b</sub> 143	17	45	54	4.02	4.80
G	Poa secunda	<sub>b</sub> 314	<sub>a</sub> 13	<sub>a</sub> 9	91	6	6	.45	.03
Total for Annual Grasses		0	14	0	0	4	0	0.07	0
Total for Perennial Grasses		708	716	758	238	220	237	46.17	51.15
Total for Grasses		708	730	758	238	224	237	46.24	51.15
F	Artemisia ludoviciana	-	3	2	-	1	1	.15	.15
F	Aster chilensis	-	4	6	-	2	3	.15	.18

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Cardaria draba	a-	a-	b29	-	-	12	-	.35
F	Cirsium spp.	a-	b25	a10	-	12	4	.68	.02
F	Collomia linearis (a)	-	-	2	-	-	1	-	.00
F	Comandra pallida	1	-	8	1	-	4	-	.04
F	Collinsia parviflora (a)	-	2	-	-	1	-	.00	-
F	Cynoglossum officinale	a-	c63	b19	-	27	11	.72	.42
F	Epilobium brachycarpum (a)	-	b152	a57	-	61	26	.40	.20
F	Erigeron pumilus	a1	b31	a-	1	14	-	.15	-
F	Grindelia squarrosa	a25	b80	a7	8	35	3	1.09	.06
F	Helianthus annuus (a)	b35	b28	a5	19	12	2	.25	.01
F	Heterotheca villosa	a-	b131	c193	-	54	78	3.53	9.06
F	Lactuca serriola	6	6	-	2	3	-	.01	-
F	Lithospermum spp.	b47	a-	a-	21	-	-	-	-
F	Lupinus argenteus	a-	b20	b27	-	10	14	.95	1.26
F	Melilotus officinalis	-	4	1	-	2	1	.15	.00
F	Medicago sativa	a1	b14	b20	1	6	11	.90	1.48
F	Polygonum douglasii (a)	-	3	-	-	1	-	.00	-
F	Taraxacum officinale	a-	c53	b14	-	23	9	1.07	.32
F	Tragopogon dubius	a61	c205	b133	31	80	61	2.44	2.50
Total for Annual Forbs		35	185	64	19	75	29	0.67	0.21
Total for Perennial Forbs		142	639	469	65	269	212	12.02	15.88
Total for Forbs		177	824	533	84	344	241	12.69	16.10

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 45

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	89	85	8.82	13.24
B	Chrysothamnus nauseosus albicaulis	1	0	-	-
B	Gutierrezia sarothrae	27	41	1.20	2.37
Total for Browse		117	126	10.02	15.61

#### Key Browse Annual Leader Growth

Herd unit 17 , Study no: 45

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	3.4



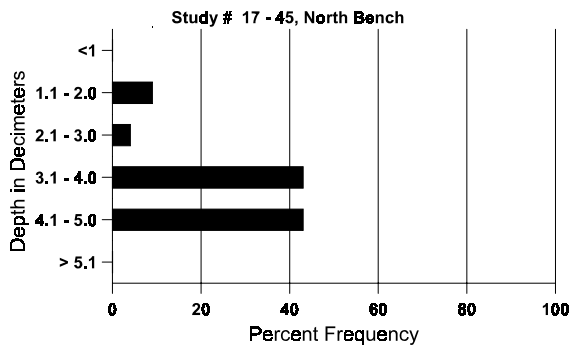
BASIC COVER --  
Herd unit 17 , Study no: 45

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	396	394	24.00	59.20	71.77
Rock	20	5	.75	.10	.02
Pavement	88	36	1.25	.28	.14
Litter	394	369	58.25	39.26	37.77
Cryptogams	86	71	0	.97	.81
Bare Ground	259	167	15.75	10.44	5.02

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 45, North Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.0	44.6 (17.7)	6.1	36.7	36.4	26.8	1.7	27.3	227.2	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 45

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre	Days Use per Acre (ha)
Elk	-	1	0	-
Deer	1	7	104	8 (20)
Cattle	2	5	70	6 (14)

BROWSE CHARACTERISTICS --  
Herd unit 17 , Study no: 45

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	73	-	-	1	-	-	-	-	-	74	-	-	-	1480		74	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	155	-	-	-	-	-	-	-	-	155	-	-	-	3100		155	
	02	25	-	-	3	-	-	-	-	-	28	-	-	-	560		28	
M	89	14	4	-	-	-	-	-	-	-	16	2	-	-	1200	29 31	18	
	97	88	8	-	-	-	-	-	-	-	95	1	-	-	1920	36 42	96	
	02	151	14	4	-	-	-	-	-	-	168	1	-	-	3380	19 23	169	
D	89	23	3	-	-	-	-	-	-	-	24	-	2	-	1733		26	
	97	23	1	-	-	-	-	-	-	-	12	-	-	12	480		24	
	02	41	12	-	-	-	-	-	-	-	38	-	-	15	1060		53	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	860		43	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	720		36	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		16%			00%			04%			+45%							
'97		03%			00%			04%			- 9%							
'02		10%			02%			06%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2999	Dec:	58%				
											'97	5500		9%				
											'02	5000		21%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	27 46	1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19 28	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
											'02	0		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	89	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	97	55	-	-	-	-	-	-	-	-	55	-	-	-	1100		55	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	66	-	-	-	-	-	-	-	-	66	-	-	-	1320		66	
	02	10	-	-	-	-	-	-	-	-	10	-	-	-	200		10	
M	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200	6	8	3
	97	101	-	-	-	-	-	-	-	-	101	-	-	-	2020	6	7	101
	02	203	1	-	7	-	-	-	-	-	209	2	-	-	4220	8	8	211
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	19	-	-	-	-	-	-	-	-	18	-	-	1	380		19	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+88%							
'97		00%			00%			00%			+29%							
'02		.41%			00%			.41%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	400	Dec:	0%			
												'97	3400		2%			
												'02	4800		8%			

Trend Study 17-46-02

Study site name: Lower Tank Hollow.

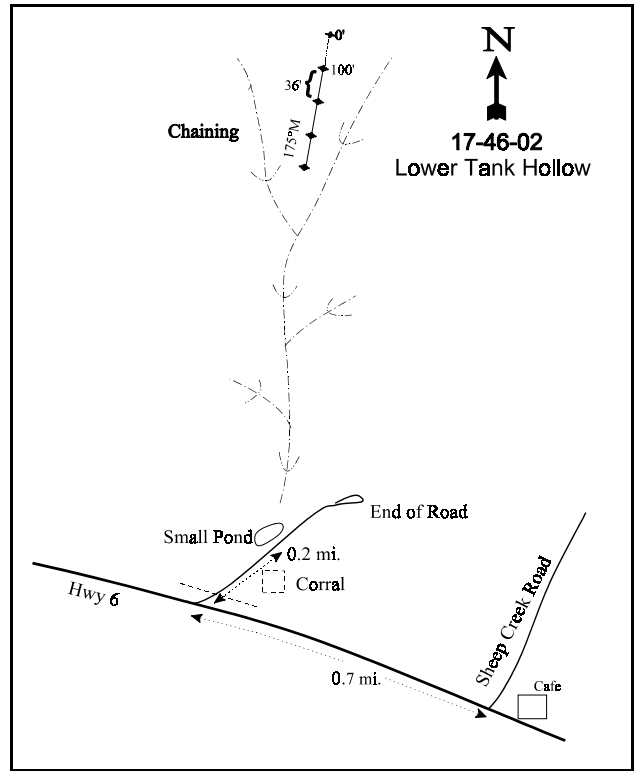
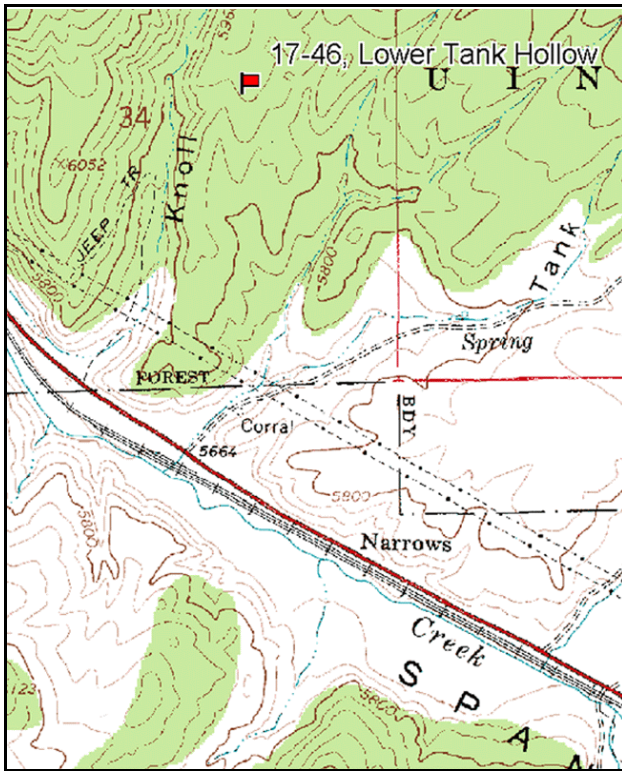
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 175 degrees magnetic.

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

LOCATION DESCRIPTION

In Spanish Fork Canyon, turn north up Tank Hollow, which is 0.7 miles west of the Sheep Creek Road and cafe on Highway 6. Drive about 0.2 miles and stop by a small stock pond in the forks of the drainage. From here, walk north about 1/2 mile up the left fork, and keep left at two other major forks. Where the wash starts to flatten out at the head, there is a chained ridge to the right. The study site is on the ridge, about 20 paces from the center of the drainage. The 0-foot baseline stake is near the highest point on the ridge.



Map Name: Mill Fork

Diagrammatic Sketch

Township 9S, Range 5E, Section 34

GPS: NAD 27, UTM 12S 4426474 N 470080 E

## DISCUSSION

### Tank Hollow - Trend Study No. 17-46

This trend study samples the chaining in Lower Tank Hollow. The 600 acre chaining and seeding treatment was completed in 1971. The study is located on a small ridge representative of the long, sloping ridges in the treated area. The bottoms tend to be dominated by grass, while basin big sagebrush occurs further down into the bottoms. There is a variety of browse on the ridges. The slope is 10% with a southerly aspect and an elevation of 5,600 feet. This Forest Service land is in the Diamond Fork cattle allotment. When not rested, it appears to receive moderate use. Judging by deer pellet groups on the small ridge where the study is located, there is moderate to heavy deer use and light elk use. Tank Hollow is considered a critical area for wintering deer. A pellet group transect read on site in 2002 estimated 47 deer and 5 elk days use/acre (116 ddu/ha and 13 edu/ha). Most of the big game use appears to be during the winter. Livestock were in the area during the 2002 reading on June 17<sup>th</sup>. They had heavily utilized forage on the lower portions of the chaining but had only lightly used the area of the trend site. Pellet group data estimated 7 cow days use/acre (16 cdu/ha).

Soil textural analysis indicates a clay loam with a shale substrate. The effective rooting depth is about 13 inches with a neutral soil reaction (pH 7.2). Phosphorous is low (6.8 ppm) and could limit plant growth and development on the site. The soil is moderately deep in most places and is dark in color. There is evidence of substantial past erosion in the form of exposed roots and pedestalled plants, but there does not appear to be significant erosion since the site was established in 1989. There seems to be enough perennial grass cover to prevent all but localized soil movement. The erosion condition class was determined to be slight in 2002.

Pre-treatment vegetation was a predominantly mature stand of pinyon and juniper. Juniper appears to be renewing its dominance in the chaining, and although they are fairly large trees, density remains moderately low. Point quarter data from 2002 estimated 74 juniper trees/acre with an average diameter of nearly 6½ inches. Thirty-five percent of the juniper sampled were mature trees that had been tipped over during the chaining but were still alive. Total canopy cover of juniper was estimated at nearly 6% in 2002.

Preferred browse is somewhat limited on this site. Basin big sagebrush and bitterbrush are the only moderately abundant preferred species on site. Basin big sagebrush has a low density averaging 400 plants/acre in 1997 and 2002. It was reportedly heavily hedged in 1989 but showed only light use in 1997. Heavy use was reported on 68% of the population in 2002. Poor vigor and percent decadence follow this same trend as both parameters showed higher levels in 1989 and 2002 compared to 1997. Drought conditions prevailed during both the 1989 and 2002 readings, while conditions were wetter than normal in 1997. Bitterbrush provides some additional preferred forage with a small density of 260 plants/acre estimated in 2002. Use has been consistently heavy but vigor was normal until 2002. Due to drought conditions combined with heavy browsing, vigor was poor on 38% of the bitterbrush sampled in 2002. The number of decadent plants increased from 0% in 1997 to 69% of the population in 2002. In addition, over half of the bitterbrush were classified as dying due to abundant crown death. No young or seedling bitterbrush were sampled in 2002.

Other palatable browse include low densities of snowberry and serviceberry. The most abundant browse is stickyleaf rabbitbrush with an estimated density of 1,320 plants/acre in 1997. It increased to 2,020 by 2002.

The herbaceous understory is diverse and fairly abundant. Crested wheatgrass, which has significantly increased in nested frequency with every reading since 1989, dominates the herbaceous understory. It provided 64% of the grass cover or almost 50% of the total herbaceous cover in 1997. During the 2002 reading, crested wheatgrass accounted for 91% of the grass cover or 82% of the total herbaceous cover. Other seeded grasses include intermediate wheatgrass, smooth brome, and orchard grass. The grasses provide abundant forage and good erosion control. Pacific aster is the most common forb. Diversity is fair, but the forage value of most species is low.

## 1989 APPARENT TREND ASSESSMENT

The soil trend appears stable with adequate protective ground cover to prevent most erosion. The trend for the desirable and preferred browse species, mountain big sagebrush and bitterbrush, appears to be in a state of decline. Utilization is heavy, vigor is poor on many plants, and the number of decadent plants is high. The herbaceous understory appears stable but a better composition of perennial forbs is desired.

## 1997 TREND ASSESSMENT

Soil trend is upward with less bare ground exposed to erosion in 1997 than in 1989. The grasses still provide abundant forage and good erosion control. Photos show more ground cover and fewer bare areas as well. Browse trend is up slightly. Most of the changes in density of shrubs are due to the much larger sample size used in 1997 which gives better population estimates for clumped or discontinuous populations. However, average vigor for mountain big sagebrush and bitterbrush has improved and the number of decadent plants has declined significantly. Herbaceous understory trend is up with an increase in nested frequency for perennial grasses and forbs. Nested frequency of the most abundant grass, crested wheatgrass, has more than doubled. It now provides 64% of the total grass cover or 47% of the total herbaceous cover. Grass understory composition is good, but a better composition of forbs is desired.

### TREND ASSESSMENT

soil - up (5)

browse - up slightly (4)

herbaceous understory - up (5)

## 2002 TREND ASSESSMENT

Trend for soil is down slightly. A return to drought conditions has caused an increase in bare soil. There is still adequate protective ground cover to prevent most soil movement. The erosion condition class was determined to be slight in 2002. Trend for the key browse species, mountain big sagebrush and bitterbrush, is down slightly. Use is heavier, vigor reduced, recruitment poor, and percent decadence up. Vigor and decadence numbers are similar to 1989 which was also a drought year. Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses has remained similar to 1997. However, the most abundant grass, crested wheatgrass, has increased significantly. It now provides 91% of the total grass cover or 82% of the total herbaceous cover. Sum of nested frequency for perennial forbs has declined dramatically. A similar trend was found on the nearby Tank Hollow site (17-42). Trend for the herbaceous understory is considered slightly down with a significant decline in several perennial grass and forb species. Another negative aspect of the herbaceous trend is an increasing dominance of crested wheatgrass.

### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 46

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron cristatum	<sub>a</sub> 71	<sub>b</sub> 164	<sub>c</sub> 224	28	54	73	12.57	14.51
G	Agropyron intermedium	31	19	23	11	7	9	.18	.19
G	Agropyron spicatum	<sub>a</sub> 7	<sub>b</sub> 36	<sub>a</sub> 4	3	14	1	2.79	.03
G	Bromus inermis	<sub>b</sub> 30	<sub>a</sub> 7	<sub>a</sub> -	13	3	-	.21	-
G	Bromus tectorum (a)	-	<sub>b</sub> 29	<sub>a</sub> 6	-	14	2	.51	.01
G	Dactylis glomerata	-	1	3	-	1	1	.03	.01
G	Leucopoa kingii	<sub>b</sub> 11	<sub>a</sub> -	<sub>a</sub> -	6	-	-	-	-
G	Oryzopsis hymenoides	<sub>b</sub> 56	<sub>a</sub> 30	<sub>a</sub> 36	29	13	15	.68	.79
G	Poa fendleriana	<sub>b</sub> 36	<sub>a</sub> 1	<sub>a</sub> 1	14	1	1	.03	.00
G	Poa pratensis	<sub>a</sub> -	<sub>b</sub> 59	<sub>a</sub> 15	-	19	4	1.44	.33
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 20	<sub>a</sub> 3	-	8	1	.55	.03
G	Sitanion hystrix	-	-	1	-	-	1	-	.00
G	Stipa comata	4	-	-	2	-	-	-	-
G	Stipa lettermani	-	14	4	-	4	2	.72	.06
Total for Annual Grasses		0	29	6	0	14	2	0.50	0.00
Total for Perennial Grasses		246	351	314	106	124	108	19.22	15.98
Total for Grasses		246	380	320	106	138	110	19.73	15.99
F	Achillea millefolium	-	1	-	-	1	-	.00	-
F	Agoseris glauca	-	5	-	-	2	-	.01	-
F	Alyssum alyssoides (a)	-	<sub>b</sub> 63	<sub>a</sub> 2	-	22	2	1.16	.01
F	Allium spp.	-	10	2	-	3	1	.02	.00
F	Aster chilensis	<sub>b</sub> 100	<sub>b</sub> 93	<sub>a</sub> 22	42	36	10	1.16	.26
F	Astragalus convallarius	<sub>ab</sub> 13	<sub>b</sub> 25	<sub>a</sub> 3	7	11	2	.36	.03
F	Astragalus spp.	3	-	-	1	-	-	-	-
F	Astragalus utahensis	5	4	-	2	3	-	.06	-
F	Cardaria draba	-	-	12	-	-	4	-	.04
F	Castilleja linariaefolia	-	8	-	-	3	-	.04	-
F	Camelina microcarpa (a)	-	<sub>b</sub> 13	<sub>a</sub> 1	-	6	1	.03	.00
F	Carduus nutans (a)	<sub>a</sub> -	<sub>b</sub> 22	<sub>a</sub> -	-	13	-	.37	-
F	Calochortus nuttallii	-	2	-	-	2	-	.01	-
F	Chaenactis douglasii	<sub>a</sub> 2	<sub>b</sub> 19	<sub>a</sub> -	2	7	-	.12	-
F	Cirsium spp.	<sub>b</sub> 39	<sub>a</sub> 22	<sub>a</sub> 4	23	11	3	.45	.06
F	Comandra pallida	<sub>a</sub> -	<sub>b</sub> 32	<sub>a</sub> -	-	12	-	.40	-
F	Crepis acuminata	-	1	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	4	-	-	4	-	.02	-
F	Epilobium brachycarpum (a)	-	1	-	-	1	-	.00	-
F	Eriogonum brevicaulis	<sub>b</sub> 21	<sub>a</sub> 10	<sub>a</sub> 8	12	4	5	.33	.46

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	<i>Erigeron pumilus</i>	<sub>b</sub> 27	<sub>a</sub> -	<sub>a</sub> 2	11	-	1	-	.00
F	<i>Hackelia patens</i>	4	4	-	2	3	-	.04	-
F	<i>Hedysarum boreale</i>	-	4	-	-	2	-	.18	-
F	<i>Lappula occidentalis</i> (a)	-	10	-	-	4	-	.19	-
F	<i>Lithospermum ruderales</i>	<sub>a</sub> -	<sub>b</sub> 18	<sub>b</sub> 13	-	9	7	.46	.28
F	<i>Lomatium</i> spp.	-	3	-	-	3	-	.01	-
F	<i>Machaeranthera canescens</i>	<sub>b</sub> 9	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-	-
F	<i>Penstemon caespitosus</i>	-	7	10	-	3	3	.33	.04
F	<i>Phlox hoodii</i>	15	16	19	10	7	10	.42	.42
F	<i>Phlox longifolia</i>	11	11	18	4	4	8	.02	.06
F	<i>Ranunculus testiculatus</i> (a)	-	4	-	-	2	-	.01	-
F	<i>Salsola pestifer</i> (a)	8	-	-	4	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	-	3	5	-	1	2	.15	.01
F	<i>Taraxacum officinale</i>	-	2	1	-	1	1	.00	.00
F	<i>Tragopogon dubius</i>	<sub>a</sub> 2	<sub>b</sub> 17	<sub>a</sub> 4	1	9	2	.10	.03
F	<i>Verbascum thapsus</i>	-	5	-	-	2	-	.03	-
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>c</sub> 35	<sub>b</sub> 11	-	14	5	.27	.05
F	<i>Viola</i> spp.	-	3	-	-	1	-	.15	-
Total for Annual Forbs		8	117	3	4	52	3	1.79	0.01
Total for Perennial Forbs		251	360	134	122	155	64	5.19	1.79
Total for Forbs		259	477	137	126	207	67	6.99	1.81

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



BROWSE TRENDS --  
Herd unit 17 , Study no: 46

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier utahensis	4	3	.78	.53
B	Artemisia tridentata tridentata	17	18	1.04	1.73
B	Chrysothamnus depressus	13	3	.43	-
B	Chrysothamnus nauseosus albicaulis	3	1	.00	-
B	Chrysothamnus parryi	0	11	-	.40
B	Chrysothamnus viscidiflorus viscidiflorus	34	37	1.88	1.71
B	Gutierrezia sarothrae	10	19	.36	.07
B	Juniperus osteosperma	10	8	6.30	10.64
B	Opuntia spp.	3	8	.18	.01
B	Purshia tridentata	5	10	1.49	3.17
B	Rhus trilobata	0	1	-	-
B	Rosa woodsii	0	1	-	-
B	Symphoricarpos oreophilus	3	5	.15	.15
Total for Browse		102	125	12.64	18.44

CANOPY COVER -- LINE INTERCEPT  
Herd unit 17 , Study no: 46

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	1.25
Artemisia tridentata tridentata	-	1.33
Chrysothamnus depressus	-	.07
Chrysothamnus parryi	-	.42
Chrysothamnus viscidiflorus viscidiflorus	-	1.42
Gutierrezia sarothrae	-	.03
Juniperus osteosperma	6.4	5.83
Purshia tridentata	-	2.42
Symphoricarpos oreophilus	-	.17

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 46

Species	Average leader growth (in) '02
Artemisia tridentata tridentata	1.5
Purshia tridentata	1.6

Point-Quarter Tree Data  
Herd unit 17, Study no: 46

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	57	74	5.8	6.4

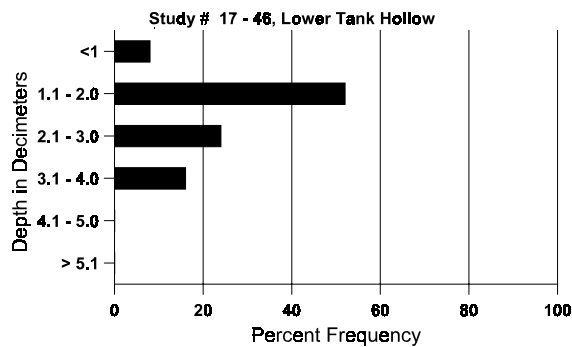
BASIC COVER --  
Herd unit 17, Study no: 46

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	326	305	6.00	36.93	34.80
Rock	73	100	1.25	.73	1.97
Pavement	207	248	9.75	5.83	3.66
Litter	389	378	45.25	41.37	40.40
Cryptogams	57	51	0	1.41	2.48
Bare Ground	263	286	37.75	24.28	35.84

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 46, Lower Tank Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.2	45.8 (15.5)	7.2	40.7	21.4	37.8	3.2	6.8	275.2	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17, Study no: 46

Type	Quadrat Frequency		Pellet Transect	
	'97	'02	Pellet Groups per Acre 02	Days Use per Acre (ha) 02
Rabbit	3	8	-	-
Elk	11	14	70	5 (13)
Deer	30	36	609	47 (116)
Cattle	1	2	78	7 (16)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 46

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	2	-	-	-	3	-	-	-	60	28	36	3
	02	-	-	-	-	-	2	-	-	-	2	-	-	-	40	32	38	2
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	1	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			60%			00%			-40%							
'02		00%			100%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	100		0%				
											'02	60		33%				
<i>Artemisia tridentata tridentata</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	26	22	1
	97	7	1	1	4	-	-	-	-	-	13	-	-	-	260	40	38	13
	02	-	3	7	-	-	-	-	-	-	9	-	1	-	200	32	32	10
D	89	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1	
	97	2	1	-	-	-	-	-	-	-	1	-	-	2	60		3	
	02	-	-	6	1	-	-	-	-	-	4	-	1	2	140		7	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			67%			33%			+76%							
'97		10%			05%			10%			-10%							
'02		16%			68%			21%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	33%				
											'97	420		14%				
											'02	380		37%				

A Y G R E		Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus depressus</b>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	38	-	-	1	-	-	-	-	-	39	-	-	-	780	6	14	39
	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	4	9	5
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			-86%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	860		0%				
											'02	120		17%				
<b>Chrysothamnus nauseosus albicaulis</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	1	-	-	-	-	-	1	1	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	24	27	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	40	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		33%			00%			00%			-67%							
'02		00%			00%			100%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	0%				
											'97	60		0%				
											'02	20		100%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Chrysothamnus parryi</b>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	8	26	3	-	-	-	-	-	-	37	-	-	-	740	6	13	37
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	2	1	4	-	-	-	1	-	-	3	-	-	5	160			8
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		60%			16%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	0		0%			
												'02	900		18%			
<b>Chrysothamnus viscidiflorus viscidiflorus</b>																		
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	97	4	-	-	2	-	-	1	-	-	7	-	-	-	140			7
	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	89	76	-	-	-	-	-	-	-	-	76	-	-	-	2533	11	12	76
	97	48	-	-	4	-	-	-	-	-	52	-	-	-	1040	14	14	52
	02	56	6	3	2	-	-	-	-	-	64	-	3	-	1340	8	12	67
D	89	8	-	-	-	-	-	-	-	-	3	-	-	5	266			8
	97	4	-	1	1	-	-	-	-	-	5	-	-	1	140			7
	02	19	10	2	-	-	-	-	-	-	16	-	2	13	620			31
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			05%			-56%							
'97		00%			02%			02%			+35%							
'02		16%			05%			18%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	3032	Dec:	9%			
												'97	1320		11%			
												'02	2020		31%			
<b>Eriogonum microthecum</b>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	8	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
												'02	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360	11	11	
	02	17	1	-	-	-	-	-	-	-	16	-	2	-	360	8	10	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	14	-	1	-	-	-	-	-	-	3	-	-	12	300		15	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+29%							
'02		03%			03%			41%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	480		4%				
											'02	680		44%				
Juniperus osteosperma																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	1	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80		4	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	4	-	1	2	-	-	-	-	-	7	-	-	-	140	74	101	
	02	7	-	-	-	-	-	-	-	-	6	1	-	-	140	-	-	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			09%			00%			-27%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	220		-				
											'02	160		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	9	
	97	4	-	-	1	-	-	-	-	-	5	-	-	-	100	3	15	
	02	7	-	-	-	-	-	-	-	-	7	-	-	-	140	4	12	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+76%							
'97		00%			00%			00%			+13%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	140		-				
											'02	160		-				
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	10	35	
	97	-	-	-	-	1	4	-	-	-	5	-	-	-	100	16	55	
	02	-	-	3	-	-	1	-	-	-	4	-	-	-	80	16	57	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	6	-	-	2	-	-	1	4	-	-	5	180		9	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+73%							
'97		17%			67%			00%			+54%							
'02		00%			100%			38%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	0%				
											'97	120		0%				
											'02	260		69%				
Rhus trilobata																		
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	0		0%				
											'02	20		100%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rosa woodsii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
												'02	20		-			
Symphoricarpos oreophilus																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	15	17	1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	22	35	4
	02	3	-	-	1	-	-	-	-	-	4	-	-	-	80	16	22	4
D	89	-	-	1	-	-	-	-	-	-	-	-	1	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	02	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			50%			50%			+18%							
'97		00%			00%			00%			+20%							
'02		20%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	50%			
												'97	80		0%			
												'02	100		20%			



Trend Study 17-47-02

Study site name: Tie Fork East.

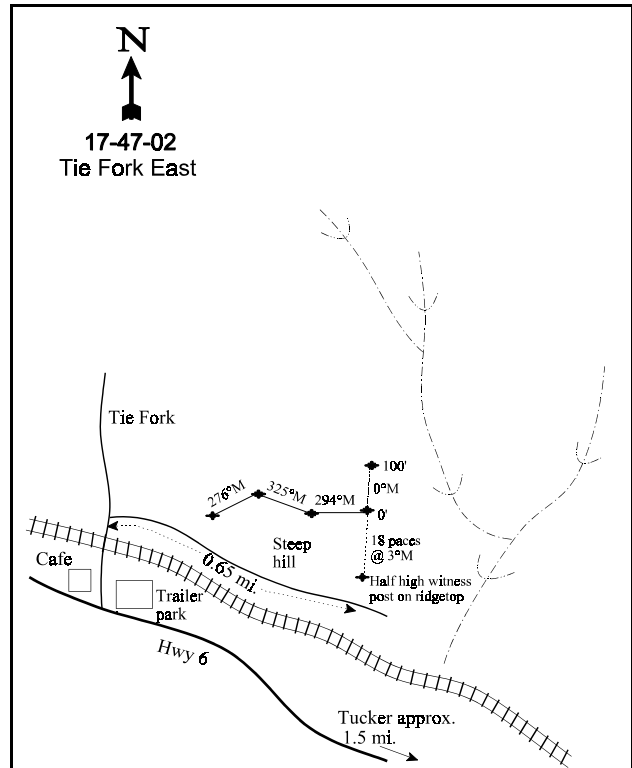
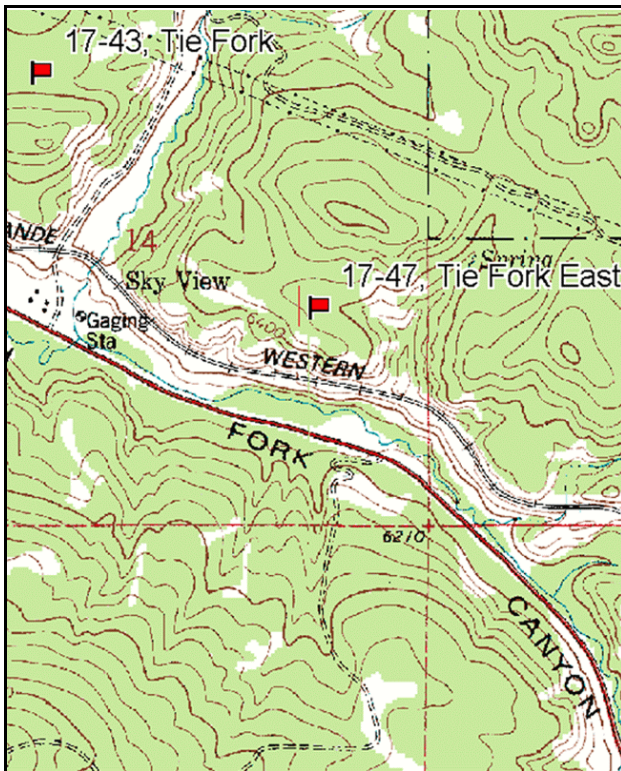
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 0 degrees magnetic (line 2 @ 294°M, line 3 @ 325°M, line 4 @ 286°M).

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

LOCATION DESCRIPTION

From the intersection of Highway U.S. 6 and Tie Fork at Sky View in Spanish Fork Canyon, go north up to the railroad tracks. Cross the tracks and turn right. Follow the road along the railroad tracks for 0.65 miles. Stop at a pullout at the mouth of a small side canyon. Walk up the ridge to the west 200 yards to a witness post in a small rock outcrop on the bare ridgetop, by some mahogany. From the witness post, walk 18 paces north (3 degrees) to the 0-foot baseline stake.



Map Name: Tucker

Diagrammatic Sketch

Township 10S, Range 6E, Section 14

GPS: NAD 27, UTM 12S 4421995 N 482213 E

## DISCUSSION

### Tie Fork East - Trend Study No. 17-47

The Tie Fork range trend study (17-43) was established in the Tie Fork area in 1983. However, since the site was not considered representative of the large critical wintering area in Tie Fork, this study was established in 1989. The new study is on a more xeric site, supporting less oak and pinyon on a moderately steep slope. The area supports a scattered juniper community with a mountain brush understory. This site would be more representative of the winter range in the area. The lower end of Tie Fork is private land along the railroad. No livestock are currently grazed in the area but sheep are thought to trail through. The area receives considerably heavy winter use by deer, with light to moderate use by elk. Quadrat frequency of deer pellet groups was moderate in 1997 and 2002 at 38% and 33% respectively. A pellet group transect read on site in 2002 estimated 76 deer and 8 elk days use/acre (187 ddu/ha and 20 edu/ha). All of the deer and elk pellet groups appear to be from winter use.

This study is on a north facing slope at an elevation of 6,440 feet. The slope varies between 10% and 20%. Litter and organic matter buildup is good beneath shrub and tree crowns and combined with vegetative cover, helps to reduce erosion. However, there are still areas of localized erosion with active gullies forming below the site. The soil erosion condition class was determined to be slight in 2002. The soil is light gray in color and lacks structure. Soil textural analysis indicates a clay loam with a neutral reaction (pH 7.3). The effective rooting depth is 16 inches. Phosphorous is marginal at 8.3 ppm as values less than 10 ppm could be limiting to plant growth and development.

The browse community is a combination of large juniper and pinyon in association with an important shrub understory. The more prevalent juniper are largely unavailable due to height and past high-lining. Juniper rees average 25 to 30 feet in height with smaller trees in the understory. Density was estimated at 174 trees/acre in 2002 from point-center quarter data. Diameter of juniper averaged nearly 8 inches. Pinyon are less common on this site with a density of 30 trees/acre estimated in 2002. Juniper and pinyon canopy cover is variable but averaged almost 5% for juniper and nearly 2% for pinyon over the whole site.

Several preferred forage species occur in the understory including serviceberry, mountain big sagebrush, true mountain mahogany, and bitterbrush. Saskatoon serviceberry density was estimated about 300 plants/acre in 1997 and 2002. It displayed heavy use in 2002, although vigor was normal. True mountain mahogany is the most abundant palatable species. Density was estimated at 700 plants/acre in 2002. Utilization has been consistently heavy since 1989, yet most plants have good vigor. The number of decadent plants has ranged from 11% in 1997 to 23% in 2002.

Sagebrush on the site has some characteristics of basin big sagebrush (*Artemisia tridentata tridentata*) but was classified as Mountain big sagebrush (*Artemisia tridentata vaseyana*) in 2002. It had a low density estimated at only 260 plants/acre in 2002. Utilization was moderate to heavy in 1997 and 2002 and the number of decadent plants was moderately high at 50% and 38% respectively. Bitterbrush are highly preferred but only a few heavily utilized plants occur on the site.

Snowberry is abundant but less preferred. It had a density estimated at 5,300 plants/acre with mostly light utilization in 1997. Density increased to 6,200 plants/acre in 2002, and use continued to be mostly light. A few oak clones occur on site. These average about three feet in height with light to moderate use on available plants. Other scattered browse species include white rubber rabbitbrush, stickyleaf rabbitbrush, Wood's rose, and gray horsebrush.

Total herbaceous cover is relatively low on this site with grasses and forbs providing only 9% cover in 2002. The most abundant grasses are Indian ricegrass, a *Carex*, and bluebunch wheatgrass. Indian ricegrass and *Carex* remained at stable frequencies in 2002, but bluebunch wheatgrass significantly declined. Cheatgrass is present but not in high amounts. Forb cover is sparse with high diversity but low abundance. Several annual species were encountered, with many of the species being increasers or invaders including musk thistle.

## 1989 APPARENT TREND ASSESSMENT

With continued soil loss and no signs of an increasing understory or herbaceous component, the soil trend appears to be declining. The vegetative trend also has some downward indicators such as increasing juniper and continued heavy use of the preferred browse. Still, there is fair reproduction and significant amounts of unutilized browse forage (especially on the sagebrush).

## 1997 TREND ASSESSMENT

Erosion is still apparent, but is not excessive. This vegetative type will likely always have some erosion occurring, so establishment of herbaceous understory should be encouraged. Soil trend is up slightly due to a decline in bare ground and an increase in the sum of nested frequency for grasses and forbs. The browse trend is stable. There is little change in any of the browse species. The mountain big sagebrush population is 50% decadent with similar utilization and vigor as reported in 1989. It is still only a minor component of the browse composition at this time. True mountain mahogany has remained stable with moderate to heavy use, good vigor, and low decadence. The herbaceous understory trend is slightly upward with an increase in nested frequency for both perennial grasses and forbs.

### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - slightly upward (4)

## 2002 TREND ASSESSMENT

Trend for soil is down slightly. Cover of bare ground has increased from 15% to 25%, while litter cover has declined slightly. In addition, total herbaceous cover has declined from 14% to 9% and the sum of nested frequency for perennial grasses and forbs has declined. Current erosion is occurring but it is not severe and the erosion condition class was determined to be slight. Trend for browse is stable but showing the effects of drought. Serviceberry, mountain big sagebrush, and true mountain mahogany are the key browse species. Densities have remained relatively stable while use is more heavy. Sagebrush and mahogany display increased poor vigor and the number of decadent mahogany has increased from 11% to 23%. However, recruitment appears adequate to maintain their respective populations. Annual leader growth for mahogany was estimated at only 1.6 inches. Most plants showed little growth and many terminal buds were shriveling up by July 3<sup>rd</sup> due to the dry conditions. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses and forbs has declined and frequency of bluebunch wheatgrass declined significantly. The other abundant perennial grass, Indian ricegrass, has remained stable. Nested frequency of the most abundant forb, Wasatch penstemon, also declined significantly. Another negative indicator with respect to the herbaceous understory is the continued increase in cover of juniper.

### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 47

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
G	Agropyron spicatum	a8	b42	a12	3	20	5	2.20	.31
G	Bromus tectorum (a)	-	b101	a11	-	38	5	.48	.03
G	Carex spp.	a6	ab25	b34	4	11	13	1.14	.78
G	Oryzopsis hymenoides	b121	a77	a77	49	30	33	3.03	3.55
G	Poa fendleriana	-	-	4	-	-	2	-	.16
G	Poa pratensis	24	19	10	8	7	5	.13	.10
G	Poa secunda	-	6	-	-	2	-	.30	-
G	Sitanion hystrix	7	16	11	4	7	6	.13	.14
G	Stipa columbiana	10	7	8	3	3	3	.41	.04
G	Stipa lettermani	a1	b20	ab8	1	8	3	.67	.21
Total for Annual Grasses		0	101	11	0	38	5	0.48	0.03
Total for Perennial Grasses		177	212	164	72	88	70	8.05	5.30
Total for Grasses		177	313	175	72	126	75	8.53	5.33
F	Achillea millefolium	5	6	4	2	2	2	.18	.01
F	Agoseris glauca	-	1	11	-	1	4	.00	.02
F	Antennaria rosea	7	7	-	2	2	-	.41	-
F	Astragalus convallarius	3	8	10	2	5	5	.02	.08
F	Castilleja linariaefolia	2	-	4	2	-	2	.01	.03
F	Carduus nutans (a)	a-	b13	b23	-	7	11	.42	.30
F	Chenopodium album (a)	-	1	-	-	1	-	.00	-
F	Chaenactis douglasii	7	4	-	4	2	-	.03	-
F	Cirsium spp.	4	21	2	4	11	1	.28	.03
F	Collinsia parviflora (a)	-	13	8	-	6	3	.03	.01
F	Cryptantha spp.	4	1	12	2	1	6	.03	.22
F	Cynoglossum officinale	c107	b50	a2	43	19	1	.99	.00
F	Delphinium nuttallianum	-	1	-	-	1	-	.00	-
F	Descurainia pinnata (a)	a-	b29	a2	-	13	1	.09	.00
F	Epilobium brachycarpum (a)	-	3	4	-	1	2	.00	.03
F	Erigeron spp.	-	2	-	-	2	-	.01	-
F	Gayophytum ramosissimum (a)	-	-	1	-	-	1	-	.03
F	Hackelia patens	a-	b16	b21	-	7	11	.41	.44
F	Lappula occidentalis (a)	-	1	-	-	1	-	.00	-
F	Lactuca serriola	-	-	2	-	-	1	-	.00
F	Lithospermum ruderales	-	-	2	-	-	1	-	.06
F	Machaeranthera canescens	11	27	9	6	12	6	.13	.03
F	Melilotus officinalis	-	1	-	-	1	-	.00	-
F	Penstemon cyananthus	a58	b101	a69	29	43	31	1.96	2.35

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'89	'97	'02	'89	'97	'02	'97	'02
F	Penstemon humilis	<sub>b</sub> 16	<sub>a</sub> -	<sub>a</sub> 2	6	-	1	-	.03
F	Phlox hoodii	-	-	1	-	-	1	-	.00
F	Phlox longifolia	3	3	-	1	2	-	.01	-
F	Ranunculus testiculatus (a)	-	3	3	-	1	1	.00	.00
F	Schoenocrambe linifolia	<sub>a</sub> -	<sub>b</sub> 16	<sub>ab</sub> 9	-	9	4	.16	.04
F	Senecio multilobatus	3	2	-	1	1	-	.03	-
F	Streptanthus cordatus	-	-	-	-	-	-	.00	-
F	Taraxacum officinale	-	2	-	-	1	-	.00	-
F	Tragopogon dubius	-	6	3	-	4	2	.04	.01
F	Unknown forb-perennial	3	-	-	1	-	-	-	-
F	Verbascum thapsus	-	7	4	-	3	2	.07	.18
Total for Annual Forbs		0	63	41	0	30	19	0.56	0.39
Total for Perennial Forbs		233	282	167	105	129	81	4.82	3.57
Total for Forbs		233	345	208	105	159	100	5.39	3.97

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 47

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Amelanchier alnifolia	13	9	.21	.09
B	Artemisia tridentata vaseyana	8	8	.45	.36
B	Cercocarpus montanus	22	26	2.58	2.12
B	Chrysothamnus nauseosus albicaulis	1	2	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	4	8	.06	.06
B	Juniperus osteosperma	10	12	2.23	4.59
B	Mahonia repens	1	1	-	-
B	Opuntia spp.	3	1	-	-
B	Pinus edulis	0	2	-	-
B	Purshia tridentata	1	0	.01	-
B	Quercus gambelii	9	8	2.01	1.16
B	Ribes spp.	0	1	-	-
B	Rosa woodsii	11	12	.57	.22
B	Symphoricarpos oreophilus	58	67	11.46	13.06
B	Tetradymia canescens	2	3	-	.15
Total for Browse		143	160	19.61	21.84

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 47

Species	Percent Cover	
	'97	'02
Amelanchier utahensis	-	.08
Artemisia tridentata vaseyana	-	.25
Cercocarpus montanus	-	2.67
Chrysothamnus viscidiflorus viscidiflorus	-	.42
Juniperus osteosperma	5.8	4.42
Pinus edulis	2.0	1.58
Quercus gambelii	4.4	2.00
Rosa woodsii	-	.07
Symphoricarpos oreophilus	-	18.33

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 47

Species	Average leader growth (in)
	'02
Cercocarpus montanus	1.6

Point-Quarter Tree Data

Herd unit 17 , Study no: 47

Species	Trees per Acre		Average diameter (in)	
	'97	'02	'97	'02
Juniperus osteosperma	106	174	8.9	7.8
Pinus edulis	22	30	8.8	4.8

BASIC COVER --

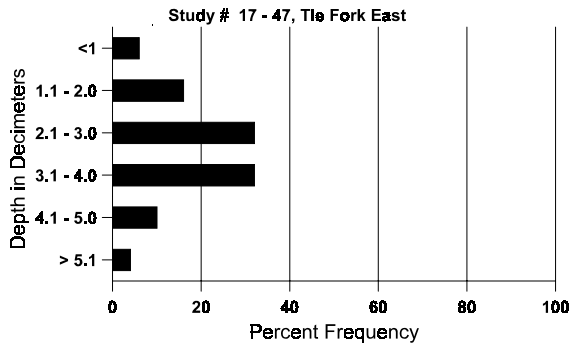
Herd unit 17 , Study no: 47

Cover Type	Nested Frequency		Average Cover %		
	'97	'02	'89	'97	'02
Vegetation	314	244	7.25	31.06	31.76
Rock	115	155	2.25	4.31	4.36
Pavement	176	187	13.50	4.74	8.36
Litter	395	379	50.50	50.47	48.48
Cryptogams	39	58	0	.70	3.32
Bare Ground	203	277	26.50	15.30	24.68

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 47, Tie Fork East

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.1	45.4 (15.4)	7.3	26.7	34.4	38.8	4.5	8.3	112.0	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17 , Study no: 47

Type	Quadrat Frequency	
	'97	'02
Sheep	-	1
Rabbit	23	21
Elk	12	3
Deer	38	33

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
'02	'02
-	-
-	-
104	8 (20)
983	76 (187)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 47

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	89	2	-	-	4	-	-	1	-	-	7	-	-	-	233		7	
	97	9	-	-	4	-	-	-	-	13	-	-	-	260		13		
	02	-	-	1	5	-	-	-	-	-	6	-	-	-	120		6	
M	89	-	-	1	2	-	-	-	-	3	-	-	-	100	27	20	3	
	97	-	-	-	-	1	1	-	-	2	-	-	-	40	26	29	2	
	02	-	-	3	4	1	-	-	-	8	-	-	-	160	22	18	8	
D	89	-	1	-	-	2	-	-	-	2	-	-	1	100		3		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		23%			08%			08%			-31%							
'97		07%			07%			00%			- 7%							
'02		07%			29%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	433	Dec:	23%				
											'97	300		0%				
											'02	280		0%				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	1	-	-	-	-	2	-	-	-	66		2		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
Y	89	4	-	-	1	-	-	-	-	5	-	-	-	166		5		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	02	2	-	-	-	-	-	-	-	2	-	-	-	40		2		
M	89	3	-	-	-	-	-	-	-	3	-	-	-	100	20	10	3	
	97	1	2	1	-	-	-	-	-	4	-	-	-	80	27	32	4	
	02	4	1	1	-	-	-	-	-	6	-	-	-	120	23	31	6	
D	89	5	1	1	-	-	-	-	-	6	-	-	1	233		7		
	97	2	1	-	1	-	-	-	-	3	-	-	1	80		4		
	02	-	3	2	-	-	-	-	-	2	-	-	3	100		5		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	260		13		
	02	-	-	-	-	-	-	-	-	-	-	-	-	320		16		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		07%			07%			07%			-68%							
'97		38%			13%			13%			+38%							
'02		31%			23%			23%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	499	Dec:	47%				
											'97	160		50%				
											'02	260		38%				



A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Cercocarpus montanus</b>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	97	2	-	-	-	-	1	-	-	-	3	-	-	-	60		3	
	02	-	-	2	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	10	-	-	-	-	-	-	10	-	-	-	333	67 79	10	
	97	1	2	4	1	7	6	-	-	-	21	-	-	-	420	33 29	21	
	02	6	1	16	-	2	-	-	-	-	24	-	1	-	500	31 26	25	
D	89	-	1	2	-	-	-	-	-	-	2	-	1	-	100		3	
	97	-	-	-	1	1	1	-	-	-	3	-	-	-	60		3	
	02	-	-	6	-	-	2	-	-	-	5	-	1	2	160		8	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		05%			63%			05%			-15%							
'97		37%			44%			00%			+23%							
'02		09%			74%			11%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	633	Dec:	16%				
											'97	540		11%				
											'02	700		23%				
<b>Chrysothamnus nauseosus albicaulis</b>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	1	-	1	-	-	-	-	-	-	2	-	-	-	66	35 22	2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24 23	0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24 23	0	
D	89	1	1	1	-	-	-	-	-	-	3	-	-	-	100		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		17%			33%			00%			-90%							
'97		00%			00%			00%			+50%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	199	Dec:	50%				
											'97	20		100%				
											'02	40		50%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	27	-	-	4	-	-	-	-	-	31	-	-	-	1033		31	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	20	-	-	-	-	-	1	-	-	21	-	-	-	700	18	24	21
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	12	12	5
	02	9	4	-	-	-	-	-	-	-	10	3	-	-	260	11	16	13
D	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-95%							
'97		00%			00%			00%			+64%							
'02		29%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1966	Dec:	12%			
												'97	100		0%			
												'02	280		0%			
<i>Juniperus osteosperma</i>																		
S	89	-	-	-	1	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	1	-	-	1	-	-	-	-	-	2	-	-	-	66		2	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
	02	4	-	-	-	-	-	-	-	-	3	-	1	-	80		4	
M	89	-	-	-	-	-	-	-	-	1	1	-	-	-	33	197	122	1
	97	4	-	-	-	-	-	-	1	-	5	-	-	-	100	3	5	5
	02	6	-	-	-	-	-	-	1	-	6	-	1	-	160	-	-	8
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	2	-	-	-	-	-	-	-	-	-	-	1	1	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			33%			00%			+55%							
'97		00%			00%			00%			+21%							
'02		00%			00%			29%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	99	Dec:	0%			
												'97	220		0%			
												'02	280		14%			
<i>Mahonia repens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	5	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	2	3	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
												'02	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	6	2
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	7	1
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	16	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-39%							
'97		00%			00%			33%			-67%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	0%				
											'97	60		33%				
											'02	20		0%				
Pinus edulis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	0		-				
											'02	40		-				
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	12	24	1
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	33	0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		100%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
											'02	0		-				

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	7	6	-	1	-	-	-	-	-	14	-	-	-	280		14	
	02	4	-	-	2	-	-	-	-	-	6	-	-	-	120		6	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	20	3	-	-	-	-	3	-	-	26	-	-	-	520	49	29	
	02	23	12	-	7	-	-	-	-	-	35	-	7	-	840	33	18	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
	02	2	-	-	-	-	-	-	-	-	-	-	1	1	40		2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		24%			00%			00%			+18%							
'02		24%			00%			18%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	820		2%				
											'02	1000		4%				
Ribes spp.																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	2	-	-	-	-	2	-	-	-	66	18	22	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%										
'97		00%			00%			00%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	0		-				
											'02	20		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Rosa woodsii																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	12	-	-	11	-	-	-	-	-	23	-	-	-	460		23	
	02	7	-	-	7	-	-	-	-	-	14	-	-	-	280		14	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	4	-	-	5	-	-	-	-	-	9	-	-	-	180	22	14	
	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120	6	6	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	1	-	-	-	1	-	-	-	20		1	
	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		00%			03%			00%			-36%							
'02		00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	660		3%				
											'02	420		5%				
Symphoricarpos oreophilus																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	3	4	-	-	-	-	-	-	-	6	-	-	1	140		7	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	8	2	1	-	-	-	12	-	-	23	-	-	-	766		23	
	97	29	-	-	-	-	-	-	-	-	29	-	-	-	580		29	
	02	12	-	-	-	-	-	-	-	-	12	-	-	-	240		12	
M	89	36	21	5	33	6	-	15	-	-	116	-	-	-	3866	20	26	
	97	148	40	11	37	-	-	-	-	-	236	-	-	-	4720	43	62	
	02	240	17	25	-	-	-	-	-	-	267	15	-	-	5640	18	35	
D	89	-	2	1	-	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	02	14	-	2	-	-	-	-	-	-	11	-	-	5	320		16	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		22%			05%			00%			+11%							
'97		15%			04%			00%			+15%							
'02		05%			09%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	4732	Dec:	2%				
											'97	5300		0%				
											'02	6200		5%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'97	-	3	-	-	-	-	-	-	-	-	-	-	60	13	11	3	
	'02	3	-	-	-	-	-	-	-	-	-	-	-	60	13	16	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%										
'97		100%			00%			00%			+ 0%							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			
												'02	60		-			

Trend Study 17-60-02

Study site name: Center Creek.

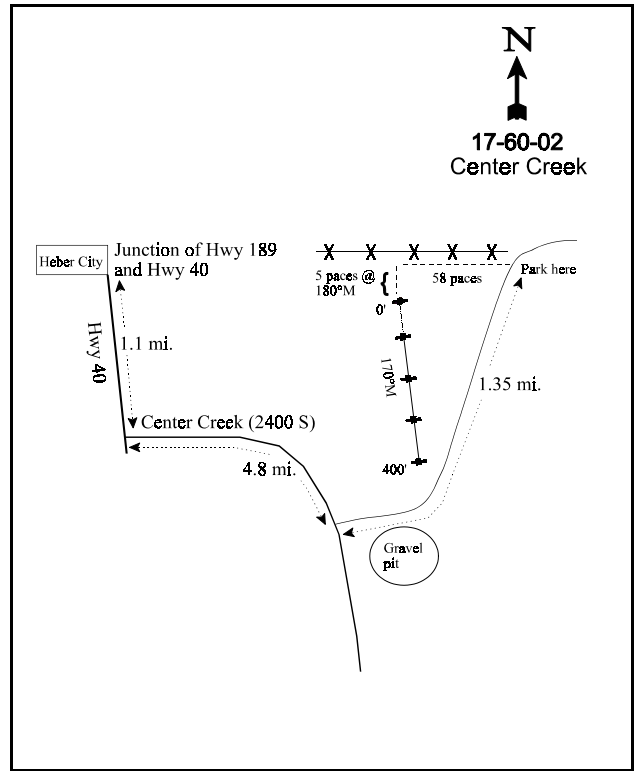
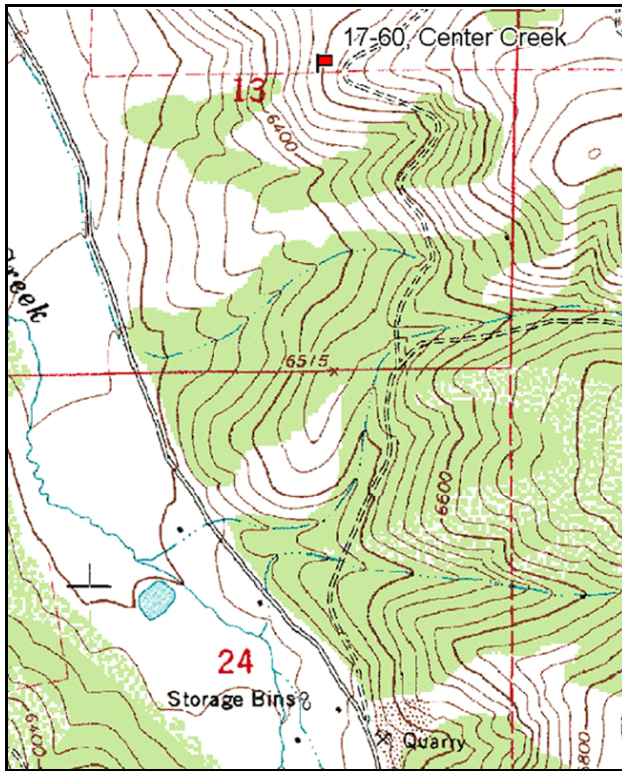
Vegetation type: Mountain Big Sage.

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From Heber City, proceed on Highway 40 towards Daniel's Canyon for 1.1 miles to Center Creek Road (2400 South). Go 3.0 miles until the road changes to a gravel road. Continue for another 1.8 miles to a gravel pit. Turn left and go 1.35 miles to a fence line, park here. Go 58 paces down the fence line. The 0-foot stake is 25 feet south of the fence line marked by browse tag # 174.



Map Name: Center Creek.

Diagrammatic Sketch

Township 4S, Range 5E, Section 13

GPS: NAD 27, UTM 12S 4479869 N 472366 E

## DISCUSSION

### Center Creek - Trend Study No. 17- 60

The Center Creek trend study was established in 2002 to monitor increasingly important winter range on the east foothills of the Heber Valley. The site supports a moderately high density of sagebrush with small numbers of bitterbrush and cliffrose. The study area has a moderate slope of 24% with a west aspect. Elevation is about 6,600 feet. The area receives winter use by deer and elk. A pellet group transect read on site in 2002 estimated 117 deer and 5 elk days use/acre (289 ddu/ha and 13 edu/ha). Most of the deer and elk pellet groups appear to be from winter use with a few from late winter and early spring. One lone juniper on site showed signs of being a rub tree for deer bucks or elk bulls. In addition, a dead deer carcass was found near the study site baseline. There was also some sign of horses using the area.

Soil on the site is moderately deep with an effective rooting depth of nearly 13 inches. Soils are rocky both on the surface and throughout the profile. In some areas there is a calcium carbonate layer 4 to 6 inches below the surface and many rocks have a calcium carbonate layer on them. Soil texture is a clay loam with a neutral reaction (pH of 7.0). The soil surface contains abundant rock and pavement cover. Bare soil is exposed mostly on trails which crisscross the site. Otherwise the surface is armored and erosion is minimal. The erosion condition class was determined to be slight in 2002.

The browse component is dominated by big sagebrush. Some of the sagebrush have characteristics of basin big sagebrush (*Artemisia tridentata tridentata*) while others are more like mountain big sagebrush (*Artemisia tridentata vaseyana*). There is obviously some hybridization between these two subspecies of sagebrush. There was also differential use with heavier use noted on individuals with more mountain big sagebrush characteristics. For simplification of the data, all of the sagebrush on the site was classified as mountain big sagebrush and overall use was classified as moderate to heavy. The population was estimated at just over 3,000 plants/acre in 2002. Most of the plants are mature (70%) with about one-third being decadent. No seedlings were encountered and young plants account for only 2% of the population. Dead plants were common and 74% of the decadent plants were classified as dying (>50% crown death). Mature plants exhibit normal vigor with annual leader growth averaging 2.7 inches in 2002.

Other preferred species occur in limited numbers. These include serviceberry, an occasional cliffrose, and a small population of bitterbrush. All of these species displayed extremely heavy use with a clubbed growth form on available plants. Broom snakeweed is abundant with a population estimated at 3,620 plants/acre. The population is mostly mature with good vigor.

The herbaceous understory is diverse but not particularly productive. The annuals, cheatgrass and Japanese brome, dominate the herbaceous understory by providing 53% of the total grass cover or 39% of the total herbaceous cover. Common perennial grasses include bluebunch wheatgrass and Indian ricegrass. Forbs are diverse with 28 species sampled in 2002. However, all species combined produce only about 3% total cover. The most abundant forb is the annual, pale alyssum. The most abundant perennial forbs are poor value forage species, hairy goldaster and heath aster.

### 2002 APPARENT TREND ASSESSMENT

Soil conditions are marginal. Most of the ground surface is protected by rock and litter cover but some erosion is still occurring and herbaceous vegetation cover is limited. The erosion condition class was determined to be slight in 2002. The sagebrush population appears to be in a state of decline. The current population is mostly mature with moderate to heavy use. Decadent plants account for 28% of the population and 74% of those were classified as dying. Recruitment is poor and not adequate to maintain the current population. Dead plants are common and it appears that the population will continue this state of decline in the future. The herbaceous understory is diverse but not productive. Total herbaceous cover is estimated at only 11%. The annuals, cheatgrass and Japanese brome provide most of the grass cover, and the forb component is dominated by annuals and poor value perennials.



HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 60

Type	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
G	<i>Agropyron dasystachyum</i>	5	3	.18
G	<i>Agropyron spicatum</i>	37	15	1.02
G	<i>Bromus japonicus</i> (a)	185	63	1.25
G	<i>Bromus tectorum</i> (a)	217	72	3.11
G	<i>Oryzopsis hymenoides</i>	39	20	1.65
G	<i>Poa bulbosa</i>	1	1	.00
G	<i>Poa fendleriana</i>	23	10	.12
G	<i>Poa pratensis</i>	10	4	.09
G	<i>Poa secunda</i>	42	16	.39
G	<i>Sitanion hystrix</i>	32	13	.29
G	<i>Stipa comata</i>	2	2	.06
Total for Annual Grasses		402	135	4.36
Total for Perennial Grasses		191	84	3.84
Total for Grasses		593	219	8.21
F	<i>Agoseris glauca</i>	6	2	.03
F	<i>Alyssum alyssoides</i> (a)	175	69	.76
F	<i>Allium</i> spp.	47	19	.10
F	<i>Antennaria rosea</i>	6	2	.15
F	<i>Arabis</i> spp.	1	1	.00
F	<i>Artemisia ludoviciana</i>	3	2	.01
F	<i>Astragalus convallarius</i>	3	1	.00
F	<i>Castilleja linariaefolia</i>	3	2	.06
F	<i>Camelina microcarpa</i> (a)	5	2	.01
F	<i>Calochortus nuttallii</i>	13	8	.04
F	<i>Chaenactis douglasii</i>	4	1	.00
F	<i>Chenopodium</i> spp. (a)	3	1	.03
F	<i>Cirsium</i> spp.	7	5	.07
F	<i>Collomia linearis</i> (a)	5	2	.01
F	<i>Cymopterus</i> spp.	15	7	.06
F	<i>Epilobium brachycarpum</i> (a)	20	9	.04
F	<i>Eriogonum brevicaulis</i>	1	1	.00
F	<i>Erodium cicutarium</i> (a)	20	6	.08
F	<i>Eriogonum racemosum</i>	4	2	.03
F	<i>Gilia</i> spp. (a)	1	1	.00
F	<i>Helianthus annuus</i> (a)	2	2	.01
F	<i>Heterotheca villosa</i>	32	16	.41
F	<i>Leucelene ericoides</i>	19	7	.52

Type	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
F	<i>Microsteris gracilis</i> (a)	27	11	.13
F	<i>Phlox longifolia</i>	18	8	.06
F	<i>Sphaeralcea coccinea</i>	20	7	.28
F	<i>Viguiera multiflora</i>	3	2	.03
Total for Annual Forbs		258	103	1.07
Total for Perennial Forbs		205	93	1.90
Total for Forbs		463	196	2.98

BROWSE TRENDS --

Herd unit 17 , Study no: 60

Type	Species	Strip Frequency	Average Cover %
		'02	'02
B	<i>Amelanchier alnifolia</i>	7	.41
B	<i>Artemisia tridentata vaseyana</i>	76	21.50
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	3	.15
B	<i>Gutierrezia sarothrae</i>	38	1.99
B	<i>Mahonia repens</i>	5	.45
B	<i>Opuntia</i> spp.	31	.28
B	<i>Purshia tridentata</i>	8	.30
B	<i>Tetradymia canescens</i>	15	.59
Total for Browse		183	25.68

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 60

Species	Percent Cover '02
<i>Amelanchier utahensis</i>	.02
<i>Artemisia tridentata vaseyana</i>	20.67
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.17
<i>Gutierrezia sarothrae</i>	2.17
<i>Mahonia repens</i>	.33
<i>Opuntia</i> spp.	.17
<i>Purshia tridentata</i>	.50
<i>Tetradymia canescens</i>	.92

Key Browse Annual Leader Growth  
Herd unit 17 , Study no: 60

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	2.7

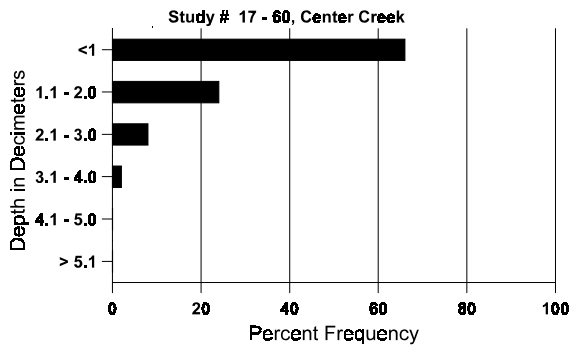
BASIC COVER --  
Herd unit 17 , Study no: 60

Cover Type	Nested Frequency '02	Average Cover % '02
Vegetation	368	36.21
Rock	335	18.43
Pavement	353	12.66
Litter	451	33.97
Cryptogams	12	.22
Bare Ground	318	15.71

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 60, Center Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.5	67.0 (12.7)	7.0	41.3	24.7	34.0	4.3	16.4	278.4	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 60

Type	Quadrat Frequency '02	Pellet Transect	
		Pellet Groups per Acre '02	Days Use per Acre (ha) '02
Rabbit	7	-	-
Elk	1	70	5 (13)
Deer	27	1523	117 (289)
Cattle	1	-	-

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 60

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	02	-	-	1	-	-	1	-	-	-	2	-	-	-	40			2
M	02	-	-	2	-	1	3	-	-	-	6	-	-	-	120	17	27	6
% Plants Showing '02		<u>Moderate Use</u> 13%			<u>Heavy Use</u> 88%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	160	Dec:	-
<i>Artemisia tridentata vaseyana</i>																		
Y	02	2	1	-	-	-	-	-	-	-	3	-	-	-	60			3
M	02	51	37	17	-	-	-	-	-	-	105	-	-	-	2100	28	39	105
D	02	15	10	17	1	-	-	-	-	-	11	-	-	32	860			43
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	1000			50
% Plants Showing '02		<u>Moderate Use</u> 32%			<u>Heavy Use</u> 23%			<u>Poor Vigor</u> 21%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	3020	Dec:	28%
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	02	3	-	-	-	-	-	-	-	-	2	-	1	-	60	9	16	3
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 33%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	60	Dec:	-
<i>Cowania mexicana stansburiana</i>																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	85	67	0
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	0	Dec:	-
<i>Gutierrezia sarothrae</i>																		
M	02	171	-	-	-	-	-	-	-	-	171	-	-	-	3420	8	10	171
D	02	10	-	-	-	-	-	-	-	-	2	1	1	6	200			10
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 04%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	3620	Dec:	6%
<i>Mahonia repens</i>																		
M	02	113	-	-	-	-	-	-	-	-	113	-	-	-	2260	3	4	113
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)															'02	2260	Dec:	-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	02	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	02	44	-	-	3	-	-	-	-	-	46	1	-	-	940	4	8	47
D	02	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)														'02	1080	Dec:	2%	
Purshia tridentata																		
M	02	-	-	3	-	-	3	-	-	1	7	-	-	-	140	9	26	7
D	02	-	-	-	-	-	1	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)														'02	160	Dec:	13%	
Rhus trilobata																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	27	51	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	
Tetradymia canescens																		
M	02	15	1	1	-	-	-	-	-	-	17	-	-	-	340	10	16	17
D	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		06%			06%			00%										
Total Plants/Acre (excluding Dead & Seedlings)														'02	360	Dec:	6%	

Trend Study 17-61-02

Study site name: American Fork Canyon.

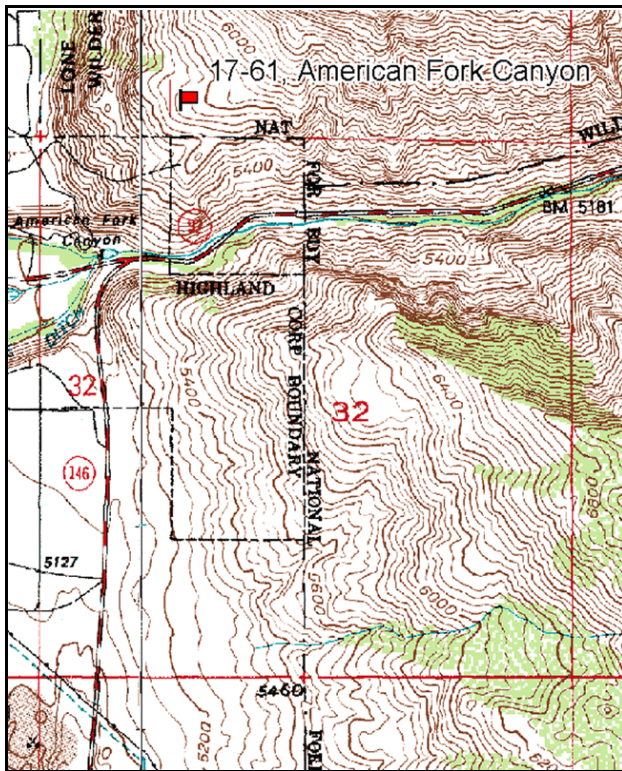
Vegetation type: P-J and Big Sagebrush.

Compass bearing: frequency baseline 330 degrees magnetic.

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

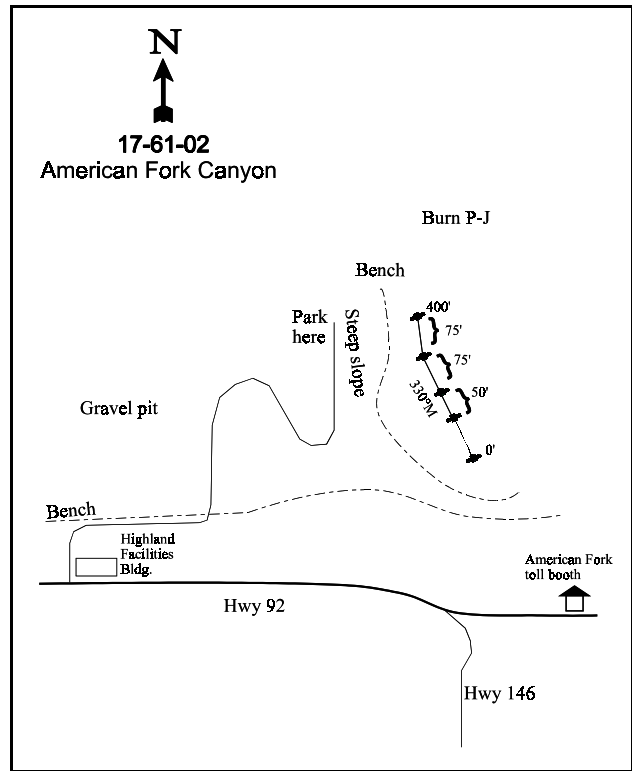
LOCATION DESCRIPTION

Go to American Fork Canyon on Highway 92. Toward the mouth of the canyon, there is a gravel pit on the north side of the road along with Highland Facilities building. Turn left on the road going north just before the buildings. Continue up this road until a steep slope is encountered. The site lies on the first bench of this slope. Park here. Walk east up the steep slope about 1/4 of a mile to another bench that has been burned. The site is just south of the burn. GPS coordinates will be helpful on this site. Development is currently under construction and this route may not be available in the future.



Map Name: Lehi

Township 4S, Range 2E, Section 29



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4476253 N 436513 E

## DISCUSSION

### American Fork Canyon - Trend Study No. 17- 61

This trend study was established in 2002 at the mouth of American Fork Canyon to monitor important winter range for an increasing population of Rocky Mountain bighorn sheep which were transplanted in the late 1990's. The study samples a sagebrush-cliffrose community with an overstory of Utah juniper. Slope is 20% with a west aspect and an elevation of 5,700 feet. The area receives some winter use by deer and elk, but bighorn sheep use the area heavily. A pellet group transect read on the site in 2002 estimated 29 deer and 17 elk days use/acre (72 ddu/ha and 42 edu/ha). Bighorn sheep use was estimated at 56 sheep days use/acre (137 sdu/ha). Most of the big game pellet groups appear to be from winter use.

Soil at the site is shallow and extremely rocky. Parent material is limestone which is exposed in large bed rock outcrops. The surface contains abundant large and small limestone gravel. The rocky soil made digging soil samples and probing for effective rooting depth difficult. As a result, effective rooting depth measurements averaged only about 10 inches. Deeper rooted shrubs, mountain big sagebrush and cliffrose, are obviously rooting through cracks in the rock. Soil texture is a loam with a slightly alkaline reaction (pH 7.4). Soil temperature is relatively high averaging 73° F at 13 inches in depth. There is little exposed bare ground and the erosion condition class was determined as stable in 2002.

The site is dominated by juniper with an understory of mountain big sagebrush, true mountain mahogany, and cliffrose. Juniper overstory accounts for over two-thirds of the total browse cover. Point quarter data from 2002 estimated a density of 41 trees/acre with an average diameter of 9 inches. About one-half of the trees sampled were highlined. Total juniper canopy cover is variable but averaged nearly 15%.

The key browse species is mountain big sagebrush which accounted for 89% of the understory shrub cover. Density was estimated at 1,500 plants/acre in 2002. The population is mostly mature with decadent plants accounting for 25% of the population. Utilization is light to moderate with about 20% of the population displaying heavy hedging. Vigor of mature plants is good, but 68% of the decadent plants sampled were classified as dying (>50% crown death).

Other preferred shrubs sampled include a few moderate to heavily hedged true mountain mahogany and cliffrose. Mahogany is estimated at only 40 plants/acre, while cliffrose numbered 80 plants/acre. Less palatable shrubs sampled include a few white rubber rabbitbrush, broom snakeweed, and pricklypear cactus.

The herbaceous understory is poor and totally dominated by a thick stand of cheatgrass. It accounts for nearly 100% of the grass cover or 97% of the total herbaceous cover. Only a few perennial grasses were encountered on the site. Forbs are rare and contain mostly weedy annuals. This site is in danger of burning which would totally eliminate all of the winter browse forage. A fire did burn just to the north of the study site a few years ago.

### 2002 APPARENT TREND ASSESSMENT

The soil is shallow, rocky, and adequately protected from erosion. Protective ground cover is abundant and the erosion condition class was determined to be stable. The sagebrush population appears to be feeling the effects of drought combined with competition with juniper and cheatgrass. Vigor is normal on mature plants, but 68% of the decadent plants sampled appear to be dying. Recruitment is marginal and not currently adequate to prevent a future decline in density. A return to normal precipitation patterns would do much to improve the sagebrush population. The herbaceous understory is very poor and totally dominated by cheatgrass. It accounts for nearly all of the grass cover and 97% of the total herbaceous cover with a high cover value of 41%. Perennial forbs are nearly absent. The abundance of cheatgrass puts this site in danger of burning.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 61

T y p e	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
G	<i>Agropyron spicatum</i>	2	1	.03
G	<i>Bromus japonicus</i> (a)	3	1	.00
G	<i>Bromus tectorum</i> (a)	425	95	41.21
G	<i>Poa bulbosa</i>	6	3	.01
G	<i>Poa secunda</i>	1	1	.00
Total for Annual Grasses		428	96	41.22
Total for Perennial Grasses		9	5	0.04
Total for Grasses		437	101	41.27
F	<i>Alyssum alyssoides</i> (a)	63	21	.18
F	<i>Descurainia pinnata</i> (a)	4	2	.01
F	<i>Draba</i> spp. (a)	4	2	.01
F	<i>Erodium cicutarium</i> (a)	30	10	.56
F	<i>Heterotheca villosa</i>	1	1	.00
F	<i>Holosteum umbellatum</i> (a)	3	3	.01
F	<i>Ranunculus testiculatus</i> (a)	5	3	.19
F	<i>Salsola iberica</i> (a)	1	1	.00
F	<i>Sisymbrium altissimum</i> (a)	5	3	.24
Total for Annual Forbs		115	45	1.21
Total for Perennial Forbs		1	1	0.00
Total for Forbs		116	46	1.22

BROWSE TRENDS --  
Herd unit 17 , Study no: 61

T y p e	Species	Strip Frequency	Average Cover %
		'02	'02
B	<i>Artemisia tridentata vaseyana</i>	40	3.49
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	-
B	<i>Cowania mexicana stansburiana</i>	6	.45
B	<i>Juniperus osteosperma</i>	5	7.80
B	<i>Opuntia</i> spp.	4	-
Total for Browse		56	11.74



CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 61

Species	Percent Cover '02
Artemisia tridentata vaseyana	4.33
Cowania mexicana stansburiana	2.58
Juniperus osteosperma	14.83

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 61

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	3.1
Cowania mexicana stansburiana	3.8

Point-Quarter Tree Data

Herd unit 17, Study no: 61

Species	Trees per Acre '02	Average diameter (in) '02
Juniperus osteosperma	41	9.1

BASIC COVER --

Herd unit 17 , Study no: 61

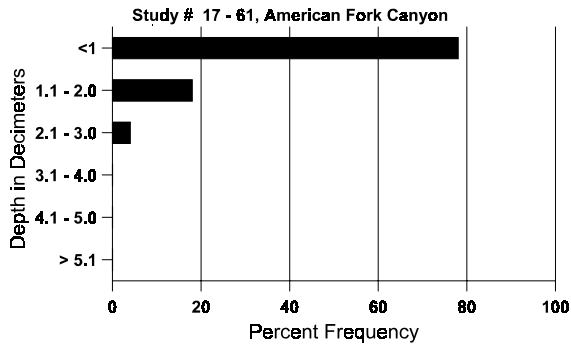
Cover Type	Nested Frequency '02	Average Cover % '02
Vegetation	437	52.60
Rock	320	21.68
Pavement	147	1.52
Litter	464	40.96
Cryptogams	7	.09
Bare Ground	130	4.66

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 61, American Fork Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.8	73.3 (13.0)	7.4	29.3	46.7	24.0	6.3	105.6	313.6	.9

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 61

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'02	'02	'02
Rabbit	18	-	-
Bighorn Sheep	33	722	56 (137)
Elk	7	226	17 (43)
Deer	13	383	29 (73)

## BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 61

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4			
<i>Artemisia tridentata vaseyana</i>								
Y '02	2 - - - - -	2	-	-	-	40		2
M '02	40 7 7 - - - - -	54	-	-	-	1080	22 31	54
D '02	2 6 7 - 1 1 2 - -	6	-	-	13	380		19
X '02	- - - - -	-	-	-	-	540		27
% Plants Showing '02		<u>Moderate Use</u> 19%	<u>Heavy Use</u> 20%	<u>Poor Vigor</u> 17%	<u>%Change</u>			
Total Plants/Acre (excluding Dead & Seedlings) '02						1500	Dec:	25%
<i>Chrysothamnus nauseosus albicaulis</i>								
M '02	- - - - -	-	-	-	-	0	23 44	0
D '02	1 - - - - -	1	-	-	-	20		1
X '02	- - - - -	-	-	-	-	140		7
% Plants Showing '02		<u>Moderate Use</u> 00%	<u>Heavy Use</u> 00%	<u>Poor Vigor</u> 00%	<u>%Change</u>			
Total Plants/Acre (excluding Dead & Seedlings) '02						20	Dec:	100%

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cowania mexicana stansburiana</i>																		
M	02	-	1	-	-	-	1	-	-	-	2	-	-	-	40	39	43	2
D	02	-	-	1	-	2	1	-	-	-	3	-	-	1	80			4
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '02		<u>Moderate Use</u> 50%			<u>Heavy Use</u> 50%			<u>Poor Vigor</u> 17%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)												'02	120	Dec:	67%			
<i>Gutierrezia sarothrae</i>																		
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)												'02	0	Dec:	-			
<i>Juniperus osteosperma</i>																		
M	02	5	-	-	-	-	-	-	-	-	5	-	-	-	100	-	-	5
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)												'02	100	Dec:	-			
<i>Opuntia spp.</i>																		
Y	02	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60	3	5	3
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)												'02	80	Dec:	-			

Trend Study 17-62-02

Study site name: Grove Creek

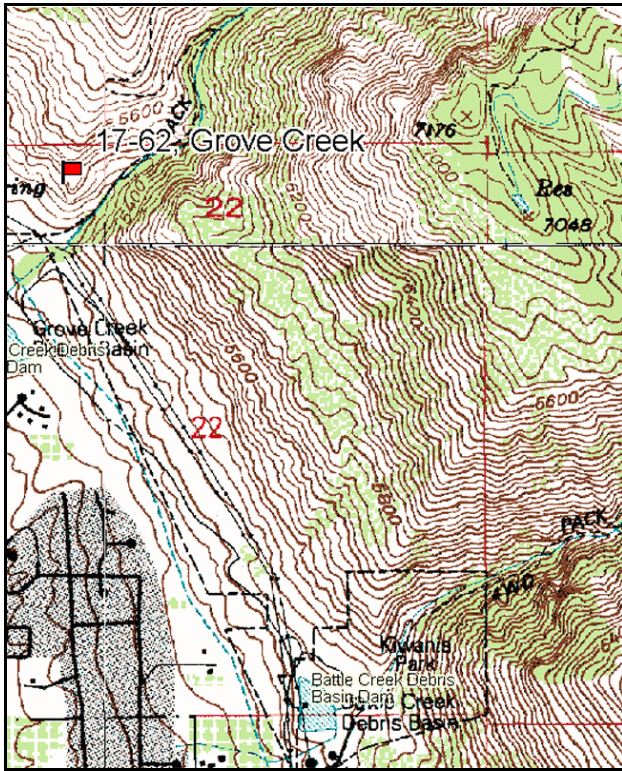
Vegetation type: Stansbury Cliffrose

Compass bearing: frequency baseline 355 degrees magnetic.

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

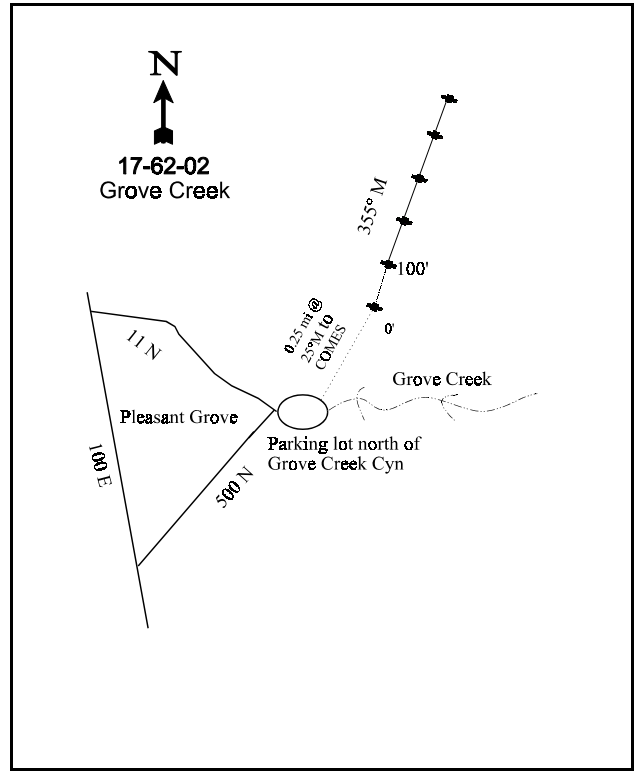
LOCATION DESCRIPTION

From the junction of Highway's 89 (State St.) and 146 in Pleasant Grove, continue on Highway 146 until 500 North, just before the school. Continue on this road until it comes to the parking lot at the mouth of Grove Creek Canyon. From the parking lot, follow the ridge for 0.25 miles at 25 degrees magnetic to the 0-foot stake in the cliffrose.



Map Name: Lehi

Township 4S, Range 2E, Section 29



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4469577 N, 439757 E

## DISCUSSION

### Grove Creek - Trend Study No. 17- 62

The Grove Creek trend study was established in 2002 to monitor important deer and bighorn sheep winter range above Pleasant Grove. Bighorn sheep were transplanted into the area in the late 1990's. The site was placed on a moderately steep slope just north of the mouth of Grove Creek. It has a southwest aspect with an elevation of 5,470 feet. The site contains a sparse stand of cliffrose with some mountain big sagebrush in the understory. Cheatgrass dominates the herbaceous understory and perennial grasses and forbs are not abundant. The site has become increasingly important winter range as residential development has expanded in this area. The only available winter range is found on the steeper slopes on Forest Service land. The area is used heavily by wintering deer and a few elk. A pellet group transect read on site in 2002 estimated 72 deer days use/acre (177 ddu/ha) and 5 elk days use/acre (12 edu/ha). Bighorn sheep also use the area with sheep pellet groups being about half as numerous as deer. It is very difficult to differentiate bighorn sheep pellet groups from mule deer on this site. Every pellet group was carefully evaluated but some of the deer pellet groups may be bighorn sheep. Bighorn sheep use was estimated 38 days use/acre (94 sdu/ha) in 2002.

Soil at the site is relatively shallow and very rocky. Effective rooting depth is estimated at only about 9 inches. Soil parent material is limestone which is exposed as bedrock and large rock outcrops on the site. As with the trend study at American Fork Canyon (17-61), the effective rooting depth measurements are not a good indication of actual rooting depth for the deeper rooted shrubs. The site is terraced and soil movement down slope is occurring and inevitable due to the steep slope and lack of perennial herbaceous vegetation. The soil erosion condition class was determined to be slight in 2002. Due to the high rock content, soil temperature is relatively high averaging nearly 75° F at 8.5 inches in depth. Surface temperatures are much higher and make seedling establishment of shrubs very difficult.

The site supports a small population of large cliffrose with some mountain big sagebrush in the understory. Density of cliffrose was estimated at 120 plants/acre in 2002. Mature cliffrose average over 5 feet in height making some plants partly unavailable to browsing. Utilization was moderate to heavy on available mature plants but light on young plants. Vigor was normal on all plants and annual leader growth averaged 3.3 inches in 2002. Mountain big sagebrush had a density estimated at only 380 plants/acre. Utilization was variable with some plants displaying a clubbed growth form while others appeared to be unutilized. Just over half of the population was classified as decadent, with 70% of these classified as dying. No seedlings or young plants were encountered. A few scattered white rubber rabbitbrush offer some additional forage.

The herbaceous understory is dominated by cheatgrass which accounted for 81% of the total grass cover or 68% of the total herbaceous cover. It had a high cover value of 19%. Bluebunch wheatgrass was the most abundant perennial. It had a cover value of nearly 4% which accounted for 16% of the total grass cover in 2002. Other perennial grasses are rare in their occurrence. Forbs are lacking, producing a total of less than 5% cover. The forb component is also totally dominated by annuals. Pale alyssum and storksbill are the most dominant. Perennial forbs are rare.

### 2002 APPARENT TREND ASSESSMENT

Soil conditions are poor with marginal protective ground cover. Due to the steep slope, some erosion is inevitable but a healthy herbaceous understory of perennial grasses and forbs would do much to stabilize the slope. The small stand of cliffrose appears stable. It displays moderate to heavy use but has good vigor and no decadent plants were encountered. Mountain big sagebrush appears to be feeling the effects of drought and a steep west aspect. This is also a marginal site for sagebrush due to the shallow, rocky soil. Just over half of the population was classified as decadent and 70% of those appear to be dying. No recruitment was noted, especially with the competitive understory of winter annuals. It appears that the population will decline in the future. The herbaceous understory is poor with most of the cover coming from cheatgrass and annual forbs.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 62

T y p e	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
G	Agropyron spicatum	114	50	3.82
G	Bromus japonicus (a)	60	25	.25
G	Bromus tectorum (a)	396	98	19.07
G	Poa bulbosa	6	3	.09
G	Poa fendleriana	1	1	.00
G	Poa secunda	37	15	.40
Total for Annual Grasses		456	123	19.32
Total for Perennial Grasses		158	69	4.31
Total for Grasses		614	192	23.64
F	Alyssum alyssoides (a)	135	55	.40
F	Ambrosia psilostachya	6	2	.15
F	Antennaria rosea	1	1	.03
F	Artemisia ludoviciana	5	1	.03
F	Astragalus utahensis	-	-	.00
F	Camelina microcarpa (a)	3	1	.00
F	Erodium cicutarium (a)	145	51	2.34
F	Holosteum umbellatum (a)	5	3	.01
F	Lathyrus brachycalyx	28	9	.31
F	Lappula occidentalis (a)	4	1	.18
F	Ranunculus testiculatus (a)	154	49	.83
F	Sisymbrium altissimum (a)	7	3	.09
F	Tragopogon dubius	4	1	.00
Total for Annual Forbs		453	163	3.88
Total for Perennial Forbs		44	14	0.54
Total for Forbs		497	177	4.42

BROWSE TRENDS --

Herd unit 17 , Study no: 62

Type	Species	Strip Frequency	Average Cover %
		'02	'02
B	Artemisia tridentata vaseyana	19	1.65
B	Chrysothamnus nauseosus albicaulis	8	1.50
B	Cowania mexicana stansburiana	6	2.70
B	Gutierrezia sarothrae	2	-
B	Rhus trilobata	0	.03
Total for Browse		35	5.90

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 62

Species	Percent Cover '02
Artemisia tridentata vaseyana	.75
Chrysothamnus nauseosus hololeucus	1.17
Cowania mexicana stansburiana	2.75

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 62

Species	Average leader growth (in) '02
Artemisia tridentata vaseyana	6.3
Cowania mexicana stansburiana	3.3

BASIC COVER --

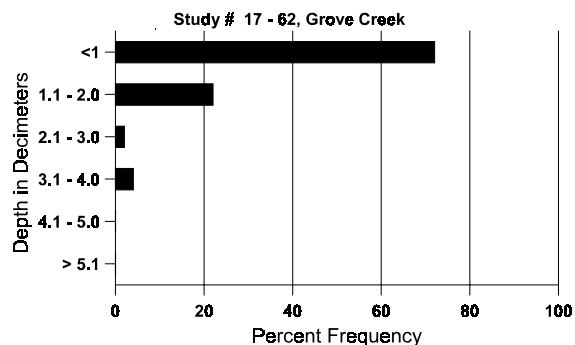
Herd unit 17 , Study no: 62

Cover Type	Nested Frequency	Average Cover %
	'02	'02
Vegetation	436	35.56
Rock	290	9.63
Pavement	396	16.01
Litter	470	31.64
Cryptogams	10	.21
Bare Ground	327	22.88

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 62, Grove Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.7	74.6 (8.6)	7.3	33.3	34.7	32.0	3.4	11.4	198.4	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 62

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'02	02	02
Bighorn Sheep	25	496	36 (89)
Elk	1	61	5 (12)
Deer	11	931	72 (177)

BROWSE CHARACTERISTICS --  
Herd unit 17 , Study no: 62

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
Artemisia tridentata vaseyana															
M	02	3	2	4	-	-	-	9	-	-	-	180	24	35	9
D	02	3	3	3	-	-	-	1	-	-	7	200			10
X	02	-	-	-	-	-	-	-	-	-	-	320			16
% Plants Showing '02		<u>Moderate Use</u> 26%			<u>Heavy Use</u> 37%			<u>Poor Vigor</u> 37%			<u>%Change</u>				
Total Plants/Acre (excluding Dead & Seedlings)											'02	380	Dec:	53%	



A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	02	4	1	-	-	-	-	-	-	-	5	-	-	-	100	28	50	5
D	02	3	-	-	-	-	-	1	-	-	2	-	-	2	80			4
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		11%			00%			22%										
Total Plants/Acre (excluding Dead & Seedlings)												'02	180	Dec:	44%			
<i>Cowania mexicana stansburiana</i>																		
Y	02	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	02	-	-	-	-	1	1	-	1	-	3	-	-	-	60	65	79	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		17%			17%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'02	120	Dec:	-			
<i>Gutierrezia sarothrae</i>																		
M	02	2	-	-	-	-	-	-	-	-	2	-	-	-	40	8	12	2
X	02	-	-	-	-	-	-	-	-	-	-	-	-	-	440			22
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'02	40	Dec:	-			

Trend Study 17-63-02

Study site name: Hobble Creek Bench.

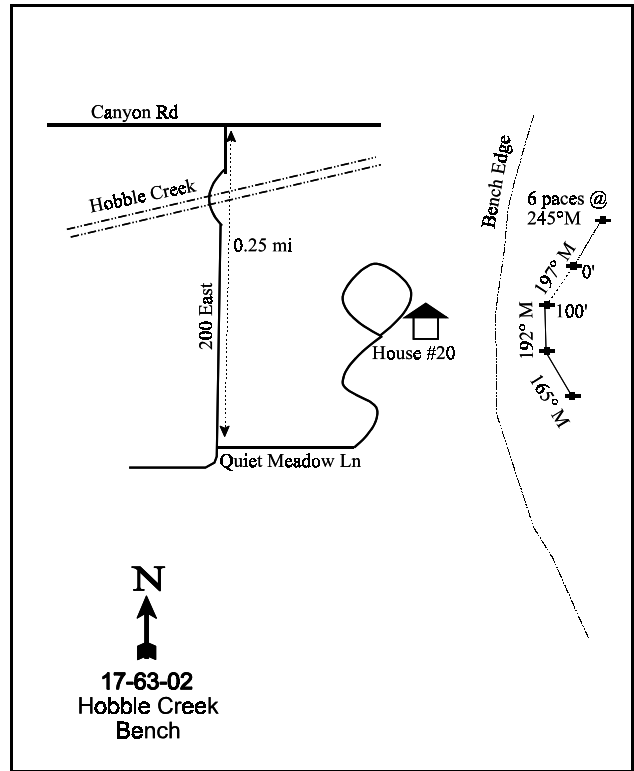
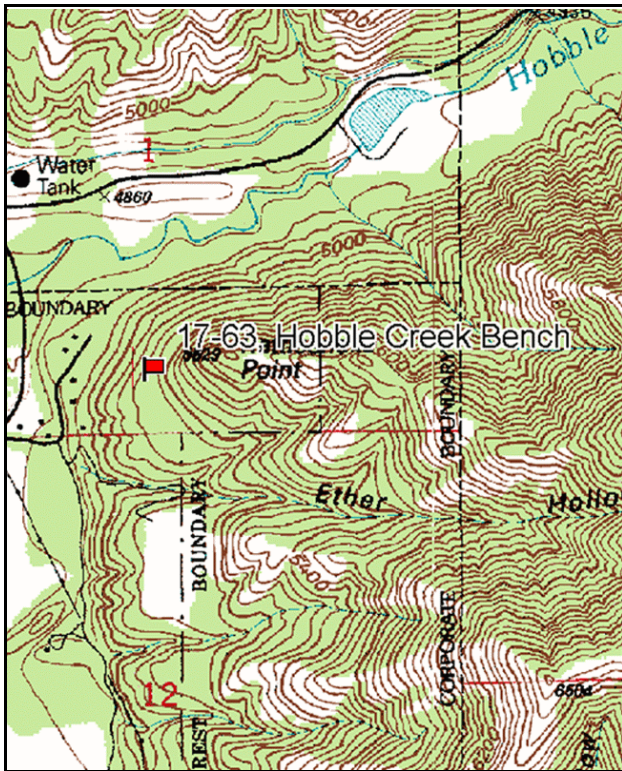
Vegetation type: Bitterbrush.

Compass bearing: frequency baseline 355 degrees magnetic (line 1 @ 245°M, line 2 @ 192°M, line 3 @ 165°M).

Frequency belt placement: line 1 (97 ft), line 2 (11 ft, 37 ft and 95 ft), line 3 (34 ft).

LOCATION DESCRIPTION

On Highway 89 in Mapleton, take 1650 South which will change into 1600 North. Follow 1600 North until it junctions with Quiet Meadow Lane (1600 North ends at this point). Park in front of house # 20. Ask owner, Mark Petersen, for permission to walk into his backyard. Go up his driveway to a footpath up the hill. Go up the steep hill until a bench is reached. A half high witness post is located in a clearing. The 0-foot stake is 6 paces at 245 degrees magnetic from the witness post and is marked by browse tag #183.



Map Name: Lehi

Diagrammatic Sketch

Township 8S, Range 3E, Section 1

GPS: NAD 27, UTM 12S 4443956 N 453083 E

## DISCUSSION

### Hobble Creek Bench - Trend Study No. 17-63

This trend study was established in 2002 to sample critical winter range at the mouth of Hobble Creek Canyon. It samples a bitterbrush community surrounded by Gambel oak clones on a nearly level bench about 300 yards above a housing development. Elevation at the site is about 5,100 feet. The site receives winter use by deer and elk. A pellet group transect read on the site in 2002 estimated 58 deer and 23 elk days use/acre (143 ddu/ha and 56 edu/ha).

Soil at the site is moderately deep with an effective rooting depth estimated at 14 inches. There is very little rock or pavement on the surface or within the profile. Soil compaction was the only thing limiting deeper soil depth measurements. Soil texture is a sandy loam with a neutral reaction (pH of 6.9). Soil temperature is moderately high for a level site averaging 68°F at a depth of 13 inches. There is little bare ground exposed due to the abundant herbaceous vegetation. Erosion is not a problem and the erosion condition class was determined to be stable in 2002.

The site supports a large stand of bitterbrush with an understory of bulbous bluegrass. Density of bitterbrush was estimated at 1,040 mostly mature plants/acre in 2002. These are low growing shrubs that average only about 2 feet in height with a large crown diameter of over 6 feet. They were heavily hedged but vigorous with annual leader growth averaging nearly 5 inches in 2002.

Mountain big sagebrush occurs in fairly low numbers with a population estimated at 640 plants/acre in 2002. They are mostly lightly hedged and vigorous with annual leader growth averaging 3 inches. About one-third of the population was decadent and recruitment is poor. There are a few large moderately hedged true mountain mahogany on site. Gambel oak clones occur around the site. They are lightly utilized and vary in size from small plants of about 2 to 3 feet in height to large tree-like forms of 8 to 10 feet in height.

The herbaceous understory is abundant but dominated by the low value increaser bulbous bluegrass. It provided 91% of the grass cover or 87% of the total herbaceous cover in 2002. Other fairly common perennial grasses included purple three-awn, sand dropseed, and needle-and-thread. Cheatgrass, an annual, was also encountered in low numbers. Forbs are uncommon. The most abundant perennial species consisted of arrowleaf balsamroot, stone seed, and longleaf phlox. All forbs combined produced less than 3% total cover.

### 2002 APPARENT TREND ASSESSMENT

Soil at the site is well protected with abundant herbaceous vegetation. There is little bare ground exposed and there is no noticeable erosion occurring. The abundant bitterbrush is heavily hedged but vigorous. It appears to have a stable population. Other preferred browse occur in low numbers. The herbaceous understory is abundant but composition is poor. The low value perennial, bulbous bluegrass, totally dominates the understory by providing 91% of the grass cover or 87% of the total herbaceous cover. This grass cures out early in the summer and can provide fine fuels for wildfire. Forbs are rare.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 63

T y p e	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
G	Agropyron spicatum	29	12	.53
G	Aristida purpurea	44	17	1.09
G	Bromus tectorum (a)	65	22	.57
G	Poa bulbosa	460	98	52.47
G	Poa secunda	5	2	.01
G	Sporobolus cryptandrus	32	17	1.47
G	Stipa comata	29	10	1.23
Total for Annual Grasses		65	22	0.57
Total for Perennial Grasses		599	156	56.81
Total for Grasses		664	178	57.38
F	Agoseris glauca	2	1	.00
F	Alyssum alyssoides (a)	3	1	.00
F	Astragalus utahensis	-	-	.00
F	Balsamorhiza sagittata	14	4	.82
F	Calochortus nuttallii	2	2	.01
F	Comandra pallida	4	2	.03
F	Crepis acuminata	2	1	.03
F	Cymopterus spp.	1	1	.00
F	Erodium cicutarium (a)	5	3	.04
F	Galium aparine (a)	4	1	.03
F	Heterotheca villosa	6	3	.63
F	Lithospermum ruderales	12	4	.92
F	Microsteris gracilis (a)	2	1	.00
F	Phlox longifolia	16	9	.11
F	Sphaeralcea coccinea	-	-	.00
F	Tragopogon dubius	6	4	.10
Total for Annual Forbs		14	6	0.08
Total for Perennial Forbs		65	31	2.69
Total for Forbs		79	37	2.76

BROWSE TRENDS --

Herd unit 17 , Study no: 63

Type	Species	Strip Frequency	Average Cover %
		'02	'02
B	Artemisia tridentata vaseyana	25	2.08
B	Gutierrezia sarothrae	3	.18
B	Opuntia spp.	1	.15
B	Purshia tridentata	36	13.60
B	Quercus gambelii	3	.63
Total for Browse		68	16.64

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 63

Species	Percent Cover
	'02
Artemisia tridentata vaseyana	2.08
Purshia tridentata	17.92
Quercus gambelii	2.50

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 63

Species	Average leader growth (in)
	'02
Artemisia tridentata vaseyana	3.0
Purshia tridentata	5.0

BASIC COVER --

Herd unit 17 , Study no: 63

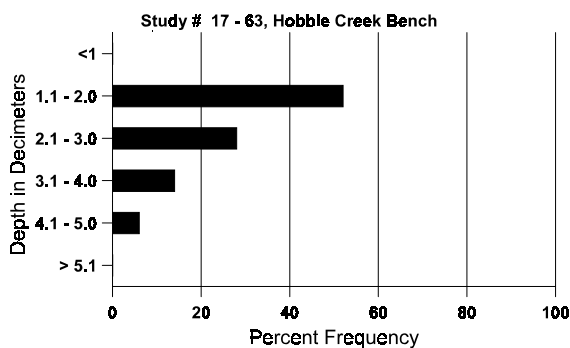
Cover Type	Nested Frequency	Average Cover %
	'02	'02
Vegetation	488	75.90
Rock	19	.07
Pavement	78	.50
Litter	453	26.54
Cryptogams	168	8.05
Bare Ground	76	3.07

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 63, Hobbie Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.1	68.0 (13.4)	6.9	65.3	20.7	14.0	1.0	13.4	92.8	.5

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17, Study no: 63

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'02	'02	'02
Rabbit	2	-	-
Elk	13	296	23 (56)
Deer	28	757	58 (144)

BROWSE CHARACTERISTICS --

Herd unit 17, Study no: 63

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4			
Artemisia tridentata vaseyana								
Y '02	1 - - - - -	1	-	-	-	20		1
M '02	18 2 - - - - -	20	1	-	-	420	22 34	21
D '02	7 2 - - - - -	3	-	-	7	200		10
X '02	- - - - -	-	-	-	-	280		14
% Plants Showing '02		<u>Moderate Use</u> 13%	<u>Heavy Use</u> 00%	<u>Poor Vigor</u> 22%	<u>%Change</u>			
Total Plants/Acre (excluding Dead & Seedlings)						'02 640	Dec:	31%
Cercocarpus montanus								
M '02	- - - - -	-	-	-	-	0	96 122	0
% Plants Showing '02		<u>Moderate Use</u> 00%	<u>Heavy Use</u> 00%	<u>Poor Vigor</u> 00%	<u>%Change</u>			
Total Plants/Acre (excluding Dead & Seedlings)						'02 0	Dec:	-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	60	0
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)													'02	0	Dec:	-		
Gutierrezia sarothrae																		
M	02	1	-	-	-	-	-	1	-	-	-	-	-	40	16	16	2	
D	02	2	-	-	-	-	-	-	-	-	-	-	1	40			2	
X	02	-	-	-	-	-	-	-	-	-	-	-	-	120			6	
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 25%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)													'02	80	Dec:	50%		
Opuntia spp.																		
M	02	4	-	-	-	-	-	-	-	-	-	-	-	80	3	8	4	
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)													'02	80	Dec:	-		
Purshia tridentata																		
Y	02	-	-	2	-	-	-	-	-	-	-	-	-	40			2	
M	02	7	3	33	-	-	1	-	-	-	-	-	-	880	28	78	44	
D	02	-	1	5	-	-	-	-	-	-	-	-	-	120			6	
% Plants Showing '02		<u>Moderate Use</u> 08%			<u>Heavy Use</u> 79%			<u>Poor Vigor</u> 02%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)													'02	1040	Dec:	12%		
Quercus gambelii																		
M	02	9	-	-	-	-	-	-	-	-	-	-	-	180	34	27	9	
X	02	-	-	-	-	-	-	-	-	-	-	-	-	40			2	
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)													'02	180	Dec:	-		

Trend Study 17-64-02

Study site name: Water Hollow

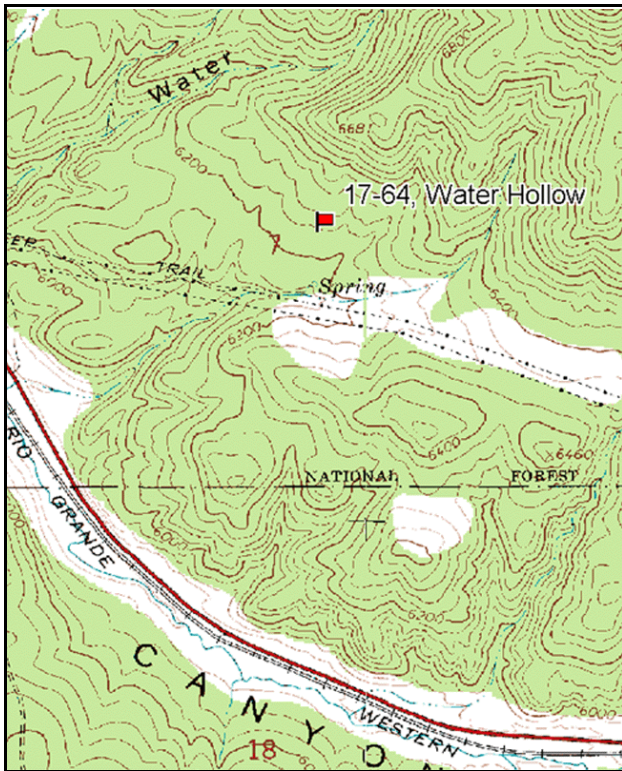
Vegetation type: Chained, Seeded P-J

Compass bearing: frequency baseline 277 degrees magnetic.

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

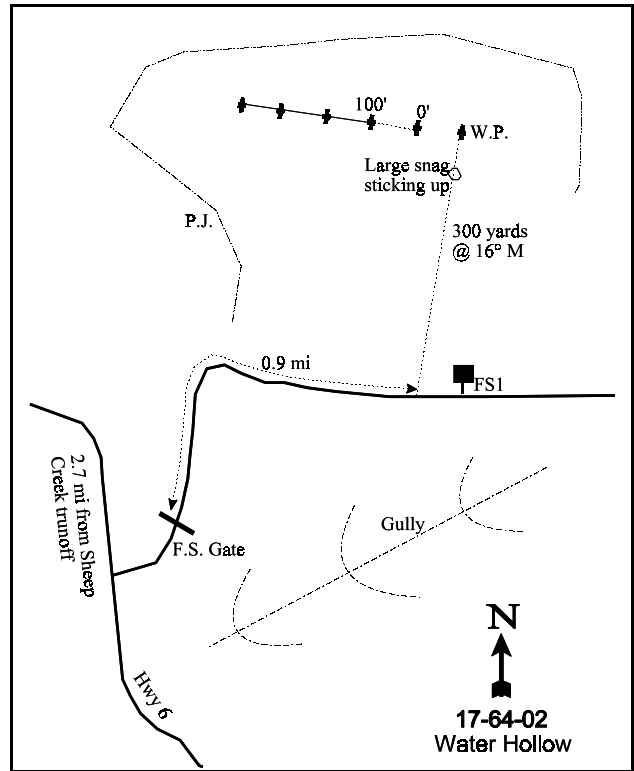
LOCATION DESCRIPTION

From Spanish Fork Canyon, take Highway 6 to the Sheep Creek turnoff. Continue on Highway 6 for 2.2 miles to a road on the north side of the road (left). Follow this road to a Forest Service gate. From the gate, go 0.9 miles to a Forest Service sign. Park here and walk 300 yards at 16 degrees magnetic to the witness post. A large clump of chained P-J is in front of the post. The 0-foot stake is just west of the witness post and is marked with browse tag # 132.



Map Name: Mill Fork

Township 10S, Range 6E, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4423898 N 474939 E



## DISCUSSION

### Water Hollow - Trend Study No. 17- 64

This is a new trend study established in 2002 to monitor a pinyon-juniper chaining on big game winter range. The area is located in Spanish Fork Canyon, just north of Highway 6 on U.S. Forest Service land. Several small areas were chained and seeded in the 1990's to improve winter range and stabilize the watershed. The trend study is located within a chained area of about 60 acres. It has a slope of about 11% with a south aspect and an elevation of approximately 6,200 feet. The area receives heavy winter deer and elk use with additional use occurring in the spring and fall. Some deer use the area year round. A pellet group transect read on site in 2002 estimated 25 deer and 115 elk days use/acre (62 ddu/ha and 284 edu/ha). Rabbit pellets were also common.

Soil at the site is moderately deep with an estimated effective rooting depth estimated at over 15 inches. There is little rock on the surface or within the profile. Geologically, the area is part of the Green River Shale formation. These soils are notoriously highly erodible and severe erosion is apparent outside of the chained area. Soil texture on the site is a sandy clay loam with a slightly alkaline reaction (pH of 7.4). Soil organic matter is fairly high averaging 3.4%. Vegetation and litter cover is high but there are areas of exposed bare soil and some localized soil movement is occurring. The soil erosion condition class was determined to be slight in 2002.

Prior to the chaining, this area was totally dominated by juniper and pinyon trees with few shrubs in the understory. The chaining was done using a smooth 90 lb chain. Density of surviving juniper was estimated using point quarter data in 2002 at 30 trees/acre with an average diameter of 4.6 inches. About 75% of the juniper sampled were trees tipped over by the chaining but were still living. The other 25% were small young trees which survived the chaining. Pinyon was estimated at only 7 trees/acre with an average diameter of 2 inches.

Fourwing saltbush and antelope bitterbrush, which were seeded using a dribbler, occur in low numbers. All bitterbrush was heavily hedged but displayed good vigor. Annual leader growth was excellent, averaging 4 inches in 2002. Fourwing saltbush was moderately browsed and had good vigor. Annual leader growth averaged 3.4 inches. Small numbers of mountain big sagebrush and white rubber rabbitbrush, which were included within the aerial seed mix, were also found on the site.

The herbaceous understory is abundant and very diverse. Fifteen species of grass was encountered on the site. These combined to produce nearly 21% cover in 2002. Common species include native and exotic seeded species, crested, western, and intermediate wheatgrass, smooth brome, and Great Basin wildrye. Forbs are rare and include alfalfa and blue flax.

### 2002 APPARENT TREND ASSESSMENT

The soil is well protected compared to the nearby unchained pinyon-juniper woodland where erosion is severe. There is some localized soil movement on the site and the soil erosion index was determined to be slight in 2002. Shrubs occur in small numbers. Preferred species, fourwing saltbush and bitterbrush, were seeded by a dribbler. They show moderate to heavy use and have good vigor. A few sagebrush and white rubber rabbitbrush also occur on the site. It will take several more years before shrubs become very abundant on this site. The herbaceous understory is abundant, diverse, and dominated by seeded perennial grasses. Forbs are lacking.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 64

T y p e	Species	Nested Frequency	Quadrat Frequency	Average Cover %
		'02	'02	'02
G	Agropyron cristatum	156	58	6.66
G	Agropyron intermedium	128	42	3.11
G	Agropyron smithii	42	13	2.02
G	Agropyron spicatum	9	3	.41
G	Bromus carinatus	6	2	.18
G	Bromus inermis	103	38	2.67
G	Bromus japonicus (a)	3	1	.00
G	Bromus tectorum (a)	5	3	.01
G	Carex spp.	-	-	.00
G	Dactylis glomerata	19	10	.56
G	Elymus cinereus	24	12	3.69
G	Oryzopsis hymenoides	13	4	.93
G	Poa secunda	12	4	.02
G	Secale montanum	-	-	.00
G	Sitanion hystrix	7	4	.21
Total for Annual Grasses		8	4	0.01
Total for Perennial Grasses		519	190	20.52
Total for Grasses		527	194	20.54
F	Astragalus spp.	2	2	.01
F	Carduus nutans (a)	5	2	.01
F	Cirsium spp.	-	-	.00
F	Gilia spp. (a)	4	1	.03
F	Lactuca serriola	1	1	.00
F	Linum lewisii	18	7	.28
F	Lithospermum ruderae	-	-	.00
F	Medicago sativa	-	-	.00
F	Penstemon caespitosus	1	1	.03
F	Streptanthus cordatus	1	1	.00
F	Tragopogon dubius	9	5	.02
Total for Annual Forbs		9	3	0.03
Total for Perennial Forbs		32	17	0.37
Total for Forbs		41	20	0.40

BROWSE TRENDS --

Herd unit 17 , Study no: 64

Type	Species	Strip Frequency	Average Cover %
		'02	'02
B	Atriplex canescens	2	.63
B	Juniperus osteosperma	1	1.86
B	Purshia tridentata	2	-
Total for Browse		5	2.49

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 64

Species	Percent Cover
	'02
Atriplex canescens	.50
Juniperus osteosperma	2.50
Purshia tridentata	.33

Key Browse Annual Leader Growth

Herd unit 17 , Study no: 64

Species	Average leader growth (in)
	'02
Atriplex canescens	3.4
Purshia tridentata	4.0

Point-Quarter Tree Data

Herd unit 17 , Study no: 64

Species	Trees per Acre	Average diameter (in)
	'02	'02
Juniperus osteosperma	30	4.6
Pinus edulis	7	2.1

BASIC COVER --

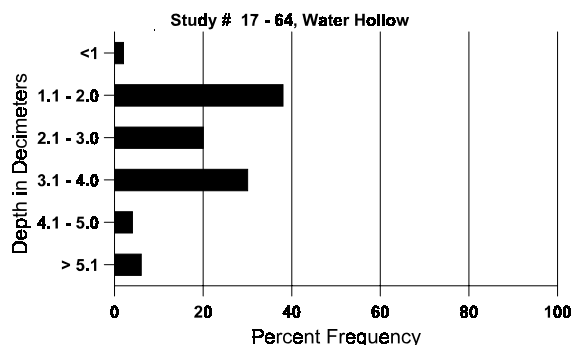
Herd unit 17 , Study no: 64

Cover Type	Nested Frequency	Average Cover %
	'02	'02
Vegetation	324	25.31
Rock	116	1.94
Pavement	260	3.73
Litter	484	56.09
Cryptogams	17	.23
Bare Ground	312	30.10

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 64, Water Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.4	60.4 (12.8)	7.4	48.7	20.0	31.3	3.4	4.5	236.8	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17, Study no: 64

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'02	'02	'02
Rabbit	27	-	-
Elk	36	1496	115 (284)
Deer	14	331	25 (63)

BROWSE CHARACTERISTICS --  
Herd unit 17, Study no: 64

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total		
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<b>Artemisia tridentata vaseyana</b>																		
M '02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19	26	0
X '02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%				<u>%Change</u>						
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	
<b>Atriplex canescens</b>																		
M '02	1	1	-	-	-	-	-	-	-	2	-	-	-	40	45	51	2	
% Plants Showing '02		<u>Moderate Use</u> 50%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%				<u>%Change</u>						
Total Plants/Acre (excluding Dead & Seedlings)														'02	40	Dec:	-	

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	43	0
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	24	0
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	
<i>Gutierrezia sarothrae</i>																		
X	02	-	-	-	-	-	-	-	-	-	-	-	-	500				25
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	
<i>Juniperus osteosperma</i>																		
Y	02	1	-	-	-	-	-	-	-	-	-	-	-	20				1
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	20	Dec:	-	
<i>Purshia tridentata</i>																		
Y	02	-	-	-	-	-	2	-	-	-	-	-	-	40				2
M	02	-	-	1	-	-	-	-	-	-	-	-	-	20	17	28		1
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 100%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	60	Dec:	-	
<i>Symphoricarpos oreophilus</i>																		
M	02	-	-	-	-	-	-	-	-	-	-	-	-	0	12	18		0
% Plants Showing '02		<u>Moderate Use</u> 00%			<u>Heavy Use</u> 00%			<u>Poor Vigor</u> 00%			<u>%Change</u>							
Total Plants/Acre (excluding Dead & Seedlings)														'02	0	Dec:	-	

## SUSPENDED TREND STUDIES

Trend Study 17-6-96

Study site name: Daniels Canyon.

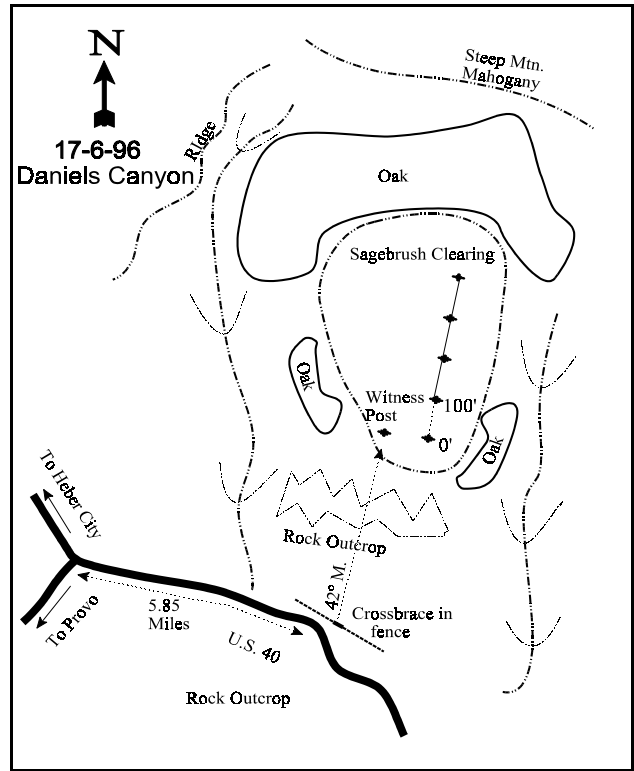
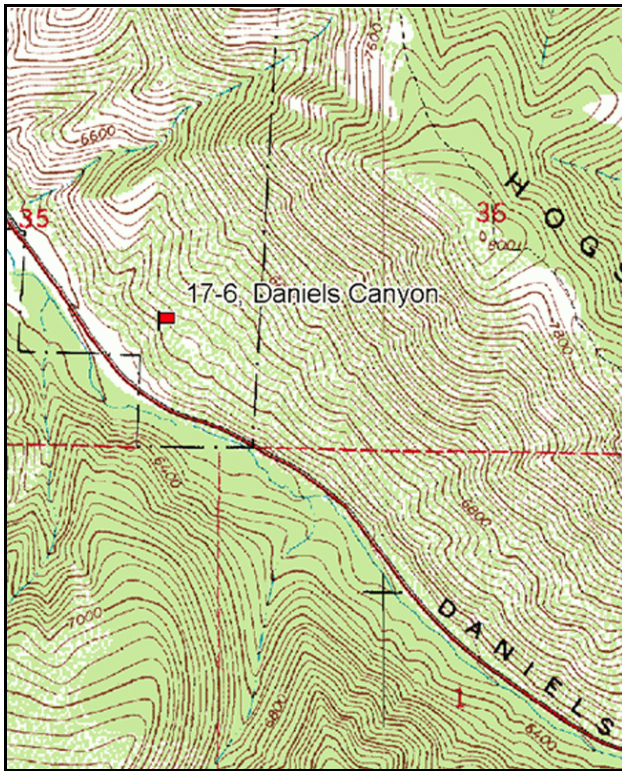
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 27 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of U.S. 189 and U.S. 40 (southeast of Heber City), proceed southeast on U.S. 40 towards Daniels Pass for 5.85 miles, to mile marker 25. From mile marker 25, proceed towards Daniels Pass for and additional 0.25 miles and stop. Cross the fence on the northeast side of the road and walk 34 paces along the fence in a southeasterly direction until you reach a cross brace in the fence. From this point, proceed up the slope 140 paces at an azimuth of 42 degrees magnetic, to the witness post. From the witness post, walk at a bearing of 112 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline runs at an azimuth of 27 degrees magnetic. Line 2 runs at 13 degrees magnetic. Line 3 runs 21 at degrees magnetic. Line 4 runs at 22 degrees magnetic. The last baseline stake is 50 feet away. A red browse tag, number 3962, is attached to the 0-foot baseline stake.



Map Name: Center Creek

Diagrammatic Sketch

Township 4S, Range 5E, Section 35

GPS: NAD 27, UTM 12S 4474740 N 47182 E

## DISCUSSION

### Daniels Canyon - Trend Study No. 17-6

\*\*\* SUSPENDED - This study was suspended in 2002. It has been found not to be representative of the critical winter range in the area. The transect was placed in a small sagebrush opening that is surrounded by thick oakbrush.

This study is located on Division property in the lower portion of Daniels Canyon just above Highway 40. Elevation is approximately 6,200 feet and exposure is southwesterly on a moderate slope. Vegetationally, the site is occupied by a sagebrush-grass community surrounded by thick Gambel oakbrush. Numerous elk and deer pellet groups suggest heavy winter utilization. In 1996, one small buck was seen just north of the site and a cow elk was seen across the canyon.

Textural analysis indicates a loamy soil with a neutral pH. The average soil temperature is 48°F measured at 12 inches in depth. Some gravel is scattered throughout the horizon with larger rocks found on the surface. There is little bare ground and almost no erosion apparent. Vegetative cover is estimated to be 41%, most of which is contributed by annual species. Litter cover also comes primarily from annuals and is estimated to be nearly 58%. Rock and pavement cover combine to provide 22% cover. Bare ground cover is extremely low at an estimated 1%, thereby decreasing the erosion rate.

As in 1983 and 1989, evidence suggests winter use by deer and elk. The mountain big sagebrush is vigorous with some producing abundant seedheads this year. Many, however, have no seedheads and are moderately hedged. Fifty-six percent of the sage were classified as heavily hedged in 1989, as opposed to only 3% in 1996. Mountain big sagebrush age structure reveals a mostly mature population with very few seedlings encountered in 1996. The density appears to be stable and estimated to be 3,000 plants/acre in 1996.

Oak clones are scattered on the slopes with most being 4-8 feet in height. Some of the smaller oak plants are heavily hedged. The patches of oakbrush do not appear to be rapidly expanding. A few more oak plants were encountered in 1996 with the increased sample size. White-stemmed rubber rabbitbrush and stickyleaf low rabbitbrush may be slightly increasing in density on the site. These plants show no utilization and good vigor. The broom snakeweed density is estimated to be 2,500 plants/acre in 1996, which is much lower than the estimated 11,799 plants/acre in 1989. This population is mature with low biotic potential this season.

Sum of nested frequency for perennial grasses has increased since 1989, mostly due to Kentucky bluegrass and Sandberg bluegrass. Both species have significantly increased in nested frequency. Much of the herbaceous understory cover comes from two annual grasses, cheatgrass and Japanese brome. These species were not counted previously, but were reported as lush in 1983. Other grass species include Indian ricegrass, sand dropseed, bluebunch wheatgrass, and bulbous bluegrass. Perennial forb sum of nested frequency has declined since 1989, although it still higher than the initial reading in 1983. While the forbs are not abundant, there is a high diversity.

### 1983 APPARENT TREND ASSESSMENT

Soil condition appears to be declining. Overall, the site is poorly developed and eroded sufficiently to prevent any significant soil buildup. There is evidence of continuing erosion and soil loss. Vegetation is more difficult to assess. The key browse species, mountain big sagebrush, is healthy and moderately productive but may be threatened by other vegetative trends. Most obvious are the competitive influence of increaser shrubs and a depleted herbaceous understory.



## 1989 TREND ASSESSMENT

The soil trend is downward. Litter cover is less than half of the 1983 estimate. The trend for the key browse species, mountain big sagebrush, is declining due to lack of replacement of the increasingly decadent population. Heavy use increased to 56% of the population. These small sagebrush openings provide attractive forage on the winter range, but are limited in the oak-dominated canyon. The herbaceous understory has a slightly upward trend as sum of nested frequency values for both perennial grasses and forbs increased.

### TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - slightly up (4)

## 1996 TREND ASSESSMENT

Because there is very little soil exposed, soil trend is stable at this time. Much of the litter protecting the soil is contributed by annual species and could easily be washed down the slope exposing the soil. Vegetative cover helps provide protection, but most is also contributed by annual species. The browse trend is stable with a vigorous mountain big sagebrush population. The broom snakeweed population can fluctuate highly from season to season and appears to have stabilized at 2,500 plants/acre since the 1989 estimate of 11,799 plants/acre. Herbaceous trend for perennial species is slightly downward with a decrease in sum of nested frequency. Annual species dominated the herbaceous understory and were not counted previously.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly downward (2)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 6

Type	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'96	'83	'89	'96	Cover %
G	Agropyron intermedium	-	-	-	-	-	-	.03
G	Agropyron spicatum	2	5	10	1	3	4	.53
G	Bromus japonicus (a)	-	-	182	-	-	53	7.01
G	Bromus tectorum (a)	-	-	315	-	-	89	11.61
G	Oryzopsis hymenoides	a <sup>9</sup>	b <sup>29</sup>	ab <sup>19</sup>	4	11	10	.78
G	Poa bulbosa	-	-	1	-	-	1	.03
G	Poa fendleriana	-	4	-	-	3	-	-
G	Poa pratensis	a <sup>-</sup>	a <sup>1</sup>	b <sup>44</sup>	-	1	14	2.08
G	Poa secunda	a <sup>-</sup>	a <sup>2</sup>	b <sup>22</sup>	-	1	11	.30
G	Sporobolus cryptandrus	45	39	39	18	19	19	1.00
Total for Annual Grasses		0	0	497	0	0	142	18.63
Total for Perennial Grasses		56	80	135	23	38	59	4.76
Total for Grasses		56	80	632	23	38	201	23.39
F	Agoseris glauca	3	-	3	2	-	1	.15

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'96	'83	'89	'96	'96
F	<i>Alyssum alyssoides</i> (a)	-	-	188	-	-	56	1.28
F	<i>Antennaria rosea</i>	-	-	-	-	-	-	-
F	<i>Artemisia ludoviciana</i>	34	31	59	14	13	24	1.34
F	<i>Astragalus utahensis</i>	-	1	3	-	1	1	.03
F	<i>Calochortus nuttallii</i>	5	6	-	3	3	-	-
F	<i>Chaenactis douglasii</i>	-	1	-	-	1	-	-
F	<i>Cirsium</i> spp.	<sub>a</sub> 1	<sub>b</sub> 17	<sub>ab</sub> 15	1	9	6	.59
F	<i>Epilobium brachycarpum</i> (a)	-	-	15	-	-	6	.03
F	<i>Erodium cicutarium</i> (a)	-	-	11	-	-	3	.18
F	<i>Erigeron</i> spp.	<sub>a</sub> 3	<sub>a</sub> -	<sub>b</sub> 24	1	-	12	.18
F	<i>Eriogonum racemosum</i>	<sub>a</sub> -	<sub>b</sub> 14	<sub>b</sub> 19	-	7	10	.27
F	<i>Helianthus annuus</i> (a)	-	<sub>b</sub> 41	<sub>a</sub> -	-	21	-	-
F	<i>Heterotheca villosa</i>	<sub>a</sub> 8	<sub>b</sub> 23	<sub>a</sub> 5	4	9	3	.45
F	<i>Holosteum umbellatum</i> (a)	-	-	1	-	-	1	.00
F	<i>Lactuca pulchella</i>	-	4	3	-	3	2	.04
F	<i>Lactuca serriola</i>	14	-	-	7	-	-	-
F	<i>Machaeranthera canescens</i>	-	-	1	-	-	1	.03
F	<i>Melilotus officinalis</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 20	-	-	9	.95
F	<i>Oenothera albicaulis</i> (a)	13	13	3	7	5	1	.03
F	<i>Penstemon</i> spp.	-	1	-	-	1	-	-
F	<i>Phlox longifolia</i>	-	2	-	-	1	-	-
F	<i>Polygonum douglasii</i> (a)	-	-	21	-	-	12	.08
F	<i>Sphaeralcea coccinea</i>	<sub>b</sub> 16	<sub>a</sub> 2	<sub>a</sub> 1	8	2	1	.03
F	<i>Taraxacum officinale</i>	-	1	-	-	1	-	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> 37	<sub>a</sub> 13	<sub>b</sub> 71	19	9	40	.58
F	<i>Trifolium</i> spp.	<sub>a</sub> -	<sub>b</sub> 63	<sub>a</sub> -	-	30	-	-
F	Unknown forb-annual (a)	-	-	7	-	-	4	.07
F	<i>Verbascum thapsus</i>	-	3	-	-	1	-	-
F	<i>Vicia americana</i>	-	2	-	-	1	-	-
F	<i>Viguiera multiflora</i>	<sub>a</sub> 19	<sub>b</sub> 57	<sub>a</sub> 2	8	33	2	.01
Total for Annual Forbs		13	54	246	7	26	83	1.69
Total for Perennial Forbs		140	241	226	67	125	112	4.67
Total for Forbs		153	295	472	74	151	195	6.37

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 6

Type	Species	Strip Frequency	Average Cover %
		'96	'96
B	Artemisia tridentata vaseyana	61	10.36
B	Chrysothamnus nauseosus albicaulis	7	.18
B	Chrysothamnus viscidiflorus viscidiflorus	5	.15
B	Gutierrezia sarothrae	51	.77
B	Opuntia spp.	29	.55
B	Quercus gambelii	6	1.74
Total for Browse		159	13.77

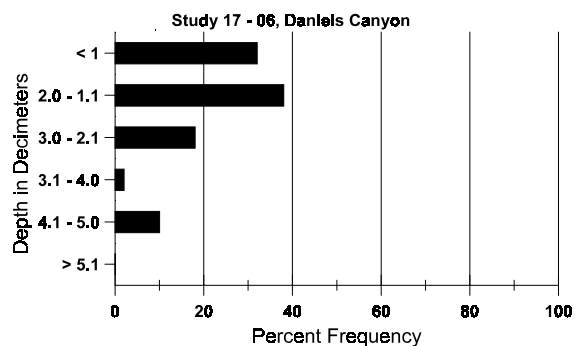
BASIC COVER --  
Herd unit 17 , Study no: 6

Cover Type	Nested Frequency	Average Cover %		
	'96	'83	'89	'96
Vegetation	391	3.00	7.00	41.45
Rock	262	12.75	18.00	14.23
Pavement	163	28.50	48.75	8.03
Litter	398	51.25	23.00	57.88
Cryptogams	6	3.25	0	.01
Bare Ground	80	1.25	3.25	1.31

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 06, Daniels Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.7	48.0 (11.9)	7.0	42.9	31.1	26.0	3.6	19.0	227.2	.3

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 6

Type	Quadrat Frequency '96
Rabbit	8
Elk	24
Deer	23

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 6

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	89	5	5	-	-	-	-	-	-	-	10	-	-	-	666			10
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	83	32	14	-	-	-	-	-	-	-	46	-	-	-	3066	14	17	46
	89	3	7	27	-	-	-	-	-	-	36	1	-	-	2466	12	13	37
	96	72	45	3	-	-	-	-	-	-	120	-	-	-	2400	17	33	120
D	83	1	7	-	-	-	-	-	-	-	8	-	-	-	533			8
	89	3	-	2	-	-	-	-	-	-	5	-	-	-	333			5
	96	7	12	1	-	-	-	-	-	-	18	-	-	2	400			20
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	800			40
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		33%			00%			00%			-19%							
'89		23%			56%			00%			-13%							
'96		38%			03%			01%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4265	Dec:	12%			
												'89	3465		10%			
												'96	3000		13%			
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	41	39	1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	47	39	1
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	32	55	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			00%			+53%							
'96		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'89	66		-			
												'96	140		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total								
		1	2	3	4											
Chrysothamnus viscidiflorus viscidiflorus																
M	83	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	3	-	-	-	7	-	-	-	140	9	19	7
X	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		00%		00%		00%										
'89		00%		00%		00%										
'96		00%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-			
										'89	0		-			
										'96	140		-			
Gutierrezia sarothrae																
S	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	27	-	-	-	-	-	-	27	-	-	-	900			27
	96	3	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	2	-	-	-	-	-	-	2	-	-	-	133			2
	89	4	-	-	-	-	-	-	4	-	-	-	266			4
	96	20	-	-	2	-	-	-	22	-	-	-	440			22
M	83	32	-	-	-	-	-	-	32	-	-	-	2133	14	15	32
	89	173	-	-	-	-	-	-	173	-	-	-	11533	8	9	173
	96	103	-	-	-	-	-	-	103	-	-	-	2060	8	11	103
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		00%		00%		00%		+81%								
'89		00%		00%		00%		-79%								
'96		00%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	2266	Dec:	-			
										'89	11799		-			
										'96	2500		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	10	-	-	-	-	-	-	-	-	10	-	-	-	333		10	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	7	10	8
	89	5	-	-	-	-	-	-	-	-	4	-	1	-	333	3	6	5
	96	35	-	-	-	-	-	-	-	-	35	-	-	-	700	4	8	35
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	1	-	-	1	66		2	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+27%							
'89		00%			00%			12%			+ 4%							
'96		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	0%			
												'89	732		9%			
												'96	760		0%			
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	20	-	-	3	-	-	-	23	-	-	-	460	39	37	23
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'96		00%			82%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'96	560		-			

Trend Study 17-10-96

Study site name: Upper Big Hollow .

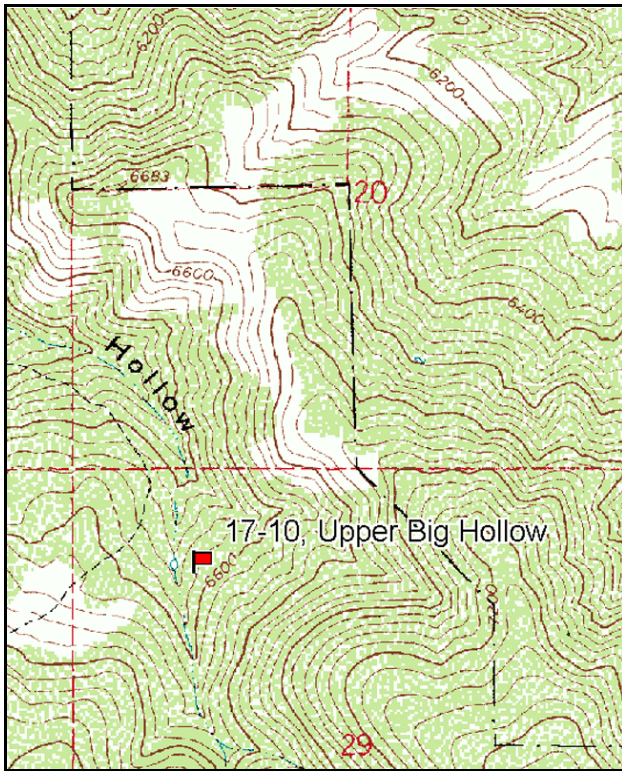
Vegetation type: Gambel Oakbrush .

Compass bearing: frequency baseline 167 degrees magnetic.

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

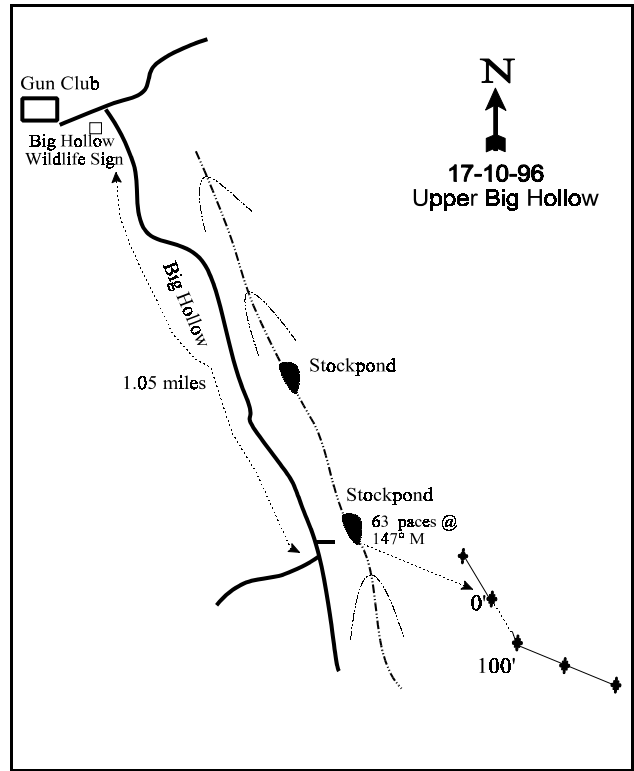
LOCATION DESCRIPTION

Beginning at the Heber Valley gun club located at the mouth of Big Hollow, proceed west for 0.10 miles to the main road which goes up Big Hollow. Proceed southerly up Big Hollow for 1.05 miles to a small turnoff (slightly above the second stockpond). From the southeast corner of the stockpond, walk 63 paces at an azimuth of 147 degrees magnetic, to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Charleston

Township 4S, Range 5E, Section 29



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4477497 N 465063 E

## DISCUSSION

### Upper Big Hollow - Trend Study No. 17-10

\*\*\*SUSPENDED - This site was suspended in 2002. The narrative and data tables are included from the 1996 report.

This study is located on Division property in the upper part of Big Hollow, an area used for transitional range by deer during spring and fall and to some extent for fawn rearing in summer. Winter use is restricted to open, mild winters. The area is grazed by cattle and there is a stock pond about 150 yards down the slope. Elevation at the site is 6,600 feet, slope is 20% to 25%, and exposure is west to northwest. The range type is Gambel oakbrush, which was burned and seeded in 1976. The area is currently characterized by a vigorous seeded grass understory, a patchy overstory of resprouted oak and other fire tolerant shrubs, and a moderate number of mountain big sagebrush.

Textural analysis indicates a clay soil with a pH of 6.1. Soil temperature is 41°F measured at 15 inches. The soil is moderately deep with rocks on the soil surface and throughout the profile. Gravel on the soil surface helps protect the soil from erosion. Erosion does not appear to be occurring presently, but many shrubs are pedestalled on the uphill slope indicating soil movement in the past. The accelerated erosion which occurred immediately after the fire has been largely arrested. Vegetative cover is estimated to be 45%, nearly half of which is contributed by grasses. Rock and pavement cover combine to provide 8% cover. Litter cover is estimated at 48%, contributed by perennial grasses and leaves from the surrounding oakbrush. Bare ground cover is estimated at 8% with little soil movement visible.

Mountain big sagebrush has an estimated density of 1,600 plants/acre. These plants exhibit light to moderate utilization and good vigor in 1996. Decadency has declined since 1989 to only 6%. Since 1989, age structure has remained nearly the same with 1/3 of the population classified as young and 2/3 classified as mature. The size of the oakbrush on the burn in Upper Big Hollow has stabilized. Seeded grasses are abundant and seem to be competing well with the oak. The clones on the site are mostly 3-5 feet in height while the clones above and below the site are 8-12 feet in height. Utilization has declined since 1989 when many of the plants were classified as moderately hedged. Snowberry has an estimated density of 440 plants/acre with light hedging. Saskatoon serviceberry show moderate to heavy utilization with an estimated density of 260 plants/acre.

The vigorous and productive seeded grasses continue to thrive in the herbaceous understory. Sheep fescue offers the most grass cover and has significantly increased in nested frequency since 1983. Kentucky bluegrass has significantly increased since 1989. Other abundant grasses include intermediate wheatgrass, smooth brome, and orchard grass. Sum of nested frequency for forbs has decreased since 1983 with a high in 1989. Alfalfa continues to be important in the community and has not significantly changed over any of the years. Wild onion, which was numerous in the past, was only sampled once in 1996. Longleaf phlox also decreased significantly since 1989.

### 1983 APPARENT TREND ASSESSMENT

Soil trend is improving with the buildup of litter and organic matter. Vegetative cover is good and probably increasing. Vegetative composition is becoming more oak dominated with a concurrent small decrease in grass productivity. Other shrub species are currently stable but may decline in the future. Forb density is lower than optimum and is affected by competition with grasses and shrubs.



## 1989 TREND ASSESSMENT

The amount of bare soil declined from 30 to 20% due to increases in vegetative cover and pavement. The soil trend is improving. Trend for browse is up. Mountain big sagebrush increased in density, and young plants are abundant. Serviceberry also slightly increased in density. Oakbrush expansion may eventually have a negative impact on the understory, but it currently receives enough utilization and competition to slow any increase. The herbaceous understory has an upward trend with sum of nested frequency of grasses and forbs showing large increases. Composition and diversity are good.

### TREND ASSESSMENT

soil - slightly up (4)

browse - up (5)

herbaceous understory - up (5)

## 1996 TREND ASSESSMENT

Soil on the site appears to be stable with adequate vegetative and litter cover to protect against erosion. Mountain big sagebrush has a healthy age structure with young plants coming into the community. The oakbrush around the site have stayed nearly the same size since 1989 and do not appear to be encroaching into the sagebrush-grass opening. The browse trend is stable. Sum of nested frequency for grasses has stayed nearly the same since 1989. The perennial grasses provide good soil protection and forage for wildlife. Sum of nested frequency for forbs has greatly declined since 1989 with many of the perennial species showing significant decreases. Alfalfa continues to do well while many of the native species appear to be decreasing in abundance. Herbaceous trend is slightly downward.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly downward (2)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 10

Type	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'96	'83	'89	'96	Cover %
G	Agropyron cristatum	5	3	-	3	1	-	-
G	Agropyron intermedium	<sub>a</sub> 83	<sub>b</sub> 159	<sub>b</sub> 111	32	56	41	3.04
G	Agropyron spicatum	6	2	7	3	1	3	.12
G	Bromus inermis	<sub>a</sub> 132	<sub>b</sub> 191	<sub>ab</sub> 167	54	66	57	3.40
G	Dactylis glomerata	89	111	87	42	45	37	3.05
G	Festuca ovina	<sub>a</sub> 45	<sub>ab</sub> 66	<sub>b</sub> 95	19	30	39	6.89
G	Poa fendleriana	17	30	19	9	13	7	.45
G	Poa pratensis	<sub>a</sub> 42	<sub>a</sub> 32	<sub>b</sub> 104	16	14	33	3.74
G	Poa secunda	<sub>a</sub> -	<sub>c</sub> 40	<sub>b</sub> 18	-	18	8	.06
G	Stipa lettermani	-	-	10	-	-	4	.07
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		419	634	618	178	244	229	20.85
Total for Grasses		419	634	618	178	244	229	20.85

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'96	'83	'89	'96	'96
F	<i>Achillea millefolium</i>	34	21	13	13	10	5	.24
F	<i>Agoseris glauca</i>	<sub>a</sub> 8	<sub>b</sub> 65	<sub>a</sub> 2	4	29	2	.01
F	<i>Alyssum alyssoides</i> (a)	-	-	8	-	-	3	.01
F	<i>Allium</i> spp.	<sub>b</sub> 53	<sub>c</sub> 199	<sub>a</sub> 1	26	76	1	.00
F	<i>Arabis</i> spp.	<sub>a</sub> 16	<sub>b</sub> 64	<sub>a</sub> 19	11	29	10	.08
F	<i>Astragalus</i> spp.	4	4	-	2	2	-	-
F	<i>Calochortus nuttallii</i>	<sub>b</sub> 10	<sub>ab</sub> 8	<sub>a</sub> -	5	3	-	-
F	<i>Cirsium</i> spp.	-	3	-	-	1	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	4	-	-	2	.01
F	<i>Crepis acuminata</i>	<sub>a</sub> -	<sub>b</sub> 16	<sub>a</sub> -	-	8	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	51	-	-	23	.16
F	<i>Eriogonum racemosum</i>	1	-	-	1	-	-	-
F	<i>Helianthus annuus</i> (a)	-	2	-	-	1	-	-
F	<i>Lathyrus brachycalyx</i>	3	12	8	1	6	5	.30
F	<i>Lathyrus pauciflorus</i>	1	-	-	1	-	-	-
F	<i>Lactuca pulchella</i>	<sub>b</sub> 6	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-
F	<i>Lomatium triternatum</i>	-	5	-	-	2	-	.00
F	<i>Machaeranthera canescens</i>	-	2	-	-	1	-	-
F	<i>Medicago sativa</i>	78	99	83	34	45	40	2.10
F	<i>Microsteris gracilis</i> (a)	-	-	9	-	-	3	.01
F	<i>Orthocarpus</i> spp. (a)	3	-	7	1	-	4	.12
F	<i>Phlox longifolia</i>	<sub>a</sub> 25	<sub>b</sub> 99	<sub>a</sub> 10	14	44	5	.05
F	<i>Polygonum douglasii</i> (a)	-	-	36	-	-	19	.11
F	<i>Taraxacum officinale</i>	2	-	3	1	-	1	.00
F	<i>Tragopogon dubius</i>	6	2	1	3	1	1	.03
F	<i>Viguiera multiflora</i>	<sub>c</sub> 86	<sub>b</sub> 40	<sub>a</sub> 11	38	22	5	.07
F	<i>Zigadenus paniculatus</i>	1	4	1	1	2	1	.00
Total for Annual Forbs		3	2	115	1	1	54	0.44
Total for Perennial Forbs		334	643	152	160	281	76	2.93
Total for Forbs		337	645	267	161	282	130	3.38

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

BROWSE TRENDS --

Herd unit 17 , Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'96	'96
B	Amelanchier alnifolia	11	.70
B	Artemisia tridentata vaseyana	41	4.15
B	Chrysothamnus nauseosus consimilis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	-
B	Gutierrezia sarothrae	14	-
B	Quercus gambelii	32	11.56
B	Symphoricarpos oreophilus	17	.80
Total for Browse		118	17.21

CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 10

Species	Percent Cover
	'96
Quercus gambelii	24.4

BASIC COVER --

Herd unit 17 , Study no: 10

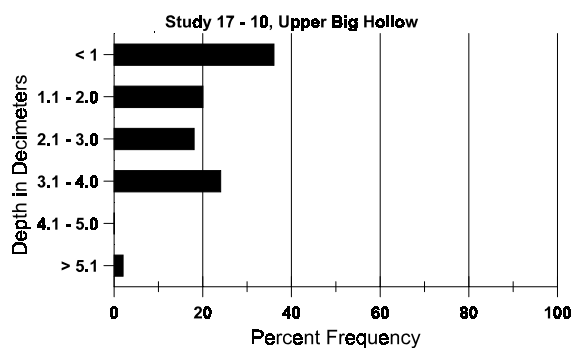
Cover Type	Nested Frequency	Average Cover %		
		'96	'83	'89
Vegetation	368	4.50	14.50	44.76
Rock	226	8.25	6.25	6.83
Pavement	152	7.75	16.75	1.21
Litter	393	49.00	42.25	48.45
Cryptogams	55	.25	.50	.53
Bare Ground	192	30.25	19.75	7.69

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 10, Upper Big Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.7	41.4 (15.4)	6.1	34.2	21.4	44.4	3.3	7.9	217.6	.4

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 10

Type	Quadrat Frequency '96
Rabbit	1
Elk	3
Deer	3
Cattle	2

## BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 10

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Amelanchier alnifolia													
Y	83	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	0		0	
	96	-	-	2	-	-	-	-	-	2		2	
M	83	2	2	-	-	-	-	-	-	4	-	-	4
	89	4	2	-	-	-	-	-	-	6	-	-	6
	96	2	4	5	-	-	-	-	-	11	-	-	11
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		50%		00%		00%		+34%					
'89		33%		00%		00%		+23%					
'96		31%		54%		00%							
Total Plants/Acre (excluding Dead & Seedlings)						'83	133	Dec:	-				
						'89	200		-				
						'96	260		-				

A Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	-	-	-	33			1
	96	3	-	-	1	-	-	-	-	-	-	-	-	80			4
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	12	6	-	-	-	-	-	-	-	-	-	-	600			18
	96	23	2	-	1	-	-	-	-	-	-	-	-	520			26
M	83	15	2	-	-	-	-	-	-	-	-	-	-	566	15	16	17
	89	10	17	-	-	-	-	-	-	-	-	-	-	900	20	28	27
	96	31	13	4	1	-	-	-	-	-	-	-	-	980	21	36	49
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	4	-	-	-	-	-	-	-	-	-	-	233			7
	96	-	1	-	-	-	-	-	-	-	-	-	1	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		12%			00%			00%			+67%						
'89		52%			00%			00%			-8%						
'96		20%			05%			03%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	566	Dec:	0%		
												'89	1733		13%		
												'96	1600		6%		
<i>Chrysothamnus nauseosus consimilis</i>																	
M	83	1	-	-	-	-	-	-	-	-	-	-	-	33	20	14	1
	89	1	-	-	-	-	-	-	-	-	-	-	-	33	20	21	1
	96	-	-	-	1	-	-	-	-	-	-	-	-	20	37	28	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+0%						
'89		00%			00%			00%			-39%						
'96		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-		
												'89	33		-		
												'96	20		-		
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
M	83	8	-	-	-	-	-	-	-	-	-	-	-	266	11	14	8
	89	10	-	-	-	-	-	-	-	-	-	-	-	333	13	17	10
	96	-	-	-	2	-	-	-	-	-	-	-	-	40	16	20	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+20%						
'89		00%			00%			00%			-88%						
'96		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	266	Dec:	-		
												'89	333		-		
												'96	40		-		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	29	7	-	6	-	-	-	-	-	42	-	-	-	840		42
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	96	10	-	-	15	-	-	-	-	-	25	-	-	-	500	-	25
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	3	2	-	1	-	-	-	-	-	6	-	-	-	120		6
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%									
'89		00%			00%			00%									
'96		12%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%			
											'89	0		0%			
											'96	1460		8%			
<i>Quercus gambelii</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	8	-	-	-	-	-	11	-	-	-	366		11
	96	5	-	-	2	-	-	-	-	-	7	-	-	-	140		7
Y	83	10	-	-	-	-	-	-	-	10	-	-	-	333		10	
	89	31	25	-	9	-	-	6	-	33	38	-	-	2366		71	
	96	41	-	-	-	-	-	-	-	38	3	-	-	820		41	
M	83	42	8	-	-	-	-	-	-	45	5	-	-	1666	36	29	50
	89	6	23	-	-	-	-	-	-	29	-	-	-	966	46	28	29
	96	91	3	-	5	-	-	8	-	96	11	-	-	2140	42	51	107
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	5	23	-	-	-	-	-	-	-	28	-	-	933		28	
	96	2	-	-	1	-	-	-	-	3	-	-	-	60		3	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		13%			00%			00%			+53%						
'89		55%			00%			00%			-29%						
'96		02%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	1999	Dec:	0%			
											'89	4265		22%			
											'96	3020		2%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
Y	83	2	-	-	-	-	-	-	-	-	1	-	1	-	66		2	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
M	83	12	4	-	-	-	-	-	-	-	11	5	-	-	533	19	23	16
	89	32	-	-	1	-	-	-	-	-	33	-	-	-	1100	22	26	33
	96	18	-	-	4	-	-	-	-	-	22	-	-	-	440	21	37	22
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		22%			00%			06%			+46%							
'89		00%			00%			00%			-60%							
'96		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	599	Dec:	-			
												'89	1100		-			
												'96	440		-			

Trend Study 17-20-96

Study site name: Lake Creek Road.

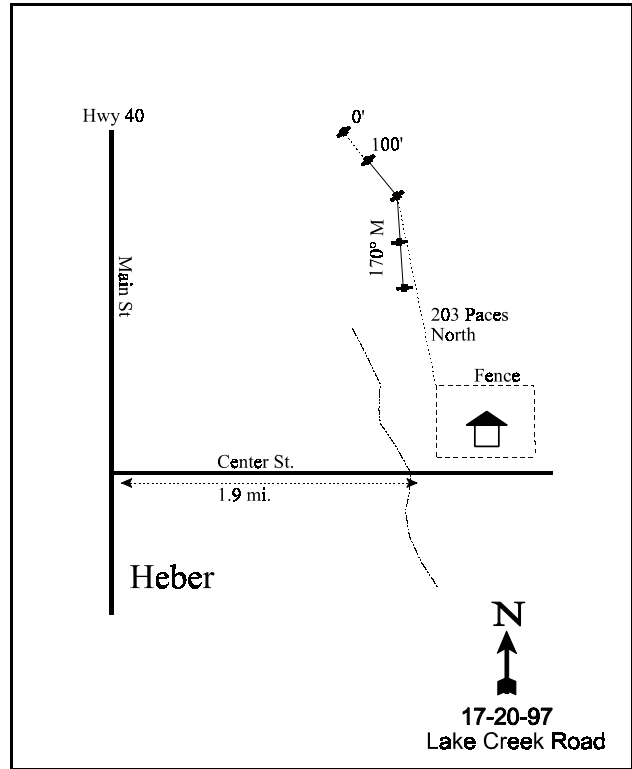
Vegetation type: Big Sagebrush.

Compass bearing: frequency baseline 146 degrees magnetic.

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

LOCATION DESCRIPTION

From Main and Center Street in Heber, proceed east 1.9 miles to a point where the road crosses an irrigation canal. Just east of the canal on the north side of the road is a house enclosed by a chain link fence. From the northwest corner of the fence, walk 203 paces north (approximately 1,000 feet) at 348 degrees true to the 100-foot end of the baseline. The 0-foot end is marked by browse tag # 7023.



Map Name: Heber

Diagrammatic Sketch

Township 3S, Range 5E, Section 33

GPS: NAD 27, UTM 12S 4484407 N 468160 E



## DISCUSSION

### Lake Creek Road - Trend Study No. 17-20

\*\*\*SUSPENDED - This site was suspended in 2002 as it is no longer representative of critical big game winter range. The site has an overstory of juniper and an understory of oak. The site primarily serves as thermal cover for wildlife which feed in the agriculture fields nearby. The narrative and data tables are included from the 1996 report.

This study samples one of several isolated knolls and ridge tops occupied by Utah juniper that lie east of Heber City and north of Lake Creek Road. These areas are extremely critical to wintering deer and exhibit levels of deer and livestock use that can only be classed as extreme. The study lies on a narrow ridge top oriented in a north-south direction. Exposure is south to southeast with the slope varying from nearly level to about 15%. Elevation varies between 5,860 feet and 6,000 feet. Deer use appears high in 1996 and numerous deer carcasses were found in the area.

Vegetatively, the area varies from rather open juniper with a strong but low-growing Gambel oak understory to a nearly closed stand of mature junipers with relatively little understory. Other shrubs such as mountain big sagebrush, true and curleaf mountain mahogany, and antelope bitterbrush occur occasionally throughout the area but always show excessive and heavy utilization. More than 40 years of nearly year-long cattle grazing have greatly depleted the herbaceous understory.

Soil is classified as the "Brad-Rock Outcrop Complex." Where soil exists within this mapping unit, it is very shallow and very cobbly. Textural analysis indicates a sandy loam with a neutral pH. Depth to bedrock seldom exceeds 10 inches and is more often in the neighborhood of 4 to 6 inches. The study area has large expanses of exposed reddish-brown sandstone which has been extensively fractured and thus provides numerous cracks which trap sediment and provide a plant growth medium. Brad soils are highly permeable and not surprisingly, have low available water capacity and restricted root zones. The erosion hazard is high, but overland movement of soil is often interrupted by catchments and cracks in the exposed conditions, any improvement in trend will be very slow. Rock and pavement cover combined have decreased along with bare ground cover. Litter cover is similar to that estimated in 1990 at 38%. Vegetative cover is estimated at 28% in 1996.

This area is characterized by a sparse juniper stand underlain by a very low growing Gambel oak understory composed predominantly of young re-sprouts. Scattered throughout the area are a variety of other browse plants and grasses. This particular site should not be regarded as a representative sample of the total plant community on the juniper ridges. It has more plant diversity and production than most of the surrounding area.

The key browse species is Gambel oak. It seems to be the only species that responds positively to browsing use by sprouting profusely and thus increasing production while availability is unaffected. Oak also seems particularly well suited for growth in the many rock crevices and shallow soil pockets in this area. In 1996, the estimated density of Gambel oak was 5,860 stems/acre. All other browse species are of secondary importance on this site and will likely remain so.

Herbaceous vegetation is represented by a mix of annual and perennial grasses and relatively few forbs. Annual grasses dominate the understory and include cheatgrass, Japanese brome, and rattail fescue. Pale alyssum dominates the forbs with most other species being incidental. Neither grasses or forbs are highly productive. This is a site where Gambel oak will continue to dominate but will remain low-growing because of browsing and soil deficiencies. Species such as antelope bitterbrush and mountain mahogany may persist; but will not become important producers. Increaser shrubs such as pricklypear cactus and broom snakeweed may increase slightly but will eventually be limited by oak and the poor site potential because of poor soil conditions.

### 1984 APPARENT TREND ASSESSMENT

Soil trend appears stable. This is a shallow rocky soil with poor potential. It is unlikely to degrade much further than it already has. Similarly, the potential for soil building and erosion control is equally low. Vegetative trend appears to have deteriorated slightly over the past few years because of declines in abundance and production of mountain big sagebrush and highlining of Utah juniper. However, neither condition can get much worse so trend appears stable. Gambel oak has increased its production to at least partially compensate for the impairment of juniper production and availability. Grasses have increased at least temporarily, but are not a significant competitive factor.

### 1990 TREND ASSESSMENT

The signs of past heavy use of this site are obvious in the highlined juniper and depleted understory. Use since 1984 has been more moderate in terms of deer, although several fawn carcasses were discovered. Use by livestock, controlled by the private landowner, appears to be limited to spring and fairly light on this site. Preferred browse species such as true and curleaf mountain mahogany, big sagebrush, and bitterbrush are rare and heavily hedged. The key species is Gambel oak, which provides the bulk of the available forage. The oak are moderately to heavily hedged, but use does not adversely impact the sprouting oakbrush. Overall the site has experienced little change in the browse component. The junipers have been highlined, and except for the young trees, are unavailable. Juniper density is 92 trees/acre. Grasses, including bluebunch wheatgrass and Indian ricegrass, increased in frequency. The individual grasses are larger in size this time leading to a higher cover estimate. The very shallow soil on the sandstone ridge has adequate protection from erosion.

#### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

### 1996 TREND ASSESSMENT

Soil trend is slightly upward with a decrease in bare ground cover. No erosion was apparent on the site in 1996. The browse trend is stable and still in poor condition. The most preferred browse species are rare and heavily hedged. Gambel oak is the key browse species and exhibits moderate hedging. Decadency has declined since 1990 and vigor is better. The herbaceous understory is sparse and dominated by annual species. Sum of nested frequency for perennial species has stayed nearly the same since 1990. Herbaceous trend is stable and in poor condition.

#### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 20

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'84	'90	'96	'84	'90	'96	'96
G	Agropyron spicatum	20	31	18	9	12	8	.31
G	Bromus japonicus (a)	-	-	35	-	-	11	.37
G	Bromus tectorum (a)	-	-	250	-	-	83	2.89
G	Carex spp.	1	4	8	1	1	3	.30
G	Festuca myuros (a)	-	-	79	-	-	31	.69
G	Oryzopsis hymenoides	4	14	-	2	6	-	-
G	Poa bulbosa	-	-	3	-	-	1	.03
G	Poa fendleriana	3	1	8	2	1	4	.02
G	Poa pratensis	<sub>a</sub> 8	<sub>a</sub> 13	<sub>b</sub> 59	5	7	19	.97
G	Poa secunda	<sub>a</sub> 20	<sub>b</sub> 64	<sub>b</sub> 64	10	32	26	.98
G	Sporobolus cryptandrus	<sub>a</sub> 5	<sub>a</sub> 6	<sub>b</sub> 41	3	3	18	1.09
G	Stipa comata	4	7	-	2	4	-	-
Total for Annual Grasses		0	0	364	0	0	125	3.96
Total for Perennial Grasses		65	140	201	34	66	79	3.72
Total for Grasses		65	140	565	34	66	204	7.68
F	Alyssum alyssoides (a)	-	-	138	-	-	54	.37
F	Arabis spp.	-	1	1	-	1	1	.03
F	Artemisia ludoviciana	-	-	1	-	-	1	.00
F	Chenopodium fremontii (a)	-	-	1	-	-	1	.03
F	Collinsia parviflora (a)	-	-	2	-	-	1	.00
F	Erigeron pumilus	-	1	10	-	1	4	.12
F	Galium aparine (a)	-	-	4	-	-	2	.03
F	Hackelia patens	-	6	1	-	3	1	.03
F	Heterotheca villosa	13	27	16	7	14	6	.40
F	Lomatium spp.	-	3	-	-	1	-	-
F	Microsteris gracilis (a)	-	-	4	-	-	1	.00
F	Oxybaphus linearis	1	-	-	1	-	-	-
F	Polygonum douglasii (a)	-	-	5	-	-	2	.01
F	Solidago missouriensis	-	2	1	-	1	1	.03
F	Tragopogon dubius	-	3	4	-	1	2	.01
F	Unknown forb-perennial	-	3	-	-	1	-	-
F	Viguiera multiflora	-	10	2	-	3	1	.03
Total for Annual Forbs		0	0	154	0	0	61	0.45
Total for Perennial Forbs		14	56	36	8	26	17	0.65
Total for Forbs		14	56	190	8	26	78	1.11

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 20

Type	Species	Strip Frequency	Average Cover %
		'96	'96
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata vaseyana	3	.18
B	Cercocarpus ledifolius	1	-
B	Gutierrezia sarothrae	28	.71
B	Juniperus osteosperma	4	.41
B	Mahonia repens	2	-
B	Opuntia spp.	28	.58
B	Quercus gambelii	61	14.14
Total for Browse		128	16.03

CANOPY COVER  
Herd unit 17 , Study no: 20

Species	Percent Cover
	'96
Juniperus osteosperma	.6

Point-Quarter Tree Data  
Herd unit 17 , Study no: 20

Species	Trees per Acre	Average diameter (in)
	'96	'96
Juniperus osteosperma	135	4.7

BASIC COVER --  
Herd unit 17 , Study no: 20

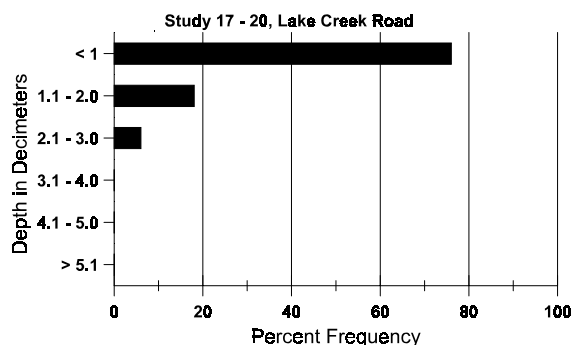
Cover Type	Nested Frequency	Average Cover %		
		'84	'90	'96
Vegetation	324	1.00	5.00	28.23
Rock	291	25.25	35.75	31.14
Pavement	22	.25	.25	.07
Litter	366	54.75	38.50	37.81
Cryptogams	150	12.75	9.25	6.61
Bare Ground	118	6.00	11.25	2.54

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 20, Lake Creek Road

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.4	55.8 (12.0)	6.6	58.2	21.4	20.4	2.1	26.0	156.8	.3

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 20

Type	Quadrat Frequency '96
Rabbit	13
Elk	10
Deer	46
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 20

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total		
	1	2	3	4	5	6	7	8	9	1	2	3	4					
Amelanchier alnifolia																		
M	'84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'96	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
	'84	00%			00%			00%										
	'90	00%			00%			00%										
	'96	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	0	Dec:	-			
												'90	0		-			
												'96	20		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40	11	18	2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		00%			00%			00%										
'90		00%			00%			00%										
'96		33%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	0	Dec:	-			
												'90	0		-			
												'96	60		-			
<i>Cercocarpus ledifolius</i>																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	1	1	-	-	-	20	26	45	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		00%			00%			00%										
'90		00%			00%			00%										
'96		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	0	Dec:	-			
												'90	0		-			
												'96	20		-			
<i>Gutierrezia sarothrae</i>																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	84	16	1	-	-	-	-	-	-	-	17	-	-	-	1133	10	12	17
	90	20	-	-	-	-	-	-	-	-	18	-	2	-	1333	9	8	20
	96	74	-	-	-	-	-	-	-	-	74	-	-	-	1480	9	14	74
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	90	4	-	-	-	-	-	-	-	-	3	-	1	-	133		4	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'84		06%			00%			00%			+26%							
'90		00%			00%			12%			-2%							
'96		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	1133	Dec:	0%			
												'90	1532		9%			
												'96	1500		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	59 33	1	
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	- -	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'84	00%			00%			00%			-50%							
	'90	00%			00%			00%			+18%							
	'96	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	132	Dec:	-			
												'90	66		-			
												'96	80		-			
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	90	2	-	-	-	-	-	5	-	-	6	1	-	-	233		7	
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	84	70	-	-	-	-	-	-	-	-	53	-	17	-	4666	3 5	70	
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	266	6 5	4	
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	2 3	4	
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	90	-	1	-	-	-	-	1	-	-	2	-	-	-	133		2	
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'84	00%			00%			24%			-87%							
	'90	08%			00%			00%			-81%							
	'96	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'84	4799	Dec:	3%			
												'90	632		21%			
												'96	120		0%			

A Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
	1	2	3	4	5	6	7	8	9	1	2	3	4			
Opuntia spp.																
S	84	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	90	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	3	-	-	-	-	-	-	-	-	-	-	-	60		3
Y	84	8	-	-	-	-	-	-	-	-	-	-	-	533		8
	90	14	-	-	-	-	-	-	-	-	-	-	-	933		14
	96	7	-	-	-	-	-	-	-	-	-	-	-	140		7
M	84	39	-	-	-	-	-	-	-	-	-	-	-	2600	8 20	39
	90	21	1	-	-	-	-	1	-	-	-	-	-	1533	6 11	23
	96	33	-	-	-	-	-	-	-	-	-	-	-	660	5 12	33
D	84	1	-	-	-	-	-	-	-	-	-	-	-	66		1
	90	17	1	-	2	-	-	-	-	-	-	-	-	1333		20
	96	-	-	-	-	-	-	-	-	-	-	-	-	0		0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	90	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'84		00%			00%			08%			+16%					
'90		04%			00%			25%			-79%					
'96		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'84	3199	Dec:	2%		
											'90	3799		35%		
											'96	800		0%		
Quercus gambelii																
S	84	3	-	-	-	-	-	-	-	-	-	-	-	200		3
	90	28	4	-	11	-	-	7	-	-	-	-	-	3333		50
	96	29	-	-	-	-	-	-	-	-	-	-	-	580		29
Y	84	95	50	5	-	-	-	-	-	-	-	-	-	10000		150
	90	52	106	24	-	2	-	2	-	-	-	-	-	12400		186
	96	50	34	-	-	-	-	-	-	-	-	-	-	1680		84
M	84	6	22	43	-	-	-	-	-	-	-	-	-	4733	23 17	71
	90	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	96	27	153	18	-	-	-	-	-	-	-	-	-	3960	29 34	198
D	84	-	4	21	-	-	-	-	-	-	-	-	-	1666		25
	90	6	15	8	1	-	-	1	-	-	-	-	-	2066		31
	96	1	4	5	-	1	-	-	-	-	-	-	-	220		11
X	84	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	90	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	96	-	-	-	-	-	-	-	-	-	-	-	-	340		17
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'84		31%			28%			07%			-12%					
'90		57%			15%			05%			-59%					
'96		66%			08%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'84	16399	Dec:	10%		
											'90	14466		14%		
											'96	5860		4%		



Trend Study 17-21-97

Study site name: Box Elder Canyon.

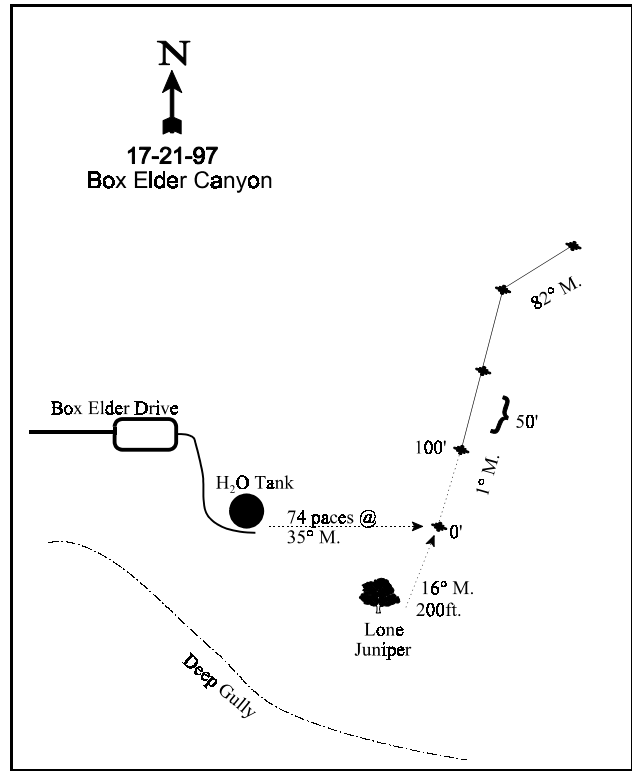
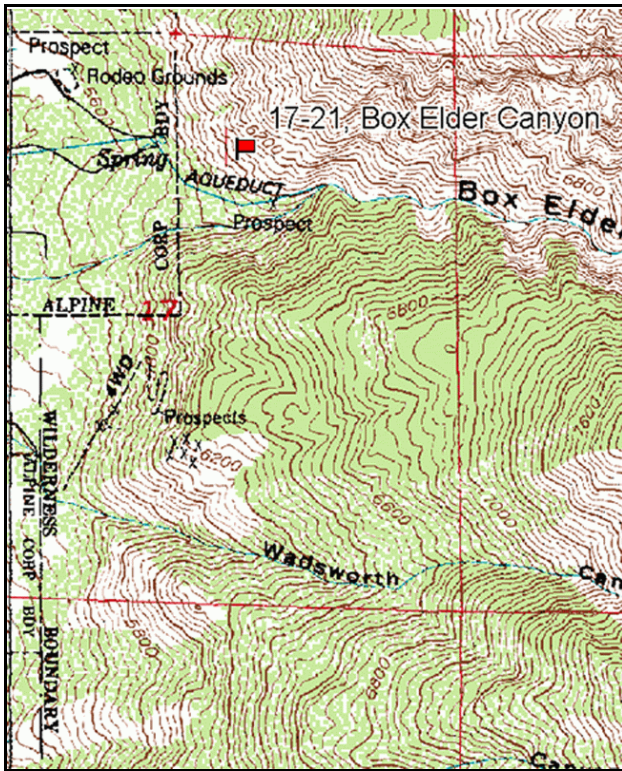
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 1 degrees magnetic (line 4 @ 82°M).

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

LOCATION DESCRIPTION

From Alpine, proceed northeast to the road which runs up Box Elder Canyon. Proceed up Box Elder Canyon until you come to a cement spring water collection structure, on the north side of the road. From the collection system, proceed 0.15 miles to the east, to an aqueduct breather pipe on the south side of the road. From the breather pipe, walk 74 paces at an azimuth of 35 degrees magnetic to a lone Utah juniper on the hillside. From the juniper, the 0-foot baseline stake is 200 feet away at an azimuth of 16 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag, # 3811, attached.



Map Name: Timpanogos Cave

Diagrammatic Sketch

Township 4S, Range 2E, Section 17

GPS: NAD 27, UTM 12S 4480673 N 437082 E

## DISCUSSION

### Box Elder Canyon - Trend Study No. 17-21

\*\*\*SUSPENDED - This site was suspended in 2002.

This study has in the past been thought of as critical deer winter range located at the mouth of Box Elder Canyon. It has an elevation of 6,700 feet and lies on a steep (60-65%) south to southwest slope. Like other similar sites along the Wasatch Front, the plant community is highly variable. Patches of Gambel oak, curleaf mountain mahogany, and true mountain mahogany are separated by larger openings dominated by annual and perennial grasses and broad-leafed weeds. Utilization of the browse species was reportedly high in the past, but recent data indicates a drop in utilization. Pellet groups were low with some wildlife bedding areas noted in 1997.

For such a steep slope, soil conditions are remarkably good. Soil and rock movement downslope is occurring, but not at an accelerated rate. Soil is shallow and extremely rocky with a limestone parent material. Soil textural analysis indicates a loam with a neutral pH of 7.2. Phosphorous may be limiting in the soil. Effective rooting depth is estimated at 16 inches, although most of the deeper soil is found where cracks occur in the rocks below the soil surface. Litter and vegetative cover are adequate to prevent serious soil loss.

Gambel oak is the dominant browse species and occurs as low-growing clumps or patches with an average height for mature plants of 35 inches. In 1983, heavy hedging was reported on this mostly mature population. In 1989 hedging was reported as light with only 25% of the population classified as mature. In 1997 hedging was reported as light, but now the population is classified as mostly mature. A combination of heavy hedging and some insect and disease damage has adversely affected vigor in the past. Vigor was excellent in 1997.

True mountain mahogany is also present on the site. As with Gambel oak, hedging intensity has declined since the initial classification in 1983. In 1997 all plants encountered were classified as mature with good vigor. Broom snakeweed density has declined since 1989 to 1,220 plants/acre. No plants were encountered in 1983. This is a mature population with very few young and no seedlings reported in 1997. Other browse includes small numbers of stickyleaf low rabbitbrush, isolated junipers, curleaf mountain mahogany, and remnant plants of basin big sagebrush.

Grasses are most abundant in the shrub interspaces. Along with forbs, they are quite rare under the oak canopy. Perennial grasses are perhaps more abundant on this site than on many comparable areas. They provide a measurable amount of forage and are also important for soil retention. Bluebunch wheatgrass comprises the bulk of grass cover with annual grasses such as cheatgrass and rattlesnake brome present, but not overly abundant.

Forb composition is much less favorable than that of grasses. Most forbs are undesirable invader or increaser species. These include ragweed, storksbill, Canada thistle, and spurge. Perennials and biennials include Louisiana sage, spreading fleabane, milkweed, yellow salsify, and false aster.

### 1983 APPARENT TREND ASSESSMENT

In spite of a very steep slope, soil appears stable. However, the site is fragile and potentially erodible. If ground cover were to be depleted, serious erosion would follow. Vegetatively, Gambel oakbrush will likely continue as the dominant browse. Curleaf and true mountain mahogany occur frequently and are heavily hedged. Their trend is difficult to predict. Basin big sagebrush has been nearly eliminated and is unlikely to recover. Grass composition and density is above average and should be maintained for watershed protection purposes. Forb composition, from a forage quality standpoint, is poor.

## 1989 TREND ASSESSMENT

The soil trend is slightly downward. Rock and pavement cover increased with a concurrent decline in vegetative and litter cover. This mountain brush site maintains a stable vegetative trend. The data show only slight changes since the 1983 reading. There is less hedging on the young population in 1989 than in 1983. True mountain mahogany has a low density and a stable population. Forb occurrence is lower in 1989 than in 1983, but this is probably related more to the drought conditions and a mid-September reread date than to declines in the generally weedy species.

### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - stable, poor forb component (3)

## 1997 TREND ASSESSMENT

The soil trend is stable with no accelerated erosion present. Vegetative and litter cover are adequate to reduce erosion. Soil and rocks are accumulating on the uphill side of the shrubs and trees. The browse trend is also stable. The Gambel oak population does not appear to be expanding at this time. Hedging for all species is light and vigor is good. Grasses and forbs have changed very little since 1983. Bluebunch wheatgrass is the dominate grass with some annual species present. Forbs are sparse with most classified as invader or increaser species. Herbaceous understory trend is stable with a poor forb component.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, poor forb component (3)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 21

Type	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'97	'83	'89	'97	Cover %
G	Agropyron elongatum	<sub>b</sub> 14	<sub>a</sub> -	<sub>a</sub> -	7	-	-	-
G	Agropyron spicatum	<sub>a</sub> 127	<sub>c</sub> 176	<sub>b</sub> 132	49	69	55	3.84
G	Bromus brizaeformis (a)	-	-	118	-	-	43	.93
G	Bromus japonicus (a)	-	-	95	-	-	34	.63
G	Bromus tectorum (a)	-	-	179	-	-	68	.88
G	Poa pratensis	-	2	-	-	1	-	-
G	Poa secunda	22	12	16	9	5	6	.11
G	Stipa comata	20	36	23	7	17	10	.97
Total for Annual Grasses		0	0	392	0	0	145	2.45
Total for Perennial Grasses		183	226	171	72	92	71	4.93
Total for Grasses		183	226	563	72	92	216	7.38
F	Alyssum alyssoides (a)	-	-	256	-	-	84	2.00
F	Allium spp.	-	-	2	-	-	1	.00
F	Ambrosia psilostachya	<sub>a</sub> -	<sub>b</sub> 8	<sub>b</sub> 11	-	4	6	.15
F	Arabis drummondi	-	-	3	-	-	1	.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	<i>Artemisia ludoviciana</i>	<sub>b</sub> 87	<sub>b</sub> 63	<sub>a</sub> 28	37	30	13	.88
F	<i>Asclepias labrifloris</i>	4	1	3	3	1	2	.03
F	<i>Cirsium arvense</i>	14	4	-	8	4	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	7	-	-	3	.02
F	<i>Epilobium brachycarpum</i> (a)	-	-	1	-	-	1	.01
F	<i>Erodium cicutarium</i> (a)	-	-	3	-	-	1	.00
F	<i>Erigeron divergens</i>	<sub>b</sub> 34	<sub>a</sub> 3	<sub>a</sub> 13	15	1	6	.22
F	<i>Euphorbia</i> spp.	2	-	-	1	-	-	-
F	<i>Galium aparine</i> (a)	-	-	28	-	-	12	.24
F	<i>Hackelia patens</i>	9	2	3	4	1	2	.15
F	<i>Lygodesmia grandiflora</i>	-	-	1	-	-	1	.00
F	<i>Machaeranthera canescens</i>	3	3	3	1	1	1	.03
F	<i>Microseris nutans</i>	8	3	-	3	2	-	-
F	<i>Oenothera</i> spp.	-	-	8	-	-	3	.09
F	<i>Phlox longifolia</i>	-	1	-	-	1	-	-
F	<i>Stellaria jamesiana</i>	-	-	1	-	-	1	.00
F	<i>Tragopogon dubius</i>	19	4	7	9	3	4	.04
F	Unknown forb-annual (a)	-	-	20	-	-	10	.26
F	<i>Vicia americana</i>	-	2	-	-	1	-	-
Total for Annual Forbs		0	0	315	0	0	111	2.55
Total for Perennial Forbs		180	94	83	81	49	41	1.64
Total for Forbs		180	94	398	81	49	152	4.20

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 21

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	<i>Cercocarpus ledifolius</i>	0	.03
B	<i>Cercocarpus montanus</i>	15	5.80
B	<i>Gutierrezia sarothrae</i>	30	1.03
B	<i>Quercus gambelii</i>	36	11.59
Total for Browse		81	18.46

CANOPY COVER --

Herd unit 17 , Study no: 21

Species	Percent Cover '97
Juniperus osteosperma	.6
Quercus gambelii	1.4

BASIC COVER --

Herd unit 17 , Study no: 21

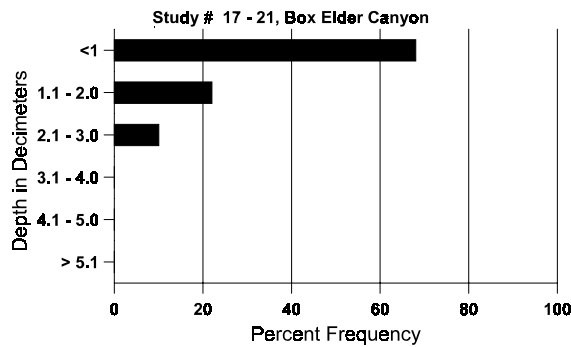
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	335	6.00	3.50	27.98
Rock	243	13.25	19.00	16.49
Pavement	226	6.00	16.00	7.09
Litter	393	68.75	56.75	42.16
Cryptogams	19	1.50	.25	.12
Bare Ground	229	4.50	4.50	14.78

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 21, Box Elder Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.1	57.36 (16.0)	7.2	46.0	29.1	24.9	2.9	6.0	76.8	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 21

Type	Quadrat Frequency '97
Rabbit	1
Elk	10
Deer	9

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 21

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<b>Cercocarpus ledifolius</b>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	106	109	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
<b>Cercocarpus montanus</b>																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	'83	-	2	5	-	-	-	-	-	-	4	1	2	-	233	46	39	7
	'89	1	4	-	-	2	-	-	-	-	7	-	-	-	233	43	53	7
	'97	10	5	1	-	3	-	-	-	-	19	-	-	-	380	65	73	19
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		29%			71%			29%			+12%							
'89		75%			13%			00%			+30%							
'97		42%			05%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	233	Dec:	-			
												'89	266		-			
												'97	380		-			
<b>Chrysothamnus viscidiflorus lanceolatus</b>																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	13	20	1
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	0		-			
												'97	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	42	-	-	-	-	-	-	-	-	42	-	-	-	1400	10	13	42
	97	58	-	-	-	-	-	-	-	-	58	-	-	-	1160	12	14	58
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	12	-	-	-	-	-	-	-	-	9	-	-	3	400		12	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			06%			-32%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	1800		22%				
											'97	1220		0%				
<i>Juniperus osteosperma</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	10	0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Quercus gambelii													
S	83	2	-	-	-	-	-	-	-	-	66		2
	89	13	-	-	1	-	-	-	-	-	466		14
	97	6	-	-	-	-	-	-	-	-	120		6
Y	83	-	5	6	-	-	-	-	-	-	366		11
	89	86	-	-	1	-	-	-	-	-	2900		87
	97	36	-	-	-	-	-	-	-	-	720		36
M	83	-	12	51	-	-	-	-	-	-	2100	31 23	63
	89	34	-	-	-	-	-	-	-	-	1133	32 16	34
	97	99	38	-	-	1	-	-	-	-	2760	35 43	138
D	83	-	-	2	-	-	-	-	-	-	66		2
	89	10	4	-	1	-	-	-	-	-	500		15
	97	-	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		22%		78%		43%		+44%					
'89		03%		00%		06%		-23%					
'97		22%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	2532	Dec:	3%
										'89	4533		11%
										'97	3480		0%



Trend Study 17-22-97

Study site name: Schoolhouse Springs.

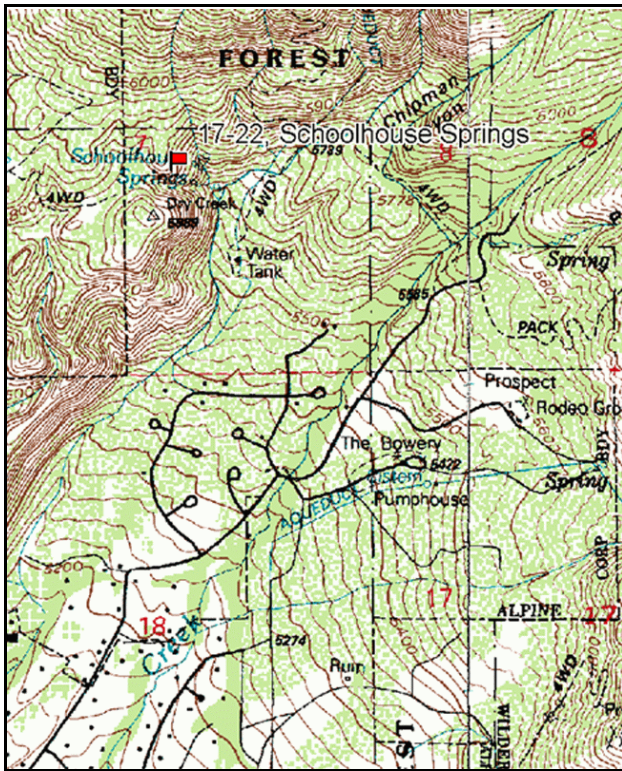
Vegetation type: Bitterbrush.

Compass bearing: frequency baseline 30 degrees magnetic.

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

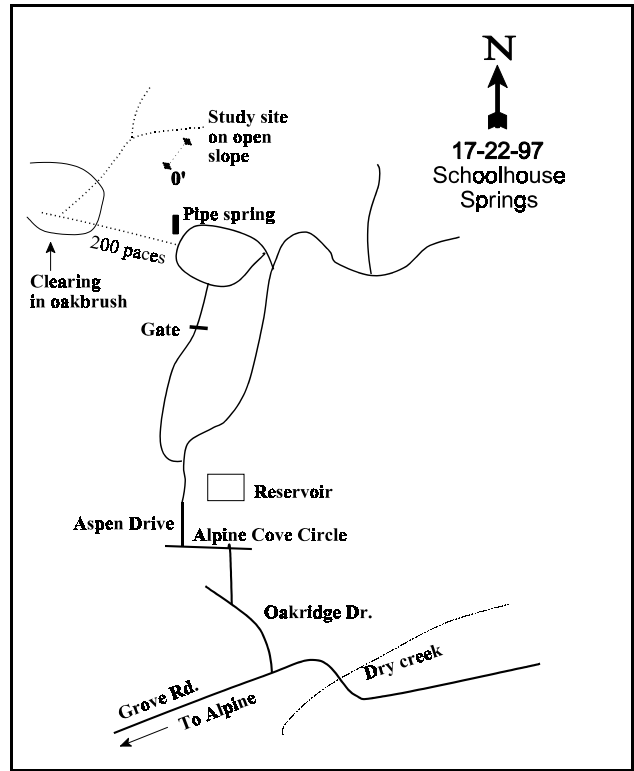
LOCATION DESCRIPTION

Access to this study site may change due to continued road and housing development. In 1989, the easiest way to access Schoolhouse Springs was from the end of the pavement on Aspen Drive (13560 North 4300 West). Continue northerly on a dirt road for approximately 0.5 miles to the springs and the trail to the study site. Walk west up the trail approximately 200 paces until you enter a sagebrush-grass clearing. To the right, near the edge of the clearing, a deer trail runs to the northeast along the hillside. Walk 55 paces along the trail, then turn and walk 9 paces south down to the 0-foot baseline stake. It is marked by a red browse tag #3908.



Map Name: Lehi

Township 45, Range 2E, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4481701 N 435465 E

## DISCUSSION

### Schoolhouse Springs - Trend Study No. 17-22

\*\*\*SUSPENDED - This site was suspended in 2002. The study area is very small with only a 100 foot baseline and does not represent critical winter range.

This study is located on deer winter range near the top of a small ridge west of Schoolhouse Springs. Slope varies from 20% near the top of the slope to 70% on the main portion of the slope. Aspect is south. The range type is mixed mountain brush varying from relatively open big sagebrush-bitterbrush areas to rather dense and tall growing Gambel oak and Rocky Mountain maple. Although few deer pellet groups were observed, browse utilization appeared to be moderate to heavy. Grazing of domestic cattle during summer has occurred in the past, but there are no signs that this still occurs.

Soil is a well drained stony or cobbly loam derived from granite and quartzite. The pH is 6.6 which is neutral with a soil temperature of 54°F at a depth of 17 inches. The soil is rapidly permeable and has poor water retention capabilities. Erosion potential is high when disturbed (USDA-SCS, 1972). Badly eroded horse and ORV trails in the immediate area are ample proof of erosion potential. The immediate study area is relatively intact with adequate vegetative and litter cover to keep erosion to a minimum, considering the steepness of the slope.

Available browse forage comes principally from Gambel oakbrush and antelope bitterbrush. Both species are considered important. However, bitterbrush is probably a better key species. In the more open areas it is the most abundant and most preferred shrub available. The bitterbrush population is composed of mature plants with a semi-prostrate growth habit. No seedling and few young plants were encountered in any year. Vigor is good even though plants are heavily hedged and have a 'clubbed' appearance. Height of the plants has stayed relatively the same over the years at about one foot. Mountain big sagebrush is also present in the openings and is irregularly distributed and less abundant than bitterbrush. Plants are light to moderately hedged. There are nearly as many dead plants present as there are young and mature plants combined. Most plants encountered in 1997 were classified as young with all exhibiting good vigor. Gambel oakbrush averaged over 4 feet tall in 1997 with forage utilization of the available portions variable. In 1983 it was suggested that it would be desirable to knock down or burn some of the over mature oak thickets to increase availability and understory production, which was then poor. This is still the case in 1997, although, many annual grasses and forbs are present making seeding after treatment with perennial species necessary.

Perennial grasses occur only occasionally with an overall decrease in abundance since 1983. In the more open areas, cheatgrass, rattlesnake brome, and Japanese brome comprise the bulk of herbaceous growth. These species are thick enough to provide severe competition with perennial seedlings and also constitute a fire hazard. Relatively few grasses or forbs grow within oak thickets.

Forbs are more diverse and numerous than perennial grasses. However, many are annuals, biennials, or poor value perennials. Production and watershed protection are fair, but forage quality is poor. Arrowleaf balsamroot is probably the best quality forb available.

### 1983 APPARENT TREND ASSESSMENT

Soil is stable with adequate protective ground cover to prevent erosion. However, soil protection is overly dependant on annuals for soil retention. The bulk of litter and live vegetation cover in the open areas comes from annual grasses and forbs. Within oak thickets, a thick layer of oak leaves prevails. Shrub trend is difficult predict but probably is at least temporarily stable. Over a long period, we can expect some expansion of Gambel oak. Antelope bitterbrush seems dependant on stem layering for stand maintenance. Whether layering will be adequate remains to be seen. The heavy use of bitterbrush depresses seed production and the dense annual grass cover offers stiff competition to developing seedlings. The herbaceous understory is diverse and relatively abundant. However, annual grasses and annual forbs provide most of the herbaceous cover.

## 1989 TREND ASSESSMENT

The data shows a reduction in litter and significantly more erosion pavement exposed. Total rock and pavement cover have increased since 1983. Still, soil movement is less than expected, especially considering the steep slope and lack of effective perennial ground cover. Sum of nested frequency of grasses and forbs has also declined. The soil trend is down slightly. There are no seedlings and few young of either sagebrush or bitterbrush. Forage production is low on these key browse species, and the openings where they occur are limited. The bitterbrush continues to spread by layering and most of the new growth is close to the ground. Trend for browse is considered stable. Species composition of the forb component is similar between years, but lower numbers were encountered due to the late season and dry conditions. There are numerous annual species present. Trend for the herbaceous understory is down slightly due to a significant decline in bluebunch wheatgrass, the most abundant perennial grass on the site. Sum of nested frequency of forbs has also declined substantially.

### TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - slightly down (2)

## 1997 TREND ASSESSMENT

The soil trend is stable at this time. There are no signs of accelerated erosion, but the soil stability depends greatly on the annual grasses and forbs that are present. Establishment of perennial species to protect the watershed should be encouraged. Densities for browse species have remained relatively stable over all years. Hedging intensity has decreased on bitterbrush and Gambel oak. These two species can tolerate heavy utilization for long periods of time which keeps the densities stable on this site. Browse trend is stable. The herbaceous understory has changed very little over time. Many of the species encountered are annual species which provide little forage. Sum of nested frequency for perennial grasses has declined slightly. However, the abundance of bluebunch wheatgrass has remained relatively stable. Sum of nested frequency for perennial forbs has increased. This leads to a stable trend for the herbaceous understory.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 22

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	<sub>b</sub> 162	<sub>a</sub> 138	<sub>a</sub> 123	65	55	43	3.93
G	Bromus brizaeformis (a)	-	-	189	-	-	68	1.77
G	Bromus japonicus (a)	-	-	53	-	-	19	.90
G	Bromus tectorum (a)	-	-	283	-	-	87	5.86
G	Melica bulbosa	-	1	-	-	1	-	-
G	Poa bulbosa	-	-	2	-	-	1	.15
G	Poa fendleriana	2	-	-	1	-	-	-
G	Poa pratensis	5	6	-	2	2	-	-
G	Poa secunda	23	19	15	12	9	5	.26

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
	Total for Annual Grasses	0	0	525	0	0	174	8.54
	Total for Perennial Grasses	192	164	140	80	67	49	4.35
	Total for Grasses	192	164	665	80	67	223	12.89
F	<i>Agoseris glauca</i>	2	-	6	1	-	3	.06
F	<i>Agoseris grandiflora</i>	7	-	-	3	-	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	189	-	-	63	1.27
F	<i>Allium</i> spp.	77	71	64	30	26	28	.53
F	<i>Ambrosia psilostachya</i>	-	-	3	-	-	2	.01
F	<i>Artemisia ludoviciana</i>	<sub>b</sub> 41	<sub>a</sub> 14	<sub>a</sub> 15	15	9	6	.27
F	<i>Balsamorhiza sagittata</i>	-	3	-	-	1	-	.15
F	<i>Camelina microcarpa</i> (a)	-	-	6	-	-	3	.01
F	<i>Calochortus nuttallii</i>	4	-	2	2	-	1	.00
F	<i>Collomia linearis</i> (a)	-	13	4	-	7	2	.03
F	<i>Collinsia parviflora</i> (a)	-	-	3	-	-	1	.00
F	<i>Crepis acuminata</i>	3	-	-	2	-	-	-
F	<i>Cynoglossum officinale</i>	-	-	3	-	-	1	.03
F	<i>Epilobium brachycarpum</i> (a)	-	-	96	-	-	39	.66
F	<i>Erodium cicutarium</i> (a)	-	-	192	-	-	68	2.66
F	<i>Erigeron</i> spp.	<sub>b</sub> 59	<sub>a</sub> -	<sub>a</sub> -	23	-	-	-
F	<i>Erigeron pumilus</i>	-	<sub>a</sub> 9	<sub>b</sub> 94	-	6	39	2.25
F	<i>Galium aparine</i> (a)	-	-	121	-	-	46	1.55
F	<i>Hackelia patens</i>	4	1	-	2	1	-	-
F	<i>Haplopappus</i> spp.	<sub>B</sub> 6	<sub>a</sub> -	<sub>a</sub> -	5	-	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	74	-	-	32	.16
F	<i>Hydrophyllum capitatum</i>	3	-	4	3	-	2	.21
F	<i>Lactuca serriola</i>	<sub>a</sub> -	<sub>b</sub> 41	<sub>b</sub> 63	-	19	30	.30
F	<i>Lithophragma parviflora</i>	<sub>b</sub> 7	<sub>ab</sub> 1	<sub>a</sub> -	4	1	-	-
F	<i>Lithospermum ruderales</i>	3	-	1	1	-	1	.18
F	<i>Medicago sativa</i>	-	-	3	-	-	2	.01
F	<i>Microsteris gracilis</i> (a)	-	-	17	-	-	9	.07
F	<i>Montia perfoliata</i> (a)	28	-	-	13	-	-	-
F	<i>Petradoria pumila</i>	13	13	4	4	6	2	.18
F	<i>Polygonum douglasii</i> (a)	-	-	18	-	-	6	.43
F	<i>Sisymbrium altissimum</i> (a)	-	-	22	-	-	11	.18
F	<i>Solidago</i> spp.	1	-	-	1	-	-	-
F	<i>Taraxacum officinale</i>	-	1	3	-	1	1	.00
F	<i>Tragopogon dubius</i>	<sub>ab</sub> 53	<sub>a</sub> 34	<sub>b</sub> 53	21	15	27	.78
F	Unknown forb-annual (a)	-	-	5	-	-	3	.01

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	Unknown forb-perennial	<sub>b</sub> 116	<sub>a</sub> 4	<sub>a</sub> -	46	2	-	-
F	Vicia americana	-	1	2	-	1	1	.00
F	Zigadenus paniculatus	<sub>a</sub> -	<sub>b</sub> 5	<sub>ab</sub> 4	-	4	2	.06
Total for Annual Forbs		28	13	747	13	7	283	7.06
Total for Perennial Forbs		399	198	324	163	92	148	5.07
Total for Forbs		427	211	1071	176	99	431	12.14

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 22

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Acer grandidentatum	2	1.36
B	Artemisia tridentata vaseyana	13	.21
B	Gutierrezia sarothrae	25	2.50
B	Purshia tridentata	49	8.45
B	Quercus gambelii	14	6.51
Total for Browse		103	19.05

#### BASIC COVER --

Herd unit 17 , Study no: 22

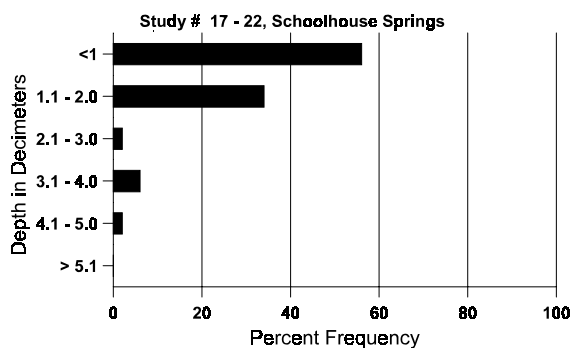
Cover Type	Nested Frequency	Average Cover %		
		'83	'89	'97
Vegetation	370	4.00	4.00	49.07
Rock	165	4.00	6.25	4.73
Pavement	237	.50	22.75	5.50
Litter	395	75.50	58.00	50.18
Cryptogams	4	.50	0	.04
Bare Ground	182	15.50	9.00	6.58

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 22, Schoolhouse Springs

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.0	54.0 (42.7)	6.6	48.0	29.4	22.6	3.3	20.6	131.2	.6

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 22

Type	Quadrat Frequency '97
Rabbit	1
Elk	3
Deer	5

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 22

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
<b>Acer grandidentatum</b>																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2		
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
M	83	1	-	-	-	-	-	-	-	1	-	-	-	66	67	59	1	
	89	-	-	-	-	-	-	-	1	1	-	-	-	66	256	185	1	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			00%			-80%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	199	Dec:	-			
												'89	199		-			
												'97	40		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																																																																								
	1	2	3	4	5	6	7	8	9	1	2	3	4																																																																												
<i>Artemisia tridentata vaseyana</i>																																																																																									
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1																																																																								
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1																																																																								
	97	10	-	1	-	-	-	-	-	-	11	-	-	-	220		11																																																																								
M	83	1	1	-	-	-	-	-	-	-	2	-	-	-	133	26	28	2																																																																							
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	15	6	1																																																																							
	97	1	2	-	-	-	-	-	-	-	3	-	-	-	60	13	15	3																																																																							
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																																																																								
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1																																																																								
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X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																																																																								
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<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> <td colspan="13"></td> </tr> <tr> <td>'83</td> <td>33%</td> <td>00%</td> <td>00%</td> <td>- 1%</td> <td colspan="13"></td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+29%</td> <td colspan="13"></td> </tr> <tr> <td>'97</td> <td>14%</td> <td>07%</td> <td>00%</td> <td></td> <td colspan="13"></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>														'83	33%	00%	00%	- 1%														'89	00%	00%	00%	+29%														'97	14%	07%	00%														
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Total Plants/Acre (excluding Dead & Seedlings)					'83	199	Dec:	0%																																																																																	
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	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																							
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9	8	0																																																																							
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% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																																																																					
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'89	00%	00%	00%																																																																																						
'97	00%	00%	00%																																																																																						
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Total Plants/Acre (excluding Dead & Seedlings)					'83	0	Dec:	-																																																																																	
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					'97	0		-																																																																																	
<i>Gutierrezia sarothrae</i>																																																																																									
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																																																																								
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																																																																								
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2																																																																								
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0																																																																							
	89	29	-	-	-	-	-	-	-	-	29	-	-	-	1933	12	11	29																																																																							
	97	82	-	-	-	-	-	-	-	-	82	-	-	-	1640	13	15	82																																																																							
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																																																																								
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2																																																																								
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% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																																																																					
'83	00%	00%	00%																																																																																						
'89	00%	00%	00%	-19%																																																																																					
'97	00%	00%	00%																																																																																						
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Total Plants/Acre (excluding Dead & Seedlings)					'83	0	Dec:	0%																																																																																	
					'89	2066		6%																																																																																	
					'97	1680		0%																																																																																	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	4	-	-	-	-	-	-	4	-	-	-	266		4	
	97	3	4	-	-	-	-	-	-	-	7	-	-	-	140		7	
M	83	-	-	23	-	-	-	-	-	-	23	-	-	-	1533	17 25	23	
	89	-	8	22	-	-	1	-	-	-	29	-	2	-	2066	13 21	31	
	97	-	21	58	-	8	6	-	-	-	93	-	-	-	1860	13 32	93	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	5	-	-	-	-	-	-	5	-	1	-	400		6	
	97	-	-	8	-	2	4	-	-	-	8	-	-	6	280		14	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			00%			+44%							
'89		22%			78%			07%			-17%							
'97		31%			67%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1533	Dec:	0%			
												'89	2732		15%			
												'97	2280		12%			
Quercus gambelii																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	21	-	-	-	-	-	-	-	-	21	-	-	-	1400		21	
	89	31	-	12	14	-	-	-	-	-	57	-	-	-	3800		57	
	97	8	-	-	4	-	-	-	-	-	12	-	-	-	240		12	
M	83	-	-	11	-	-	-	20	-	-	31	-	-	-	2066	47 31	31	
	89	5	-	-	1	-	-	-	10	-	16	-	-	-	1066	236 118	16	
	97	43	9	-	3	-	-	-	-	-	55	-	-	-	1100	55 70	55	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	1	-	-	-	-	-	2	-	5	-	-	-	333		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			21%			00%			+33%							
'89		01%			15%			00%			-74%							
'97		13%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	3466	Dec:	0%			
												'89	5199		6%			
												'97	1340		0%			



Trend Study 17-23-97

Study site name: Lower Oak Hollow.

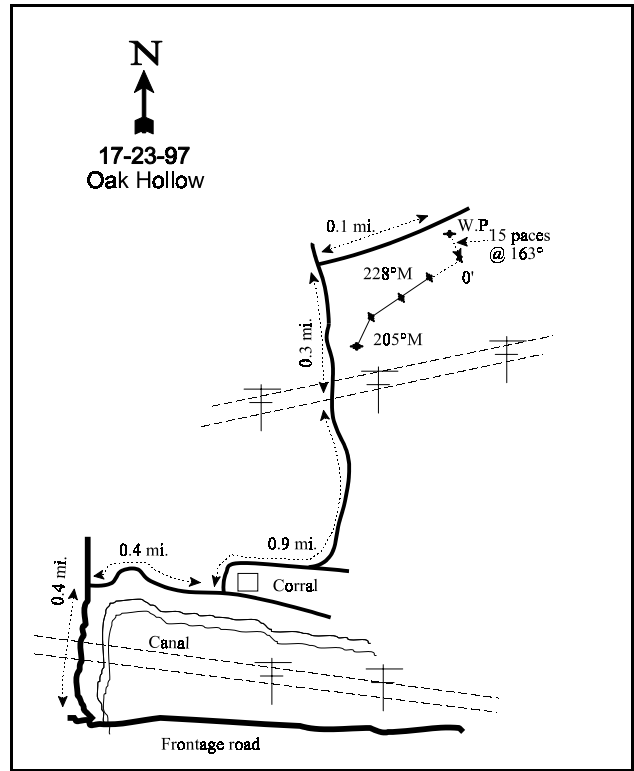
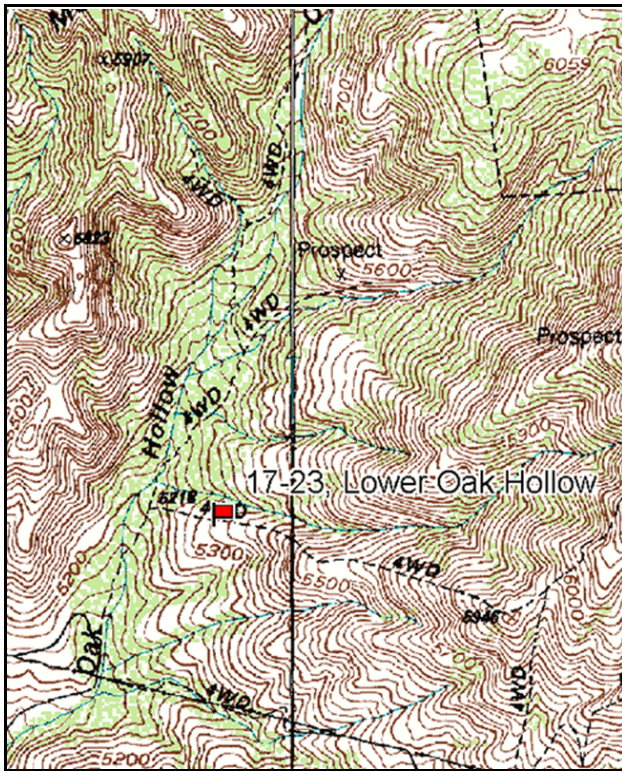
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 228 degrees magnetic (line 5 @ 205°M).

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

LOCATION DESCRIPTION

Beginning on the south side of the “Point of the Mountain”, follow the frontage road to the road that leads to Oak Hollow. This road is right next to the gravel pit. Follow this road for 0.4 miles to a right turn. Take this turn (south) and go another 0.4 miles to a fork and a corral on the left. Take the left fork and go 0.9 miles to the powerlines. Go another 0.3 miles to a road on the right. Take this road for 0.1 miles to a witness post on the right. From the witness post, walk 15 paces at an azimuth of 163 degrees magnetic to the 0-foot stake. The study is marked by green, steel fenceposts approximately 12-18 inches in height.



Map Name: Jordan Narrows

Diagrammatic Sketch

Township 4S, Range 1E, Section 19

GPS: NAD 27, UTM 12S 4478540 N 425591 E

## DISCUSSION

### Oak Hollow - Trend Study No. 17-23

\*\*\*SUSPENDED - This site was suspended in 2002. The entire area is being developed as part of the Traverse Ridge Development and access to the site is no longer possible.

In 1997 it was determined the original study site for Oak Hollow did not accurately represent the critical winter range that is present in this area. Therefore, the site was moved west of the original site to a small ridge sampling mountain big sagebrush and bitterbrush. Slope varies from 5% at the beginning of the ridge to 25% near the lower end. Aspect is southwest and elevation is approximately 5,400 feet. There is more wildlife use apparent on this site than on the original site.

Soil textural analysis indicates a sandy clay loam with a moderately acidic pH of 5.6. The effective rooting depth is nearly 17 inches with an average temperature of 54°F at this depth. At the 0 foot baseline stake there is a layer of clay about 12 inches below the soil surface, but this does not occur at any other stake down the line. Rock is common in the profile and about the size of a golf ball. Vegetative and litter cover are high at 44% and 67% respectively. There is very little bare ground present and no signs of recent erosion.

Mountain big sagebrush is the dominate browse specie with an estimated 4,480 plants/acre. This is a healthy population with nearly the same proportion of young and mature plants. Utilization of mature plants is light to moderate with only light hedging on the young plants. Average height and crown of the mature plants are 22 inches and 28 inches respectively. The dead to live ratio for mountain big sagebrush is 1:3. Some basin big sagebrush plants are scattered throughout the site and in some places it is difficult to distinguish between the two species. Many of the basin big sagebrush plants encountered were classified as dead. Broom snakeweed has an estimated density of 2,000 plants/acre with nearly 80% of the population classified as mature. Average height and crown are nearly one foot. Bitterbrush plants are large and scattered across the site. Estimated density is 260 plants/acre with 77% classified as mature. These plants are heavily hedged with some partly unavailable for hedging due to height. Surrounding slopes have discontinuous cover of Gambel oak which could provide good thermal and escape cover.

The dominate understory species is cheatgrass, which comprises 72% of the total vegetative cover. The cheatgrass cover is very dense and constitutes a fire hazard which would wipe out this critical winter range. Other annual grasses include Japanese brome and rattail fescue. Perennial species, such as Sandberg bluegrass, bluebunch wheatgrass, and intermediate wheatgrass, are scattered throughout the site. These species provide little cover or forage. Forb composition is diverse but many of the species are invader or increaser species.

### 1997 APPARENT TREND ASSESSMENT

Erosion is not apparent at this time on the site. Most of the protective ground cover comes from vegetation and litter from annual species. Erosion could become severe in the event of a high intensity storm or if there is a fire. The abundant cheatgrass litter provides very high amounts of fine fuel for a fire. The browse populations appear to be healthy and receive moderate utilization, apparently by deer. The sagebrush populations will likely suppress the broom snakeweed at this time. The herbaceous understory is dominated by cheatgrass. Perennial grasses are scattered and will likely have a tough time establishing further because of abundant winter annuals.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 23

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
G	Agropyron dasystachyum	a1	b10	a-	1	4	-	-
G	Agropyron intermedium	-	-	7	-	-	2	.76
G	Agropyron spicatum	20	29	25	9	11	9	.82
G	Aristida purpurea	-	-	4	-	-	1	.03
G	Bromus japonicus (a)	-	-	85	-	-	26	1.12
G	Bromus spp.	-	-	59	-	-	19	.75
G	Bromus tectorum (a)	-	-	300	-	-	91	14.18
G	Festuca myuros (a)	-	-	30	-	-	12	.16
G	Poa bulbosa	a3	b51	a-	1	23	-	-
G	Poa fendleriana	a22	b44	a14	10	20	5	.36
G	Poa secunda	b127	a75	a82	49	34	33	1.29
G	Vulpia octoflora (a)	-	-	15	-	-	9	.31
Total for Annual Grasses		0	0	430	0	0	138	15.78
Total for Perennial Grasses		173	209	191	70	92	69	4.03
Total for Grasses		173	209	621	70	92	207	19.82
F	Achillea millefolium	b24	b20	a-	9	9	-	-
F	Agoseris glauca	a21	a11	b60	11	6	25	.32
F	Allium acuminatum	b119	b118	a-	53	49	-	-
F	Alyssum alyssoides (a)	-	-	19	-	-	9	.04
F	Ambrosia psilostachya	-	-	1	-	-	1	.03
F	Artemisia ludoviciana	b15	b17	a3	8	7	1	.15
F	Castilleja chromosa	-	-	1	-	-	1	.00
F	Cardaria draba	a-	a-	b17	-	-	6	.05
F	Calochortus nuttallii	a-	ab2	b6	-	1	4	.04
F	Cirsium spp.	-	-	4	-	-	2	.15
F	Collinsia parviflora (a)	-	-	41	-	-	16	.13
F	Crepis acuminata	-	-	3	-	-	1	.03
F	Cruciferae	-	-	5	-	-	4	.02
F	Cryptantha spp.	-	-	2	-	-	1	.00
F	Descurainia pinnata (a)	-	-	1	-	-	1	.00
F	Draba spp. (a)	-	-	64	-	-	25	.12
F	Epilobium brachycarpum (a)	-	-	170	-	-	72	2.91
F	Eriogonum cernuum (a)	-	-	27	-	-	10	.29
F	Erodium cicutarium (a)	-	-	135	-	-	56	1.87
F	Eriogonum racemosum	3	-	6	1	-	2	.06
F	Eriogonum umbellatum	-	-	1	-	-	1	.00
F	Galium aparine (a)	-	-	28	-	-	14	.31

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	<i>Grindelia squarrosa</i>	-	1	1	-	1	1	.00
F	<i>Helianthus annuus</i> (a)	-	-	22	-	-	11	.10
F	<i>Holosteum umbellatum</i> (a)	-	-	101	-	-	42	.84
F	<i>Hydrophyllum capitatum</i>	6	-	-	3	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	8	-	-	4	.04
F	<i>Lactuca serriola</i>	a-	a1	b102	-	1	48	1.87
F	<i>Lomatium dissectum</i>	1	1	-	1	1	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	18	-	-	10	.05
F	<i>Montia perfoliata</i> (a)	20	-	-	11	-	-	-
F	<i>Petradoria pumila</i>	-	-	4	-	-	2	.38
F	<i>Phlox longifolia</i>	a-	b18	b31	-	9	14	.12
F	<i>Polygonum douglasii</i> (a)	-	-	104	-	-	48	.36
F	<i>Ranunculus testiculatus</i> (a)	-	-	14	-	-	6	.05
F	<i>Sphaeralcea coccinea</i>	-	-	3	-	-	1	.15
F	<i>Taraxacum officinale</i>	-	-	3	-	-	1	.03
F	<i>Tragopogon dubius</i>	a-	a5	b123	-	3	55	1.13
F	Unknown forb-annual (a)	-	-	5	-	-	2	.06
F	Unknown forb-perennial	a-	a-	b65	-	-	25	.81
F	<i>Verbascum blattaria</i>	a-	a-	b8	-	-	4	.24
F	<i>Vicia americana</i>	a-	b86	a-	-	34	-	-
F	<i>Viola</i> spp.	6	-	-	3	-	-	-
F	<i>Zigadenus paniculatus</i>	-	-	2	-	-	1	.00
Total for Annual Forbs		20	0	757	11	0	326	7.22
Total for Perennial Forbs		195	280	451	89	121	201	5.64
Total for Forbs		215	280	1208	100	121	527	12.86

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 23

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	<i>Artemisia tridentata tridentata</i>	14	1.46
B	<i>Artemisia tridentata vaseyana</i>	75	9.55
B	<i>Chrysothamnus nauseosus albicaulis</i>	0	.00
B	<i>Gutierrezia sarothrae</i>	29	1.65
B	<i>Purshia tridentata</i>	11	2.95
B	<i>Quercus gambelii</i>	0	-
Total for Browse		129	15.62

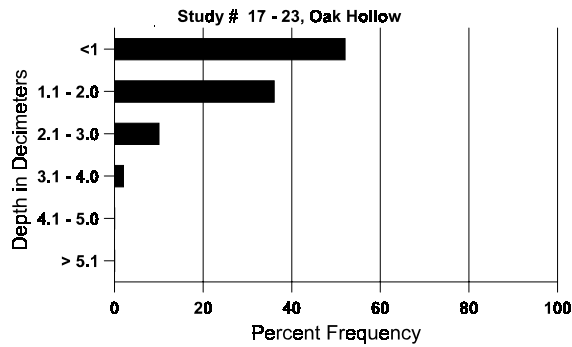
BASIC COVER --  
Herd unit 17 , Study no: 23

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	376	.50	9.00	44.26
Rock	66	17.00	17.50	1.49
Pavement	75	1.75	4.00	.70
Litter	395	79.25	66.50	66.80
Cryptogams	68	1.00	0	1.00
Bare Ground	82	.50	3.00	1.58

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 23, Oak Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.7	50.0 (17.2)	5.6	46.0	27.4	26.6	3.6	11.2	214.4	.4

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 23

Type	Quadrat Frequency '97
Rabbit	3
Elk	5
Deer	49

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 23

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<i>Artemisia tridentata tridentata</i>													
S	83	-	1	-	-	-	-	-	1	-	66		1
	89	2	-	-	-	-	-	-	2	-	133		2
	97	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	1	-	-	-	-	-	1	-	66		1
	89	4	-	-	2	-	-	-	6	-	400		6
	97	-	-	-	-	-	-	-	-	-	0		0
M	83	1	15	7	-	-	-	-	23	-	1533	41 43	23
	89	4	4	-	-	-	-	-	8	-	533	33 26	8
	97	12	7	-	-	-	-	-	19	-	380	33 42	19
D	83	-	3	4	-	-	-	-	7	-	466		7
	89	5	5	-	-	-	-	-	9	1	666		10
	97	-	1	1	-	-	-	-	2	-	40		2
X	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	580		29
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>		<u>%Change</u>			
'83		61%			35%			00%		-23%			
'89		38%			00%			00%		-74%			
'97		38%			05%			00%					
Total Plants/Acre (excluding Dead & Seedlings)										'83	2065	Dec:	23%
										'89	1599		42%
										'97	420		10%
<i>Artemisia tridentata vaseyana</i>													
S	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	13	-	-	-	-	-	-	12	-	260		13
Y	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	87	-	-	3	-	-	-	90	-	1800		90
M	83	-	-	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	-	-	0	- -	0
	97	65	30	9	1	-	-	-	105	-	2100	22 28	105
D	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	5	9	5	-	-	-	-	14	-	380		19
X	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	1540		77
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%			00%			00%					
'89		00%			00%			00%					
'97		18%			07%			02%					
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%
										'89	0		0%
										'97	4280		9%

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133	43	13	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	11	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	-	1	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-50%							
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	0%			
												'89	66		100%			
												'97	0		0%			
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	21	-	-	-	-	-	-	-	-	21	-	-	-	420			21
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	7	-	-	-	-	-	-	-	-	7	-	-	-	466	11	9	7
	97	79	-	-	-	-	-	-	-	-	79	-	-	-	1580	11	12	79
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			+77%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	466		-			
												'97	2000		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	89	-	2	-	-	-	-	-	-	-	2	-	-	-	133	20	51	
	97	-	1	9	-	-	-	-	-	-	10	-	-	-	200	40	62	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	1	-	-	1	-	-	-	2	-	-	-	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		100%			00%			00%			+49%							
'97		15%			85%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	133		0%				
											'97	260		15%				
Quercus gambelii																		
S	83	31	-	-	-	-	-	-	-	-	27	-	4	-	2066		31	
	89	12	-	-	-	-	-	-	-	-	11	1	-	-	800		12	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	49	-	-	-	-	-	-	-	-	49	-	-	-	3266		49	
	89	59	20	-	3	-	-	-	-	-	82	-	-	-	5466		82	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	24	25	-	5	-	-	-	-	46	8	-	-	3600	35	26	
	89	5	4	-	1	-	-	-	-	-	10	-	-	-	666	83	36	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	56	59	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	3	-	-	-	-	-	-	-	3	1	-	1	333		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		28%			24%			00%			- 6%							
'89		28%			00%			01%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	6866	Dec:	0%				
											'89	6465		5%				
											'97	0		0%				



Trend Study 17-28-97

Study site name: Spring Hollow.

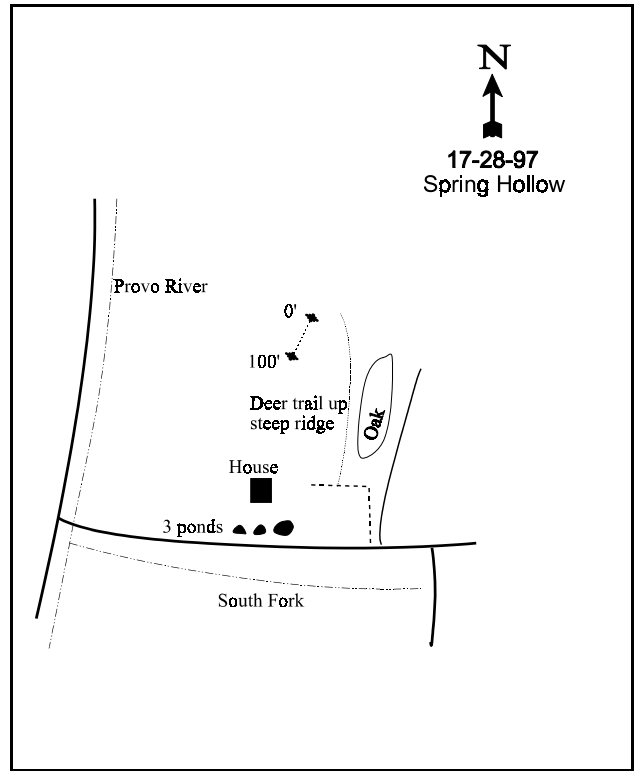
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 205 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning in Provo Canyon, proceed 3.1 miles up the south fork of the Provo River to an old road just past a house with 3 ponds in front of it. From the paved road, walk 40 paces up the old (closed) road to a fence corner. Walk west along the fence line to a deer trail. Hike northerly up the trail about 250 yards to an oak saddle. The study runs south down the ridge from the oak saddle. The 0-foot baseline stake is 20 paces from the saddle. Browse tag #3986 is attached to the 0-foot baseline stake. Hint: the oak saddle is at an azimuth of 350 degrees from the fence corner.



Map Name: Bridal Veil Falls

Diagrammatic Sketch

Township 5S, Range 4E, Section 32

GPS: NAD 27, UTM 12S 4465360 N 455373 E

## DISCUSSION

### Spring Hollow - Trend Study No. 17-28

\*\*\*SUSPENDED - This site was suspended in 2002.

The Spring Hollow study is located on the South Fork of the Provo River. The study is at approximately 5,800 feet elevation and near the top of a small north-south oriented ridge. The slope is steep at 75% with an aspect to the west and southwest. The sampled range type is a small area of mixed mountain brush that may be limited by the extremely shallow, rocky soil and very steep slope. In 1983, it was reported that the frequency of pellet groups and the intensity of browse utilization was high. This does not appear to be the situation at this time. While some browse species exhibit moderate hedging, pellet group frequency is very low. It is recommended that this site no longer be sampled in the future.

Soil is exceptionally shallow and rocky with exposed bedrock in many places. Soil textural analysis indicates a clay loam soil with a neutral pH of 6.3. The effective rooting depth (see methods) is quite shallow measuring almost 8 inches. The soil surface is mostly covered with rock and pavement. Gullies are found on either side (east and west) of the site. Presently, erosion does not appear to be higher than expected on this steep and rocky slope.

Browse composition is mixed and seemingly dependent on slope position. Near the ridge top, true mountain mahogany and mountain big sagebrush prevail. Further downslope, Gambel oak becomes increasingly common. All of these species are important forage sources. The initial reading (1983) of this site indicated 1,232 mountain big sagebrush plants/acre. The current estimate is 320 plants/acre. This is a mature population with no seedlings and only one young plant classified. All of the decadent plants encountered were classified as dying at this time. Height and crown measurements have increased to 26 inches and 39 inches respectively. The true mountain mahogany population is mostly mature with an average height of just over 4 feet. Utilization is moderate with most showing good vigor. The 1997 density estimation was 240 plants/acre. Broom snakeweed density has been highly variable with an estimated density of 840 plants/acre in 1997. In 1983, utilization of Gambel oak was moderate to heavy, but this is no longer the case. Gambel oak now exhibits light hedging with an estimated density of 1,740 stems/acre. White rubber rabbitbrush, stickyleaf low rabbitbrush, and antelope bitterbrush were other browse species encountered, but consist of only scattered individuals.

As reported in 1983, herbaceous plants are poorly represented in this community. Bluebunch wheatgrass is an important perennial grass that has significantly increased in nested frequency since 1989. Cheatgrass and Japanese brome are present but not very abundant at this time. Soil characteristics and severe erosion preclude development of any significant herbaceous understory. Apparently the only herbaceous plants that can flourish under these conditions are annuals or perennials that complete their growth cycle early, before the upper soil horizons dry completely.

### 1983 APPARENT TREND ASSESSMENT

Soil trend is declining because of the steep slope, lack of perennial cover, and excessive erosion. Vegetative trend is also down. The big sagebrush population, although reproductively dynamic, is slowly being browsed out of existence because of no recruitment of young plants. True mountain mahogany also is heavily browsed but is in slightly better condition. Oak will persist and perhaps even thicken, especially on the lower slopes. Herbaceous composition and density is poor and unlikely to improve.

## 1989 TREND ASSESSMENT

The soil trend is down due to the continual movement of rocks and the lack of developed soils. There is little sign of recent big game use. The important shrubs have increased in size since 1983 and show improved vigor. Overall, the vegetative trend is stable. Species composition is unchanged.

### TREND ASSESSMENT

soil - down (1)

browse -stable (3)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

The soil trend is stable. There are no signs of accelerated erosion at this time. Vegetation cover is scattered and the surface is armored by rock and pavement. Browse trend is stable for true mountain mahogany and oak which make up 95% of the browse cover. The mountain big sagebrush population is slowly being lost. However, currently it only contributes to 1% of the browse cover. The percent decadency has remained nearly the same over all years. Now the number of dead plants outnumber living ones. Other browse have remained relatively stable with the exception of the highly fluctuating broom snakeweed population. The herbaceous trend is slightly downward. Mutton and Sandberg bluegrasses have decreased slightly in sum of nested frequency with bluebunch wheatgrass significantly increasing. Very few forbs are found on the site while *Lathyrus brachycalyx*, the predominant forb in past years, was not sampled in 1997.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly downward (2)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 28

T y p e	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'97	'83	'89	'97	Cover %
G	<i>Agropyron spicatum</i>	<sub>a</sub> 72	<sub>a</sub> 93	<sub>b</sub> 126	31	42	50	7.83
G	<i>Bromus japonicus</i> (a)	-	-	47	-	-	18	1.07
G	<i>Bromus tectorum</i> (a)	-	-	97	-	-	33	1.31
G	<i>Poa fendleriana</i>	18	16	8	10	8	3	.30
G	<i>Poa secunda</i>	<sub>b</sub> 22	<sub>ab</sub> 12	<sub>a</sub> 3	8	6	1	.03
Total for Annual Grasses		0	0	144	0	0	51	2.39
Total for Perennial Grasses		112	121	137	49	56	54	8.17
Total for Grasses		112	121	281	49	56	105	10.56
F	<i>Alyssum alyssoides</i> (a)	-	-	22	-	-	8	.04
F	<i>Allium</i> spp.	<sub>b</sub> 62	<sub>a</sub> -	<sub>a</sub> -	29	-	-	-
F	<i>Castilleja chromosa</i>	2	-	-	1	-	-	-
F	<i>Cryptantha</i> spp.	3	-	-	1	-	-	-
F	<i>Cynoglossum officinale</i>	-	2	3	-	1	1	.03
F	<i>Eriogonum brevicaula</i>	<sub>b</sub> 30	<sub>b</sub> 28	<sub>a</sub> -	13	14	-	-
F	<i>Eriogonum</i> spp.	-	-	9	-	-	5	.33

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	Lathyrus brachycalyx	<sub>c</sub> 80	<sub>b</sub> 44	<sub>a</sub> -	33	15	-	-
F	Machaeranthera canescens	-	1	-	-	1	-	.00
F	Penstemon humilis	-	-	1	-	-	1	.00
F	Penstemon spp.	-	2	2	-	1	1	.03
F	Tragopogon dubius	2	-	-	1	-	-	-
Total for Annual Forbs		0	0	22	0	0	8	0.04
Total for Perennial Forbs		179	77	15	78	32	8	0.39
Total for Forbs		179	77	37	78	32	16	0.43

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 28

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	12	.19
B	Cercocarpus montanus	10	2.84
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	.00
B	Gutierrezia sarothrae	21	.53
B	Quercus gambelii	27	-
Total for Browse		73	3.59

#### BASIC COVER --

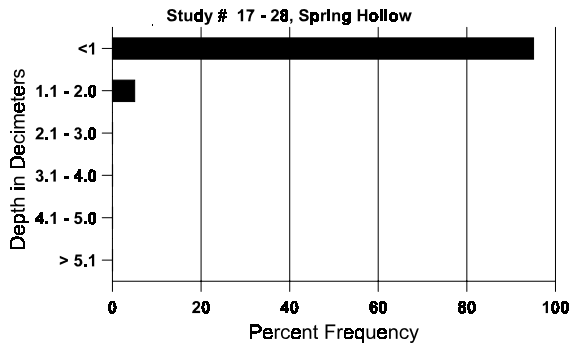
Herd unit 17 , Study no: 28

Cover Type	Nested Frequency	Average Cover %		
		'97	'83	'89
Vegetation	244	1.25	3.00	30.21
Rock	343	40.75	54.50	49.10
Pavement	159	8.75	13.00	5.99
Litter	330	37.50	24.00	23.80
Cryptogams	3	4.00	.25	.03
Bare Ground	91	7.75	5.25	3.95

SOIL ANALYSIS DATA --  
 Herd Unit 17, Study no: 28, Spring Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
7.36	60.5 (10.0)	7.3	38.0	39.1	22.9	4.9	16.4	92.8	.7

### Stoniness Index



PELLET GROUP FREQUENCY --  
 Herd unit 17, Study no: 28

Type	Quadrat Frequency	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
	'97	07	07
Deer	2	35	3 (7)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 28

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366		11	
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	11	-	-	-	-	-	-	-	-	4	7	366	5	8	11
	89	9	7	-	-	-	-	-	-	-	16	-	-	-	533	13	10	16
	97	5	2	1	2	-	-	-	-	-	10	-	-	-	200	26	54	10
D	83	-	-	15	-	-	-	-	-	-	-	-	-	15	500		15	
	89	6	1	-	1	-	-	-	-	-	8	-	-	-	266		8	
	97	3	2	-	-	-	-	-	-	-	-	-	-	5	100		5	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	2380		119	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			70%			70%			-22%							
'89		28%			00%			00%			-67%							
'97		25%			06%			31%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1232	Dec:	41%				
											'89	965		28%				
											'97	320		31%				
<i>Cercocarpus montanus</i>																		
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	89	3	2	2	-	-	-	-	-	-	6	-	1	-	233		7	
	97	1	1	-	-	-	-	-	-	-	-	1	1	-	40		2	
M	83	-	-	7	-	1	-	-	-	-	3	-	5	-	266	44	32	8
	89	5	5	1	-	-	-	-	-	-	10	-	1	-	366	51	45	11
	97	3	4	2	-	-	-	-	-	-	8	1	-	-	180	54	96	9
D	83	-	-	1	-	-	-	-	-	-	-	-	-	1	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		07%			53%			40%			+17%							
'89		39%			17%			11%			-60%							
'97		50%			17%			08%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	499	Dec:	7%				
											'89	599		0%				
											'97	240		8%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	28	47	1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	25	24	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	31	31	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	-	-	-	1	33			1
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+50%							
'89		00%			00%			50%			-70%							
'97		00%			00%			100%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	0%			
												'89	66		50%			
												'97	20		100%			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	11	9	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	40		-			
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	83	7	-	-	-	-	-	-	-	-	7	-	-	-	233	13	10	7
	89	46	-	-	-	-	-	-	-	-	36	-	10	-	1533	9	9	46
	97	32	-	-	-	-	-	-	-	-	32	-	-	-	640	15	17	32
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+85%							
'89		00%			00%			21%			-46%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	233	Dec:	-			
												'89	1566		-			
												'97	840		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	83	-	-	-	-	-	1	-	-	-	1	-	-	-	33	28	75	1
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	39	69	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			00%			+ 0%							
'89		00%			100%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	-				
											'89	33		-				
											'97	0		-				
Quercus gambelii																		
S	83	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	89	4	-	-	4	-	-	7	-	-	14	-	1	-	500			15
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	20	20	-	-	-	-	-	-	40	-	-	-	1333			40
	89	76	-	-	-	-	-	-	-	-	74	-	2	-	2533			76
	97	35	-	-	5	-	-	-	-	-	40	-	-	-	800			40
M	83	-	51	-	-	-	-	-	-	1	42	10	-	-	1733	22	13	52
	89	24	-	-	-	-	-	-	-	-	21	-	3	-	800	37	30	24
	97	28	-	-	8	-	-	3	3	-	42	-	-	-	840	49	60	42
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	5	1	-	-	-	-	-	-	-	2	-	4	-	200			6
	97	3	-	-	2	-	-	-	-	-	2	1	-	2	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		77%			23%			00%			+13%							
'89		.94%			00%			08%			-51%							
'97		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3066	Dec:	0%				
											'89	3533		6%				
											'97	1740		6%				



Trend Study 17-29-97

Study site name: Above Edgemont.

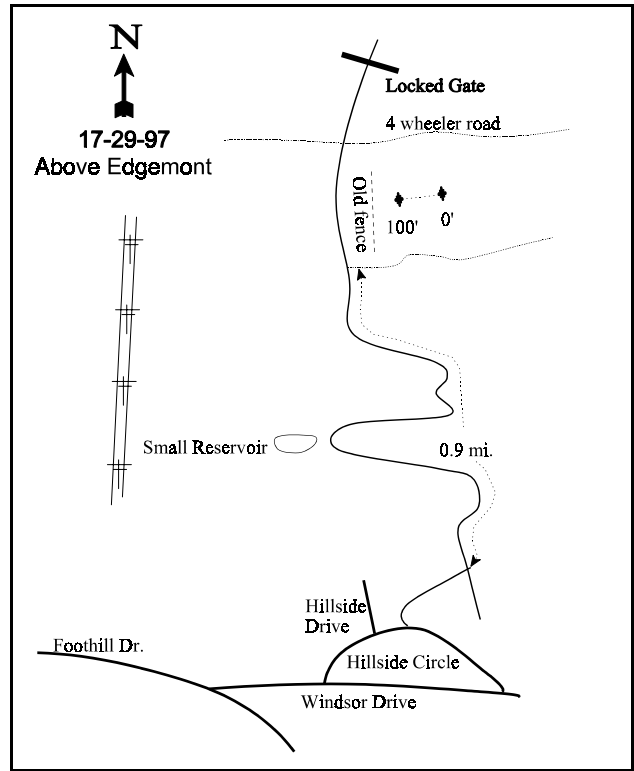
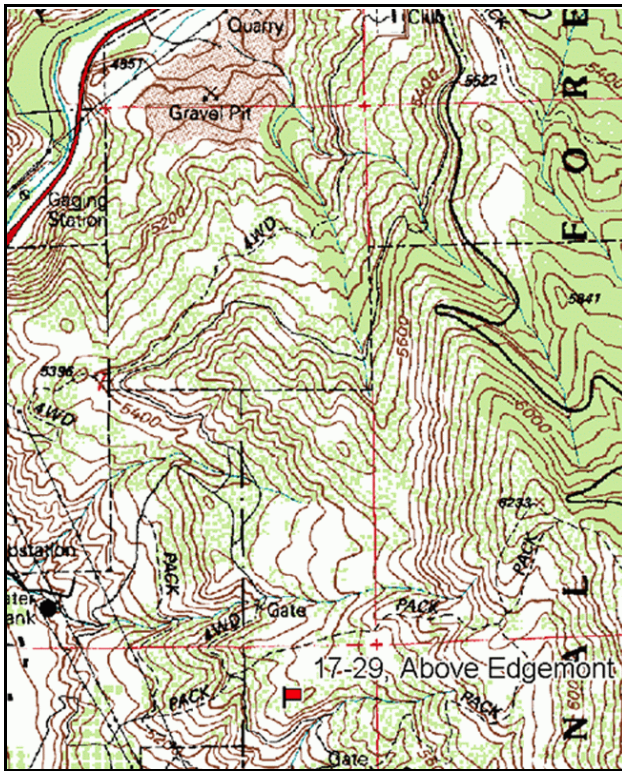
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 252 degrees magnetic.

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

LOCATION DESCRIPTION

From Route 189 south of the Orem Power Plant at the mouth of Provo Canyon, turn onto Canyon Road. Go east and south on Canyon Road for 1.0 miles to Foothill Drive. Turn left and go up Foothill Drive to Windsor Drive. Go up Windsor Drive to Hillside Circle. Turn north onto a dirt road across from 1084 Hillside Circle. You will need to contact Dave Halton (owner, 1177 East Aspen Ridge Lane, 224-0776) in order to open the gate. Drive 0.1 miles to a fork below a hillside criss-crossed with 4-wheeler roads. Go left around the riding area, then follow the main foothill road traversing the face. Go 0.9 miles from the fork to a 4-wheeler road which goes up the slope to the right. Park here, then walk up the 4-wheeler road 75 paces. Turn left and walk 13 paces north-northwest to a sage opening. The 0-foot baseline stake is located at the top of the opening. The 100-foot baseline stake is painted red.



Map Name: Orem

Diagrammatic Sketch

Township 6S, Range 3E, Section 18

## DISCUSSION

### Above Edgemont - Trend Study No. 17-29

\*\*\*SUSPENDED - This site was suspended in 2002.

In 1989, the original Edgemont study #15-9-83, latter changed to #27-3-83, could not be located. The study transect stakes had apparently been removed from the private land. A new study was established in 1989 further up the slope on Forest Service administered land. The new study was named "Above Edgemont" and was identified with the same study number. The site is on an open, dry, west-facing slope of 35%. The elevation is 5,500 feet on the open sagebrush/grass slope, approximately 300 feet higher than the oak-dominated 1983 site. Deer use is light to moderate in winter. Human activity was heavy in this area in 1989, but access is now through private property and a locked gate. There still appears to be OHV use, horseback riders, mountain bikers, and joggers. Winter recreational use is more restricted, but this winter range is impacted by its proximity to a large population base. A number of fruit orchards lying immediately below the study may attract or hold deer during periods other than winter. In 1983 one small buck was observed in the immediate area in late June.

Soil is similar to that described for study number 17-24 (Heisets Hollow). Soil textural analysis indicates a clay loam with a neutral pH (7.1). Phosphorous may be limiting (9.3 ppm) to plant development for it is below the minimum (10 ppm) thought needed for normal plant growth. Vegetative and litter cover appear adequate to prevent serious erosion. However, the area is susceptible to rill and gully erosion and some evidence of this is present. A number of roads and OHV trails in the area are significant starting points for erosion.

This study samples a more open area that at one time had a fair population of the preferred mountain big sagebrush. In 1989, it was reported that there were many sagebrush skeletons occurring on the slope. The skeletons have now fallen apart and are laying on the ground as litter. Estimated sagebrush density in 1997 was 600 plants/acre, a decline of over 900 plants/acre since 1989. From the browse table one can see that the number of dead plants found on the site was 980 plants/acre. The decrease in the population can be accounted for by the number of dead sampled in 1997. There was a significant improvement in percent decadency in 1997 (20%), where it was not as high as that reported in 1989 (87%). This is most likely because many of the plants encountered at that time have now died. Vigor of the surviving plants is improved with less utilization. Oakbrush is dense in the surrounding clones with all plants encountered on the edges of the clumps. The Gambel oak does not appear to be expanding at this time. Recruitment is poor with no seedling and few young plants being sampled. Cliffrose plants are scattered around the site but none were encountered in 1997.

Bluebunch wheatgrass provides the most vegetative cover on this site. Nested frequency and quadrat frequency have increased since 1989 with plants appearing healthy at this time. Sandberg bluegrass nested frequency has conversely declined significantly since 1989. Other perennial grasses include intermediate wheatgrass and smooth brome. Cheatgrass, rattlesnake brome, and Japanese brome are also present and provide some herbaceous cover and litter.

Sixteen different forbs were sampled in 1997. Forbs include a mixture of annual weeds, poor value perennials or biennials, and a few desirable perennials. The most common forbs include yellow salsify, pale alyssum, and arrowleaf balsam root.

## 1989 APPARENT TREND ASSESSMENT

Soil appears stable on the site due to the fairly good vegetative and litter cover and most importantly the lack of erodible trails across the site. As has long been observed across the Wasatch Front, the trend appears downward for big sagebrush on the winter range. On these sites with limited browse forage, the remaining available shrubs tend to be heavily used. Competition between native grasses and the introduced weeds is significant.

## 1997 TREND ASSESSMENT

The soil trend continues to be stable. Vegetative and litter cover are adequate to reduce the amount of soil moving downslope. Browse trend is down. More mountain big sagebrush plants were lost since 1989 and the few remaining plants will have difficulty replacing themselves with the intense competition from winter annuals. The herbaceous understory composition has changed very little since 1989. The trend is stable with a poor composition of forbs. Bluebunch wheatgrass is the most important grass and should help suppress the winter annuals.

### TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 29

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	
G	<i>Aegilops cylindrica</i> (a)	-	3	-	-	1	-	-
G	<i>Agropyron intermedium</i>	a-	a-	b19	-	-	8	.06
G	<i>Agropyron spicatum</i>	a150	b223	c265	65	80	87	8.65
G	<i>Bromus brizaeformis</i> (a)	-	-	177	-	-	66	1.52
G	<i>Bromus inermis</i>	-	-	3	-	-	1	.03
G	<i>Bromus japonicus</i> (a)	-	-	40	-	-	16	.35
G	<i>Bromus tectorum</i> (a)	-	-	291	-	-	87	4.97
G	<i>Poa secunda</i>	a8	b104	a26	4	50	12	.08
G	<i>Sitanion hystrix</i>	-	2	-	-	1	-	-
Total for Annual Grasses		0	3	508	0	1	169	6.84
Total for Perennial Grasses		158	329	313	69	131	108	8.83
Total for Grasses		158	332	821	69	132	277	15.67
F	<i>Agoseris glauca</i>	1	-	-	1	-	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	236	-	-	75	3.54
F	<i>Artemisia ludoviciana</i>	b17	a-	a-	8	-	-	-
F	<i>Astragalus</i> spp.	-	-	4	-	-	2	.01
F	<i>Balsamorhiza sagittata</i>	a-	b14	c28	-	7	12	3.05
F	<i>Calochortus nuttallii</i>	a1	b41	a2	1	21	2	.01
F	<i>Castilleja</i> spp.	-	-	2	-	-	1	.00
F	<i>Cirsium</i> spp.	a-	a-	b11	-	-	5	.10

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	<i>Collomia grandiflora</i> (a)	6	-	-	4	-	-	-
F	<i>Comandra pallida</i>	<sub>a</sub> -	<sub>ab</sub> 7	<sub>b</sub> 13	-	3	6	.10
F	<i>Crepis acuminata</i>	<sub>b</sub> 52	<sub>a</sub> -	<sub>a</sub> -	21	-	-	-
F	<i>Erodium cicutarium</i> (a)	-	-	31	-	-	18	.38
F	<i>Eriogonum racemosum</i>	-	1	1	-	1	1	.03
F	<i>Hedysarum boreale</i>	5	-	-	2	-	-	-
F	<i>Lactuca serriola</i>	-	8	6	-	3	2	.03
F	<i>Linum lewisii</i>	-	-	1	-	-	1	.00
F	<i>Lithophragma</i>	-	-	-	-	-	-	.03
F	<i>Lomatium</i> spp.	-	5	-	-	3	-	-
F	<i>Lupinus argenteus</i>	-	1	-	-	1	-	-
F	<i>Penstemon</i> spp.	<sub>a</sub> -	<sub>b</sub> 14	<sub>a</sub> -	-	7	-	-
F	<i>Phlox longifolia</i>	<sub>b</sub> 38	<sub>c</sub> 113	<sub>a</sub> 9	19	49	6	.03
F	<i>Polygonum douglasii</i> (a)	-	-	1	-	-	1	.00
F	<i>Senecio integerrimus</i>	1	-	-	1	-	-	-
F	<i>Tragopogon dubius</i>	<sub>a</sub> 23	<sub>a</sub> 14	<sub>b</sub> 218	12	10	85	4.29
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>b</sub> 74	<sub>a</sub> 3	-	32	1	.00
F	<i>Zigadenus paniculatus</i>	<sub>a</sub> -	<sub>b</sub> 30	<sub>b</sub> 26	-	17	18	.22
Total for Annual Forbs		6	0	268	4	0	94	3.94
Total for Perennial Forbs		138	322	324	65	154	142	7.95
Total for Forbs		144	322	592	69	154	236	11.89

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 29

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	<i>Artemisia tridentata vaseyana</i>	23	.96
B	<i>Gutierrezia sarothrae</i>	12	.06
B	<i>Quercus gambelii</i>	4	-
Total for Browse		39	1.02

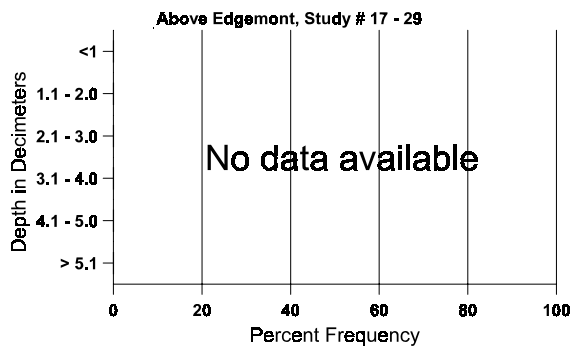
BASIC COVER --  
Herd unit 17 , Study no: 29

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	381	.25	6.00	39.70
Rock	217	18.50	13.50	6.95
Pavement	265	3.75	21.75	15.26
Litter	391	65.75	56.50	40.40
Cryptogams	9	0	0	.02
Bare Ground	114	11.75	2.25	2.87

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 29, Above Edgemont

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.0	52.0 (17.0)	7.1	42.4	29.1	28.6	2.7	9.3	220.8	1.2

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 29

Type	Quadrat Frequency '97	Pellet Transect	
		Pellet Groups per Acre	Days Use per Acre (ha)
		07	07
Rabbit	3	-	-
Elk	-	9	1 (2)
Deer	9	296	23 (56)

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 29

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	89	-	2	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160		8	
M	83	2	7	-	-	-	-	-	-	-	9	-	-	-	600	30	34	9
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	12	9	1
	97	8	8	-	-	-	-	-	-	-	16	-	-	-	320	23	48	16
D	83	-	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	4	16	-	-	-	-	-	-	7	-	4	9	1333		20	
	97	1	1	-	-	-	-	-	-	-	-	-	-	2	120		6	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	980		49	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			07%			00%			+39%							
'89		30%			70%			57%			-61%							
'97		30%			00%			07%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	932	Dec:	7%				
											'89	1532		87%				
											'97	600		20%				
<i>Cowania mexicana stansburiana</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	1	-	-	-	-	1	-	-	-	66	106	75	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		100%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	132		-				
											'97	0		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	89	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	14	11	
	97	32	-	-	-	-	-	-	-	-	32	-	-	-	640	10	19	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	-	-	-	1	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			04%			-61%							
'97		00%			00%			06%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	0%				
											'89	1732		4%				
											'97	680		0%				
<i>Quercus gambelii</i>																		
S	83	59	-	-	-	-	-	-	-	-	59	-	-	-	3933		59	
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	181	80	-	-	-	-	-	-	-	261	-	-	-	17400		261	
	89	2	2	1	4	-	-	-	-	-	4	5	-	-	600		9	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	11	-	-	-	-	-	-	-	11	-	-	-	733	56	26	
	89	-	-	-	-	-	-	2	-	-	2	-	-	-	133	110	63	
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	-	-	
D	83	-	7	-	-	-	-	-	-	-	7	-	-	-	466		7	
	89	-	2	2	-	-	-	-	-	-	1	3	-	-	266		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		35%			00%			00%			-95%							
'89		27%			20%			00%			-80%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	18599	Dec:	3%				
											'89	999		27%				
											'97	200		0%				

Trend Study 17-33-97

Study site name: Maple Canyon.

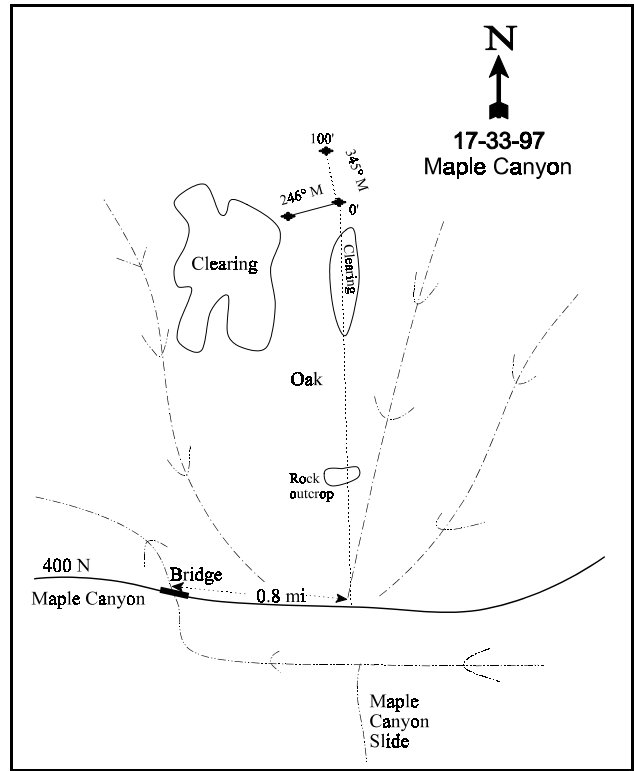
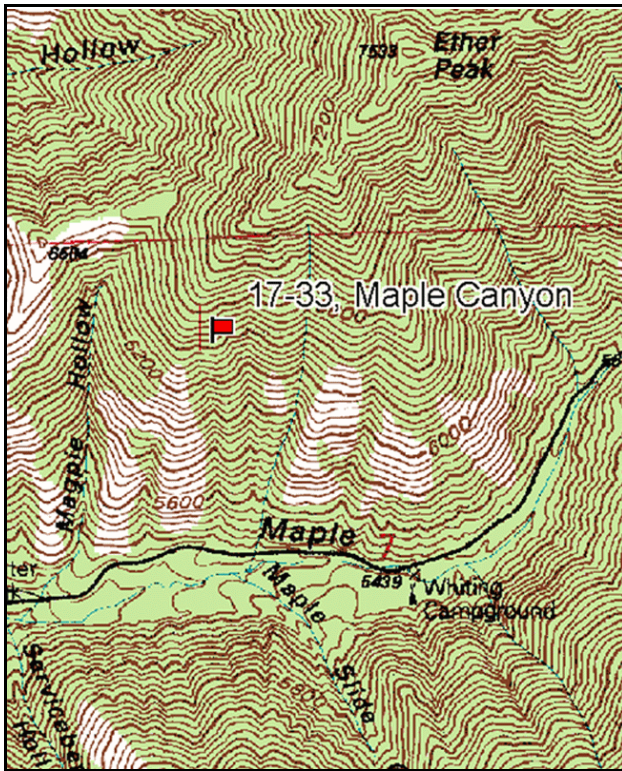
Vegetation type: Gambel Oakbrush.

Compass bearing: frequency baseline 345 degrees magnetic (line 2 @ 246°M).

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

LOCATION DESCRIPTION

From Mapleton, proceed east up Maple Canyon (400 North) to the first bridge across Maple Creek. From the bridge, proceed an additional 0.80 miles and stop just north of the Maple Canyon Slide. From this point, to the north and upslope is a long clearing within the oakbrush type which runs upslope. From the upper (northern) edge of the clearing, the 0-foot baseline stake is located just inside the edge of the oakbrush. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3919, is attached to the 0-foot baseline stake.



Map Name: Springville

Diagrammatic Sketch

Township 8S, Range 4E, Section 7

GPS: NAD 27, UTM 12S 4442887 N, 454606 E



## DISCUSSION

### Maple Canyon - Trend Study No. 17-33

\*\*\*SUSPENDED - This site was suspended in 2002.

This study samples winter range in Maple Canyon. Downslope and down-canyon from the study site, the spur ridges extending to Maple Creek are relatively barren, eroded, and occupied mainly by annual grasses, annual forbs, and low value perennials. Browse occurs only as remnants, primarily in the draws. The study is located approximately 800 vertical feet above the canyon bottom at an elevation of 6,400 feet. Exposure is southerly on a steep (60-65%) slope. The range type is mixed mountain brush. When the site was read in 1997, the location was considered poor for sampling critical winter range due to lack of preferred browse. Further east or down slope are areas with higher densities of Stansbury cliffrose and mahogany that would more accurately reflect range condition and trend with respect to wildlife.

Soil texture is characterized by an abundance of variable-sized sandstone or shale rock. Analysis indicates a loam soil with a neutral pH (6.7). The soil is moderately shallow and loose with abundant rock on the surface. Many of the depleted slopes and ridges below the study site have essentially no remaining surface soil. In these areas, near talus conditions often prevail. However, the site has more vegetative and litter cover with soil condition being measurably better but still substandard. There is little bare soil currently present with vegetative and litter cover adequate to slow erosion.

The principal browse species includes an abundance of low-growing (average height 30 inches) Gambel oak, smaller amounts of true mountain mahogany, and infrequent individuals of Saskatoon serviceberry, mountain big sagebrush, and broom snakeweed. With the greatly increased sample size used in 1997, the estimated density of Gambel oak is 7,040 stems/acre. In 1983, considerable temporary defoliation by grasshoppers and a large caterpillar was noted. Vigor was good in 1997. Estimated density of true mountain mahogany was 100 plants/acre in 1997. These plants exhibit heavy hedging, yet good vigor. Broom snakeweed was sampled for the first time on this site in 1997. This is due mostly to the increased sample size. Estimated density was 360 plants/acre, most of which were classified as mature.

Grasses are dominated by cheatgrass. It is found in nearly every quadrat (99%) and contributes to 63% of the total herbaceous understory cover. Additional annual grasses include rattlesnake brome and Japanese brome. Other infrequent grasses include bulbous bluegrass, muttongrass, Sandberg bluegrass, and Kentucky bluegrass. In 1983, intermediate wheatgrass and western wheatgrass were identified, but have not been sampled since.

Forb diversity is higher than reported in the past, although most of the species are infrequent. The most valuable and preferred species are arrowleaf balsamroot, and yellow salsify.

### 1983 APPARENT TREND ASSESSMENT

Soil trend appears to be slowly declining, especially at the lower edge of this type. Although vegetative cover is fair, the amount of exposed rock and bare soil suggests that smaller soil particles are actively moving downslope. Vegetative condition is fair. Gambel oak appears to be increasing on the site while other desirable browse species are lacking. Understory forbs and grasses are limited by dry soil conditions. There is an overabundance of annual vegetation which suggests an unacceptably high level of soil disturbance. Deer utilization of the area is intense and occurs primarily in winter with some evidence of spring-fall use.

## 1989 TREND ASSESSMENT

The very steep slope on this sidehill encourages continued soil and rock movement. As noted in 1983, conditions are near talus. Ground cover calculations indicate an increase in rock and pavement cover from 28% to 38%. Cover of bare ground has declined from 19% to 10%. There is little preferred browse on the site but trend is stable. Gambel oakbrush is the only common browse species. It has remained stable in density, shows light to moderate use, good vigor and low decadence. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses was already low and shows a decline. Perennial forbs have also declined slightly. The herbaceous trend is due primarily to drought in 1989.

### TREND ASSESSMENT

soil - up slightly (4)

browse -stable (3)

herbaceous understory - down slightly (2)

## 1997 TREND ASSESSMENT

Soil trend is stable. Vegetation and litter provide adequate cover to protect from significant erosion. Very little bare soil is present at this time. Browse has stayed relatively the same over all years. The changes in density for species is more due to the greatly increased sample size rather than any changes in the community. Utilization of Gambel oak continues to be light to moderate with heavy utilization of true mountain mahogany. The browse trend at this time is stable. Herbaceous understory trend is down slightly. Perennial species are rare and the site is dominated by cheatgrass. Nested frequency for bluebunch wheatgrass and mutton bluegrass have declined significantly.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 33

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	
G	Agropyron intermedium	6	-	-	3	-	-	-
G	Agropyron smithii	<sub>b</sub> 17	<sub>a</sub> -	<sub>a</sub> -	6	-	-	-
G	Agropyron spicatum	<sub>a</sub> 86	<sub>b</sub> 105	<sub>a</sub> 37	36	41	14	.80
G	Bromus brizaeformis (a)	-	-	25	-	-	10	1.02
G	Bromus japonicus (a)	-	-	1	-	-	1	.00
G	Bromus tectorum (a)	-	-	335	-	-	99	23.73
G	Poa bulbosa	-	-	9	-	-	6	.48
G	Poa fendleriana	<sub>c</sub> 92	<sub>b</sub> 46	<sub>a</sub> 14	41	22	5	.72
G	Poa pratensis	-	-	5	-	-	2	.03
G	Poa secunda	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 19	-	1	8	.66
Total for Annual Grasses		0	0	361	0	0	110	24.77
Total for Perennial Grasses		201	153	84	86	64	35	2.70
Total for Grasses		201	153	445	86	64	145	27.47

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	Agoseris glauca	<sub>b</sub> 22	<sub>a</sub> -	<sub>a</sub> -	10	-	-	-
F	Alyssum alyssoides (a)	-	-	47	-	-	20	.71
F	Allium spp.	13	6	2	6	4	2	.01
F	Artemisia ludoviciana	4	15	5	2	6	2	.18
F	Astragalus spp.	2	-	-	1	-	-	-
F	Balsamorhiza sagittata	15	2	12	5	2	6	3.78
F	Camelina microcarpa (a)	-	-	5	-	-	3	.01
F	Calochortus nuttallii	<sub>c</sub> 25	<sub>a</sub> -	<sub>b</sub> 12	13	-	4	.67
F	Cirsium undulatum	2	-	3	1	-	1	.70
F	Collomia linearis (a)	-	-	1	-	-	1	.00
F	Cruciferae	-	-	25	-	-	14	.32
F	Cryptantha spp.	-	-	25	-	-	12	.30
F	Descurainia pinnata (a)	-	-	12	-	-	5	.05
F	Epilobium brachycarpum (a)	-	-	5	-	-	2	.01
F	Erodium cicutarium (a)	-	-	3	-	-	2	.06
F	Erigeron divergens	5	2	-	2	1	-	-
F	Galium aparine (a)	-	-	28	-	-	14	.94
F	Lappula occidentalis (a)	-	-	8	-	-	5	.02
F	Lactuca serriola	<sub>a</sub> -	<sub>b</sub> 10	<sub>b</sub> 10	-	5	5	.21
F	Lithospermum incisum	3	-	-	1	-	-	-
F	Lomatium spp.	<sub>b</sub> 46	<sub>b</sub> 45	<sub>a</sub> 24	25	25	11	1.38
F	Phlox longifolia	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 8	-	-	4	.04
F	Sisymbrium altissimum (a)	-	-	-	-	-	-	.15
F	Tragopogon dubius	<sub>b</sub> 14	<sub>a</sub> -	<sub>b</sub> 24	7	-	11	.18
F	Unknown forb-perennial	<sub>a</sub> -	<sub>b</sub> 9	<sub>b</sub> 14	-	5	5	.25
Total for Annual Forbs		0	0	109	0	0	52	1.96
Total for Perennial Forbs		151	89	164	73	48	77	8.06
Total for Forbs		151	89	273	73	48	129	10.03

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 33

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Cercocarpus montanus	5	1.40
B	Gutierrezia sarothrae	11	.56
B	Quercus gambelii	65	19.96
Total for Browse		81	21.93

CANOPY COVER --

Herd unit 17 , Study no: 33

Species	Percent Cover '97
Cercocarpus montanus	3.4

BASIC COVER --

Herd unit 17 , Study no: 33

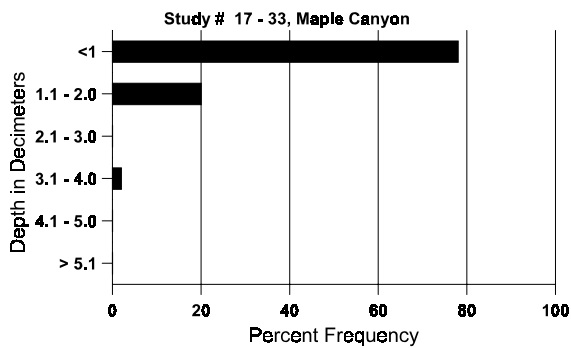
Cover Type	Nested Frequency	Average Cover %		
	'97	'83	'89	'97
Vegetation	349	1.00	4.25	50.90
Rock	276	24.50	33.00	23.09
Pavement	126	3.00	5.25	2.08
Litter	379	52.75	47.50	44.56
Cryptogams	3	.25	0	.03
Bare Ground	116	18.50	10.00	3.98

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 33, Maple Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	47.0 (17.3)	6.7	41.8	32.4	25.8	2.6	12.8	217.6	.6

### Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 33

Type	Quadrat Frequency '97
Elk	9
Deer	2

BROWSE CHARACTERISTICS --  
Herd unit 17 , Study no: 33

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total					
		1	2	3	4		1	2						
<i>Cercocarpus montanus</i>														
M	83	-	-	-	-	-	1	-	-	1	66	67	138	1
	89	-	-	-	-	-	1	-	-	1	66	126	118	1
	97	-	1	3	-	-	1	-	-	5	100	80	96	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>			
'83		00%			00%			00%			+ 0%			
'89		00%			00%			00%			+34%			
'97		20%			80%			00%						
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	-	
										'89	66		-	
										'97	100		-	
<i>Gutierrezia sarothrae</i>														
Y	83	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	1	20			1
M	83	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	17	-	-	-	-	-	-	-	17	340	13	15	17
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>			
'83		00%			00%			00%						
'89		00%			00%			00%						
'97		00%			00%			00%						
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-	
										'89	0		-	
										'97	360		-	

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	17	-	-	-	-	-	-	-	-	6	11	-	-	1133		17	
	89	9	-	-	-	-	-	-	-	-	9	-	-	-	600		9	
	97	10	-	-	2	-	-	-	-	-	12	-	-	-	240		12	
Y	83	30	12	-	-	-	-	-	-	-	36	6	-	-	2800		42	
	89	121	60	-	-	-	-	-	-	-	181	-	-	-	12066		181	
	97	47	-	-	2	-	-	-	-	-	49	-	-	-	980		49	
M	83	7	80	56	-	-	-	1	-	-	114	30	-	-	9600	39	19	144
	89	14	2	1	-	-	-	3	-	-	20	-	-	-	1333	94	53	20
	97	214	80	-	-	-	-	-	-	-	294	-	-	-	5880	30	24	294
D	83	-	-	1	-	-	-	5	-	-	5	-	1	-	400		6	
	89	4	1	-	-	-	-	-	-	-	1	-	3	1	333		5	
	97	3	5	-	1	-	-	-	-	-	6	-	1	2	180		9	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	900		45	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		48%			30%			.52%			+ 7%							
'89		31%			.48%			02%			-49%							
'97		24%			00%			.85%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	12800	Dec:	3%			
												'89	13732		2%			
												'97	7040		3%			

Trend Study 17-35-97

Study site name: Hobble Creek Golf Course.

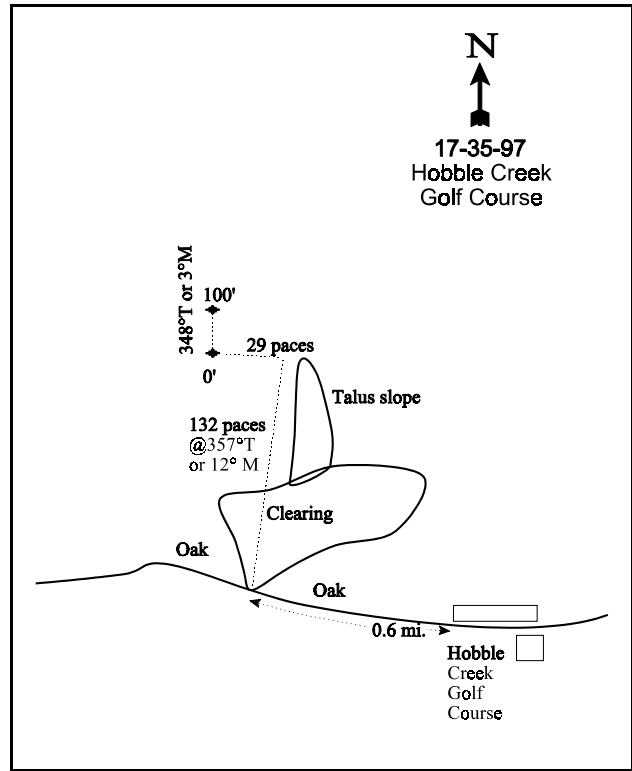
Vegetation type: Gambel Oakbrush.

Compass bearing: frequency baseline 348 degrees magnetic.

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

LOCATION DESCRIPTION

From Hobble Creek Golf Course Club House, proceed west toward Springville for 0.60 miles until you come to a clearing in the oakbrush to the north. From the beginning of the clearing, walk 132 paces at 357 degrees true in a northeasterly direction through the clearing and up a talus draw. Once at the top of the talus draw, the 0-foot baseline stake is located 29 paces away at an azimuth of 263 degrees true. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3981, is attached to the 0-foot baseline stake.



Map Name: Springville

Diagrammatic Sketch

Township 7S, Range 4E, Section 31

GPS: NAD 27, UTM 12S 4445634 N 455751 E

## DISCUSSION

### Hobble Creek Golf Course - Trend Study No. 17-35

\*\*\*SUSPENDED - This site was suspended in 2002. The site is poor and contains little winter browse forage for big game.

This trend study is located on a south facing slope, immediately north of Hobble Creek Golf Course. The slope is steep (65-70%) and the site is very dry and within the limits of severe winter range. Elevation is approximately 5,200 feet. In 1983, heavy and intense past deer use was evidenced by the density of pellet groups, the level of use on key browse species, the presence of antler drops, and the finding of at least five winter-killed deer in the immediate vicinity. By 1997, there is very little wildlife use observable. The range type is sparse mixed mountain brush characterized by scattered clumps of low growing Gambel oak, true mountain mahogany, and Saskatoon serviceberry. However, the bulk of the soil surface is occupied by talus, rimrock, and grass-forb openings.

The soil is shallow and exposed bare soil is almost nonexistent. Large areas are occupied by talus slopes and much of the remaining surface is in a near talus condition. Variable sized angular rocks are the dominant feature on this site. Drainage is very fast and erosion is a serious problem. Vegetative and litter cover are both sparse.

Shrub density, although very scattered, includes three species; service berry, true mountain mahogany, and Gambel oak. There is also occasional individuals of mountain big sagebrush and the slightly more abundant broom snakeweed. Key species designation should probably include all three of the principal shrubs. Gambel oakbrush density was estimated at 7,900 stems/acre in 1997. The density is higher than previously reported because density measurements were made in the same place the vegetative measurements were made. Also, stems for each plant were counted rather than clumps that may have been counted in the past. Saskatoon serviceberry density was estimated at 180 plants/acre in 1997. Due to the much larger sample used in 1997, this density is a much more representative estimate than the 2,099 plants/acre estimated in 1989. These plants were heavily browsed in 1983 and 1989, but showed only light utilization and good vigor in 1997. The plants are relatively short, averaging only 28 inches in height in 1997. This would indicate what poor potential the site has. True mountain mahogany was not sampled in 1997. This was due to the increased sample size which is more representative of the area. Broom snakeweed shows a slight increase in density while height and crown measurements have remained nearly the same.

Herbaceous composition is typical of many other depleted, poor condition sites on this unit. Among perennial grasses, bulbous bluegrass is dominant, providing 54% of the grass cover, followed by smaller amounts of bluebunch wheatgrass. In 1997, smooth brome was encountered on the site. Annual grasses are very abundant. Cheatgrass brome, rattlesnake brome, and sixweeks fescue all occur.

Forbs occur infrequently and are generally low or moderate in palatability. Northern bedstraw is most abundant followed by Louisiana sage, yellow salsify, and longleaf phlox. Also present are a myriad of annual forbs.

### 1983 APPARENT TREND ASSESSMENT

Most evidence suggests a declining range trend. Soil condition is poor and will likely not improve without some sort of intervening treatment. Vegetationally, low value grasses and forbs are becoming increasingly dominant. The key browse species are barely holding their own, or as in the case of serviceberry and to a lesser extent mountain mahogany, actually declining.



## 1989 TREND ASSESSMENT

Early drying grasses found on this site probably account for the differences found in the percent litter and vegetative cover between 1983 and 1989. The total ground cover is the same between years. Rock and pavement make up a significant 56% of the total, a slight increase since 1983. The three main browse species on this sparse mountain brush site appear to have improved vigor and less utilization than in 1983. From all signs, the area appears to receive moderate use by big game. Use is limited to winter and spring and cover is fair. The herbaceous component shows little change. Sandberg bluegrass was sampled on the site in 1989.

### TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

Soil trend on this site is stable, but condition is very poor. There is very little soil on the surface and no erosion is apparent. Cover is dominated by rock and litter. Although density for the browse species may have changed since 1989, this is due to the improved sampling method and much larger sample size used in 1997 which is more reflective of the true densities of the browse. Browse species showed very little utilization this season and show good vigor. Lighter use is also apparent with almost no pellet groups being found on the site. The herbaceous understory composition remains similar to that sampled in previous years. One addition to the grass component in 1997 is smooth brome. The herbaceous understory trend is stable.

### TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 35

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	<sub>b</sub> 134	<sub>a</sub> 85	<sub>a</sub> 85	54	37	32	2.55
G	Bromus brizaeformis (a)	-	-	56	-	-	23	.31
G	Bromus inermis	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 47	-	-	16	.98
G	Bromus tectorum (a)	-	-	182	-	-	63	3.62
G	Oryzopsis hymenoides	-	7	-	-	3	-	-
G	Poa bulbosa	<sub>a</sub> 177	<sub>b</sub> 232	<sub>b</sub> 245	64	81	86	9.03
G	Poa secunda	<sub>a</sub> -	<sub>b</sub> 76	<sub>a</sub> 7	-	33	3	.31
Total for Annual Grasses		0	0	238	0	0	86	3.93
Total for Perennial Grasses		311	400	384	118	154	137	12.88
Total for Grasses		311	400	622	118	154	223	16.81
F	Alyssum alyssoides (a)	-	-	10	-	-	5	.02
F	Allium spp.	-	-	4	-	-	1	.03
F	Artemisia ludoviciana	<sub>a</sub> 36	<sub>b</sub> 63	<sub>a</sub> 42	15	26	18	.45
F	Aster chilensis	2	1	3	1	1	1	.15

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
F	Cirsium spp.	-	-	3	-	-	1	.00
F	Cymopterus spp.	-	-	1	-	-	1	.15
F	Eriogonum brevicaule	-	1	6	-	1	2	.06
F	Erigeron spp.	-	-	2	-	-	2	.01
F	Galium aparine (a)	-	-	55	-	-	22	.27
F	Lathyrus brachycalyx	<sub>b</sub> 12	<sub>a</sub> -	<sub>ab</sub> 3	4	-	1	.15
F	Lactuca serriola	<sub>a</sub> -	<sub>a</sub> 1	<sub>b</sub> 22	-	1	10	.19
F	Lomatium dissectum	6	8	-	4	5	-	-
F	Phlox longifolia	<sub>a</sub> 3	<sub>ab</sub> 10	<sub>b</sub> 17	1	5	7	.22
F	Tragopogon dubius	8	2	4	4	1	3	.01
F	Trifolium gymnocarpon	-	-	8	-	-	3	.01
Total for Annual Forbs		0	0	65	0	0	27	0.29
Total for Perennial Forbs		67	86	115	29	40	50	1.47
Total for Forbs		67	86	180	29	40	77	1.76

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 35

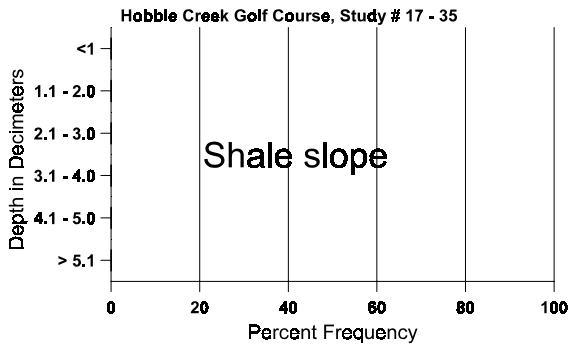
Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Amelanchier alnifolia	5	.31
B	Gutierrezia sarothrae	15	1.00
B	Quercus gambelii	70	11.08
Total for Browse		90	12.40

#### BASIC COVER --

Herd unit 17 , Study no: 35

Cover Type	Nested Frequency	Average Cover %		
		'83	'89	'97
Vegetation	341	.25	8.50	33.93
Rock	332	39.50	46.75	36.16
Pavement	128	8.00	8.75	2.91
Litter	366	46.50	30.00	31.53
Cryptogams	-	1.00	0	0
Bare Ground	108	4.75	6.00	2.54

# Stoniness Index



## PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 35

Type	Quadrat Frequency
	'97
Deer	1

## BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 35

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Amelanchier alnifolia																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	5	29	-	-	-	-	-	-	5	20	9	-	1133			34
	89	10	10	2	2	2	-	-	-	22	2	2	-	866			26	
	97	3	-	-	-	-	-	-	-	3	-	-	-	60			3	
M	83	-	-	14	-	-	-	-	-	-	-	2	12	-	466	24	14	14
	89	4	11	10	2	3	-	-	-	20	2	7	1	1000	16	10	30	
	97	5	1	-	-	-	-	-	-	6	-	-	-	120	28	28	6	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	4	2	1	-	-	-	-	-	3	-	1	3	233			7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		10%			90%			44%			+24%							
'89		44%			21%			22%			-91%							
'97		11%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1599	Dec:	0%			
												'89	2099		11%			
												'97	180		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cercocarpus montanus</i>																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	4	-	-	-	-	-	1	-	5	-	-	-	166	67 63	5	
	89	-	1	-	-	2	-	2	-	-	5	-	-	-	166	87 94	5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
D	83	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			13%			13%			+34%							
'89		25%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	265	Dec:	12%				
											'89	399		0%				
											'97	0		0%				
<i>Gutierrezia sarothrae</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	12	-	-	-	-	-	-	-	-	12	-	-	-	400	15 13	12	
	89	14	-	-	-	-	-	-	-	-	14	-	-	-	466	11 15	14	
	97	34	-	-	-	-	-	-	-	-	34	-	-	-	680	10 17	34	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+14%							
'89		00%			00%			00%			+33%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	400	Dec:	-				
											'89	466		-				
											'97	700		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
Y	83	2	30	-	-	-	-	-	-	-	32	-	-	-	1066		32	
	89	29	2	-	6	-	-	-	-	-	35	-	2	-	1233		37	
	97	315	60	-	-	-	-	-	-	-	375	-	-	-	7500		375	
M	83	-	14	1	-	-	-	-	-	-	15	-	-	-	500	58 23	15	
	89	32	6	-	1	-	-	-	-	-	37	1	1	-	1300	30 20	39	
	97	3	1	-	-	-	-	-	-	-	4	-	-	-	80	28 23	4	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	5	5	-	-	-	-	-	-	-	8	-	1	1	333		10	
	97	15	1	-	-	-	-	-	-	-	14	-	-	2	320		16	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	400		20	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		94%			02%			00%			+45%							
'89		15%			00%			06%			+64%							
'97		16%			00%			.50%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1566	Dec:	0%				
											'89	2866		12%				
											'97	7900		4%				

Trend Study 17-36-97

Study site name: Big Slide.

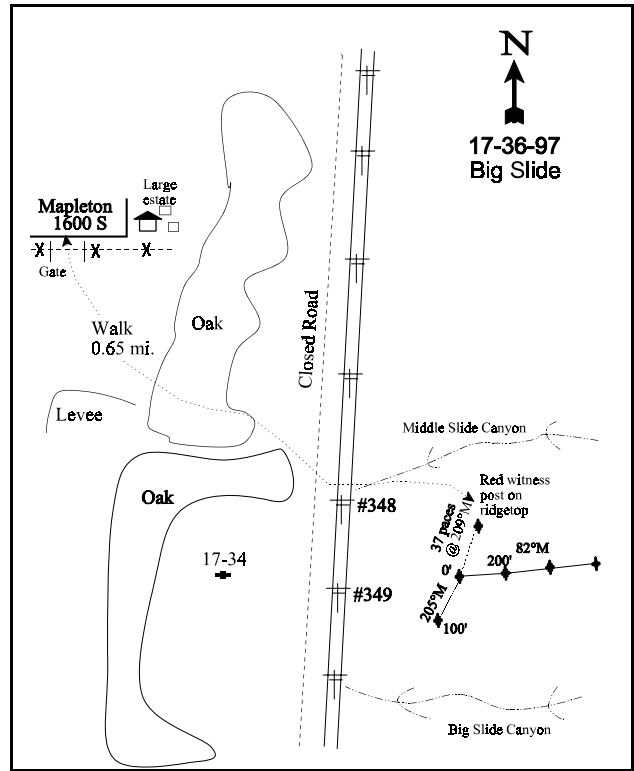
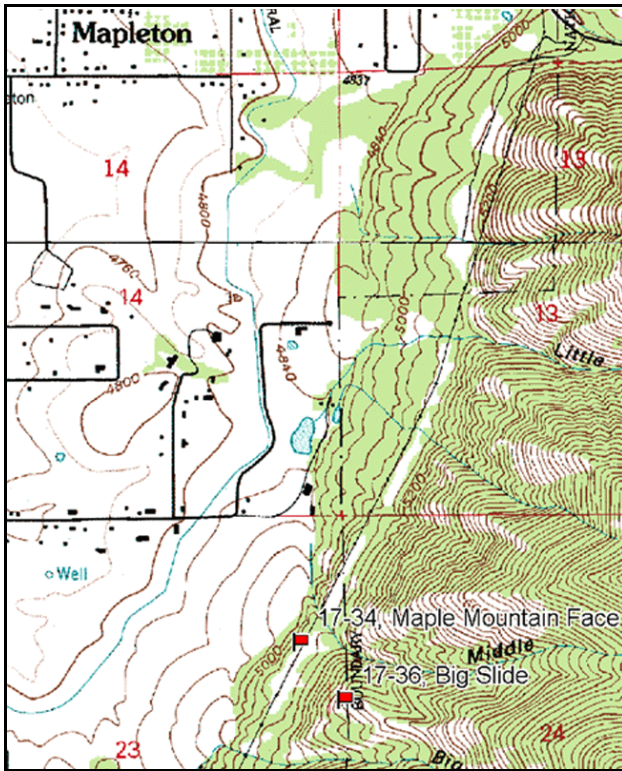
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 205 degrees magnetic (line 2-4 @ 82°M).

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

LOCATION DESCRIPTION

Drive up 1600 South in Mapleton to the end of road. Park and hike east for 0.65 miles to site. Follow the road south along the foothills to study site #17-34. On the slope above the power lines there is a small sagebrush opening north of the mouth of Big Slide Canyon. Follow game trails up the slope through the oakbrush to the study site. There is a tall red fence post on the top edge of the small bench, from it the 0-foot baseline stake is 37 paces south (209 degrees). It is marked with browse tag #9086.



Map Name: Spanish Fork Peak

Diagrammatic Sketch

Township 8S, Range 3E, Section 24

GPS: NAD 27, UTM 12S 4439870 N 452357 E

## DISCUSSION

### Big Slide - Trend Study No. 17-36

\*\*\*SUSPENDED - This site was suspended in 2002.

The Big Slide trend study is located on the slope above the Maple Mountain Face study which was established in 1989. The small open bench has a slope of 35% and an aspect to the southwest. The elevation is 5,400 feet. The slopes and drainages are dominated by clumps of oak with small openings of grass and sagebrush on the more level areas. In early September 1989, a wildfire higher up in Middle Slide Canyon burned both slopes and some timber. It was seeded by helicopter on October 15. In 1994, the site burned as part of the Big Slide Canyon burn. Parts of the mountain were seeded in the fall following the fire. Looking at the herbaceous composition of this area, some of the seed became established, although not in abundant numbers. There is currently no livestock grazing on this Forest Service administered site. Although there is very little sign of wildlife on the site, many pellet groups were encountered while hiking up the steep slope to the site. A small fawn was bedded down in some Gambel oakbrush and was flushed out while hiking up the trail.

The soil is moderately shallow and compacted. Near the top of the slope, rocks are a significant source of ground cover. There is no apparent erosion due to the grass and forb cover. Soil textural analysis indicates a clay loam with a neutral pH (6.7). The effective rooting depth is almost 14 inches with an average temperature of 55.8° F measured about 16 inches in depth.

Mountain big sagebrush was sampled in 1989, prior to the 1994 fire at a density of 699 plants/acre. Density declined in 1997 to only 20 plants/acre. Only one young mountain big sagebrush plant was sampled. Broom snakeweed, which was not previously encountered, had a density of 160 plants/acre in 1997. Apparently, some curleaf mountain mahogany bare-root stock were planted along the lower slope of the study site. Density for curleaf mountain mahogany was estimated at 160 plants/acre in 1997. Gambel oakbrush was burned and is now resprouting. Some of the taller plants, over 12 feet, were not completely burned. Most plants were classified as young with some seedling and mature. Density was estimated by counting individual stems. Utilization was light at this time.

Most of the ground cover comes from bulbous bluegrass, a low value perennial. It provided 43% of the total vegetative cover in 1997. Not all plants were producing seed heads during the 1997 reading, with most remaining dormant and low to the ground. Cheatgrass occurs in small patches scattered throughout the area providing 17% of the total vegetative cover in 1997. Other grasses include Sandberg bluegrass, orchard grass, and purple threeawn.

Forbs include many weedy species that would be expected after a fire. These include storksbill, autumn willoweed, hairy goldaster, Western ragweed, and wavyleaf thistle. Some seeded species have become established, these are mostly alfalfa and small burnet.

### 1989 APPARENT TREND ASSESSMENT

Erosion is minimal and soil condition appears stable. As on most other sites along the southern portion of the Wasatch Front, sagebrush appears to be in a state of decline. There is a high incidence of decadence and lack of recruitment. The herbaceous understory is totally dominated by the low value perennial, bulbous bluegrass.

## 1997 TREND ASSESSMENT

Soil trend is slightly upward. There is currently less bare soil, rock, and litter cover than estimated in 1989. Litter cover has remained nearly unchanged. Vegetative cover is abundant and there is no erosion apparent at this time. Browse trend is down. Mountain big sagebrush density has plummeted to only 20 plants/acre. The 1994 fire burned all mature plants leaving only one young plant being sampled in 1997. Gambel oakbrush is resprouting with an estimated 1,200 stems/acre. Broom snakeweed has become established and should be closely monitored as it has the propensity to increase its density quickly on sites like this. The herbaceous understory is stable, although a better composition is desired. Some seeded species have become established, but the winter annuals will provide intense competition and will likely exclude some species from the site in the future.

### TREND ASSESSMENT

soil - slightly up (4)

browse - down (1)

herbaceous understory - stable, but poor composition (3)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 36

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	'97
G	Agropyron spicatum	7	-	2	-	-
G	Aristida purpurea	21	14	9	6	1.43
G	Bromus tectorum (a)	-	314	-	92	12.20
G	Dactylis glomerata	a-	b15	-	9	.33
G	Poa bulbosa	b383	a346	99	94	31.67
G	Poa pratensis	15	-	6	-	-
G	Poa secunda	a-	b19	-	8	.22
G	Sporobolus cryptandrus	6	-	2	-	-
Total for Annual Grasses		0	314	0	92	12.20
Total for Perennial Grasses		432	394	118	117	33.65
Total for Grasses		432	708	118	209	45.86
F	Ambrosia psilostachya	a13	b47	4	22	1.11
F	Artemisia ludoviciana	40	42	12	17	1.39
F	Asclepias spp.	-	6	-	2	.18
F	Balsamorhiza sagittata	-	2	-	1	.38
F	Calochortus nuttallii	-	1	-	1	.00
F	Cirsium undulatum	a4	b45	2	19	2.47
F	Crepis acuminata	-	2	-	1	.15
F	Cruciferae	-	1	-	1	.00
F	Epilobium brachycarpum (a)	-	83	-	33	.96
F	Erodium cicutarium (a)	-	114	-	40	4.78
F	Erigeron divergens	a-	b31	-	15	.81
F	Eriogonum racemosum	2	1	2	1	.15
F	Helianthus annuus (a)	57	-	24	-	-



T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	'97
F	Heterotheca villosa	a-	b68	-	33	4.72
F	Lactuca serriola	24	39	11	17	1.23
F	Linum lewisii	a-	b8	-	4	.19
F	Lithospermum spp.	39	-	17	-	-
F	Lomatium spp.	a-	b8	-	5	.07
F	Medicago sativa	a-	b14	-	6	.95
F	Oenothera spp.	-	2	-	1	.03
F	Phlox longifolia	-	3	-	1	.03
F	Polygonum douglasii (a)	-	5	-	2	.01
F	Sanguisorba minor	a-	b14	-	7	.29
F	Tragopogon dubius	a36	b135	21	58	2.88
F	Trifolium gymnocarpon	a-	b24	-	8	.67
F	Unknown forb-perennial	b6	a-	4	-	-
F	Verbascum thapsus	-	-	-	-	.03
F	Zigadenus paniculatus	1	-	1	-	-
Total for Annual Forbs		57	202	24	75	5.76
Total for Perennial Forbs		165	493	74	220	17.77
Total for Forbs		222	695	98	295	23.53

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

#### BROWSE TRENDS --

Herd unit 17 , Study no: 36

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	1	-
B	Cercocarpus ledifolius	4	-
B	Gutierrezia sarothrae	2	.15
B	Quercus gambelii	6	4.34
Total for Browse		13	4.49

#### BASIC COVER --

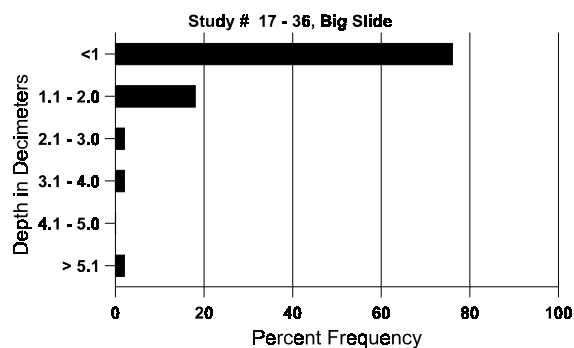
Herd unit 17 , Study no: 36

Cover Type	Nested Frequency	Average Cover %	
	'97	'89	'97
Vegetation	394	22.50	57.95
Rock	283	20.25	15.17
Pavement	204	13.00	3.27
Litter	380	36.25	37.15
Cryptogams	47	0	.49
Bare Ground	142	8.00	2.46

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 36, Big Slide

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.7	55.8 (15.5)	6.7	39.4	32.7	27.8	2.7	11.6	195.2	.5

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17, Study no: 36

Type	Quadrat Frequency '97
Elk	5
Deer	4

BROWSE CHARACTERISTICS --  
Herd unit 17, Study no: 36

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4												
<i>Artemisia tridentata vaseyana</i>																	
Y	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	1	1	-	-	-	-	-	-	2	-	-	-	66	22	24	2
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	2	16	-	-	-	-	-	-	14	-	-	4	600		18	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>				<u>Heavy Use</u>				<u>Poor Vigor</u>				<u>%Change</u>			
'89		81%				00%				19%				-97%			
'97		00%				00%				00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	699	Dec:	86%				
										'97	20		0%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Cercocarpus ledifolius</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	80		-		
<i>Gutierrezia sarothrae</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	9	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%									
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	160		-		
<i>Quercus gambelii</i>																	
S	89	-	-	-	2	-	-	-	-	-	-	2	-	-	66		2
	97	-	-	-	-	-	-	5	-	-	5	-	-	-	100		5
Y	89	-	1	-	5	1	-	2	-	-	9	-	-	-	300		9
	97	17	-	-	43	-	-	-	-	-	60	-	-	-	1200		60
M	89	2	1	-	-	-	-	-	-	-	1	2	-	-	100	88	112
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	29	41
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	400		20
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		25%			00%			00%			+67%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	400	Dec:	-		
												'97	1220		-		

Trend Study 17-38-97

Study site name: N. Fork Diamond Creek Cyn.

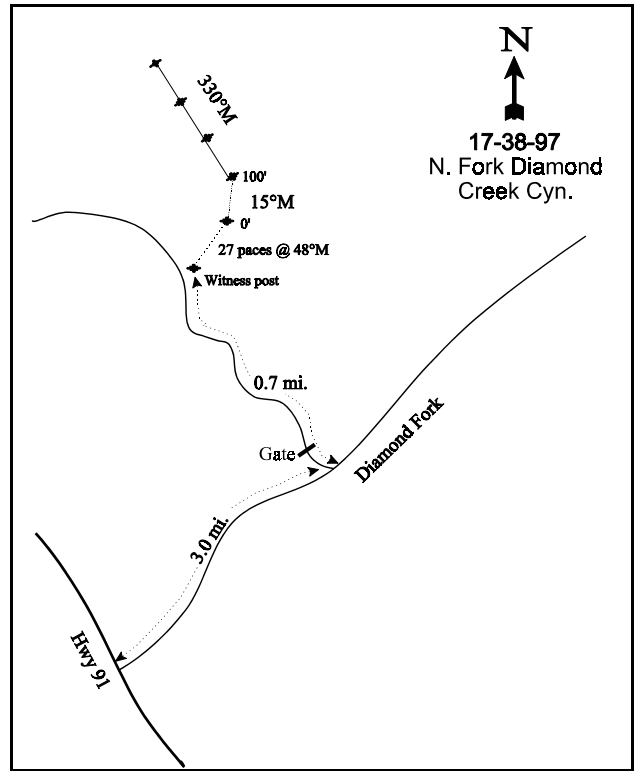
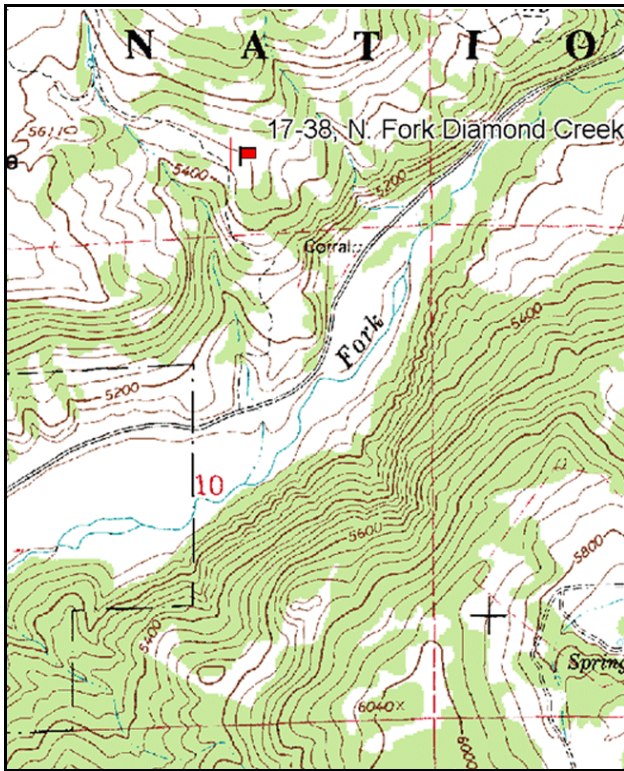
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 15 degrees magnetic (lines 2-4 @ 330°M).

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

LOCATION DESCRIPTION

From the intersection of Highway 6 and the Diamond Fork Road, proceed 2.3 miles up Diamond Fork to an intersection. Turn left and proceed 0.1 miles to a locked gate. Then go 0.70 miles to a faint road to the right (northeast). Walk 27 paces up the road to the northeast, then turn and walk 5 paces to the north to the 0-foot baseline stake. The study is marked by green steel “T” fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3978, is attached to the 0-foot baseline stake.



Map Name: Billies Mountain

Diagrammatic Sketch

Township 9S, Range 4E, Section 3

GPS: NAD 27, UTM 12S 4433752 N 460093 E

## DISCUSSION

### North Fork Diamond Canyon - Trend Study No. 17-38

\*\*\*SUSPENDED - This site was suspended in 2002 due to access problems and lack of a significant browse component.

The North Fork Diamond Canyon study was located on what in the past was considered important deer winter range in the Diamond Fork drainage. The study is at 5,480 feet elevation and on a gentle (10%), south to southeast slope. The range type is mountain big sagebrush-grass with smaller numbers of antelope bitterbrush intermixed throughout. Large numbers of deer pellet groups were reported in the past, but currently they are fairly low for deer and elk. Spring through fall cattle grazing also occurs and appears quite intense. Cattle were on site in 1997 and utilization was apparent on smooth brome. Water is found in several small livestock ponds and the creek, 100 yards to the south.

Soil is moderately deep with textural analysis indicating a clay loam. Soil pH is neutral (7.1) with an effective rooting depth of a little over 18 inches. A uniform and moderately dense grass cover provides good soil protection. Shrub cover is poor, it provides only 11% of the vegetative cover and often consists of decadent sagebrush. Trampling and compaction damage from cattle is apparent. Soil erosion is not currently a serious problem, but could easily become so.

The key preferred browse species are mountain big sagebrush and antelope bitterbrush. The mountain big sagebrush density has continued to decline since the initial reading. It had an estimated density of 340 plants/acre in 1997. There were an estimated 1,833 plants/acre in 1983 and then 766 plants/acre in 1989. Percent decadency has remained relatively similar through the years (around 60%), with 60% of the decadent plants classified as dying. Currently there is a very large number of dead plants (1,140 plants/acre) which were first counted in 1997. They outnumber live plants by more than 3 to 1. The stand currently exhibits moderate to heavy hedging. Some recruitment is occurring, but may not continue to do so because of the very dense cover of smooth brome providing intense competition. There did not appear to be any seed production on the sagebrush in 1997. Bitterbrush density appears lower than in the past, but this is due to the greatly increased sample size used in 1997, since there are no dead plants to explain this loss in numbers. The larger sample size gives significantly better population estimates for browse populations that have distributions that are discontinuous or clumped. In the recent reading, bitterbrush was found only near the beginning of the transect and not in the extended area. Utilization was heavy on the estimated 100 plants/acre. Other browse encountered in low densities include broom snakeweed, rabbitbrush, and skunkbush.

Grasses primarily consist of perennial sod formers, of which two are introduced grasses. Smooth brome and Kentucky bluegrass are both very abundant. Nested frequency of smooth brome significantly increased since 1989 and 1983. It is now found in nearly every quadrat (99%). Western wheatgrass, a native that sometimes acts as an increaser, occurs in patches and has significantly decreased in nested frequency since 1989. As reported in 1983, grasses are highly competitive and are probably a significant factor along with extended drought in the general decline of mountain big sagebrush.

Forbs are also numerous but consist largely of aggressive increasers and invaders. Although, such species as Pacific aster, are moderately palatable and heavily grazed. Decreaser forbs are absent from this site. Annuals and biennials consist of false phlox, bur buttercup, autumn willoweed, and yellow salsify.

### 1983 APPARENT TREND ASSESSMENT

Soil condition appears stable but rather precarious. Heavy grazing is reducing grass vigor and preventing litter accumulation. Erosion is currently light but could easily become worse. Mountain big sagebrush appears to be in a state of decline. Antelope bitterbrush is only maintaining itself. Grasses and increaser forbs, especially Pacific aster, are highly competitive and discourage shrub reproduction.

## 1989 TREND ASSESSMENT

While litter cover remained about 50% of ground cover, vegetative basal cover increased from 1% to 6%. With the slight increase in rock and pavement cover, the amount of bare soil encountered declined. Although potentially highly erodible, the fine-textured and compacted soil is currently slightly upward. The sagebrush appears to be suffering the effects of a herbicide treatment, but past treatments on this private land are unknown at this time. The sagebrush population is unlikely to recover from whatever is effecting it, so the value of this particular slope as winter range is low and the vegetative trend is still downward. The opposing north facing slope supports a model stand of big sagebrush. While density plot data comparisons indicate decreased grass and forb density, the frequency data for these hard to count species are similar between years.

### TREND ASSESSMENT

soil - up slightly (4)

browse - down (1)

herbaceous understory - stable (3)

## 1997 TREND ASSESSMENT

Soil trend is slightly upward. There is currently less bare ground, rock, and litter cover than reported in the past. Erosion is still low. Browse trend continues to be downward. Mountain big sagebrush density continues to decline in this decadent population. The combination of drought, competition with grasses and intense utilization will continue to reduce this mountain big sagebrush community. Some scattered patches of Gambel oakbrush surround the site and could provide wildlife escape cover during the warm season. Herbaceous understory trend is upward. This comes at the detriment to the browse component. Smooth brome nested frequency significantly increased, while western wheatgrass nested frequency significantly declined. Smooth brome is easily out-competing winter annuals like cheatgrass and Japanese brome at this elevation. Most of the forbs are increasers or invaders, similar to previous years.

### TREND ASSESSMENT

soil - slightly up (4)

browse - down (1)

herbaceous understory - up (5)

## HERBACEOUS TRENDS --

Herd unit 17 , Study no: 38

T y p e	Species	Nested Frequency			Quadrat Frequency			Average
		'83	'89	'97	'83	'89	'97	Cover %
G	Agropyron cristatum	3	-	3	1	-	1	.00
G	Agropyron smithii	<sub>b</sub> 183	<sub>b</sub> 147	37	72	57	14	.14
G	Bromus inermis	<sub>a</sub> 156	<sub>b</sub> 195	<sub>c</sub> 360	49	60	99	27.53
G	Bromus japonicus (a)	-	-	55	-	-	21	.44
G	Bromus tectorum (a)	-	-	3	-	-	1	.00
G	Oryzopsis hymenoides	1	-	-	1	-	-	-
G	Poa bulbosa	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 115	-	-	37	6.55
G	Poa fendleriana	2	2	-	1	1	-	-
G	Poa pratensis	<sub>ab</sub> 94	<sub>b</sub> 118	<sub>a</sub> 81	31	44	31	1.59

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'83	'89	'97	'83	'89	'97	'97
G	<i>Poa secunda</i>	<sub>a</sub> 5	<sub>ab</sub> 17	<sub>b</sub> 22	2	7	9	.29
Total for Annual Grasses		0	0	58	0	0	22	0.45
Total for Perennial Grasses		444	479	618	157	169	191	36.12
Total for Grasses		444	479	676	157	169	213	36.57
F	<i>Alyssum alyssoides</i> (a)	-	-	285	-	-	97	1.50
F	<i>Allium</i> spp.	-	-	12	-	-	7	.03
F	<i>Artemisia ludoviciana</i>	<sub>b</sub> 55	<sub>b</sub> 40	<sub>a</sub> 19	23	21	8	.04
F	<i>Aster chilensis</i>	215	230	230	72	72	73	8.43
F	<i>Astragalus convallarius</i>	18	18	15	9	7	5	.21
F	<i>Cardaria draba</i>	-	-	3	-	-	1	.03
F	<i>Camelina microcarpa</i> (a)	-	-	10	-	-	5	.02
F	<i>Calochortus nuttallii</i>	<sub>c</sub> 55	<sub>a</sub> 9	<sub>b</sub> 35	26	6	16	.10
F	<i>Chaenactis douglasii</i>	6	-	-	2	-	-	-
F	<i>Cirsium undulatum</i>	<sub>c</sub> 90	<sub>b</sub> 58	<sub>a</sub> 5	45	27	3	.06
F	<i>Collinsia parviflora</i> (a)	-	-	6	-	-	4	.02
F	<i>Cymopterus</i> spp.	-	-	13	-	-	8	.06
F	<i>Epilobium brachycarpum</i> (a)	-	-	41	-	-	17	.11
F	<i>Galium aparine</i> (a)	-	-	3	-	-	1	.00
F	<i>Lactuca serriola</i>	<sub>a</sub> -	<sub>a</sub> 2	<sub>b</sub> 11	-	1	5	.02
F	<i>Lomatium</i> spp.	-	5	-	-	2	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	98	-	-	41	.28
F	<i>Oenothera</i> spp.	-	-	3	-	-	1	.03
F	<i>Phlox longifolia</i>	<sub>b</sub> 26	<sub>c</sub> 53	<sub>a</sub> 4	13	24	2	.01
F	<i>Polygonum douglasii</i> (a)	-	-	5	-	-	2	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	63	-	-	24	.21
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 58	<sub>b</sub> 85	<sub>a</sub> 29	25	36	14	.17
F	<i>Tragopogon dubius</i>	<sub>b</sub> 39	<sub>a</sub> 12	<sub>a</sub> 9	20	5	5	.05
Total for Annual Forbs		0	0	511	0	0	191	2.16
Total for Perennial Forbs		562	512	388	235	201	148	9.27
Total for Forbs		562	512	899	235	201	339	11.44

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

BROWSE TRENDS --  
Herd unit 17 , Study no: 38

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	13	1.20
B	Chrysothamnus viscidiflorus viscidiflorus	3	.03
B	Gutierrezia sarothrae	5	.04
B	Purshia tridentata	4	1.18
B	Rhus trilobata	1	.03
Total for Browse		26	2.49

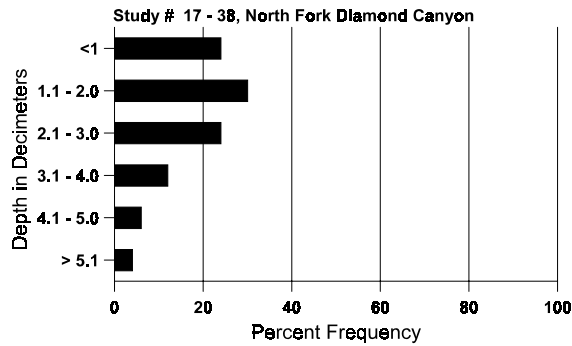
BASIC COVER --  
Herd unit 17 , Study no: 38

Cover Type	Nested Frequency	Average Cover %		
		'97	'83	'89
Vegetation	391	.75	6.25	47.46
Rock	78	2.25	4.00	.68
Pavement	210	3.25	5.75	1.18
Litter	399	48.00	50.25	46.87
Cryptogams	17	.50	0	.20
Bare Ground	316	45.25	33.75	20.97

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 38, North Fork Diamond Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
18.2	51.0 (17.7)	7.1	31.4	30.7	37.8	3.4	12.1	377.6	.6

### Stoniness Index





PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 38

Type	Quadrat Frequency '97
Elk	6
Deer	11
Cattle	8

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 38

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	-	-	-	-	-	-	3	-	1	-	133			4
	97	1	-	1	-	-	-	-	-	-	2	-	-	-	40			2
M	83	-	16	8	-	-	-	-	-	-	22	2	-	-	800	39	40	24
	89	1	2	-	-	-	-	-	-	-	2	-	1	-	100	26	31	3
	97	-	3	2	-	-	-	-	-	-	5	-	-	-	100	22	27	5
D	83	1	14	16	-	-	-	-	-	-	27	4	-	-	1033			31
	89	8	8	-	-	-	-	-	-	-	9	-	-	7	533			16
	97	4	1	4	-	-	1	-	-	-	4	-	-	6	200			10
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	1140			57
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		55%			44%			00%			-58%							
'89		43%			00%			39%			-56%							
'97		24%			47%			35%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1833	Dec:	56%			
												'89	766		70%			
												'97	340		59%			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	16	1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	12	26	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			+45%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	33		-			
												'97	60		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<b>Gutierrezia sarothrae</b>												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	22	-	-	-	-	-	-	22		22	
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	20		1	
M	83	3	-	-	-	-	-	-	100	14	16	3
	89	10	-	-	-	-	-	-	333	8	9	10
	97	6	-	-	-	-	-	-	120	6	8	6
D	83	3	-	-	-	-	-	-	100			3
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+40%				
'89		00%		00%		00%		-58%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	200	Dec:	50%			
						'89	333		0%			
						'97	140		0%			
<b>Purshia tridentata</b>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	1	-	-	-	-	-	33		1	
	97	-	-	1	-	-	-	-	20		1	
M	83	-	6	5	-	-	-	-	366	20	37	11
	89	-	-	7	-	-	-	-	233	13	33	7
	97	-	1	2	-	-	1	-	80	23	54	4
D	83	-	-	-	-	-	-	-	0			0
	89	-	-	2	-	-	-	-	66			2
	97	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		55%		45%		00%		-9%				
'89		10%		90%		00%		-70%				
'97		20%		80%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	366	Dec:	0%			
						'89	332		20%			
						'97	100		0%			
<b>Rhus trilobata</b>												
M	83	1	-	-	-	-	-	-	33	37	38	1
	89	-	1	-	-	-	-	-	33	48	35	1
	97	-	-	-	1	-	-	-	20	58	80	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		+0%				
'89		100%		00%		00%		-39%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	33	Dec:	-			
						'89	33		-			
						'97	20		-			

Trend Study 17-43-97

Study site name: Tie Fork.

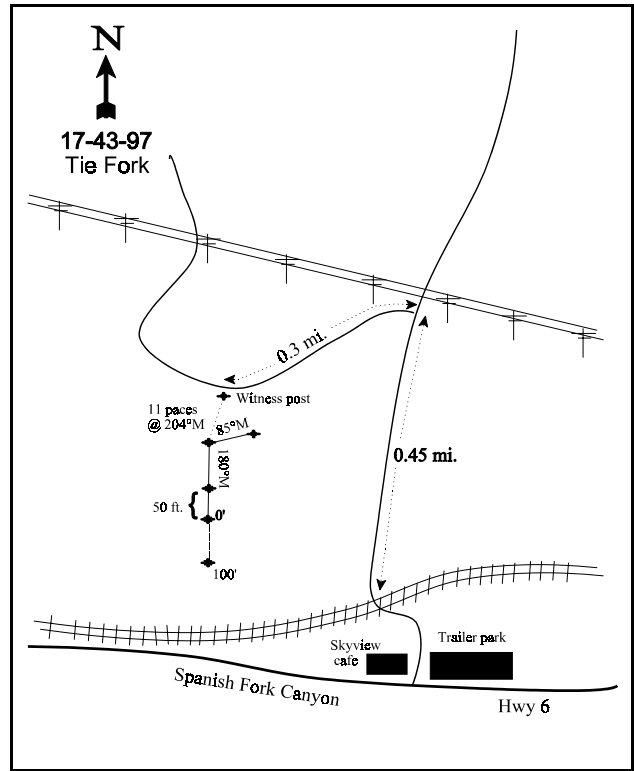
Vegetation type: Pinyon-Juniper.

Compass bearing: frequency baseline 180 degrees magnetic (line 4 @ 85°M).

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

LOCATION DESCRIPTION

From the intersection of the road in Spanish Fork Canyon and Tie Fork, proceed north up Tie Fork to where the road crosses the railroad tracks. From the railroad crossing, continue northward up Tie Fork for an additional 0.45 miles to an intersection just before the power lines. Turn left (west) and proceed 0.30 miles to where the road turns sharply northward. A stake is located on the left side of the road just before the bend. From the stake, the 300-foot baseline stake is located 11 paces away at an azimuth of 204 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Tucker

Diagrammatic sketch

Township 10S, Range 6E, Section 14

## DISCUSSION

### Tie Fork - Trend Study No. 17-43

\*\*\*SUSPENDED - This site was suspended in 2002. It has been replaced by Tie Fork East (17-47) a better, more representative site.

This study is located on deer winter range in lower Tie Fork Canyon. Much of the surrounding area is badly eroded and depleted of quality forage plants. This site is a poor representation of winter range (perhaps the reason the site was not inventoried in 1989) and should be closely looked at before sampling again in the future. Typically, juniper-pinyon predominates but is interrupted periodically by mountain brush slopes and sagebrush in the canyon bottoms. The study samples a slightly more productive juniper-pinyon type located on a moderate north facing slope (15-20%) at an elevation of 6,200 feet. Deer pellet group frequency was moderately high in 1997 (35%). During 1983, two deer carcasses, three antler drops, and at least 12 sets of deer legs were observed. During 1997 deer legs were again encountered and likely came from a nearby deer camp.

Soil is in relatively good condition when compared to surrounding south and west slopes, which are badly eroded and support almost no understory species. Textural analysis indicates a sandy clay loam with an effective rooting depth of almost 18 inches. Phosphorous could be limiting to plant growth and development with a value less than 10 ppm (8.7 ppm). Erosion is rapid enough to quickly move pellet groups and loose litter downslope, but this is localized and not wide spread.

Browse composition is divided into two levels of availability. Juniper and pinyon are abundant but largely unavailable because of excessive height. Point-center quarter data estimates 212 Utah juniper trees/acre, 33 pinyon trees/acre, and 27 Gambel oakbrush stems/acre. Most of the available browse comes from sub-dominant shrubs such as mountain big sagebrush, snowberry, stickyleaf low rabbitbrush, low growing Gambel oak, Saskatoon serviceberry, Wood's rose, true mountain mahogany, and an occasional antelope bitterbrush. The key preferred management species are mountain big sagebrush and true mountain mahogany. Together they only provide 3% of the total browse cover. Both were reported heavily hedged in 1983, but now exhibit light to moderate hedging. In 1983, mountain big sagebrush had poor vigor and consisted primarily of decadent plants. Vigor has improved, although 50% of the population are still classified as decadent. Currently the dead to live ratio is almost two dead for every live plant. Mahogany is in better vigor with only mature plants classified. The population is much less than originally estimated, but this is because of the much larger sample sized giving significantly better estimates for shrub populations that have discontinuous distributions. There are no dead plants in the population to explain the decline. Actually, snowberry provides a significant percentage of the forage as it contributes to 29% of the total browse cover and shows light to moderate use and good vigor.

Nested frequency for grass species has increased significantly since 1983. Many more palatable grasses that were not present in 1983 were now sampled. Nearly all grasses have significantly increased in nested frequency. The principle species include bluebunch wheatgrass, Kentucky bluegrass, Indian ricegrass, and crested wheatgrass.

Similar to the grasses, forb nested frequency has also greatly increased. The most common species include longleaf phlox, starwort, Hoods phlox, Utah fewflower peavine, and blue-eyed Mary. Utilization of forbs is uniformly light.

## 1983 APPARENT TREND ASSESSMENT

Although in better condition than most of the surrounding area, the study site still appears to be in a state of decline. The rate of soil erosion although steady, is not rapid. However, it is great enough to prevent any significant litter buildup. Vegetatively, juniper and pinyon appear to continue to thicken, while mountain big sagebrush is declining. Other browse species appear stable, or in some cases, even increasing. The herbaceous understory appears stable.

## 1997 TREND ASSESSMENT

Erosion is still slight and will probably always occur on this site due to the majority of the vegetative cover being aerial cover not herbaceous cover. Protective cover closer to the ground is more effective than aerial cover. Soil trend is stable. Browse trend is stable. Mountain big sagebrush vigor has improved, although there are currently more dead plants than live plants. The age structure for most species indicate stable populations with little biotic or recruitment potential. The herbaceous understory trend is upward with an increase in nested frequency for grasses and forbs. Many new grasses were encountered in 1997 that were not previously encountered.

### TREND ASSESSMENT

soil - stable (3)

browse - stable for key species (3)

herbaceous understory - up (5)

### HERBACEOUS TRENDS --

Herd unit 17 , Study no: 43

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'83	'97	'83	'97	
G	Agropyron cristatum	a <sup>3</sup>	b <sup>32</sup>	1	12	.93
G	Agropyron spicatum	79	110	39	38	3.11
G	Bromus tectorum (a)	-	19	-	7	.09
G	Oryzopsis hymenoides	a <sup>3</sup>	b <sup>50</sup>	2	20	1.44
G	Poa fendleriana	a <sup>-</sup>	b <sup>21</sup>	-	10	.20
G	Poa pratensis	51	59	24	19	1.62
G	Stipa comata	a <sup>-</sup>	b <sup>27</sup>	-	10	.81
G	Stipa lettermani	a <sup>-</sup>	b <sup>24</sup>	-	9	.34
Total for Annual Grasses		0	19	0	7	0.09
Total for Perennial Grasses		136	323	66	118	8.46
Total for Grasses		136	342	66	125	8.55
F	Achillea millefolium	24	18	11	8	.31
F	Agoseris glauca	a <sup>-</sup>	b <sup>18</sup>	-	7	.03
F	Alyssum alyssoides (a)	-	11	-	6	.17
F	Allium spp.	-	1	-	1	.00
F	Androsace septentrionalis (a)	b <sup>35</sup>	a <sup>4</sup>	19	2	.01
F	Arabis spp.	6	-	4	-	-
F	Astragalus convallarius	11	24	6	12	.25
F	Calochortus nuttallii	-	2	-	2	.01

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'83	'97	'83	'97	'97
F	<i>Collomia linearis</i> (a)	-	9	-	3	.01
F	<i>Collinsia parviflora</i> (a)	-	78	-	32	.33
F	<i>Cymopterus</i> spp.	<sub>a</sub> -	<sub>b</sub> 17	-	8	.12
F	<i>Cynoglossum officinale</i>	8	-	3	-	-
F	<i>Delphinium nuttallianum</i>	<sub>a</sub> -	<sub>b</sub> 33	-	17	.11
F	<i>Eriogonum umbellatum</i>	4	8	3	4	.09
F	<i>Geranium</i> spp.	12	1	5	1	.00
F	<i>Hackelia patens</i>	3	6	1	2	.06
F	<i>Ipomopsis aggregata</i>	-	3	-	1	.00
F	<i>Lathyrus pauciflorus</i>	50	47	20	17	2.27
F	<i>Machaeranthera canescens</i>	7	-	3	-	.00
F	<i>Penstemon caespitosus</i>	<sub>a</sub> -	<sub>b</sub> 26	-	11	.64
F	<i>Phlox hoodii</i>	<sub>a</sub> 31	<sub>b</sub> 57	13	21	2.21
F	<i>Phlox longifolia</i>	<sub>a</sub> 20	<sub>b</sub> 105	8	40	.85
F	<i>Polygonum douglasii</i> (a)	-	4	-	2	.01
F	<i>Schoenocrambe linifolia</i>	-	5	-	2	.03
F	<i>Senecio integerrimus</i>	-	4	-	4	.02
F	<i>Solidago</i> spp.	<sub>b</sub> 26	<sub>a</sub> 1	12	1	.03
F	<i>Stellaria jamesiana</i>	<sub>a</sub> -	<sub>b</sub> 79	-	26	1.83
F	<i>Taraxacum officinale</i>	-	6	-	3	.04
F	<i>Tragopogon dubius</i>	-	2	-	1	.00
F	<i>Viola</i> spp.	-	5	-	4	.02
Total for Annual Forbs		35	106	19	45	0.54
Total for Perennial Forbs		202	471	89	194	9.00
Total for Forbs		237	577	108	239	9.54

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

BROWSE TRENDS --

Herd unit 17 , Study no: 43

Type	Species	Strip Frequency	Average Cover %
		'97	'97
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata vaseyana	8	.33
B	Cercocarpus montanus	2	.15
B	Chrysothamnus depressus	6	.21
B	Chrysothamnus viscidiflorus viscidiflorus	40	4.14
B	Juniperus osteosperma	15	5.94
B	Opuntia spp.	4	.03
B	Pinus edulis	1	.15
B	Quercus gambelii	21	2.44
B	Rosa woodsii	4	-
B	Symphoricarpos oreophilus	70	5.63
B	Tetradymia canescens	1	.15
Total for Browse		173	19.19

CANOPY COVER --

Herd unit 17, Study no: 43

Point-Quarter Tree Data

Species	Percent Cover	Trees per Acre	Average diameter (in)
	'97	'97	'97
Juniperus osteosperma	20.2	211	23.1
Pinus edulis	-	33	11.6
Quercus gambelii	8.6	N/A	N/A

BASIC COVER --

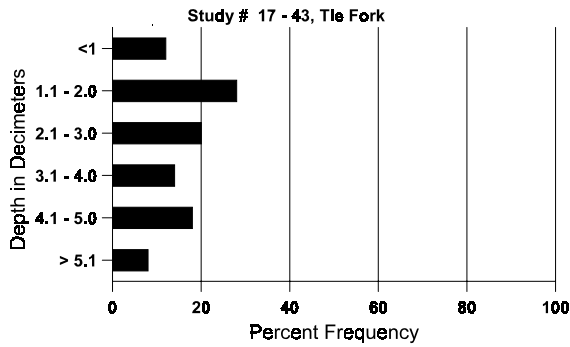
Herd unit 17 , Study no: 43

Cover Type	Nested Frequency	Average Cover %	
		'83	'97
Vegetation	345	.50	31.01
Rock	53	4.00	1.14
Pavement	123	1.00	3.32
Litter	396	60.75	44.08
Cryptogams	148	1.50	4.92
Bare Ground	229	32.25	23.31

SOIL ANALYSIS DATA --  
Herd Unit 17, Study no: 43, Tie Fork

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.8	43.8 (17.5)	7.3	55.4	20.7	23.8	4.4	8.7	339.2	.6

### Stoniness Index



PELLET GROUP FREQUENCY --  
Herd unit 17 , Study no: 43

Type	Quadrat Frequency '97
Rabbit	15
Elk	5
Deer	35

BROWSE CHARACTERISTICS --  
Herd unit 17 , Study no: 43

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier alnifolia																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	-	-	-	40		2	
D	83	-	1	-	-	-	-	-	-	-	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		100%			00%			00%			-39%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	100%		
												'97	40		0%		



A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total									
		1	2	3	4		5	6		7	8	9	1	2	3	4		
<i>Artemisia tridentata vaseyana</i>																		
M	83	2	-	-	-	-	-	-	-	-	1	-	1	-	133	24	16	2
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	20	29	4
D	83	-	3	-	-	-	-	-	-	-	-	-	3	-	200			3
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	300			15
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		60%			00%			80%			-52%							
'97		00%			00%			13%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	333	Dec:	60%				
											'97	160		50%				
<i>Cercocarpus montanus</i>																		
M	83	-	4	4	-	-	-	-	-	-	8	-	-	-	533	39	33	8
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	22	24	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			50%			00%			-92%							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	533	Dec:	-				
											'97	40		-				
<i>Chrysothamnus depressus</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	23	-	-	-	-	-	-	-	-	23	-	-	-	460	7	14	23
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'97	500		-				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280		14	
M	83	20	-	-	-	-	-	-	-	20	-	-	-	1333	17	19	20	
	97	115	-	-	-	-	-	-	-	115	-	-	-	2300	14	15	115	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	2	-	-	-	40			2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+44%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1466	Dec:	0%			
												'97	2620		2%			
<i>Juniperus osteosperma</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20			1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	2	-	-	-	40			2	
M	83	1	-	-	-	-	-	-	1	-	-	2	-	133	67	44	2	
	97	18	-	-	-	-	-	-	-	18	-	-	-	360	-	-	18	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	40			2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			100%			+67%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	-			
												'97	400		-			
<i>Opuntia spp.</i>																		
Y	83	1	-	-	-	-	-	-	-	1	-	-	-	66			1	
	97	5	-	-	-	-	-	-	-	5	-	-	-	100			5	
M	83	5	-	-	-	-	-	-	-	5	-	-	-	333	3	12	5	
	97	5	-	-	-	-	-	-	-	5	-	-	-	100	4	11	5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-50%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	399	Dec:	-			
												'97	200		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Pinus edulis</i>																		
S	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-90%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	200	Dec:	-				
											'97	20		-				
<i>Quercus gambelii</i>																		
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	83	22	-	-	-	-	-	-	-	-	22	-	-	-	1466		22	
	97	49	2	-	-	-	-	-	-	-	51	-	-	-	1020		51	
M	83	2	9	-	18	9	-	-	-	-	35	-	3	-	2533	67 20	38	
	97	106	2	-	-	-	-	-	-	-	108	-	-	-	2160	50 34	108	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	620		31	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		30%			00%			05%			-19%							
'97		04%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3999	Dec:	0%				
											'97	3220		1%				
<i>Rosa woodsii</i>																		
Y	83	9	-	-	-	-	-	-	-	-	6	3	-	-	600		9	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	1	-	-	-	-	-	-	-	-	-	1	-	-	66	17 12	1	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	17 14	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-82%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	666	Dec:	-				
											'97	120		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Symphoricarpos oreophilus</i>																		
S	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	15	-	-	-	-	-	-	-	-	15	-	-	-	300		15	
Y	83	77	-	-	-	-	-	-	-	-	77	-	-	-	5133		77	
	97	78	-	-	-	-	-	-	-	-	78	-	-	-	1560		78	
M	83	57	27	-	-	-	-	-	-	-	74	-	10	-	5600	21	16	84
	97	255	-	-	-	-	-	-	-	-	255	-	-	-	5100	16	24	255
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		17%			00%			06%			-38%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	10733	Dec:	-			
												'97	6660		-			
<i>Tetradymia canescens</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	8	10	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'97	40		-			

## SUMMARY

### WILDLIFE MANAGEMENT UNIT 17 - WASATCH MOUNTAINS

The Wasatch Mountain unit is large and covers a vast area. The western half of unit 17 was sampled in 2002. Sites on the unit are concentrated in three different areas which include the Heber Valley, the Wasatch Front, and Spanish Fork Canyon. Trend studies were established in 1983 and reread in 1989. The Heber area was reread in 1996 and the rest of the unit was reread in 1997. In 2002, 24 trend studies were reread in unit 17. One new study, Center Creek (17-60), was established east of Heber to monitor increasingly important winter ranges on the east foothills of the Heber Valley. Three trend studies, Daniels Canyon (17-6), Upper Big Hollow (17-10), and Lake Creek Road (17-20), were suspended in the Heber subunit after consideration by area biologists. Three new studies, American Fork Canyon (17-61), Grove Creek (17-62), and Hobbie Creek Bench (17-63), were established along the Wasatch Front in 2002. American Fork Canyon and Grove Creek were established to monitor bighorn sheep winter ranges and Hobbie Creek Bench was established to replace suspended sites in the area. A new study was also placed in Spanish Fork Canyon on a pinyon-juniper chaining which supports wintering deer and elk. Eight trend studies were suspended along the Wasatch Front. Many of these sites are no longer accessible due to development or are no longer representative of critical big game winter ranges. Two trend studies in Spanish Fork Canyon, North Fork Diamond Canyon (17-38) and Tie Fork (17-43), were also suspended.

Ten trend studies were reread in the Heber subunit in 2002. All sites sample winter ranges, half of which are found within the Wallsburg wildlife management area. Trend studies on the Heber subunit show slightly downward soil trends on three sites, slightly downward browse trends on three sites, and slightly downward herbaceous trends on six sites. The Deer Creek Dam (17-5) and Lower Big Hollow (17-9) trend studies displayed slightly downward trends for soil and herbaceous understory. Studies located east of Deer Creek Reservoir in the Wallsburg Wildlife Management area, Island Boat Camp (17-15) and Rainbow Bay (17-16), showed declining trends for browse and herbaceous plants. The Coyote Canyon trend study (#17-19) located northeast of Heber had downward trends on soil and browse. The only other downward trends consisted of slightly downward herbaceous understory trends at Hoovers Hollow (17-14) and Dutch Canyon (17-17).

Drought conditions for the past few years are the primary cause for these downward trends, especially downward trends for herbaceous understories. The forb component shows the most dramatic effects of drought. All 10 trend studies in the Heber subunit showed a decline in the sum of nested frequency value for forbs. Perennial grasses increased in abundance on all but one site. Nested frequency of the annual, cheatgrass, declined on eight sites and increased slightly on two sites.

Six trend studies were reread along the Wasatch Front from the mouth of American Fork Canyon to Hobbie Creek Canyon. All of these sites sample critical winter ranges. Trend studies at Heissetts Hollow (17-24) and North Battle Creek (17-25) showed declining trends for soil and browse. The only other downward trends were found for herbaceous understories at Round Peak (17-31) and Maple Mountain Face (17-34). All other sites showed stable or improving conditions. Drought conditions were not as pronounced with regard to herbaceous understory trends along the Wasatch Front as they were in the Heber Valley and in Spanish Fork Canyon. Of the six studies read along the front, three trend studies showed a decline in the sum of nested frequency of forbs while two sites increased and one remained stable. Frequency of cheatgrass declined on three sites and increased on three sites.

Eight trend studies were reread in Spanish Fork Canyon. Two trend studies, Tank Hollow (17-42) and Lower Tank Hollow (17-46), appear to have been especially hard hit by drought conditions. Trends at these sites were down or slightly down for soil, browse, and the herbaceous understory. Herbaceous understory trends were also declining at Upper Sheep Creek (17-41) and Tie Fork East (17-47). All eight sites showed a decline in the sum of nested frequency for forbs. Three trend studies displayed a decline in the abundance of perennial grasses as well.

Unit wide trends include the following: a general decline in the abundance of perennial forbs, a decline in the frequency of cheatgrass, a major decline in the density of broom snakeweed, a slight increase in the average nested frequency of perennial grasses, and an increase in the abundance of the poor value perennial, bulbous bluegrass. Sum of nested frequency for forbs was down on all but three of the 24 trend studies sampled in 2002. Average sum of nested frequency of forbs declined 39% between the last reading (1996/97) and 2002. Cheatgrass frequency declined on 16 of the 24 sites read in 2002. Broom snakeweed, a short lived invasive shrub, varies widely in density related to precipitation. Average density per site for unit 17 was estimated at 3,792 plants/acre in 1997, declining to an average of about 1,500 plants/acre in 2002. It appears that perennial grasses were not greatly effected as much by drought conditions. Perennial grasses increased in frequency on 16 of the 24 sites sampled in 2002. One disturbing trend is the increase in the poor value perennial grass, bulbous bluegrass. It has been increasing in many areas as cheatgrass has declined. Bulbous bluegrass has many similarities with cheatgrass. Both dry out early in the summer, although bulbous bluegrass does not provide the fine fuels as cheatgrass does. Ten sites supported bulbous bluegrass prior to the 2002 reading. Nested frequency increased on eight of those 10 sites in 2002, and bulbous bluegrass was sampled on three additional sites.

Precipitation is the major driving force for these trends. Data indicates a wet period from 1983 to 1986. Spring precipitation (March, April, and May) was 131% of normal in 1983, the year trend studies were established. Precipitation was below normal for the next three years (1987-89) and the trend studies were resampled at the end of that dry period in 1989. Spring precipitation was only 77% of normal in 1989. Another wet period occurred between 1995 and 1998. The 1996 and 1997 rereads occurred in the middle of this wetter than normal period. Spring precipitation was normal in 1996 and 80% of normal in 1997. Precipitation was near normal in 1999 and 2000 but very dry in 2001 at only 64% of normal. Conditions remained dry in 2002 and spring precipitation (March-May) was below normal in 2000 (68%), 2001 (75%) and 2002 (81%). This extended dry period is the cause for many of downward trends in Unit 17 in 2002.

A trend summary of each study is listed below.

SUMMARY

	Category	1983	1989	1996	2002
17-5 Deer Creek Dam	soil	est	3	3	2
	browse	est	2	5	4
	herbaceous understory	est	3	3	2
17-9 Lower Big Hollow	soil	est	4	3	2
	browse	est	2	4	3
	herbaceous understory	est	4	4	2
17-11 Wallsburg Turn	soil	est	3	4	4
	browse	est	4	3	3
	herbaceous understory	est	5	3	3
17-12 North Wallsburg Seeding	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	5	3	3
17-13 North Wallsburg	soil	est	3	3	3
	browse	est	1	4	3
	herbaceous understory	est	5	4	4
17-14 Hoovers Hollow	soil	est	3	4	3
	browse	est	3	3	3
	herbaceous understory	est	4	3	2
17-15 Island Boat Camp	soil	est	4	3	3
	browse	est	3	3	2
	herbaceous understory	est	5	5	2
17-16 Rainbow Bay	soil	est	4	3	3
	browse	est	2	2	2
	herbaceous understory	est	4	4	2
17-17 Dutch Canyon	soil	est	4	4	3
	browse	est	2	3	3
	herbaceous understory	est	4	3	2

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

	Category	1984	1990	1996	2002
17-19 Coyote Canyon	soil	est	NR	3	1
	browse	est	NR	3	2
	herbaceous understory	est	NR	4	3
	Category	1983	1989	1997	2002
17-24 Heissetts Hollow	soil	est	3	3	2
	browse	est	3	4	2
	herbaceous understory	est	4	4	3
17-25 North Battle Creek	soil	est	3	3	2
	browse	est	3	3	2
	herbaceous understory	est	3	2	3
17-26 Orem Water Tank	soil	est	3	3	5
	browse	est	1	3	3
	herbaceous understory	est	3	3	3
17-30 Spring Canyon	soil	est	3	3	3
	browse	est	4	3	3
	herbaceous understory	est	2	4	3
17-31 Round Peak	soil	est	3	3	3
	browse	est	4	2	3
	herbaceous understory	est	5	3	2
17-34 Maple Mountain Face	soil	est	2	3	4
	browse	est	2	4	4
	herbaceous understory	est	3	5	2
17-39 Little Diamond Fork	soil	est	3	4	3
	browse	est	3	3	3
	herbaceous understory	est	3	3	3
17-40 Long Hollow	soil	est	3	4	3
	browse	est	4	3	3
	herbaceous understory	est	3	5	3

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read



	Category	1983	1989	1997	2002
17-41 Upper Sheep Creek	soil	est	NR	3	3
	browse	est	NR	3	3
	herbaceous understory	est	NR	5	2
17-42 Tank Hollow	soil	est	4	4	2
	browse	est	3	3	2
	herbaceous understory	est	3	3	1
17-44 Billies Mountain	soil	est	3	4	2
	browse	est	2	4	3
	herbaceous understory	est	3	4	3
17-45 North Bench	soil		est	3	4
	browse		est	5	3
	herbaceous understory		est	5	3
17-46 Lower Tank Hollow	soil		est	5	2
	browse		est	4	2
	herbaceous understory		est	5	2
17-47 Tie Fork East	soil		est	4	2
	browse		est	3	3
	herbaceous understory		est	4	2
17-60 Center Creek	soil				est
	browse				est
	herbaceous understory				est
17-61 American Fork Canyon	soil				est
	browse				est
	herbaceous understory				est
17-62 Grove Creek	soil				est
	browse				est
	herbaceous understory				est

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

	Category	2002			
17-63 Hobble Creek Bench	soil	est			
	browse	est			
	herbaceous understory	est			
17-64 Water Hollow	soil	est			
	browse	est			
	herbaceous understory	est			
<b>SUSPENDED SITES</b>					
	Category	1983	1989	1996	2002
17-6 Daniels Canyon	soil	est	1	3	susp
	browse	est	2	3	susp
	herbaceous understory	est	4	2	susp
17-10 Upper Big Hollow	soil	est	4	3	susp
	browse	est	5	3	susp
	herbaceous understory	est	5	2	susp
	Category	1984	1990	1996	2002
17-20 Lake Creek Road	soil	est	3	4	susp
	browse	est	3	3	susp
	herbaceous understory	est	3	3	susp
	Category	1983	1989	1997	2002
17-21 Box Elder Canyon	soil	est	2	3	susp
	browse	est	3	3	susp
	herbaceous understory	est	3	3	susp
17-22 School House Spring	soil	est	2	3	susp
	browse	est	3	3	susp
	herbaceous understory	est	2	3	susp
17-23 Oak Hollow	soil			est	susp
	browse			est	susp
	herbaceous understory			est	susp

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

	Category	1983	1989	1997	2002
17-28 Spring Hollow	soil	est	1	3	susp
	browse	est	3	3	susp
	herbaceous understory	est	3	2	susp
17-29 Above Edgemont	soil		est	3	susp
	browse		est	1	susp
	herbaceous understory		est	3	susp
17-33 Maple Canyon	soil	est	4	3	susp
	browse	est	3	3	susp
	herbaceous understory	est	2	2	susp
17-35 Hobble Creek Golf Course	soil	est	3	3	susp
	browse	est	4	3	susp
	herbaceous understory	est	3	3	susp
	Category		1989	1997	2002
17-36 Big Slide	soil		est	4	susp
	browse		est	1	susp
	herbaceous understory		est	3	susp
	Category	1983	1989	1997	2002
17-38 North Fork Diamond Canyon	soil	est	4	4	susp
	browse	est	1	1	susp
	herbaceous understory	est	3	5	susp
17-43 Tie Fork	soil	est	NR	3	susp
	browse	est	NR	3	susp
	herbaceous understory	est	NR	5	susp

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended, NR = not read

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