UTAH BIG GAME
RANGE TREND STUDIES
2006 Northern Region

PUBLICATION NUMBER 07-10
REPORT FOR FEDERAL AID PROJECT W-82-R-51

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME
RANGE TREND STUDIES
2006

Written and Edited by

Daniel Summers	Asst. Range Trend Program Leader
Daniel Eddington	Asst. Range Trend Program Leader
Bracken Davis	Asst. Range Trend Program Leader
James Davis	Range Trend Program Coordinator

Tables and Maps prepared by

Daniel Summers	Asst. Range Trend Program Leader
Daniel Eddington	Asst. Range Trend Program Leader
Bracken Davis	Asst. Range Trend Program Leader
Jason Baker	Range Technician

Field Work

Jason Baker	Tyler Greathouse
Chris Balzotti	Debbie Hobart
Lexie Carroll	Anna Peterson
Bracken Davis	Aaron Thatcher
Daniel Eddington	Daniel Summers
Mark Ewell	

Performance Report for Federal Aid Project W-82-R-51

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UTAH DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES
1596 West North Temple
Salt Lake City, Utah 84114

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*Indicates study was not monitored in 2006, because it was suspended, replaced by another study, or was not accessible. Maps, discussion, and tables for these studies are available in the 2001 Volume 1 or Volume 2 report or at http://www.wildlife.utah.gov/range/.

PROGRAM NARRATIVE

State: UTAH Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need:

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

Objective:

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

Expected Results or Benefits:

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

REMARKS

The work completed during the 2001 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northern Region. Trend studies surveyed in these management units were established in the 1980's with rereads in 1990, 1996, 2001, and 2006.

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
- Bear River Resource Area
- Pony Express Resource Area

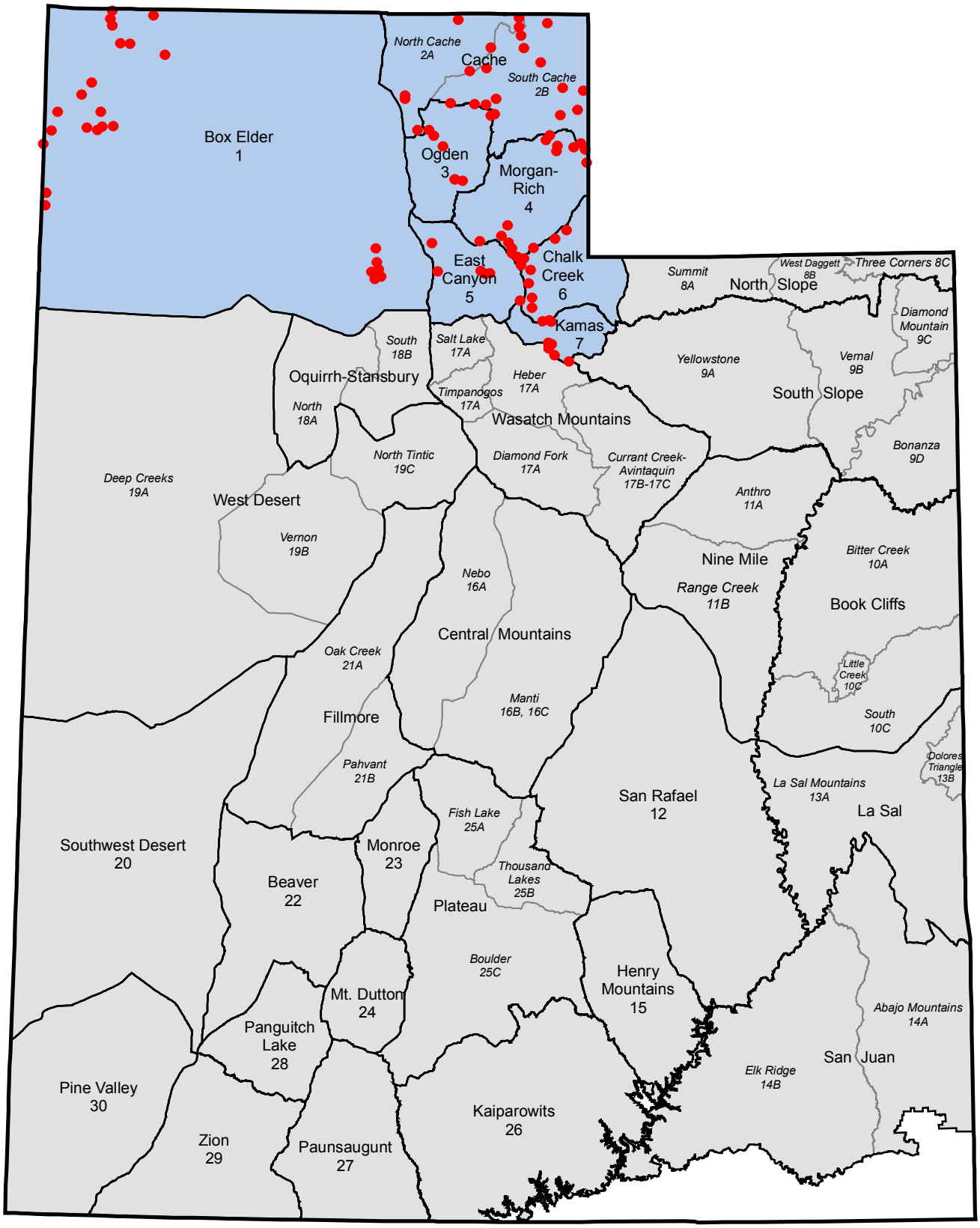
Sawtooth National Forest
- Minidoka Ranger District

Wasatch-Cache National Forest
- Logan Ranger District
- Kamas Ranger District
- Ogden Ranger District
- Salt Lake Ranger District

Utah Division of Parks and Recreation
- Antelope Island State Park

Most private landowners were cooperative in allowing access to study sites located on their land. However, a few studies were not read because landowners would not allow project personnel access.

Utah Management Units Surveyed in 2006



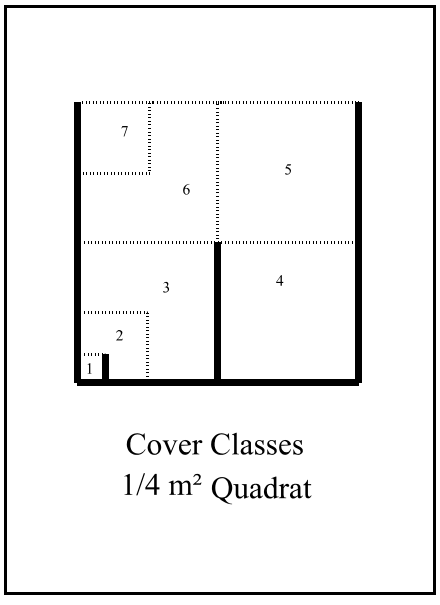
RANGE TREND STUDY METHODS

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

Vegetative composition

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

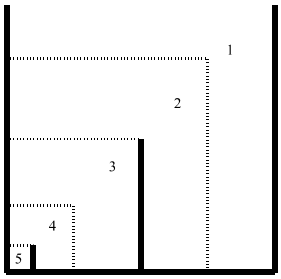
Cover is determined using an ocular cover estimation procedure using 7 cover classes (Bailey and Poulton, 1968, Daubenmire 1969). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100%. For example, to estimate vegetative cover with this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



Cover Classes
1/4 m^2 Quadrat

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

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



Nested Frequency
1/4 m² Quadrat

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

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

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

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

Young: Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/4-inch diameter.

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

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

Dead: A plant which is no longer living.

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

1. All available, lightly hedged.

2. All available, moderately hedged.

3. All available, heavily hedged.

4. Largely available, lightly hedged.

5. Largely available, moderately hedged.

6. Largely available, heavily hedged.

7. Mostly unavailable.

8. Unavailable due to height.

9. Unavailable due to hedging.

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

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

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

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

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

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

1. Normal and vigorous.

2. Insect infested or diseased.

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

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

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

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

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

TREND DETERMINATION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

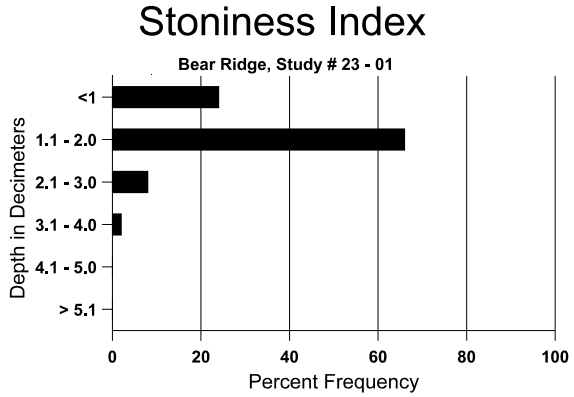
Ultra acid	< 3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	> 9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 10 ppm and 70 ppm respectively may be limiting to plant growth and development (Tiedemann and Lopez 2004).

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

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

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



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

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

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

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

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

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

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

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

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

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

Range trend data has been collected throughout Utah since 1982. In addition to determining trends on winter ranges, a system to determine the condition of these areas was needed. The desirable components index (DCI) was created by Range Trend Project personnel as a tool to address condition and/or value of winter ranges for mule deer. This subjective index is used primarily to determine if a particular site has the vegetation components necessary to be a good winter range for mule deer. Winter range condition is scored based upon several important vegetation components such as, preferred browse cover, shrub decadence and young recruitment, cover of perennial grasses, perennial forbs, and annual grasses (Clements and Young 1997; Olson 1992; Plummer et al. 1968; Stevens 2004; Wasley 2004). This index is used as one of many factors in deer herd management. It can also be used to identify areas where habitat restoration projects may be needed and assist land managers in determining possible rehabilitation options.

Ideal mule deer winter range provides 12-20% of preferred browse cover, shrub decadence is 20% or less, and has 10% or more of the shrub population that is young. The herbaceous understory contains 8-15% perennial grass cover, 5% perennial forb cover, and less than 5% annual grass cover. The DCI ratings are divided into three categories of winter range based different ecological potential, these include: Lower potential sites (Wyoming big sagebrush and desert shrubs), Mid-level potential (mountain big sagebrush), and High potential (mountain brush communities).

<u>Desirable Components Index Ratings</u>

Lower potential sites (Wyoming Big Sagebrush and Desert Shrub Communities)

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

Mid level potential sites (Mountain Big Sagebrush)

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

Higher potential sites (Mountain Brush Communities)

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

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

<u>Desirable Components Index Scoring</u>

Preferred Browse (60 points)
(Preferred Browse species are favorable or critical to deer)

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

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

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

Herbaceous Understory (40 points)

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

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

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

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

*If the total preferred browse cover for the year is below 5%, then no points are awarded for percent young in population and percent decadence.

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REPORT FORMAT

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

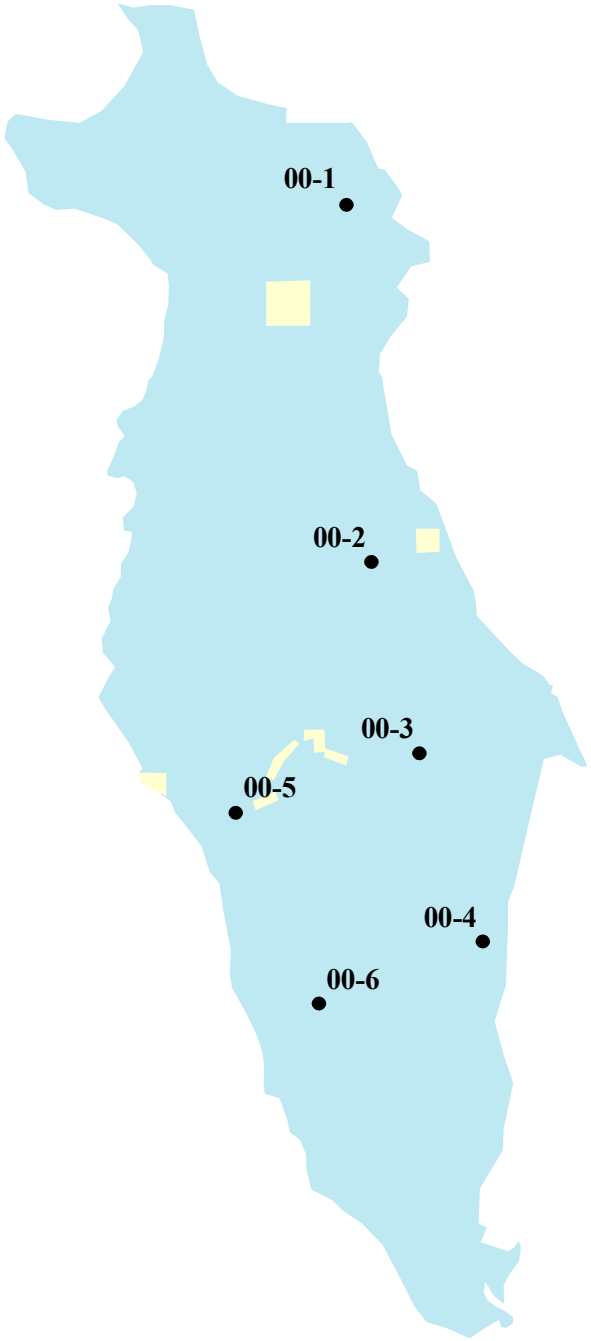
The name of the site and directions for locating the site are given on the location page. Also included on this page are the vegetation type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description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

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

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

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

Management Unit 0
Antelope Island



Transect location
BLM
State of Utah

N

Map Scale 1:135,000
(1 inch = 2.1 miles)

Unit Location

ANTELOPE ISLAND STATE PARK

Antelope Island is managed by the Utah Division of State Parks and Recreation. It is the largest island in the Great Salt Lake and can be reached via a 7.5 mile-long causeway. The island's area is 28,463 acres with elevations ranging from 4,200 feet to 6,597 feet. Campsites are located on the northwest side of the island with trails scattered throughout the area.

History

In 1845, John C. Fremont and Kit Carson made the first European exploration of Antelope Island. They shot two antelope and Fremont named the island after them (Utah State Historical Society 2007). By the 1930's, the island's namesake had disappeared from Antelope Island. In 1993, a cooperative effort between the Utah Division of Wildlife Resources and the Utah Division of State Parks and Recreation resulted in the re-introduction of 24 pronghorn antelope. By the 1995 fawning season, the population had nearly doubled. It is hoped that predation from coyotes, bobcats, and eagles will act as population control.

Fielding Garr was quick to recognize Antelope Island's potential as livestock range. He began construction of a ranch house in 1848. He not only tended his own herds, but those of other stockmen as well. In 1849, Brigham Young asked Garr to manage the LDS Church's Tithing Herd, which was kept on the island until 1871. During this time, the LDS Church also invested thousands of dollars in valuable stallions and brood mares which were turned loose on the island. Antelope Island was also used as a base camp for a government funded survey of the Great Salt Lake by Captain Howard Stansbury during the years of 1849-50.

On February 15, 1893, twelve head of bison were transported to Antelope Island. John Dooly and George Frary loaded the bison into a small sailboat that nearly capsized as they sailed to the island. The Island Improvement Company owned most of the island from 1884 thru 1972. Cattle and sheep were the company's primary ranching commodity, although bison and horses were always on the island. In the 1930's, Antelope Island was the largest private sheep sheering operation west of the Mississippi. Recognizing its recreation potential, the northern 2,000 acres were acquired by the state in 1969. In 1981, the state purchased most of the remainder of the island, thus preserving it as a state park for all people to enjoy.

The Great Salt Lake is the largest natural lake west of the Mississippi River. It is 75 miles long and about 35 miles wide. Located in several wide flat basins, a slight rise in water level expands the surface area of the lake considerably. The first scientific measurements were taken in 1849. Since then, the lake level has varied by 20 feet, shifting the shoreline in some places as much as 15 miles. The Great Salt Lake is salty because it does not have an outlet. Tributaries are constantly bringing in small amounts of salt dissolved in their fresh water flow. Once in the Great Salt Lake, much of the water evaporates leaving the salt behind.

The Great Salt Lake is the remnant of Lake Bonneville; a great ice age lake that rose dramatically from a small saline lake 30,000 years ago. The most conspicuous reminders of Lake Bonneville are the ancient terraces etched into the landscape along the lake's former shorelines. The terraces were eroded by wave action and are relatively flat areas which follow a contour line. After the ice age, the earth's climate became drier and Lake Bonneville gradually receded to form the Great Salt Lake.

The ever fluctuating Great Salt Lake has frustrated attempts to develop its shoreline. As a result, much of the lake is ringed by extensive wetlands making the Great Salt Lake one of the most important resources for migrating and nesting birds.

Wildlife

The island has a bison herd that fluctuates between 550 and 700, making it one of the largest publicly owned bison herds in the nation. The herd is also recognized as one of the oldest in the country and possesses unique genetic characteristics making it of interest to breeders. Other mammals found on the island include mule

deer, pronghorn antelope, bighorn sheep, coyotes, bobcats, badgers, porcupines, jackrabbits, and several species of rodents. Antelope Island and the Great Salt Lake attract numerous migrating and nesting birds.

Trend Studies

Range Trend studies were first established on Antelope Island in 1994. Two studies were set up that year and four additional studies established the next year. All studies were reread in 1996, 2001, and 2006 and the results are reported here.

Trend Study 00-1-06

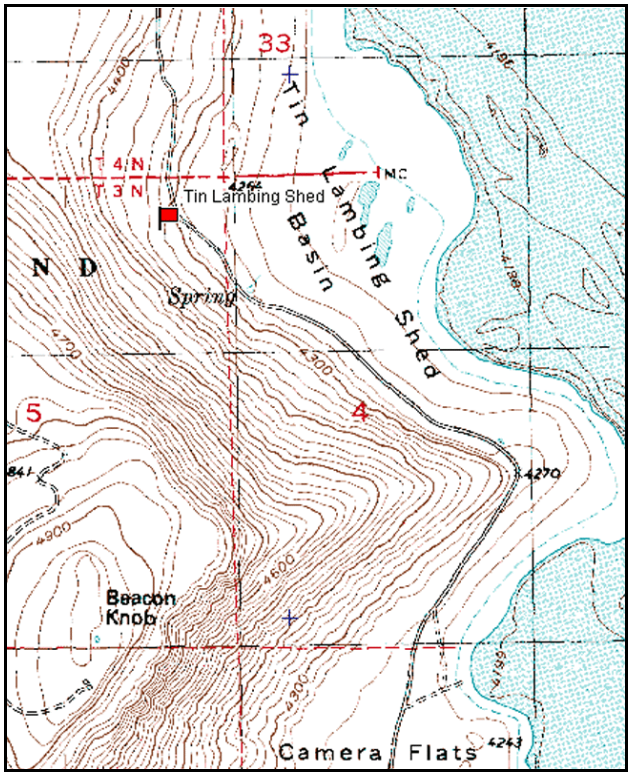
Study site name: Tin Lambing Shed . Vegetation type: Annual Grass .

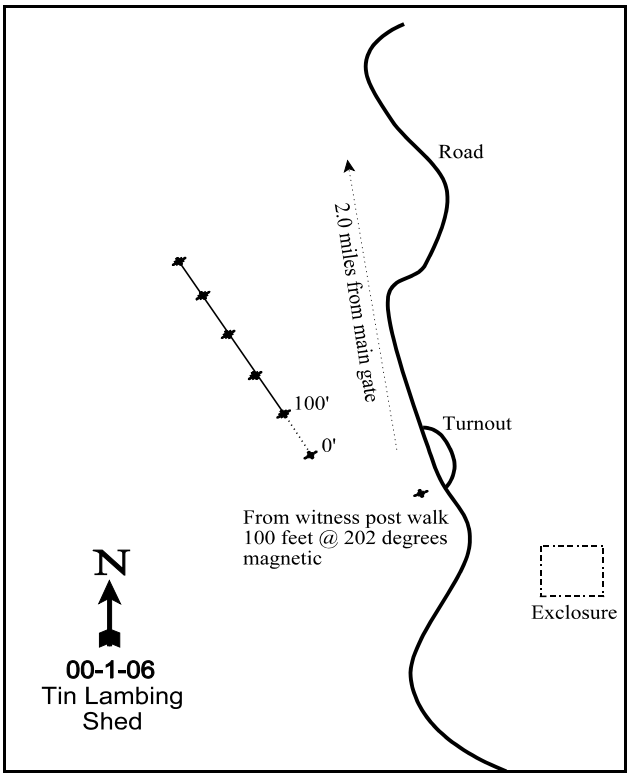
Compass bearing: frequency baseline 307 degrees magnetic.

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

LOCATION DESCRIPTION

From the main gate on Antelope Island, travel south for approximately 2.0 miles to a witness post on the right hand side of the road. From the witness post walk 105 ft. at a bearing of 202 degrees magnetic to the 0-foot baseline stake. The baseline runs in a direction of 307 degrees magnetic.





Map Name: Antelope Island North

Diagrammatic Sketch

Township 3N , Range 3W , Section 5

UTM NAD 27, UTM 12T 4542374 N 398851 E

DISCUSSION

Tin Lambing Shed - Trend Study No. 00-1

Study Information

This study is located in a small basin on the northeast side of Antelope Island about 1/4 mile from the shoreline and about 200 feet above the main road (elevation: 4,300 feet, slope: 13%, aspect: northeast). The area burned sometime prior to study establishment in 1994 and fire is a continual threat to the area due to the dominance of weeds and annual species. The pellet group transect data estimates in 2001 were 17 bison days use/acre (43 bison days use/ha). The 2006 pellet group estimates were 1 pronghorn and 10 bison days use/acre (2 pdu/ha and 25 bdu/ah). Both the antelope and bison use was not recent.

Soil

The soils are in the Kilburn series, which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. They are formed in alluvium and colluvium derived dominantly from gneiss, schist, and quartzite on fan terraces, lake terraces, stream terraces, and deltas (USDA-NRCS 2006). These are derived specifically from alluvial deposits from Lake Bonneville. The soil texture is a sandy loam with a slightly acidic pH (6.2). The effective rooting depth is nearly 18 inches. Soil phosphorus concentration is marginal at 8 ppm; values less than 6 ppm may limit plant growth and development (Tiedemann and Lopez 2004). Litter cover increased in 1996, but returned in 2001 to levels similar to those in 1994. It did not change in 2006. Bare ground cover has been low every year. Cheatgrass has provided the majority of the vegetation and litter cover every year. The erosion condition class was stable in 2006.

Browse

Broom snakeweed and Wyoming big sagebrush are the only shrubs sampled. Broom snakeweed density has decreased from 380 plants/acre in 1994 to zero in 2006. Wyoming big sagebrush was not sampled in the density strips in any year, but a small Wyoming big sagebrush plant was sampled once in the height/crown measurements in 1996.

Herbaceous Understory

The herbaceous understory is dominated by one species, cheatgrass. Cheatgrass occurred in every quadrat since 1996. Cheatgrass has provided at least 60% of the total vegetation cover for all years. Other annual grass species (sampled at lower frequencies) include rattail fescue and six weeks fescue. Both warm and cool season perennial grasses also occur. Warm season species, purple three-awn and sand dropseed, remained at stable frequencies from 1994 to 2001, but decreased significantly in 2006. Cool season grasses include salt grass, mutton bluegrass, Sandberg bluegrass, bulbous bluegrass, and needle-and-thread. Sandberg bluegrass declined significantly in nested frequency between 1994 and 1996, and remained at low a frequency since. Mutton bluegrass decreased significantly from 1994 to 2006. Bulbous bluegrass has increased significantly every year since 1996. As a group, sum of nested frequency for perennial grasses declined by 40% in 1996, increased by 24% in 2001, and decreased by 5% in 2006.

Forbs are dominated by weedy species. Storksbill, wooly plantain, prickly lettuce, and yellow salsify are the most abundant species by frequency. Prickly lettuce was abundant and significantly increased between 1994 and 1996, was rarely sampled in 2001, but increased significantly again in 2006. Perennial forb nested frequency decreased by 73% in 2001 due to the extremely dry conditions in the winter and spring of 2000-2001; it had increased some by 2006.

1996 TREND ASSESSMENT

Browse trend is stable with very few broom snakeweed plants sampled. Annual weeds provide competition for browse species and prohibit the population from establishing and expanding. The herbaceous understory is dominated by annual and weedy species, although there are some perennial species still in the community. Even if fire is suppressed, it will be extremely difficult to change the composition of the community. The

grass trend is down. The nested frequency of perennial grasses decreased 40% and the nested frequency of annual grasses increased 24%. The nested frequency of bulbous bluegrass decreased significantly. The forb trend is slightly up. The nested frequency of perennial and annual forbs increased, but the composition is poor. Yellow salsify and prickly lettuce increased significantly. Miller et al. (1981) showed that yellow salsify made up 25% of deer and elk spring and summer diet in northern Oregon and prickly lettuce made up 2%. Unfortunately, storksbill nested frequency also increased significantly. The 1994 Desirable Components Index score was very poor to poor due to the lack of browse, high annual grass cover, and very low perennial forb cover. The 1996 DCI score decreased to very poor due to decreased perennial grass cover.

1994 winter range condition (DC Index) - very poor to poor (10) Lower potential scale
1996 winter range condition (DC Index) - very poor (2) Lower potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

2001 TREND ASSESSMENT

There are no key browse due to the loss of all species to the frequency historic fires. Broom snakeweed is present, but is not very abundant and does not appear to be increasing. The grass trend is stable. The nested frequency of perennial grasses, with the exception of bulbous bluegrass, remained unchanged. The species composition remained poor and bulbous bluegrass increased significantly. Cheatgrass still dominates and increased significantly in nested frequency since 1994. Other annual and/or weedy species are also present. The nested frequency for perennial grasses increased mainly because of significant increases in salt grass and bulbous bluegrass. The forb trend is down. The nested frequency of perennial forbs decreased 73%. Yellow salsify and prickly lettuce both decreased significantly. The DCI score remained very poor.

winter range condition (DC Index) - very poor (5) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. Browse species continue to be sparse and broom snakeweed was not sampled in 2006. The grass trend is down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 35% in 2006. Bulbous bluegrass nested frequency increased significantly and the nested frequency of purple-three-awn and sand dropseed decreased signficantly. Mutton bluegrass decreased significantly and was not sampled. The forb trend is stable. The nested frequency of perennial forbs (including yellow salsify) decreased, but the nested frequency of prickly lettuce increased significantly. Storksbill nested frequency decreased significantly and cover decreased from 9 to 3%. The DCI score remained very poor.

winter range condition (DC Index) - very poor (-2) Lower potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 1

Type	Species	Nested Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
G	Aristida purpurea	$_{b}$110	$_{b}$75	$_{b}$76	$_{a}$2	4.31	2.28	4.93	.15
G	Bromus tectorum (a)	$_{a}$448	$_{ab}$479	$_{b}$482	$_{ab}$466	29.99	44.62	43.94	35.79
G	Distichlis spicata	$_{a}$92	$_{b}$138	$_{c}$175	$_{c}$187	3.07	1.15	2.88	6.24
G	Festuca myuros (a)	$_{a}$-	$_{b}$228	$_{b}$184	$_{b}$187	-	4.78	3.04	2.84

Type	Species	Nested Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
G	Poa bulbosa	$_{b}$56	$_{a}$6	$_{b}$81	$_{c}$192	.78	.04	3.82	4.43
G	Poa fendleriana	$_{c}$37	$_{ab}$4	$_{bc}$18	$_{a}$-	.44	.01	.09	-
G	Poa secunda	$_{b}$221	$_{a}$51	$_{a}$46	$_{a}$21	4.47	.33	.51	.05
G	Sporobolus cryptandrus	$_{b}$56	$_{b}$59	$_{b}$38	$_{a}$9	.97	.91	.72	.11
G	Stipa comata	58	45	35	33	1.93	1.39	1.28	.66
G	Vulpia octoflora (a)	$_{c}$136	$_{a}$17	$_{ab}$49	$_{b}$81	1.06	.05	.19	.29
Total for Annual Grasses		584	724	715	734	31.06	49.46	47.18	38.93
Total for Perennial Grasses		630	378	469	444	15.99	6.13	14.26	11.65
Total for Grasses		1214	1102	1184	1178	47.05	55.59	61.44	50.59
F	Agoseris heterophylla (a)	5	1	-	-	.03	.00	-	-
F	Calochortus nuttallii	-	1	7	6	-	.00	.02	.01
F	Descurainia pinnata (a)	-	-	-	2	-	-	-	.00
F	Draba nemorosa (a)	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$53	-	-	-	.09
F	Epilobium brachycarpum (a)	$_{a}$2	$_{a}$-	$_{a}$11	$_{b}$40	.00	-	.01	.12
F	Erodium cicutarium (a)	$_{a}$137	$_{bc}$284	$_{c}$316	$_{b}$220	1.25	4.18	9.41	2.87
F	Erigeron flagellaris	-	-	-	3	-	-	-	.00
F	Eriogonum umbellatum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$19	-	-	-	.25
F	Helianthus annuus (a)	$_{b}$26	$_{a}$-	$_{a}$-	$_{c}$80	.60	-	-	.66
F	Holosteum umbellatum (a)	$_{b}$14	$_{a}$-	$_{a}$5	$_{a}$3	.04	-	.03	.00
F	Lappula occidentalis (a)	-	-	-	2	-	-	-	.00
F	Lactuca serriola	$_{a}$11	$_{b}$145	$_{a}$7	$_{b}$96	.04	2.07	.01	.86
F	Machaeranthera canescens	$_{a}$-	$_{b}$89	$_{a}$-	$_{a}$-	-	3.75	-	-
F	Medicago sativa	-	-	-	-	-	.00	-	-
F	Plantago patagonica (a)	$_{b}$86	$_{ab}$52	$_{a}$45	$_{a}$33	.46	.16	.21	.09
F	Sisymbrium altissimum (a)	$_{ab}$3	$_{ab}$6	$_{a}$-	$_{b}$10	.01	.01	-	.36
F	Sphaeralcea coccinea	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$-	-	-	.74	-
F	Tragopogon dubius	$_{a}$-	$_{c}$93	$_{b}$63	$_{a}$2	-	1.67	1.41	.01
F	Verbascum blattaria	$_{a}$-	$_{bc}$13	$_{ab}$2	$_{c}$30	-	.94	.06	.62
Total for Annual Forbs		273	343	377	443	2.42	4.36	9.67	4.22
Total for Perennial Forbs		11	341	91	156	0.04	8.46	2.25	1.77
Total for Forbs		284	684	468	599	2.46	12.82	11.92	5.99

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

BROWSE TRENDS --
Management unit 00 , Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
B	Gutierrezia sarothrae	3	3	2	0	.01	.18	.03	-
Total for Browse		3	3	2	0	0.00	0.17	0.03	0

BASIC COVER --
Management unit 00 , Study no: 1

Cover Type	Average Cover %			
	'94	'96	'01	'06
Vegetation	67.72	63.46	67.59	60.81
Rock	.16	.04	0	.02
Pavement	.58	.74	1.13	.41
Litter	54.37	73.58	50.65	41.40
Cryptogams	2.53	2.34	1.04	.41
Bare Ground	5.24	1.79	6.78	6.05

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 01, Tin Lambing Shed

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
17.6	61.0 (18.6)	6.2	76.92	9.08	14.0	1.2	8.1	124.8	0.3

PELLET GROUP DATA --
Management unit 00 , Study no: 1

Type	Quadrat Frequency				Days use per acre (ha)	
	'94	'96	'01	'06	'01	'06
Rabbit	2	8	-	7	-	-
Elk	-	1	-	-	-	-
Deer	1	3	-	-	-	1 (2)
Buffalo	1	6	4	6	17 (43)	10 (25)

BROWSE CHARACTERISTICS --
Management unit 00 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	7/9
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
94	**380**	-	120	220	40	-	0	0	11	11	11	7/8
96	**280**	20	20	260	-	-	0	0	0	-	0	9/9
01	**240**	-	-	220	20	40	0	0	8	8	8	14/19
06	**0**	-	-	-	-	-	0	0	0	-	0	13/18
Opuntia sp.												
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	8/27

Trend Study 00-2-06

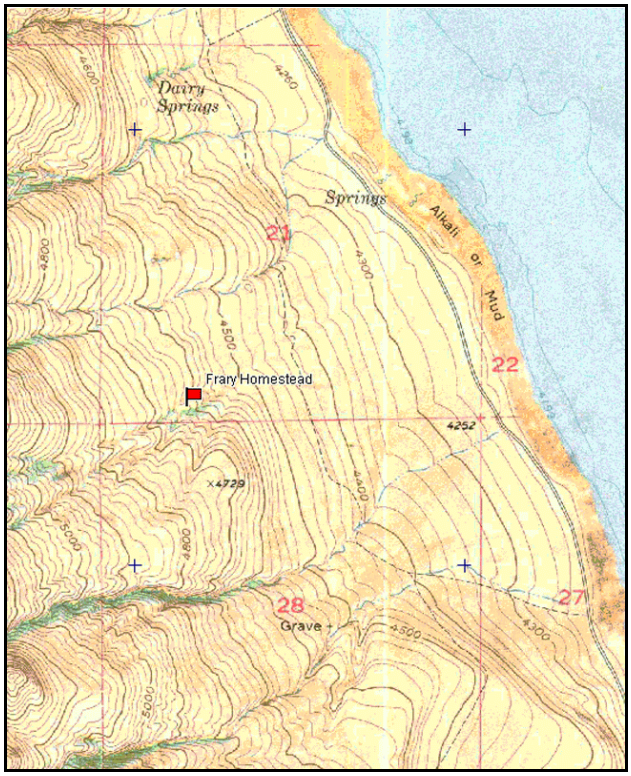
Study site name: Frary Homestead . Vegetation type: Annual Grass .

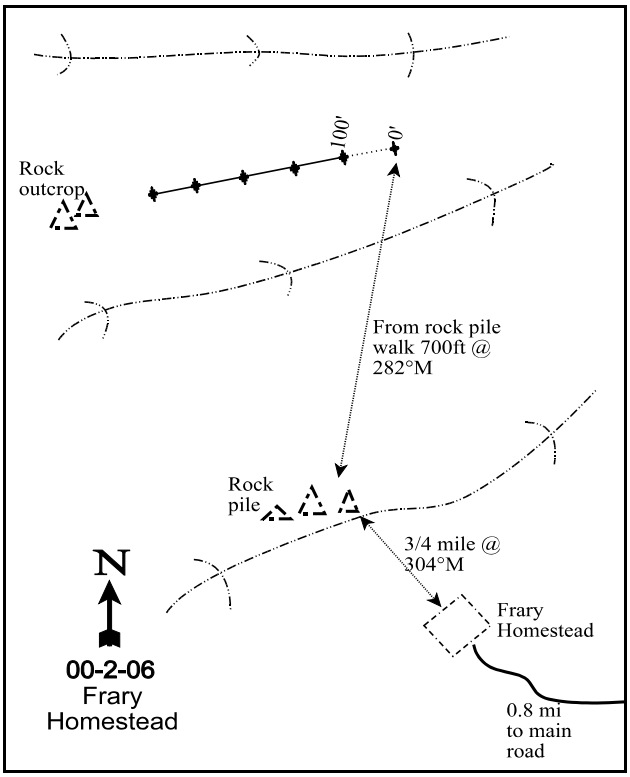
Compass bearing: frequency baseline 208 degrees magnetic.

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

LOCATION DESCRIPTION

From the main gate on Antelope Island, travel south for approximately 6.9 miles. Turn west and travel 0.8 miles to the Frary homestead and gravesite. From the Frary gravesite, walk 3/4 mile at a bearing of 304 degrees magnetic to the left most rock on the end of the ridge. From the left most rock walk 15 paces at a bearing of 295 degrees magnetic to a rock pile. From the rock pile walk 700 feet at a bearing of 282 degrees magnetic to the 0-foot baseline stake. The baseline runs 208 degrees magnetic toward some rock outcrops.





Map Name: Antelope Island

Diagrammatic Sketch

Township 3N , Range 3W , Section 21

UTM NAD 27, UTM 12T 4536210 N 399242 E

DISCUSSION

Frary Homestead - Trend Study No. 00-2

Study Information

This study is located on the east side of Antelope Island north of the Frary Homestead grave site (elevation: 4,650 feet, slope: 8%, aspect: northeast). It is located on an alluvial fan with drainages on both sides (north and south) and has burned several times in the past, resulting in very little browse cover. Some surrounding ridges and drainages are still covered with sagebrush. Bison use of the area has been moderate. Numerous bedding sites and buffalo pats were noted in 1996. The pellet group transect in 2001 estimated 7 deer, 7 bighorn sheep, and 28 bison days use/acre (17 ddu/ha, 18 bhdu/ha, and 68 bdu/ha). In 2006, 23 bison days use/acre (57 bdu/ha) were estimated.

Soil

The soil is in the Ridd-Wasatch series complex, which consists of moderately to very deep, well to excessively drained, moderately permeable soils that formed in residuum and colluvium derived from gneiss, schist, quarzite, metamorphic, and igenous rocks; they are found on fan remnants, lake terraces, hillsides, and mountainsides (USDA-NRCS 2006). The soil texture is a sandy loam with a slightly acidic pH (6.1). The effective rooting depth is nearly 27 inches. Moisture was apparent in the profile while taking soil samples in 1996. Vegetation and litter cover are abundant and cover nearly all of the ground surface. The erosion condition class rating was stable in 2006.

Browse

Browse is scarce at this location due to recurring fire. Broom snakeweed and basin big sagebrush have been sampled, but at very low densities. The estimated density for broom snakeweed was 260 plants/acre in 1996 and 2001. The broom snakeweed population had increased to 880 plants/acre by 2006. The majority of plants have been mature and the population is stable. Wyoming big sagebrush density had an estimated density of 20 plants/acre in 1996 and 2001, but increased slightly to 160 plants/acre in 2006. No young or seedling sagebrush plants were sampled previous to 2006, but 80 young plants/acre and 20 seedlings/acre were sampled in 2006. The low recruitment is due to high competition with annual weeds in the understory. Rubber rabbitbrush was sampled for the first time in 2006 at 80 plants/acre. Most of these were young. No utilization was measured on any species previous to 2006, but there was some moderate browsing on sagebrush and rubber rabbitbrush in 2006.

Herbaceous Understory

The herbaceous understory is dominated by cheatgrass, which is thick and uniformly distributed. Cheatgrass was sampled in all quadrats in both 1996 and 2001, but only 80% in 2006. Cheatgrass nested frequency decreased significantly in 2001 and 2006. Other annual grass species include Japanese brome and rattail fescue, both of which have significantly increased in nested frequency since 1995. In 2001, rattail fescue significantly decreased in nested frequency. In 2006, Japanese brome nested frequency increased significantly. Six perennial grass species have been sampled; purple three-awn, bulbous bluegrass, and Sandberg bluegrass are the most abundant. Purple three-awn was the most abundant perennial grass until 2006, when bulbous bluegrass surpassed it in nested frequency and quadrat frequency. Bulbous bluegrass was sampled in 94% of quadrats and provided 13% cover in 2006, compared to 43% quadrat frequency and 3% cover in 2001. Sum of nested frequency of all perennial grasses combined increased by 25% in 2001 and 50% in 2006.

The forb composition is dominated by weedy annual species. Storksbill is the dominant forb; it has provided much of the forb cover since 1995. Yellow salsify, prickly lettuce, and annual agoseris (all of which are beneficial to wildlife) were both abundant in 1996, but significantly decreased in nested frequency in 2001 with the drier conditions. Salsify was not sampled in 2006 and annual agoseris had increased significantly. The nested frequency for all perennial forbs has continually decreased since 1996 and the nested frequency of

annual forbs has increased continually.

1996 TREND ASSESSMENT

The browse trend is stable with very few broom snakeweed plants encountered. Herbaceous weedy species, primarily annuals, will provide competition to browse species and prohibit the population from expanding. The grass trend is stable. The nested frequency of perennial grasses remained unchanged, but the nested frequency of annual grasses increased 24%. Cheatgrass nested frequency did not increase, but continues to dominate the herbaceous understory. Even if fire is suppressed, it will be extremely difficult to change the community composition. The forb trend is slightly up. The nested frequency of perennial forbs increased substantially and that of annual forbs decreased 69%. Yellow salsify, which is used by big game (Miller et al. 1981), increased significantly in nested frequency. Bur buttercup nested frequency decreased significantly and storksbill cover decreased. Unfortunately, composition is poor and the nested frequency of prickly lettuce, which is also utilized by big game (Miller et al. 1981), and annual agoseris decreased significantly. The nested frequency of the weedy moth mullein increased significantly. The 1995 Desirable Components Index score was very poor due to the lack of browse cover, high annual grass cover, and low perennial forb cover. The 1996 DCI score improved to very poor to poor due to increases in perennial grass and forb cover.

1995 winter range condition (DC Index) - very poor (-5) Lower potential scale
1996 winter range condition (DC Index) - very poor to poor (9) Lower potential scale
browse - stable (0) grass - stable (0) forb - slightly up (+1)

2001 TREND ASSESSMENT

Browse density is very low due to the recurrence of fire at short intervals. Broom snakeweed and sagebrush both remain at low, but identical, densities compared to 1996 estimates. There is still no sagebrush recruitment, which will likely continue in the future with the dominance of annuals. The grass trend is stable. The nested frequency of perennial grasses, excluding bulbous bluegrass, remained unchanged. The nested frequency of annual grasses changed little, despite a significant decrease in cheatgrass nested frequency. Bulbous bluegrass nested frequency increased significantly as well. The forb trend is down. The nested frequency of perennial forbs decreased 41% and that of annuals increased 22%. The nested frequencies of prickly lettuce, annual agoseris, and yellow salsify all decreased significantly. Then nested frequency of storksbill increased significantly. The DCI score increased to poor due to the increased in perennial grass cover.

winter range condition (DC Index) - poor (19) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush increased slightly, but remained very low. Rubber rabbitbrush was sample for the first time in 2006 and had been moderately utilized. The grass trend is slightly up. The nested frequency of perennial grasses (excluding that of bulbous bluegrass) has increased 10% since 1995, the nested frequency of annual grasses decreased 12% since 1996, and cheatgrass nested frequency decreased significantly again in 2006. The forb trend is slightly down. The nested frequency of perennial forbs decreased 49%, the nested frequency of annual forbs increased 15%, and yellow salsify was not sampled (a significant decrease). Dalmation toadflax, a noxious weed in Wasatch County, was sampled for the first time. Weedy forbs continue to make up much of the community. Fortunately, the nested frequencies of storksbill and moth mullein decreased significantly. The DCI score remained poor.

winter range condition (DC Index) - poor (18) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 2

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
G	Aristida purpurea	a185	b220	c279	c280	5.05	9.79	19.31	22.85
G	Bromus japonicus (a)	a17	ab47	b71	c165	.03	.46	.89	3.82
G	Bromus tectorum (a)	c482	c480	b463	a315	43.42	34.31	28.07	12.61
G	Elymus cinereus	-	-	3	-	-	-	.15	-
G	Festuca myuros (a)	a29	c126	b68	bc95	.26	1.58	.41	2.50
G	Poa bulbosa	a6	a8	b115	c363	.01	.02	2.95	12.89
G	Poa fendleriana	b37	c84	a3	ab16	.28	.42	.00	.11
G	Poa secunda	c181	a54	b120	b140	1.16	.13	.88	6.48
G	Sporobolus cryptandrus	a24	b81	a39	a37	.08	.87	.78	.60
G	Vulpia octoflora (a)	-	-	-	4	-	-	-	.00
Total for Annual Grasses		528	653	602	579	43.72	36.36	29.38	18.95
Total for Perennial Grasses		433	447	559	836	6.59	11.24	24.09	42.93
Total for Grasses		961	1100	1161	1415	50.31	47.60	53.47	61.88
F	Agoseris heterophylla (a)	d137	c74	a-	b10	.63	.18	-	.02
F	Arabidopsis thaliana (a)	-	-	-	5	-	-	-	.03
F	Aster sp.	-	10	-	-	-	.01	-	-
F	Cirsium undulatum	-	-	-	1	.00	.15	-	.01
F	Delphinium nuttallianum	1	-	-	-	.00	-	-	-
F	Descurainia pinnata (a)	b190	a-	a8	a-	.42	-	.01	-
F	Draba nemorosa (a)	c261	a-	b56	b85	1.25	-	.22	.36
F	Epilobium brachycarpum (a)	a-	a-	a-	b21	-	-	-	.06
F	Erodium cicutarium (a)	ab257	a246	b313	a225	5.39	2.84	8.91	2.46
F	Erigeron divergens	a2	b51	b42	b46	.00	.90	.59	1.36
F	Helianthus annuus (a)	a-	a-	a-	b103	-	-	-	.45
F	Heterotheca villosa	-	-	-	-	-	-	.00	-
F	Holosteum umbellatum (a)	b21	a-	b14	b17	.20	-	.08	.08
F	Lactuca serriola	c106	b70	a9	a1	.41	.32	.01	.00
F	Linaria dalmatica	-	-	-	2	-	-	-	.00
F	Lychnis drummondii	a-	a-	b27	a13	-	-	.07	.02
F	Machaeranthera spp	9	-	-	-	.01	-	-	-
F	Polygonum douglasii (a)	-	3	-	-	-	.00	-	-
F	Ranunculus testiculatus (a)	b184	a2	a-	a-	1.48	.00	-	-
F	Sisymbrium altissimum (a)	12	2	7	2	.02	.00	.19	.03
F	Taraxacum officinale	ab6	ab9	b11	a-	.05	.07	.13	-
F	Tragopogon dubius	b12	d96	c37	a-	.02	.51	.37	-

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
F	Verbascum blattaria	a-	b61	b48	a16	.01	.93	2.96	.22
Total for Annual Forbs		1062	327	398	468	9.41	3.04	9.42	3.51
Total for Perennial Forbs		136	297	174	79	0.53	2.91	4.15	1.62
Total for Forbs		1198	624	572	547	9.94	5.95	13.57	5.14

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

BROWSE TRENDS --
Management unit 00 , Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
B	Artemisia tridentata tridentata	0	1	1	6	-	.03	.63	.36
B	Chrysothamnus nauseosus	0	0	0	3	-	-	-	.03
B	Chrysothamnus nauseosus albicaulis	0	0	0	0	-	-	-	.06
B	Gutierrezia sarothrae	6	7	10	17	.01	.19	.45	.98
Total for Browse		6	8	11	26	0.00	0.22	1.07	1.43

CANOPY COVER, LINE INTERCEPT --
Management unit 00 , Study no: 2

Species	Percent Cover '06
Artemisia tridentata tridentata	.21
Chrysothamnus nauseosus	.08
Gutierrezia sarothrae	1.85

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 00 , Study no: 2

Species	Average leader growth (in) '06
Artemisia tridentata tridentata	3.8

BASIC COVER --
Management unit 00 , Study no: 2

Cover Type	Average Cover %			
	'95	'96	'01	'06
Vegetation	70.77	62.96	65.87	73.74
Rock	.36	.03	.01	.03
Pavement	0	1.22	.11	1.98
Litter	76.29	76.46	60.50	27.75
Cryptogams	.02	1.03	.00	.08
Bare Ground	1.21	.78	.44	1.54

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 02, Frary Homestead

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
26.9	58.4 (19.7)	6.1	69.7	15.0	15.3	1.7	21.2	179.2	0.3

PELLET GROUP DATA --
Management unit 00 , Study no: 2

Type	Quadrat Frequency			
	'95	'96	'01	'06
Big Horn	-	-	1	-
Deer	-	-	4	-
Buffalo	5	15	9	7

Days use per acre (ha)	
'01	'06
7 (18)	-
7 (17)	-
28 (68)	23 (57)

BROWSE CHARACTERISTICS --
Management unit 00 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	10/12
01	**20**	-	-	20	-	-	0	0	-	-	0	23/43
06	**160**	20	80	80	-	20	38	0	-	-	0	19/20
Chrysothamnus nauseosus												
95	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**80**	-	60	-	20	-	50	0	25	-	0	-/-
Chrysothamnus viscidiflorus												
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	9/12
06	**0**	-	-	-	-	-	0	0	-	-	0	14/25
Gutierrezia sarothrae												
95	**220**	-	160	60	-	-	0	0	0	-	0	9/11
96	**260**	120	-	260	-	-	0	0	0	-	0	11/11
01	**260**	-	20	100	140	140	0	0	54	31	31	8/10
06	**880**	-	20	860	-	-	0	0	0	-	0	13/18

Trend Study 00-3-06

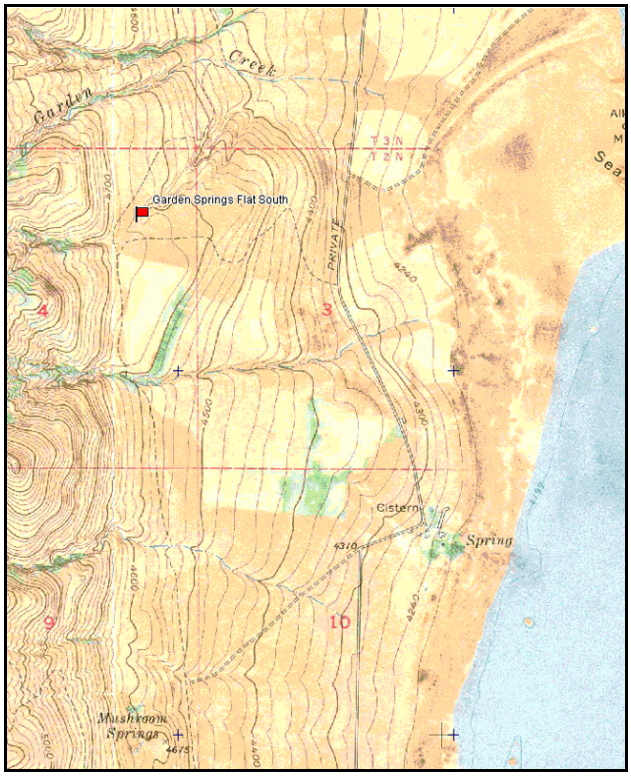
Study site name: Garden Springs Flat South . Vegetation type: Annual Grass .

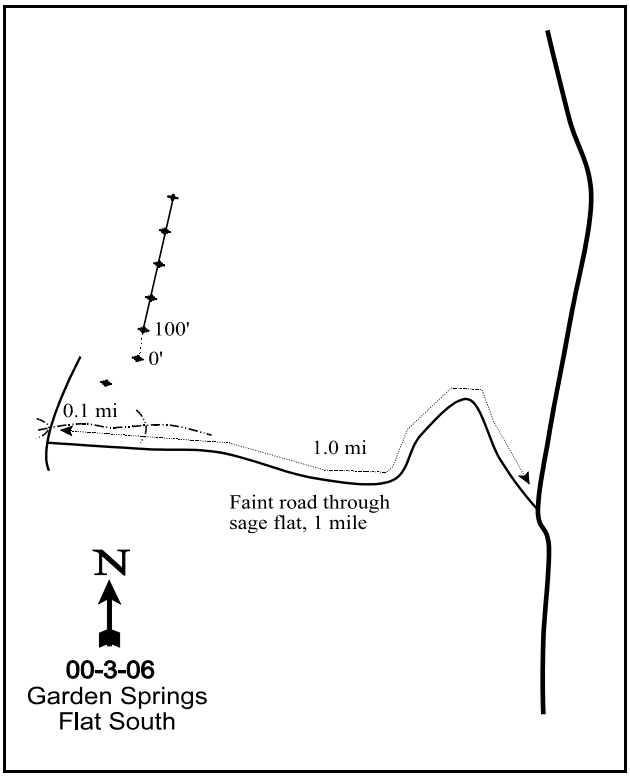
Compass bearing: frequency baseline 14 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (35ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar at 1ft on all belts.

LOCATION DESCRIPTION

From the main gate on Antelope Island, travel south for 9.1 miles to a faint road on the right, walk up the road for 1.0 mile to where the road crosses a gully. Travel 0.1 miles from the gully to the witness post on the east side of the road. The baseline runs 14 degrees magnetic. The 0 foot stake is marked with browse tag number 172.





Map Name: Antelope Island

Township 2N , Range 3W , Section 4

Diagrammatic Sketch

UTM NAD 27, UTM 12T 4532576 N 400161 E

DISCUSSION

Garden Spring Flat South - Trend Study No. 00-3

Study Information

This study is located about 1/4 mile south of Garden Creek on the east side of Antelope Island about 1 mile west of the shoreline (elevation: 4,660 feet, slope: 5-10%, aspect: east). A fire burned through the area between the 1995 and 1996 readings, but did not substantially change the plant community structure. The pellet group transect data in 2001 estimated 44 bison days use/acre (109 bison days use/ha). There was also an indication of light use by bighorn sheep. The pellet group estimates in 2006 were 1 deer and 28 bison days use/acre (2 ddu/ha and 68 bdu/ha). A deer was seen near the study in 2006.

Soil

The soils are in the Kilburn series, which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. They are formed in alluvium and colluvium derived dominantly from gneiss, schist, and quartzite on fan terraces, lake terraces, stream terraces, and deltas (USDA-NRCS 2006). These are derived specifically from alluvial deposits from Lake Bonneville. The soil texture is a sandy clay loam with a neutral pH (6.6). The estimated effective rooting depth was 23 inches. Very little rock was measured within the soil profile. Erosion is not a problem with vegetation and litter covering nearly the entire soil surface. The erosion condition class was stable in 2006.

Browse

As with most of the other range trend studies on the island, fire has eliminated nearly all the browse. Only broom snakeweed was sampled in density and cover measurements. This species has been low in abundance and has not exceeded a density of 100 plants/acre, despite the fire between the 1995 and 1996 readings. Several basin big sagebrush individuals were sampled for the first time in 2006 in the height/crown measurements.

Herbaceous Understory

The grass composition has been dominated by two annual species, cheatgrass and rattail fescue. Both species combined to provide nearly half of the total vegetation cover in 1995 and 1996. In 2001, rattail fescue substantially decreased in nested frequency, quadrat frequency, and percent cover. Although cheatgrass decreased in nested frequency in 2001, it still remained abundant and was sampled in nearly every quadrat (98%). In 2006, cheatgrass nested frequency decreased significantly and cover decreased from 19 to 10%; rattail fescue nested frequency did not change, but cover increased from 1 to 4%. The decrease in annual grasses in 2001 and 2006 is likely a product of increases in the low value perennial purple three-awn and bulbous bluegrass jumpstarted by the drought in 2000-01. Purple three-awn nested frequency increased significantly every year through 2001, then did not change significantly in 2006. Its cover has increased from 7% in 1995 to 27% in 2001 and 25% in 2006. Bulbous bluegrass nested frequency increased significantly from 1996 to 2001 and has remained unchanged since. Its cover increased from 2% in 1995 to 12% in 2001, then decreased to 5% in 2006. It was suggested by Stewart and Hull (1949) that bulbous bluegrass can outcompete cheatgrass. Two desired perennial grasses, Sandberg bluegrass and sand dropseed, are also present. Sand dropseed is scarce, but Sandberg bluegrass nested frequency increased significantly in 2001 and 2006 and has increased from less than 1% cover in 1995 to 9% in 2006.

Forbs are also dominated by weedy annual and perennial species. Storksbill has been the dominant forb in both frequency and cover. Other weedy species, such as prickly lettuce, yellow salsify, and moth mullein were abundant in previous readings, but due to low precipitation in 2000-2001, these species' abundances were greatly reduced in 2001; prickly lettuce had recovered by 2006. The nested frequency of all perennial forbs declined by 81% in 2001 due to the dry conditions, but had increased somewhat by 2006. Some utilization of yellow salsify was apparent in 1996. Annual agoseris, prickly lettuce, and yellow salsify are the only desirable forb species.

1996 TREND ASSESSMENT

The browse trend is stable with few plants sampled and little change in their respective densities. Annual weeds provide rigorous competition with browse species and will likely prohibit the population from expanding. Cheatgrass and rattail fescue dominate the grasses and rattail nested frequency increased significantly. Despite this high annual grass abundance, perennial grass nested frequency (excluding bulbous bluegrass) increased 41%. Sand dropseed and purple three-awn nested frequencies increased significantly. The grass trend is slightly up. Forb composition has changed because of fire, but remains poor. Even if fire is suppressed, it will be extremely difficult to change the composition of the community. The beneficial forbs, yellow salsify and prickly lettuce, nested frequencies increased significantly and the nested frequency of storksbill decreased significantly. A few other weedy species increased significantly, but nested frequency of annual forbs decreased 51%. The forb trend is up. The 1995 Desirable Components Index score was very poor because of the lack of browse cover and high annual grass cover. It did not change in 1996.

1995 winter range condition (DC Index) - very poor (2) Lower potential scale
1996 winter range condition (DC Index) - very poor (3) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - up (+2)

2001 TREND ASSESSMENT

Browse is sparse and has not changed due to short fire intervals. Therefore, the browse trend is stable. Broom snakeweed is the only shrub species sampled and has had an estimated density of less than 100 plants/acre in all years. Desirable shrubs, primarily sagebrush, have very little chance to establish and persist due to the extreme fire hazard and high competition with annual species. The grass trend is slightly up. The nested frequency of perennial grasses, excluding bulbous bluegrass, remained unchanged. However, the nested frequencies of cheatgrass and rattail fescue decreased significantly. The nested frequencies of Sandberg bluegrass and purple three-awn increased significantly. Unfortunately, the nested frequency of sand dropseed decreased significantly. Perennial grass cover (excluding that of bulbous bluegrass) increased from 10 to 28%. The forb trend is down. The nested frequency of perennial forbs decreased by 81%; prickly lettuce, yellow salsify, and annual agoseris nested frequencies decreased significantly. As well, the nested frequency of storksbill increased significantly. Storksbill has been shown to outcompete and prevent the establishment of native species (Kimball and Schiffman 2003). The DCI score improved to poor-fair due the increase in perennial grass cover, increase in perennial forb cover, and decrease in annual grass cover.

winter range condition (DC Index) - poor-fair (25) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. Broom snakeweed continued to be the only browse species, and its density was very low. Sagebrush was sampled for the first time in a height/crown measurement. The grass trend is slightly up. The nested frequency of cheatgrass decreased significantly, annual grass cover decreased slightly, and perennial grass cover (excluding bulbous bluegrass) increased slightly. The nested frequency of Sandberg bluegrass increased significantly. Perennial grass nested frequency was unchanged. The forb trend is stable. The nested frequency of perennial forbs increased, due to increases in prickly lettuce, foothill death kamas, and curlcup gumweed. The nested frequency of annual species increased substantially. Fortunately, storksbill nested frequency decreased significantly. The increase in prickly lettuce and decrease in storksbill are positive, but are countered by the increase in weedy annuals and perennials. The DCI score increased to fair due to the decrease in annual grass cover.

winter range condition (DC Index) - fair (28) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 3

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
G	Agropyron intermedium	-	-	-	3	-	-	-	.03
G	Aristida purpurea	a203	b266	c303	bc272	6.98	9.07	26.89	25.31
G	Bromus japonicus (a)	a-	a-	a4	b29	-	-	.00	.08
G	Bromus tectorum (a)	bc436	c463	b416	a355	18.07	20.18	19.46	9.63
G	Festuca myuros (a)	b270	c379	a153	a150	14.43	18.01	1.11	4.15
G	Poa bulbosa	a157	a120	b271	b274	2.10	3.58	12.21	5.16
G	Poa secunda	ab65	a43	b103	c178	.14	.28	1.01	9.41
G	Sporobolus cryptandrus	a49	b139	a37	a23	.11	.69	.10	.22
G	Vulpia octoflora (a)	ab8	a-	ab2	b18	.01	-	.00	.17
Total for Annual Grasses		714	842	575	552	32.52	38.19	20.58	14.05
Total for Perennial Grasses		474	568	714	750	9.35	13.62	40.24	40.14
Total for Grasses		1188	1410	1289	1302	41.88	51.82	60.83	54.19
F	Agoseris heterophylla (a)	b123	b126	a9	a23	.43	.35	.01	.11
F	Ambrosia psilostachya	a-	a-	ab6	b16	-	-	.06	.12
F	Arabidopsis thaliana (a)	-	-	-	10	-	-	-	.19
F	Astragalus cibarius	-	3	-	3	-	.01	-	.03
F	Aster sp.	a8	b17	a-	a-	.03	.07	-	-
F	Calochortus nuttallii	b34	a4	b37	b36	.08	.00	.11	.09
F	Cirsium undulatum	1	4	8	18	.01	.33	.39	.13
F	Descurainia pinnata (a)	b24	a-	a-	a6	.04	-	-	.01
F	Draba nemorosa (a)	b115	a3	a-	b144	.26	.00	-	.24
F	Epilobium brachycarpum (a)	a-	a-	a-	b145	-	-	-	.64
F	Eriogonum cernuum (a)	-	-	-	4	-	-	-	.15
F	Erodium cicutarium (a)	d459	b311	c388	a259	26.47	3.29	13.95	3.27
F	Erigeron divergens	a-	c25	ab3	b11	-	.11	.15	.25
F	Grindelia squarrosa	a-	b18	a-	b22	-	.15	-	.40
F	Helianthus annuus (a)	a-	a-	a-	b51	-	-	-	.13
F	Heterotheca villosa	a-	b8	ab3	a1	-	.05	.03	.15
F	Holosteum umbellatum (a)	b31	a-	a2	c104	.07	-	.03	1.31
F	Lappula occidentalis (a)	b13	a-	a-	ab10	.02	-	-	.04
F	Lactuca serriola	b54	c116	a-	c109	.17	1.37	-	.60
F	Lychnis drummondii	-	-	3	1	-	-	.03	.00
F	Machaeranthera spp	b15	b18	a-	a-	.03	.08	-	-
F	Tragopogon dubius	b60	c263	a12	a17	.11	3.10	.07	.06
F	Verbascum blattaria	a5	c134	ab23	b36	.02	2.40	1.25	.71

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
F	Zigadenus paniculatus	$_{a}$50	$_{a}$46	$_{a}$48	$_{b}$74	.62	.62	2.33	1.30
Total for Annual Forbs		765	440	399	756	27.31	3.65	14.00	6.12
Total for Perennial Forbs		227	656	143	344	1.10	8.32	4.43	3.87
Total for Forbs		992	1096	542	1100	28.41	11.97	18.44	9.99

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

BROWSE TRENDS --
Management unit 00 , Study no: 3

Type	Species	Strip Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
B	Gutierrezia sarothrae	2	1	2	2	-	.00	.06	.00
Total for Browse		2	1	2	2	0	0.00	0.06	0.00

BASIC COVER --
Management unit 00 , Study no: 3

Cover Type	Average Cover %			
	'95	'96	'01	'06
Vegetation	69.59	64.01	72.55	66.74
Rock	.09	.02	0	0
Pavement	0	.50	.12	.03
Litter	69.98	69.05	42.34	40.68
Cryptogams	.00	.18	0	.01
Bare Ground	.98	1.14	2.08	3.32

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 03, Garden Spring Flat South

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
23.0	57.2 (19.7)	6.6	54.7	24.0	21.3	1.8	13.4	185.6	0.4

PELLET GROUP DATA --
Management unit 00 , Study no: 3

Type	Quadrat Frequency			
	'95	'96	'01	'06
Rabbit	-	-	-	1
Big Horn	-	-	-	-
Deer	-	5	-	-
Buffalo	5	12	7	12

Days use per acre (ha)	
'01	'06
-	-
1 (2)	-
-	1 (2)
44 (109)	28 (68)

BROWSE CHARACTERISTICS --
Management unit 00 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	15/29
Chrysothamnus nauseosus												
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	14/39
Gutierrezia sarothrae												
95	**60**	-	-	60	-	-	0	0	-	-	0	6/9
96	**80**	20	-	80	-	-	0	0	-	-	0	11/14
01	**40**	-	-	40	-	-	0	0	-	-	0	9/10
06	**40**	-	20	20	-	-	0	0	-	-	0	11/13

Trend Study 00-4-06

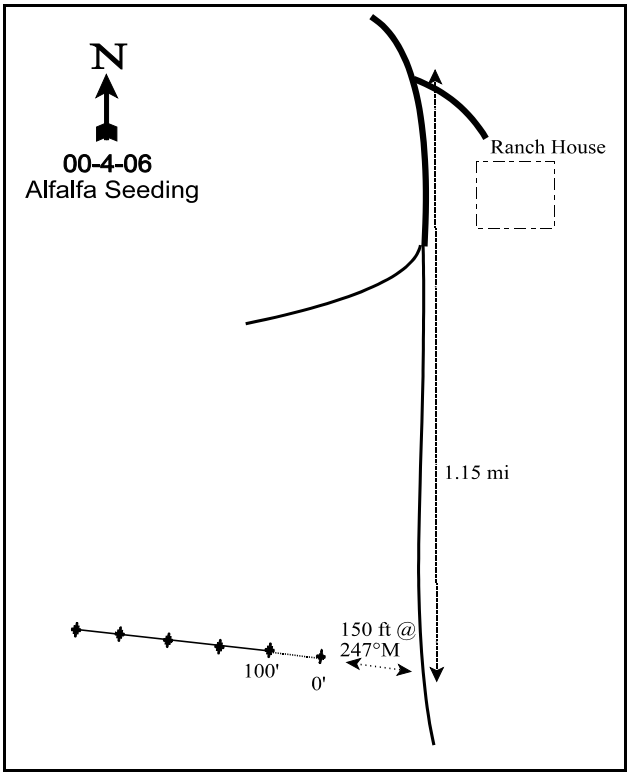
Study site name: Alfalfa Seeding . Vegetation type: Alfalfa Seeding .

Compass bearing: frequency baseline 295 degrees magnetic.

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

LOCATION DESCRIPTION

From the ranch house, travel south for 1.15 miles to a witness post on the right hand (west) side of the road. From the witness post walk 150 feet at 247 degrees magnetic to the 0-foot baseline stake. The baseline runs 295 degrees magnetic. The 0 foot stake is marked with browse tag number 171.



Map Name: Antelope Island

Diagrammatic Sketch

Township 2N , Range 3W , Section 15

UTM NAD 27, UTM 12T 4529216 N 401284 E

DISCUSSION

Alfalfa Seeding - Trend Study No. 00-4

Study Information

This study is located south of the old ranch house and northeast of Blackburn Spring (elevation: 4,280 feet, slope: 9%, aspect: east). It was placed in a burn that was seeded primarily with alfalfa, intermediate wheatgrass, and crested wheatgrass. Bison use is heavy. In 2001, the pellet group transect data estimated 121 bison days use/acre (299 bison days use/ha). Deer use of the area is very low at an estimated 2 deer days use/acre (5 ddu/ha). The estimated pellet group data in 2006 was only 23 bison days use/acre (57 bdu/ha). The area had received year round use and the bison pats counted were only those left since late fall.

Soil

The soils are in the Kilburn series, which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. They are formed in alluvium and colluvium derived dominantly from gneiss, schist, and quartzite on fan terraces, lake terraces, stream terraces, and deltas (USDA-NRCS 2006). These are derived specifically from alluvial deposits from Lake Bonneville. The soil is shallow with a layer of gravel about 4 inches below the soil surface. The soil texture is a sandy loam with a slightly alkaline pH (7.7). Effective rooting depth was estimated at less than 11 inches. Phosphorus may be limiting factor at only 7.6 ppm, values less than 6 ppm may limit normal growth and development (Tiedemann and Lopez 2004). Cover from vegetation and litter were abundant and well disbursed prior to 2006; by 2006, drought and heavy use by bison had greatly reduced vegetation cover. Except for a few bison wallowing areas, erosion is minimal. The erosion condition class rating in 2006 was stable.

Browse

Only one browse species was sampled, white rubber rabbitbrush. Rabbitbrush density was estimated at only 20 plants/acre in 1994 and 1996. It was only sampled in the height and crown measurements in 2001 and 2006. The lower height and crown measurements in 2001 and 2006 indicated that big game had been browsing the shrubs.

Herbaceous Understory

Cheatgrass is the dominant grass despite the seeding of intermediate and crested wheatgrass. Cheatgrass provided 29% cover in 1994, 24% in 1996, 12% in 2001, and 20% in 2006. In 2001, cheatgrass significantly decreased in nested frequency, but did not change significantly in 2006. Cheatgrass quadrat frequency was at its lowest in 1994 at 96%. Intermediate wheatgrass is the most abundant perennial species followed by crested wheatgrass and bulbous bluegrass. Intermediate wheatgrass and bulbous bluegrass both significantly increased in nested frequency in 2001, but neither species increased in 2006. Crested wheatgrass nested frequency did not change until 2006, when it decreased significantly. Moderate to heavy use was noted on intermediate and crested wheatgrass in 2001 and all species had been heavily utilized by bison in 2006.

The dominant forb is alfalfa; it contributed 21% cover in 1994, 32% in 1996, 28% in 2001, but only 2% in 2006. These plants were very robust, healthy, and displayed some use previous to 2006, but were very heavily grazed in 2006. Most plants were nearly 2 feet tall in 2001, but were only 6-8 inches tall in 2006. Storksbill nested frequency was low in 1994 and 1996, sharply increased in 2001, then decreased again in 2006. Storksbill had an estimated cover of less than 1% in 1994 and 1996, 24% in 2001, then only 2% in 2006. All other forbs have been infrequent and provided very little cover.

1996 TREND ASSESSMENT

The browse trend is stable with only white rubber rabbitbrush sampled. Although cheatgrass is the dominant grass, other seeded grass species are present to help keep it in check. The grass trend is stable. Alfalfa is large, vigorous, and provides excellent cover and forage. Weedy species are few. The forb trend is stable. The 1994 Desirable Components Index score is very poor-poor due to the lack of browse cover and the high

annual grass cover. It decreased to very poor in 1996 due to decreased perennial grass cover.

1994 winter range condition (DC Index) - very poor-poor (8) Lower potential scale
1996 winter range condition (DC Index) - very poor (5) Lower potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

The browse trend is stable. Rubber rabbitbrush was measured only in the height and crown measurements. The grass trend is up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 33% and cheatgrass nested frequency decrease significantly. The nested frequency of intermediate wheatgrass and bulbous bluegrass increased significantly. The forb trend is slightly down. The nested frequency of storksbill increased significantly and cover increased from less than 1% in 1996 to 24% in 2001. The nested frequency of perennial forbs also decreased 13%. Alfalfa, which maintained a relatively stable nested frequency, remains the dominant forb. The DCI score increased to poor due to an increase in perennial grass cover and a decrease in annual grass cover.

winter range condition (DC Index) - poor (22) Lower potential scale
browse - stable (0) grass - up (+2) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is stable. No browse species were sampled in the density measurements again. The grass trend is down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 37%. Crested wheatgrass nested frequency deceased significantly. Cheatgrass nested frequency did not change, but cover increased from 12 to 20%. The forb trend is down. Alfalfa nested frequency decreased significantly and cover decreased from 28 to 2%. Drought and overgrazing by the bison are the causes of the decrease. Some could grow back with lighter grazing and normal precipitation, but will not likely return to the previous condition and abundance. Storksbill nested frequency decreased significantly and cover also decreased, which is beneficial to the rangeland health. The DCI score decreased because of decreased perennial forb cover and increased annual grass cover.

winter range condition (DC Index) - very poor-poor (12) Lower potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 4

Type	Species	Nested Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
G	Agropyron cristatum	$_{b}$98	$_{b}$77	$_{b}$76	$_{a}$18	2.75	1.09	1.47	.33
G	Agropyron intermedium	$_{a}$116	$_{b}$156	$_{c}$230	$_{ab}$170	6.19	5.06	5.57	7.77
G	Aristida purpurea	-	-	-	2	-	-	-	.15
G	Bromus tectorum (a)	$_{b}$427	$_{b}$455	$_{a}$393	$_{a}$405	29.17	23.51	12.03	19.76
G	Elymus cinereus	1	-	-	-	.03	.00	.03	-
G	Festuca myuros (a)	$_{a}$-	$_{b}$21	$_{c}$38	$_{c}$32	-	.43	1.21	.31
G	Poa bulbosa	$_{a}$-	$_{a}$3	$_{b}$81	$_{b}$109	-	.15	3.42	2.98
G	Poa fendleriana	1	-	-	3	.00	-	-	.00

Type	Species	Nested Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
G	Poa secunda	5	-	4	1	.15	.00	.30	.00
G	Vulpia octoflora (a)	$_{a}$-	$_{a}$-	$_{ab}$10	$_{b}$11	-	-	.04	.42
Total for Annual Grasses		427	476	441	448	29.17	23.95	13.29	20.50
Total for Perennial Grasses		221	236	391	303	9.14	6.31	10.80	11.25
Total for Grasses		648	712	832	751	38.31	30.27	24.09	31.75
F	Alyssum alyssoides (a)	-	-	-	6	-	-	-	.01
F	Arabidopsis thaliana (a)	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$12	-	-	-	.07
F	Descurainia pinnata (a)	-	-	-	1	-	-	-	.00
F	Draba nemorosa (a)	$_{a}$-	$_{a}$-	$_{a}$8	$_{b}$31	-	-	.02	.10
F	Erodium cicutarium (a)	$_{a}$33	$_{b}$102	$_{c}$379	$_{b}$120	.22	.58	23.91	2.41
F	Holosteum umbellatum (a)	$_{ab}$5	$_{a}$2	$_{b}$16	$_{ab}$6	.01	.00	.11	.02
F	Lappula occidentalis (a)	-	-	1	2	-	-	.00	.00
F	Lactuca serriola	-	-	-	3	-	-	-	.03
F	Medicago sativa	$_{b}$211	$_{b}$209	$_{b}$182	$_{a}$36	21.29	32.47	27.95	2.21
F	Polygonum douglasii (a)	-	2	-	-	-	.00	-	-
F	Ranunculus testiculatus (a)	-	-	-	2	-	-	-	.00
F	Salsola iberica (a)	3	-	-	-	.03	-	-	-
F	Sisymbrium altissimum (a)	$_{a}$-	$_{a}$-	$_{a}$8	$_{b}$85	-	-	.01	1.60
F	Tragopogon dubius	-	-	-	-	-	-	.03	.00
Total for Annual Forbs		41	106	412	265	0.27	0.59	24.06	4.24
Total for Perennial Forbs		211	209	182	39	21.29	32.47	27.98	2.25
Total for Forbs		252	315	594	304	21.57	33.06	52.05	6.49

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

BROWSE TRENDS --
Management unit 00 , Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'94	'96	'01	'06	'94	'96	'01	'06
B	Chrysothamnus nauseosus hololeucus	1	1	0	0	.15	.03	.00	-
Total for Browse		1	1	0	0	0.15	0.03	0.00	0

BASIC COVER --
Management unit 00 , Study no: 4

Cover Type	Average Cover %			
	'94	'96	'01	'06
Vegetation	69.76	62.37	68.24	44.75
Rock	1.02	.61	1.77	.98
Pavement	.39	.14	.19	.86
Litter	60.32	69.96	46.87	59.75
Cryptogams	.23	.04	.18	.06
Bare Ground	1.83	.78	3.91	5.31

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 04, Alfalfa Seeding

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.7	61.4 (11.3)	7.7	72.7	14.0	13.3	1.1	7.6	259.2	0.8

PELLET GROUP DATA --
Management unit 00 , Study no: 4

Type	Quadrat Frequency			
	'94	'96	'01	'06
Rabbit	1	-	-	-
Deer	1	-	-	-
Buffalo	3	10	29	24
Antelope	-	1	-	1

Days use per acre (ha)	
'01	'06
-	-
2 (5)	-
121 (299)	23 (57)
-	-

BROWSE CHARACTERISTICS --
Management unit 00 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
94	**20**	-	-	-	20	-	100	0	100	-	0	25/38
96	**20**	-	-	20	-	-	0	0	0	-	0	23/44
01	**0**	-	-	-	-	-	0	0	0	-	0	5/15
06	**0**	-	-	-	-	-	0	0	0	-	0	18/43

Trend Study 00-5-06

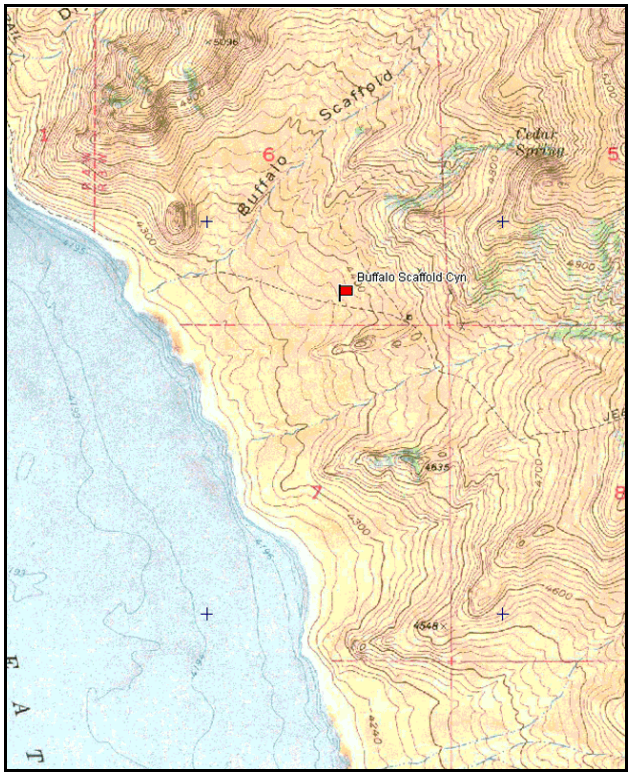
Study site name: Buffalo Scaffold . Vegetation type: Annual Grass .

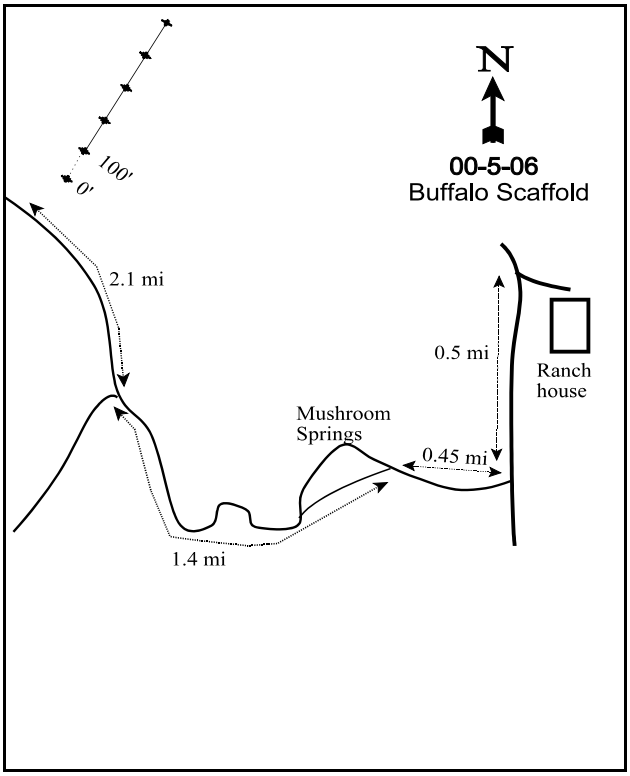
Compass bearing: frequency baseline 110 degrees magnetic.

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

LOCATION DESCRIPTION

From the ranch house, drive 0.5 miles to a fork. Turn right and drive another 0.45 miles to a fork. Turn right, and drive 1.4 miles to a fork by the Sentry Mountain Peak. Stay right, and drive 2.1 miles to witness post on the right side of the road at the bottom of a hill in a meadow. From the witness post walk 34 steps at a bearing of 110 degrees magnetic to the 0-foot baseline stake. The baseline runs in a direction of 340 degrees magnetic.





Map Name: Antelope Island

Diagrammatic Sketch

Township 2N , Range 3W , Section 6

UTM NAD 27, UTM 12T 4531522 N 396874 E

DISCUSSION

Buffalo Scaffold - Trend Study No. 00-5

Study Information

This study is located on the west side of Antelope Island about ½ mile south of Buffalo Scaffold Canyon (elevation: 4,360 feet, slope: 5-8%, aspect: southwest). The shoreline of the Great Salt Lake is about 3/4 mile to the west. Fire burned the area sometime prior to establishment in 1995 and it is now dominated by annual herbaceous species. Bison pats and bighorn sheep pellets were sampled by a pellet group transect read in 2001. Use by bighorn sheep was light, while that of bison was estimated at 12 days use/acre (30 days use/ha). The pellet group transect data in 2006 was estimated at 1 pronghorn and 21 bison days use/acre (2 pdu/ha and 52 bdu/ha). Some of the bison pats were from the current summer, but the majority were from spring and winter.

Soil

The soils are in the Kilburn series, which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. They are formed in alluvium and colluvium derived dominantly from gneiss, schist, and quartzite on fan terraces, lake terraces, stream terraces, and deltas (USDA-NRCS 2006). These are derived specifically from alluvial deposits from Lake Bonneville. The soil texture is a sandy loam with a neutral pH (6.8). Effective rooting depth is estimated at under 13 inches. There is a slight color change in the soil profile about 8 inches below the soil surface. Organic matter is very low at less than 1%. Very little rock was encountered within the soil profile. Vegetation and litter cover have been high in all sampling years most of which was provided by annual species. The cover value for bare ground has been low at less than 1%. The erosion condition class score was stable in 2006.

Browse

No browse species have been sampled. Frequent fire intervals have effectively removed the browse component from the surrounding area.

Herbaceous Understory

Annual grasses dominate the area; they provided 78% cover in 1995, 61% in 1996, 28% in 2001, and 42% in 2006. In 1995 and 1996, nearly 90% of the grass cover was contributed by cheatgrass and rattail fescue. Due to the extremely dry conditions in Northern Utah in 2000-2001, these species decreased in cover and nested frequency in 2001. In 2006, cheatgrass cover increased, but nested frequency did not change. Rattail fescue nested frequency decreased significantly and cover did not change. Perennial grasses nearly doubled in nested frequency in 2001. This increase is due mainly to the increase in purple three-awn and bulbous bluegrass, both low value species. Purple three-awn nested frequency decreased significantly in 2006. Sand dropseed is the only high value perennial grass, but is in low abundance.

Storksbill was the dominant forb previous to 2006, but moth mullein provided more cover and nested frequency in 2006. It was noted in 1996 that there were many old stalks from annual sunflower, but no plants were sampled until 2006. Other species sampled are prickly lettuce, yellow salsify, and sego lily. None of these species provide significant cover.

1996 TREND ASSESSMENT

Browse species are were not sampled during either reading. Rattail fescue and cheatgrass dominate and compete with perennial species. Cheatgrass and rattail fescue nested frequencies did not change. Purple three-awn nested frequency increased which is good to get an increase in a perennial species, even if they provide little forage value. Mutton bluegrass, one of the two desirable grasses, decreased significantly and was not sampled in 1996. The grass trend is slightly up, although the composition is poor. The forb trend is stable. Storksbill nested frequency decreased significantly, but the nested frequency of moth mullein increased significantly. Storksbill was replaced by the mullein. The 1995 Desirable Components Index score was very

poor due to the lack of browse cover, high annual grass cover, and only moderate perennial grass cover. It did not change by 1996.

1995 winter range condition (DC Index) - very poor (-6) Lower potential scale
1996 winter range condition (DC Index) - very poor (-3) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

2001 TREND ASSESSMENT

There is no browse. The grass trend is up. Both cheatgrass and rattail fescue significantly decreased in nested frequency. The cover of annual grasses decreased from 61 to 28% (91% of the grass cover to 53%). The nested frequency of perennial grasses increased, but the increase in perennial grass frequency comes primarily from two low value species (purple three-awn and bulbous bluegrass); both species increased significantly. The forb trend is down. The nested frequency of storksbill increased significantly and that of moth mullein decreased significantly, but the combined cover of both species increased from 5 to 18%. The nested frequency of sego lily increased significantly, but it provides little cover and forage. The DCI score increased slightly because of the decrease in annual grass cover.

winter range condition (DC Index) - very poor-poor (10) Lower potential scale
browse - stable (0) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend remained stable with no browse. The grass trend is down. The most beneficial perennial grass species, sand dropseed, decreased significantly in nested frequency and provides less than 1% cover. Cheatgrass nested frequency did not change, but cheatgrass cover increased due to the increased precipitation. Purple three-awn nested frequency also decreased significantly. The forb trend is slightly up. The nested frequency of prickly lettuce increased significantly. The nested frequency of storksbill decreased significantly and cover decreased from 12 to 1%. Unfortunately, moth mullein nested frequency increased significantly and cover also increased. The DCI score decreased to very poor due to increased annual grass cover and decreased perennial grass cover.

winter range condition (DC Index) - very poor (-6) Lower potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 5

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
G	Aristida purpurea	a74	b147	c216	b163	3.39	4.82	17.06	12.67
G	Bromus tectorum (a)	b483	b484	a448	a455	41.41	27.39	22.23	35.62
G	Festuca myuros (a)	c458	c465	b315	a256	29.28	32.27	6.05	5.57
G	Poa bulbosa	a35	a6	b120	b124	.17	.01	5.44	.83
G	Poa fendleriana	b20	a-	a-	a-	1.59	-	-	-
G	Sporobolus cryptandrus	b67	b64	b84	a21	1.31	.96	2.21	.12
G	Vulpia octoflora (a)	b156	a37	a26	a19	7.74	.98	.08	.58
Total for Annual Grasses		1097	986	789	730	78.44	60.66	28.36	41.77
Total for Perennial Grasses		196	217	420	308	6.47	5.78	24.71	13.62
Total for Grasses		1293	1203	1209	1038	84.92	66.45	53.08	55.40
F	Agoseris heterophylla (a)	b9	a-	a-	a-	.02	-	-	-
F	Calochortus nuttallii	b37	a9	c62	a11	.10	.01	.19	.04
F	Draba nemorosa (a)	-	-	6	5	-	-	.01	.01
F	Erodium cicutarium (a)	d407	b265	c342	a154	8.93	2.24	11.95	.72
F	Fritillaria sp.	3	-	-	-	.00	-	-	-
F	Helianthus annuus (a)	a-	a-	a-	b36	-	-	-	.07
F	Lactuca serriola	a1	a5	a1	b49	.00	.01	.00	.08
F	Sisymbrium altissimum (a)	-	-	-	2	-	-	-	.15
F	Tragopogon dubius	-	11	1	2	-	.02	.03	.00
F	Veronica biloba (a)	-	-	2	-	-	-	.06	-
F	Verbascum blattaria	a20	c190	b149	d237	.40	2.74	5.78	8.94
Total for Annual Forbs		416	265	350	197	8.96	2.24	12.02	0.95
Total for Perennial Forbs		61	215	213	299	0.52	2.78	6.01	9.07
Total for Forbs		477	480	563	496	9.48	5.03	18.04	10.03

BASIC COVER --
Management unit 00 , Study no: 5

Cover Type	Average Cover %			
	'95	'96	'01	'06
Vegetation	79.72	62.80	75.09	66.75
Rock	.45	.00	.03	.03
Pavement	.00	.69	.25	.04
Litter	78.74	79.65	38.20	40.95
Bare Ground	.18	.10	.47	.63

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 05, Buffalo Scaffold

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.7	64.4 (12.4)	6.8	56.7	24.0	19.3	0.9	10.8	208.0	0.7

PELLET GROUP DATA --
Management unit 00 , Study no: 5

Type	Quadrat Frequency			
	'95	'96	'01	'06
Deer	-	2	1	-
Buffalo	2	1	3	6

Days use per acre (ha)	
'01	'06
1 (2)	1 (3)
12 (30)	21 (52)

Trend Study 00-6-06

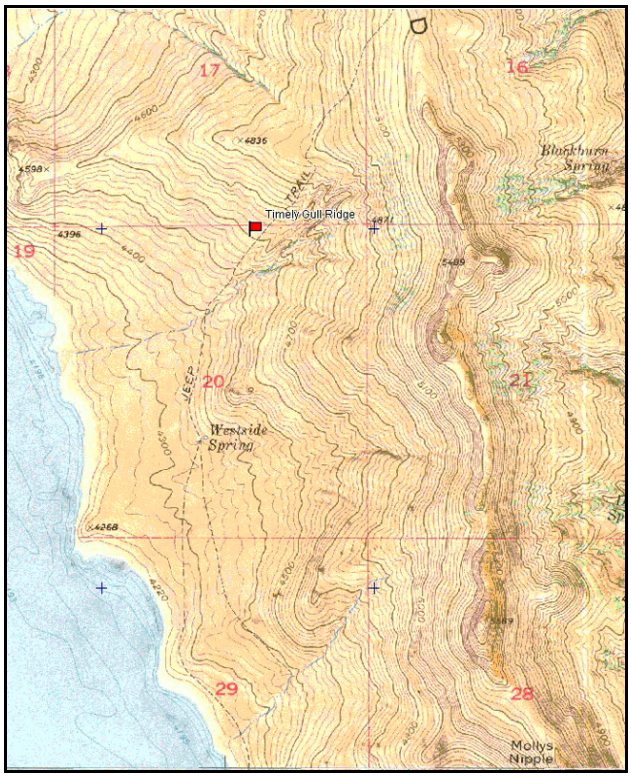
Study site name: Timely Gull Ridge . Vegetation type: Annual Grass .

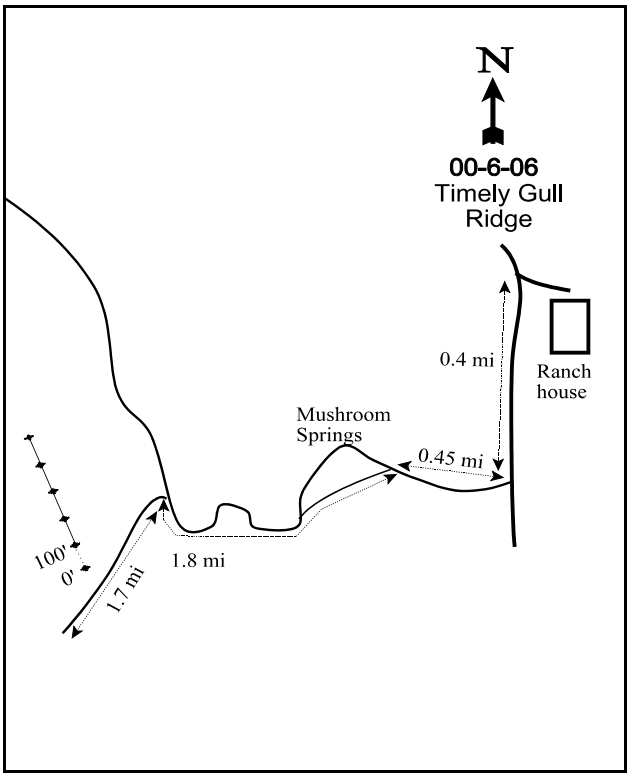
Compass bearing: frequency baseline 260 degrees magnetic.

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

LOCATION DESCRIPTION

From the Ranch House drive 0.4 miles and take a right turn. Travel 0.45 miles where the road forks. Stay left and travel 1.8 miles to another fork in the road. Stay left, from the fork travel 1.7 miles to a witness post which is 30 feet off the right hand side of the road. From the witness post walk 5 paces at a bearing of 260 degrees magnetic to the 0-foot baseline stake. The baseline runs in a direction of 260 degrees magnetic.





Map Name: Timely Gull Ridge Diagrammatic Sketch

Township 2N , Range 3W , Section 20 UTM NAD 27, UTM 12T 4528112 N 398365 E

DISCUSSION

Timely Gull Ridge - Trend Study No. 00-6

Study Information

This study is located on the west side of Antelope Island about ½ mile above the shoreline and 2/3 mile north of Westside Spring (elevation: 4,600 feet, slope:13%, aspect: southwest). To the east is a large gully with scattered pinyon and juniper on the opposite slope. A group of bison were observed near the study in 2001. A pellet group transect read in 2001 noted light use by both deer and bighorn sheep. Bison use was 19 days use/acre (47 days use/ha). The estimates from the pellet group transect in 2006 were 3 pronghorn and 6 bison days use/acre (7 pdu/ha and 14 bdu/ha). Many bison pats from the previous year were not counted. Pronghorn and bison use was from spring. Two deer were spotted east of the study in 2006.

Soil

The soils are in the Kilburn series, which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils. They are formed in alluvium and colluvium derived dominantly from gneiss, schist, and quartzite on fan terraces, lake terraces, stream terraces, and deltas (USDA-NRCS 2006). These are derived specifically from alluvial deposits from Lake Bonneville. The soil texture is a sandy loam with a neutral pH (6.6). Effective rooting depth was estimated at just over 18 inches. Phosphorus soil concentration was 6 ppm; values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). Organic matter is low at less than 1%. Vegetation cover and litter have been abundant and effective at limiting erosion. Due to the extremely dry conditions prior to sampling in 2001, litter cover had decreased and bare ground slightly increased. The soil erosion condition class was stable in 2006.

Browse

No browse species were sampled in any year due to short, intense, recurring fire intervals.

Herbaceous Understory

Cheatgrass has been the dominant species every year. Cheatgrass made up more than 90% of the total grass cover in 1995 and 1996, decreased to 69% in 2001, then increased to 82% in 2006. Cheatgrass provided about 63% cover in 1995 and 1996 (90% or great each year of the total grass cover). The extremely dry conditions of 2000-2001 in northern Utah caused cheatgrass cover to decrease to 14% in 2001 (69% of total grass cover), but then increased to 49% in 2006 after normal precipiation (82% of total grass cover). Cheatgrass nested frequency also decreased significantly in 2001, but was still high and increased significantly again in 2006. Sixweeks and rattail fescue both decreased in nested frequency in 2001, but increased in 2006. Sand dropseed and purple three-awn are the only perennial grasses that have been sampled since 1996. Other than a large increase in purple three-awn in 2001, these two species have provided less than 2% cover.

Forb cover was scant in 1995 and 1996. In 2001 however, storksbill increased to more than 26% cover. Perennial forbs are rare; moth mullein is the dominant perennial forb species. Moth mullein was sampled first in 1996 and has increased significantly every year in nested frequency and substantially in cover. By 2006, mullein had surpassed storksbill in nested frequency and cover, similar to the Buffalo Scaffold (00-5) study.

1996 TREND ASSESSMENT

There is no browse cover. Cheatgrass, rattail fescue, and six weeks fescue are the dominant herbaceous species and provided the bulk of the vegetation cover. Even if fire is suppressed, it will be extremely difficult to change the composition of the community. The nested frequency of perennial grasses decreased slightly. The grass trend is slightly down. The forb trend is stable. The nested frequency of storksbill decreased significantly and that of moth mullein increased significantly. The nested frequency of perennial forbs increased, but almost exclusively because of moth mullein. The 1995 Desirable Components Index score was very poor due to very low perennial grass and forb cover and high annual grass cover and did not change by 1996.

1995 winter range condition (DC Index) - very poor (-18) Lower potential scale
1996 winter range condition (DC Index) - very poor (-14) Lower potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2001 TREND ASSESSMENT

There is still no browse cover. The nested frequency of cheatgrass decreased significantly and the nested frequency of perennial grasses, mainly purple three-awn, increased. Annual grass cover decreased from 69% in 1996 to 15% in 2001. The grass trend is up. Storksbill and moth mullein both increased significantly in nested frequency and substantially in cover. The forb trend is down. The DCI score increased due to the decrease in annual grass cover and the increase in perennial grass and forb cover.

winter range condition (DC Index) - very poor-poor (10) Lower potential scale
browse - stable (0) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The soil trend is stable. The relative bare ground cover is low and litter and vegetation cover are high. The soil erosion condition rating was stable. There is still no browse cover. The grass trend is down. The nested frequencies of cheatgrass, rattail fescue, and sixweeks fescue all increased significantly. The cover of each of the annual grass species increased substantially as well. Both of the perennial grasses, purple three-awn and sand dropseed, nested frequencies decreased significantly. Bulbous bluegrass was sampled for the first time. The forb trend is slightly up. The nested frequency of moth mullein increased significantly and cover increased substantially. Storksbill cover decreased substantially and nested frequency decreased significantly. The net change of storksbill and moth mullein is a total decrease in combined nested frequency and cover, which is positive. The DCI score declined due to the decrease in perennial grass cover and increased annual grass cover.

winter range condition (DC Index) - very poor (-6) Lower potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 00 , Study no: 6

Type	Species	Nested Frequency				Average Cover %			
		'95	'96	'01	'06	'95	'96	'01	'06
G	Aristida purpurea	$_{a}$25	$_{a}$11	$_{c}$142	$_{b}$66	.32	.12	4.08	1.54
G	Bromus tectorum (a)	$_{b}$499	$_{b}$499	$_{a}$471	$_{b}$492	61.79	63.37	13.82	49.13
G	Festuca myuros (a)	$_{a}$75	$_{b}$163	$_{b}$135	$_{c}$302	.69	3.75	.56	7.87
G	Poa bulbosa	-	-	-	4	-	-	-	.01
G	Poa fendleriana	3	-	-	-	.01	-	-	-
G	Sporobolus cryptandrus	$_{b}$55	$_{b}$47	$_{b}$67	$_{a}$12	.88	1.51	1.22	.23
G	Vulpia octoflora (a)	$_{d}$344	$_{c}$257	$_{a}$66	$_{b}$155	1.99	1.85	.34	1.00
Total for Annual Grasses		918	919	672	949	64.47	68.98	14.72	58.01
Total for Perennial Grasses		83	58	209	82	1.21	1.63	5.31	1.78
Total for Grasses		1001	977	881	1031	65.68	70.62	20.03	59.80
F	Agoseris heterophylla (a)	8	-	-	-	.02	-	-	-
F	Calochortus nuttallii	-	-	3	-	-	-	.01	-
F	Draba nemorosa (a)	$_{a}$12	$_{a}$23	$_{a}$24	$_{b}$108	.01	.03	.04	.21
F	Epilobium brachycarpum (a)	-	-	-	2	-	-	-	.00
F	Erodium cicutarium (a)	$_{c}$430	$_{b}$342	$_{d}$456	$_{a}$209	3.79	2.78	26.70	4.27
F	Helianthus annuus (a)	-	-	-	4	-	-	-	.01
F	Tragopogon dubius	-	1	-	-	-	.00	-	-
F	Verbascum blattaria	$_{a}$-	$_{b}$29	$_{c}$94	$_{d}$226	-	1.58	8.14	12.63
Total for Annual Forbs		450	365	480	323	3.82	2.81	26.74	4.50
Total for Perennial Forbs		0	30	97	226	0	1.59	8.15	12.62
Total for Forbs		450	395	577	549	3.82	4.41	34.90	17.13

BASIC COVER --
Management unit 00 , Study no: 6

Cover Type	Average Cover %			
	'95	'96	'01	'06
Vegetation	73.59	68.52	56.05	71.03
Rock	2.95	.18	.03	.01
Pavement	0	1.54	10.95	9.54
Litter	66.70	79.70	32.95	28.75
Cryptogams	.52	.35	0	.03
Bare Ground	.12	.05	1.85	2.20

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 06, Timely Gull Ridge

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
18.2	65.8 (16.5)	6.6	76.9	10.1	13.0	0.9	6.0	89.6	0.4

PELLET GROUP DATA --
Management unit 00 , Study no: 6

Type	Quadrat Frequency				Days use per acre (ha)	
	'95	'96	'01	'06	'01	'06
Bighorn Sheep	-	-	2	-	2 (5)	-
Deer	-	-	5	-	5 (13)	-
Buffalo	1	1	8	5	19 (47)	6 (14)
Antelope	-	-	-	1	-	3 (7)

SUMMARY

MANAGEMENT UNIT - 00 - ANTELOPE ISLAND

Six trend studies were reread in the spring of 2006, all of which were dominated by annual grass and forb species.

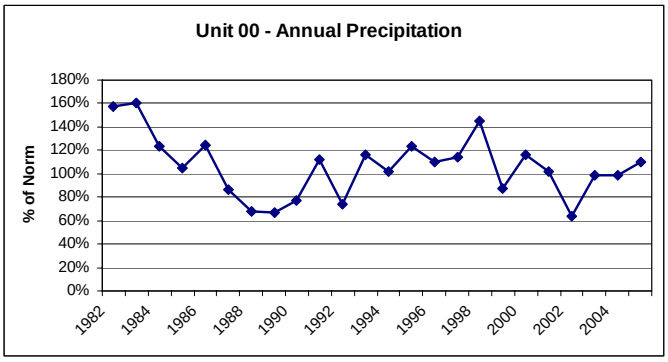


Figure 1. Annual precipitation data for Antelope Island. Data was collected at the Garfield and National Weather Sevice Forecast Office weather stations (Utah Climate Summaries 2006).

Vegetation trends are dependent upon fall and spring precipitation patterns. Precipitation data from this herd unit was compiled from the Garfield (just west of Magna and south of the Great Salt Lake) and National Weather Service Forecast Office (just south of the airport) weather stations (Figures 1 and 2). These weather stations were chosen for their similarity in precipitation to historical Antelope Island precipitation data collected from 1952 to 1972. In 2002, the average precipitation value at the 2 weather stations was below drought level (75% of normal; Figure 1). Spring precipitation for the unit was below normal from 2000 to 2004 and below 75% of normal in 2000 and 2001 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation was below drought level in 1999 and 2002 (Figure 2), which decreases cheatgrass establishment. Many of the changes in the trends discussed below are resultant of changes in precipitation.

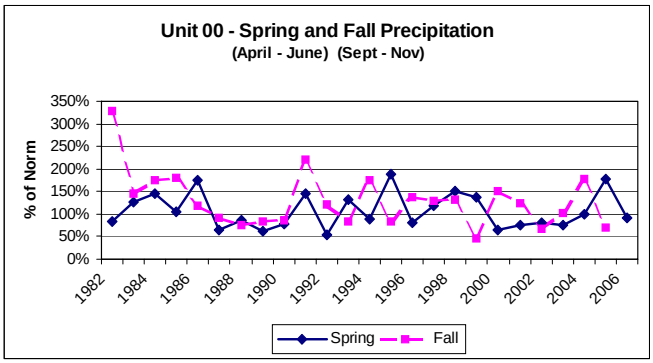


Figure 2. Spring and fall precipitation data for Antelope Island. Data was collected at the Garfield and National Weather Service Forecast Office weather Stations (Utah Climate Summaries 2006).

The browse trends have not changed on the island since the studies were established in 1994 and 1995 (Figure 3). This is due to a lack of browse on the study areas. Sagebrush was sampled in the density measurements of only 1 of the 6 studies, Frary Homestead (00-2). On this study, the density of basin big sagebrush increased slightly from 20 plants/acre in 1996 and 2001 to 160 plants/acre in 2006. In the case of all studies, the fire frequency is far too high for sagebrush to establish and thrive which depletes sagebrush seed in the seedbank. The fire frequency is increased because of increased fine fuels provided by the high abundance of annual grasses (namely cheatgrass; Figure 4). The dense annual grasses also prevent the recruitment of perennial grasses and shrubs.

The grass trends have fluctuated since the study establishments in 1994/1995 (Figure 3). The grass trends have oscillated as nested frequencies of cheatgrass and perennial grasses have fluctuated (Figures 3, 4, and 5). The most notable change occurred in 2001 when cheatgrass nested frequency decreased and the nested frequency of perennial grasses increased; the grass trend reached a unit high (Figures 3 and 5). Overall, it appears as though the nested frequency and cover of cheatgrass has

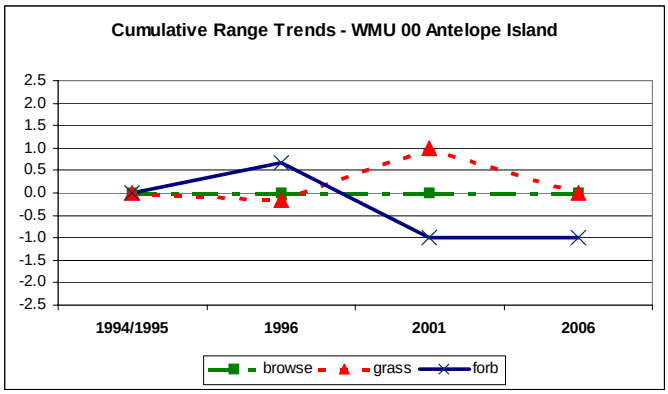


Figure 3. Cumulative range trends for unit 00, Antelope Island.

decreased since 1994/1995 (Figures 4 and 5). One explanation for the decrease in cheatgrass is the drought in 2000 and 2001, which caused a substantial decrease in cheatgrass nested frequency in 2001 and did not recover by 2006. Another likely explanation for the decrease in cheatgrass is the increase in bulbous bluegrass (Figures 4 and 5). Stewart and Hull (1949) noticed that bulbous bluegrass has the ability to displace and outcompete cheatgrass. The nested frequency unit averages for these two species appear to be supporting that observation (Figure 5). The grass composition is poor and, in 2006, the majority of the perennial grass cover and nested frequency was contributed by purple three-awn and bulbous bluegrass, low value increasers.

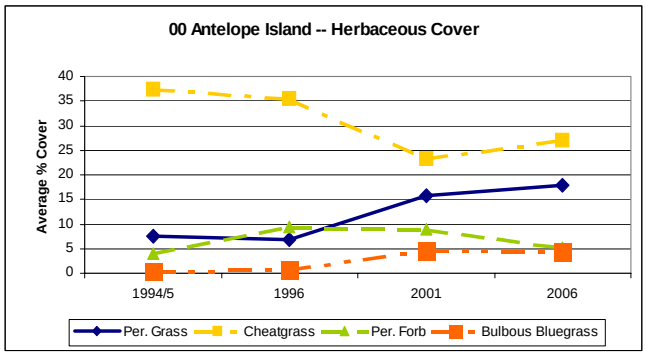


Figure 4. Antelope Island herbaceous understory cover unit averages.

The forb composition is also poor. Most forbs in the unit provide little forage value for big game and many are weedy. The forb trend (Figure 3) decreased from 1996 to 2001, then stabilized in 2006. It appears that the perennial forbs are not able to compete with the abundant annual grasses (Figures 4 and 5). Coupled with heavy grazing pressure from bison, many forbs have been decreasing in nested frequency and cover. This was exemplified at the Alfalfa Seeding study (00-4), where the combination of drought and heavy grazing decreased the abundance of alfalfa. It now appears that annual weeds are replacing the alfalfa. The exception to the decrease in perennial forbs is moth mullein. Moth mullein has been sampled on 5 of the 6 studies, but has been increasing in nested frequency and cover on the western studies (Timely Gull Ridge and Buffalo Scaffold). It and storksbill have been increasing despite competition with cheatgrass.

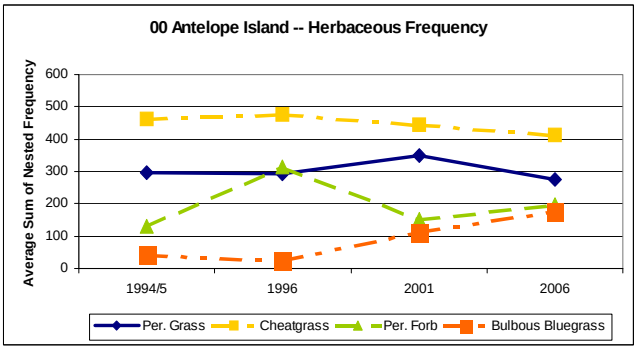


Figure 5. Antelope Island herbaceous understory nested frequency unit averages.

The Desirable Components Index (DCI) scores for the unit are quite low and will continue to be so long as annual grasses dominate and key browse species are unable to establish (Figure 6). The DCI scores in 1994/1995 and 1996 were very poor. The scores increased to poor in 2001 and 2006. The reasons for the low scores are the high annual grass cover and low browse cover. Until the cheatgrass is controlled and preferred browse for big game are reestablished, the DCI scores will remain low.

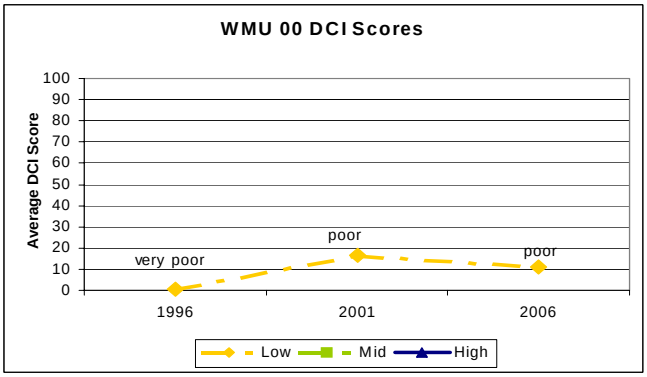
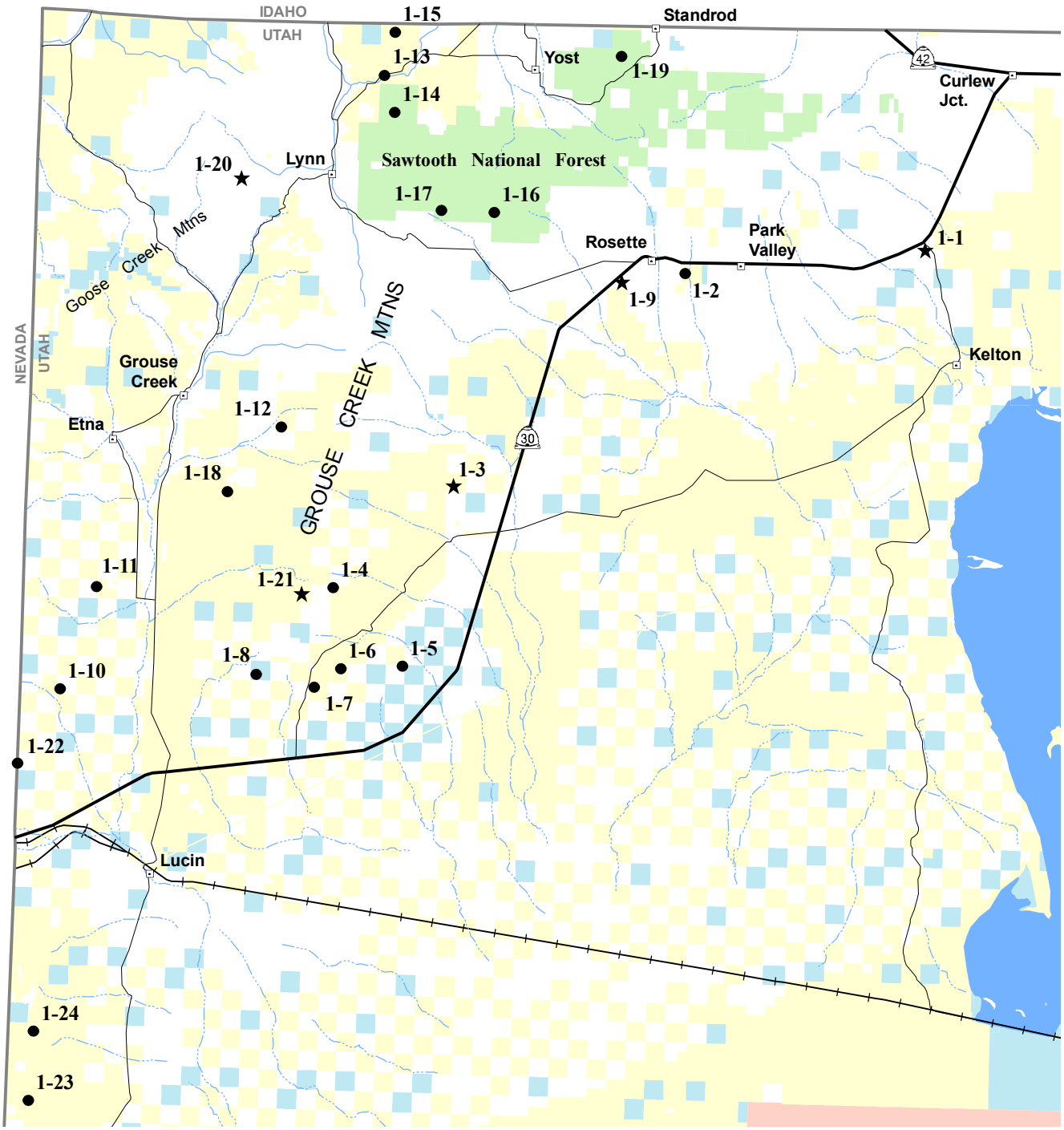


Figure 6. Antelope Island unit average Desirable Components Index (DCI) scores by year. The DCI score are divided into 3 categories based on ecological potential. These are: Low, Mid-level, and High. All studies on Antelope Island are low potential.

Management Unit 1

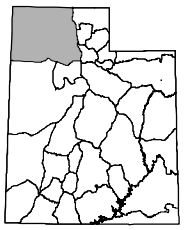


- Transect location
- Suspended site
- Forest Service
- BLM
- State of Utah
- Private
- Military
- Water body
- Perennial stream
- Intermittent stream
- Major road
- Other road
- Railroad
- County boundary

N

Map Scale 1:506,880
(1 inch = 8 miles)

Unit Location



WILDLIFE MANAGEMENT UNIT 1 - BOX ELDER

Boundary Description

Box Elder, Tooele, Salt Lake, Davis and Weber counties - Boundary begins at the Utah-Idaho state line and Interstate 15; then west along this state line to the Utah-Nevada state line, south along this state line to Interstate 80, east on I-80 to I-15, north on I-15 to the Utah-Idaho state line.

Herd Unit Description

Wildlife Management Unit 1 is one of the largest in the state. However, big game range accounts for less than one-third of the unit. The Box Elder subunit 1B (Promontory region) is located in the east side and consists primarily of private land and was considered unsuitable for permanent trend studies. The Pilot Mountain subunit 1C is made up of the most southern portion of the unit and Pilot Mountain. The Raft River subunit 1A (western portion of the unit), where studies have been established, is dominated by the Raft River, Grouse Creek, and Goose Creek Mountains. Here again, private land accounts for almost 70% of what is considered "normal" winter range (King and Muir 1971) and is arranged in a checkerboard pattern with public lands. Towns located within this area are Etna, Grouse Creek, Lynn, Yost, and Park Valley.

The Raft River Mountains run parallel to the Utah-Idaho border, are moderately steep on the south and east, and more gentle on the north and west. The highest point is 9,925 feet on an unnamed peak at the head of the Clear Creek drainage. The Grouse Creek Mountains are relatively narrow and steep and run north-south. At 9,000 feet, Red Butte is the highest point in the Grouse Creek Range. The topography of the Goose Creek Mountains is generally more nominal, the highest point being 8,584 feet on Twin Peaks. The Dove Creek Mountains are more rough, but the terrain becomes more gentle near the Three Corners area.

Normal winter range covers 588,898 acres in subunits 1A and 1B. The upper elevation limits range between 6,000 and 8,000 feet depending on aspect. Winter concentration areas include: the Raft River Narrows, Devils Playground, Bovine, Kimber Ranch, Red Butte Basin, Black Hills, Hardister Creek, and Mud Springs Basin. During severe winters, the normally available winter range can be reduced as much as 74% (King and Muir 1971).

Seasonal migration consists mainly of elevational and north to south migrations from summer range to winter range. A significant number of deer spend their summers in Idaho then migrate south onto unit 1 winter ranges.

King and Muir (1971) estimated that the summer range was restricted to 194,612 acres (only 17% of the range) located in the upper portions of the Raft River, Goose Creek and Grouse Creek Mountains. They considered this quality summer range to be critical to the unit's big-game herds, especially for deer. Areas specifically listed as summer concentration areas for deer are the uppermost elevations of the Raft River Mountains, Johnson Creek Drainage, the head of Lynn Valley, the crest of the Grouse Creek Mountains, and Hardister Creek Plateau. Fawn production estimates from 1975 through 1990 have averaged a little more than 74 fawns/100 does (Jense et al. 1985, Jense et al. 1991). Between 1990 and 1995 the average was nearly 60. This would indicate that the summer range appears to be of sufficient quantity and quality to maintain a healthy herd, at least at present levels. But, if one examines a regression of trend on the fawn/doe ratios, it shows a declining trend through this same 15 year period (1975-90) with the ratios going from almost 86 down to 46. This is reflective of periods of drought that are so detrimental to summer ranges, especially if they are already a limiting factor. Climate data from Grouse Creek and Rosette show precipitation below 90% of normal for eight out of the past 23 years (1983 to 2005). Drought conditions (less than 75% of normal precipitation) existed in five years during this period (additionally, data was insufficient in 1989 and 2002, but these were very dry years across Utah). See precipitation graphs in unit summary (Figure 1).

King and Muir (1971) also describe seven general vegetation types which appear to dominate this big-game range. Sagebrush makes up 55% of the winter range and 58% of the summer range. With an estimated

production of 2,010 lbs/acre and 3,033 lbs/acre on the winter and summer ranges respectively, the big sagebrush type produces the most forage of any type. Black sagebrush occupies ridge tops within the summer range and the upper reaches of the winter range. On the summer range, the black sagebrush type has the highest abundance of grasses and forbs. Within the summer range, the browse type is dominated by curlleaf mountain mahogany on the drier sites and by maple on the more mesic sites. This type provides a good variety of spring-fall forage, yet makes up less than 1% of the winter range. The sagebrush-juniper and juniper types together account for 31% of the winter range. Juniper are more important for the thermal cover they provide in this type. Although small amounts of the aspen-timber and forb-grass types are found along the upper edges of winter range, their primary value is as summer range. A more detailed description and vegetation maps of the different vegetation types for deer herd unit 1 can be found in the 1970 Range Inventory Report published in 1971 by King and Muir.

The Box Elder herd unit was divided into two areas in the 1970 inventory, the western segment, with 588,898 acres of useable big-game range and the eastern segment with 342,567 acres of useable big-game range. The average vegetation production for each vegetation type and their respective acreages for each range type were determined as follows:

> Black sagebrush 1,940 lbs/acre on 26,188 acres; sagebrush 2,010 lbs/acre on 511,744 acres; mixed browse 1,842 lbs/acre on 5,767 acres; sagebrush-juniper 1,863 lbs/acre on 134,167 acres; juniper 1,556 lbs/acre on 154,912 acres; aspen-timber 384 lbs/acre on 5,056 acres; forb-grass 1,164 lbs/acre on 7,564 acres; and maple-sagebrush 1,086 lbs/acre on 21,203 acres (this last type is located only on the eastern segment of the unit). The remainder of the acreage was made up of non-range and agricultural land types.

These average production figures were determined by sampling a total of 404 one-hundred-foot transect lines during the range inventory in 1970.

Big Game Trends

Pratt (1983) gave a brief history of the recent management of this unit's deer populations. In 1950, the season was primarily buck only with a few special permits. Between 1951 and 1970, regulations allowed either sex hunting with some special permits and season extensions. During 1971 and 1972, the first three days were either sex, followed by eight days of buck only hunting. From 1973 to the present, hunts have been buck only with a few special antlerless permits to help lower the population because of depredation to agricultural lands. The 1990 management objectives were to maintain the population necessary to sustain a yearly harvest of 2,250 bucks from subunits A and B and 1,100 for subunit C. Current objectives are to manage for a modeled target winter population of 24,000 deer with an annual buck harvest of about 2,800 animals, achieve post season ratio of 15 bucks/100 does, and to maintain and protect 588,000 acres of winter range and 194,000 acres of summer range.

Between 1950 and 1981, the buck harvest for the western portion of the unit ranged between 508 and 3,022, with an average of 1,302 bucks per year (Pratt 1983). However, the harvest has been increasing in recent years. In 1982, there were 2,891 bucks taken and 3,364 and 2,233 were taken in 1983 and 1984, respectively (Jense et al. 1985). Harvests peaked in 1988 and 1991 when 4,454 and 4,323 bucks were harvested, respectively. Harvests dropped significantly after the severe winter of 1992-93. Only 503 bucks were taken in 1993 and 1,081 by 1994. Anterless permits have been issued each year averaging 1,418 does per year between 1986 and 1992. Numbers dropped to only 583 in 1993, 39 in 1994 and 117 in 1995.

A regression trend line of buck harvest for the 40 year period of 1950-1990 shows an increasing trend from 838 in 1950 to 3,014 by 1990. While the regression of fawn-doe ratios have decreased from 86 to 46 from 1975-1990. This would suggest that the harsh winters of 1982-84 and a 3 year period of drought from 1988-89 have had a detrimental effect on the fawn population. Between 1991-92 and 1994-95 the fawn/doe ratio

has averaged 64 fawns/100 does. Since the severe winter of 1992-93, numbers have increased from 54 fawns/100 does in 1992-93 to 70 in 1994-95.

Elk herd unit 1 boundary coincides with Deer herd unit 1. The Pilot Mountain elk unit population had been relatively stable from 1984 to 1990, with two aerial counts (1989 and 1990) showing totals of 302 and 327 animals. The calve-cow ratios have bounced around since 1984 and have gone from a low of 24 to a high of 51 in 1990. Between 1991-92 and 1995-96 the calves/100 cow ratio has averaged only 39. The regressed trend for calve-cow ratios has shown a slightly downward trend since 1984, following the downward trend of the fawn-doe ratios.

Pratt (1983) listed several concerns about the increasing pressure on the unit's range and deer herd. A livestock owners group called the "Park Valley Improvement Association" is attempting to rehabilitate the range (for livestock use) by burning or chaining sagebrush and juniper on private lands. Much of this range is then seeded to monotypic stands of crested wheatgrass. This results in reductions in important wintering areas, and thermal-hiding cover. It has changed migration routes and concentration areas and has resulted in increased agricultural depredation problems. Other problems mentioned were: access problems resulting in uneven harvests and increasing hunter pressure in more open vegetation types, which could result in over-harvests. More importantly, these monotypic grass stands are more susceptible to catastrophic events, such as drought, insect outbreaks, disease, and also limits the season of use for this type. The more diverse a plant community is, the more resilient it is, especially in it's recovery from periods of drought. Community diversity also extends season of use for both wildlife and livestock. Several private land owners are investing money in restoration projects for this purpose.

When interpreting the data, it should be recalled that the 1984 studies were read in a period of above average precipitation. In fact both 1983 and 1984 were well above normal. The 1990 readings were conducted after several successive years of drought (1988-1990). The 1996 readings occurred in a year of above normal precipitation. These conditions must be considered when evaluating long-term trend data, especially pertaining to herbaceous vegetation. Since the studies sample mostly winter range where browse, most often sagebrush, is the key forage, the following study discussions focus more on trends related to browse condition, composition and availability.

Trend Study Summary

Twenty four studies have been established in this management unit. Fourteen of these studies were established in 1984. Twelve study sites sampled winter ranges on sagebrush-grass range types, two were placed in the pinyon-juniper type, and one in mixed mountain brush. The Cedar Hills (1-15) trend study was established in 1990. Nine new trend studies were established in 1996 to provide data in other areas of concern. These include mixed mountain brush sites at Nut Pine Hills (1-16), Clark's Basin (1-17), and Keg Spring (1-21). A high elevation black sagebrush site was added on Bally Mountain (1-19) and an aspen site was established at Cotton Thomas (1-20). Due to the increasing elk numbers on the Pilot Range, two studies, Patterson Pass (1-23) and Sheep Range Spring (1-24), were also established. An additional site was established at Dake Pass (1-22) to monitor a black sagebrush wintering area for elk north of the Pilot mountains.

In 2006, five studies were not monitored due to lack of use by wildlife. If the need arises in the future these studies can be sampled again. The suspended studies were: Kelton (1-1), Rosebud Hills (1-3), Southwest Rosette (1-9), Cotton Thomas (1-20), and Keg Spring (1-21). To access maps, discussions, and data tables for these studies see: http://www.wildlife.utah.gov/range.

Trend Study 1-2-06

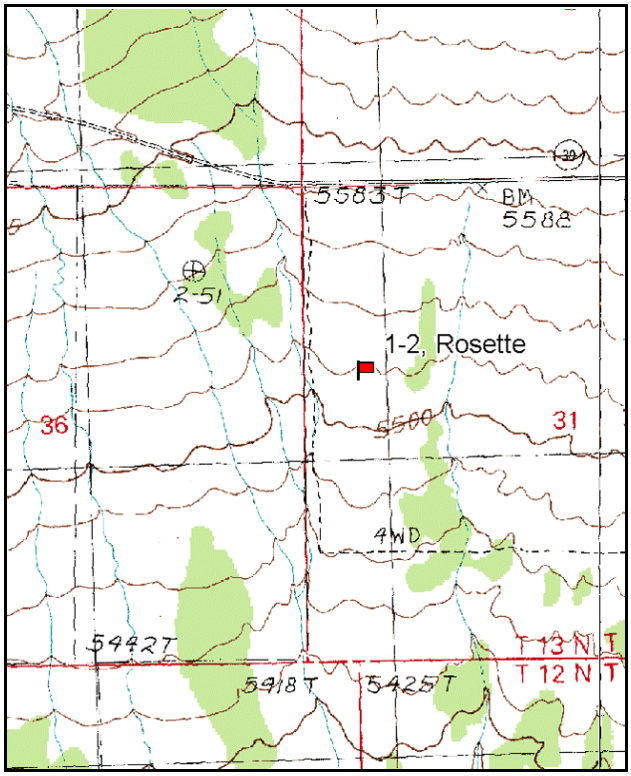
Study site name: Rosette . Vegetation type: Big Sagebrush .

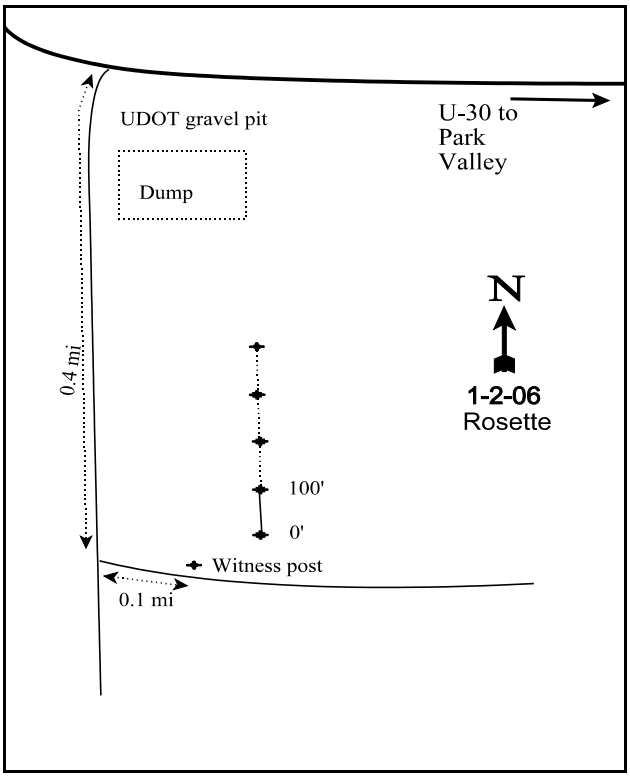
Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

From Rosette, Utah and mile marker 51, proceed northeast on U-30 approximately 1.0 miles and turn right. Proceed through the Utah Department of Transportation gravel dump and find a dirt road on the west side of gravel pile area. Proceed south on this road for 0.4 miles (passing a left fork) to a left fork. Turn left (i.e., east) and proceed 0.1 miles to a witness post on the left side of the road and stop. From the witness post take a bearing of 9 degrees magnetic and walk 22 paces to the 0-foot stake of the frequency baseline. The 0-foot stake is wired with a red browse tag, number 7906.





Map Name: Rosette

Diagrammatic Sketch

Township 13N , Range 13W , Section 31

UTM NAD 27, UTM 12T 4631263 N, 301911E

DISCUSSION

Rosette - Trend Study No. 1-2

Study Information

This trend study is located approximately two miles east of Rosette on critical deer winter range (elevation: 5,500 feet, slope: nearly level, aspect: south). This area is a Wyoming big sagebrush type which also contains some scattered Utah juniper and a few pockets of black sagebrush. Judging from browse utilization and pellet group frequency, deer use through the years has ranged from moderate to heavy. Cattle also graze the area and were on the study area in 1984. This area is within the BLM Hirschi allotment which is assigned for 25 cattle with a season of use from October 16 through December 31. A pellet group transect read in 2001 estimated 26 deer days use/acre (65ddu/ha). In 2006, animal use was estimated at 25 deer days use/acre (61 ddu/ha) and 1 cow day use/acre (2 cdu/ha).

Soil

This soil is part of the the Taylorsflat series, which consists of very deep, well drained, moderate or moderately slowly permeable soils. These soils formed in alluvium and lacustrine sediments from igneous and sedimentary rocks on fan remnants, lake terraces, fan skirts, alluvial flats, and lake plains (USDA-NRCS 2006). Soil texture is a clay loam with a neutral soil reaction (7.3 pH). Soil phosphorus is marginal at 7.2 ppm, which can limit plant growth and development (Tiedemann and Lopez 2004). Rocks are rare in the profile. Average effective rooting depth was just over 15 inches. The ratio of protective ground cover from vegetation and litter compared to percent bare ground is relatively poor. The erosion condition classification was determined to be moderate in 2001 and 2006. Pedestalling was high, while flow patterns and rills were found across the site.

Browse

The key browse species is Wyoming big sagebrush, which also shows characteristics of basin big sagebrush. Density estimates have varied since 1984, however the methods were slightly modified by increasing the sample size by more than three times in 1992. Since 1996, sagebrush density has declined from 6,160 plants/acre to 5,380 plants/acre in 2001, to 4,180 plants/acre in 2006. Young plants were extremely abundant in 1996 (49% of population), which may have inflated the density. Young recruitment was still good in 2001 at 23%, but dropped to only 7% in 2006. Decadence rose to 77% in 1990, then declined to 29% by 1996 and 18% in 2001. This increased to 35% in 2006. Sagebrush cover was 14% in 1996, 19% in 2001, and 16% in 2006. Utilization was determined to be heavy in 1984 with 52% of the population displaying heavy use. By 1990, only 11% of the sagebrush was classified as heavily hedged. Use was mostly light in the last three readings. The sagebrush type in the 1970 Range Inventory estimated air dry production of 2,010 pounds/acre.

Other shrubs found which produce additional forage consist of small numbers of black sagebrush and rubber rabbitbrush. Narrowleaf low rabbitbrush, a low growing increaser, has been decreasing in density since 1996. Rabbitbrush cover has decreased from 6% in 1996 to less than 2% in 2006. Monitoring of this species abundance will be an important trend parameter in the future. A different variety of low rabbitbrush was sampled in 2006. The leaves were wider, darker green, and heavily hedged. Utah juniper density was estimated using the point-center-quarter method. Density was 56 trees/acre in both 2001 and 2006. Juniper cover was about 7% in 2001 and 2006, using the line intercept method.

Herbaceous Understory

Sandberg bluegrass and western wheatgrass are the most abundant perennial grasses. Sum of nested frequency for western wheatgrass has increased since 1990. Sandberg bluegrass is the most abundant perennial grass. Unfortunately cheatgrass is also present and can out-compete young shrubs and other perennial plants. In 2006, cheatgrass significantly increased in nested frequency and cover and was sampled in 95% of the quadrats. Forbs are diverse, but sparse. Total forb cover has only been about 2%. Common perennial forb species include hooker balsamroot, hoods phlox, and cryptantha.

1990 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush had an estimated 25% canopy cover in 1990. However, density declined from 6,332 plants/acre in 1984 to 3,799 plants per acre in 1990. Decadence has also increased from 23% to 77%. Very few seedlings and no young sagebrush were sampled in 1990. Recent utilization of sagebrush has been light to moderate. In contrast, narrowleaf low rabbitbrush density increased by 17%. Trend for grasses is up. Sandberg bluegrass and squirreltail have increased in nested frequency and quadrat frequency values since 1984. Sum of nested frequency of perennial forbs has also increased slightly.

browse - down (-2) grass - up (+2) forb - slightly up (+1)

1996 TREND ASSESSMENT

The trend for the key browse species, Wyoming big sagebrush, has also improved since 1990. Density has increased from 3,799 to 6,160 plants/acre, some of these differences may be due to the expanded sampling size implemented in 1996. Percent decadence has declined from 77% to 29% and vigor is good. Age class composition indicates an expanding population with 2,620 seedlings/acre and 3,040 young plants/acre estimated. Cover was estimated at 14%. Trend for grasses is stable. Sum of nested frequency for perennial grasses changed very little. Cheatgrass is widely distributed across the site and abundant, but annuals were not previously sampled so trend determination cannot be done at this time. The trend for forbs is also stable with a very slight increase in forb frequency. The Desirable Components Index (see methods) rated this site as good.

winter range condition (DC Index) - good (56) Lower potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, has remained fairly stable with only a slight decrease in density due to a lower number of young plants. There are more than enough young plants to maintain the current population. Decadence has declined from 77% in 1990 to 29% in 1996 and 18% in 2001. The number of young plants outnumbering the estimated number of dead plants indicates a slightly expanding population . Cover for Wyoming big sagebrush has increased from an estimated 14% to 19% in 2001. A further increase in sagebrush cover could negatively affect the herbaceous understory. Trend for grasses is stable. Sum of nested frequency for perennial grasses and cheatgrass was stable. The trend for forbs is down. The sum of nested frequency for perennial forbs declined 41% and annual forbs increased. The Desirable Components Index increased to excellent. Browse cover and perennial grass cover were higher.

winter range condition (DC Index) - excellent (68) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Wyoming big sagebrush density declined 22%, but the majority of this decline was a loss of young plants. Decadence increased from 18% to 35% in 2006. Young plants were abundant in 1996 and 2001, but declined to only 7% of the population in 2006. Sagebrush cover also declined from 19% to 16%. Narrowleaf low rabbitbrush also decreased in density, which is positive. Rabbitbrush has been declining since 1996. The grass trend is slightly down. Sandberg bluegrass declined to the lowest sum of nested frequency since this study was established. Cheatgrass sum of nested frequency increased significantly and was sampled in 95% of the quadrats. Cheatgrass cover was up to 5%, was nearly half of the total grass cover. If this continues to increase the site could be susceptible to fire. The forb trend is down. Perennial forb abundance continued to decline. Recent dry years may have lead to this decline. The DCI score declined to fair due to less perennial grass, sagebrush cover, increased decadence, reduced recruitment, and increased cheatgrass cover.

winter range condition (DC Index) - fair (41) Lower potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	$_{ab}$73	$_{a}$51	$_{ab}$67	$_{ab}$83	$_{b}$102	.57	1.12	1.36
G	Agropyron spicatum	$_{a}$-	$_{a}$1	$_{b}$14	$_{a}$-	$_{a}$-	.05	-	-
G	Bromus tectorum (a)	-	-	$_{a}$259	$_{a}$227	$_{b}$296	3.20	3.66	5.34
G	Oryzopsis hymenoides	1	2	-	1	6	-	.00	.19
G	Poa secunda	$_{ab}$180	$_{b}$231	$_{ab}$189	$_{ab}$212	$_{a}$171	5.15	7.40	3.74
G	Sitanion hystrix	$_{a}$21	$_{b}$74	$_{b}$70	$_{a}$29	$_{a}$22	.61	.68	.42
G	Vulpia octoflora (a)	-	-	3	-	6	.00	-	.01
Total for Annual Grasses		0	0	262	227	302	3.21	3.66	5.36
Total for Perennial Grasses		275	359	340	325	301	6.38	9.22	5.71
Total for Grasses		275	359	602	552	603	9.59	12.88	11.07
F	Agoseris glauca	-	-	3	-	-	.01	-	-
F	Allium acuminatum	$_{c}$23	$_{a}$-	$_{a}$-	$_{bc}$9	$_{ab}$3	-	.04	.00
F	Alyssum alyssoides (a)	-	-	$_{a}$4	$_{a}$-	$_{b}$18	.03	-	.06
F	Antennaria rosea	-	-	3	7	3	.03	.07	.03
F	Arabis sp.	-	-	6	3	2	.01	.03	.00
F	Astragalus beckwithii	-	-	2	-	1	.00	-	.03
F	Astragalus sp.	-	-	3	-	-	.00	-	-
F	Astragalus utahensis	-	2	6	7	4	.07	.04	.04
F	Balsamorhiza hookeri	-	-	2	7	-	.18	.33	-
F	Calochortus nuttallii	-	3	-	-	-	-	-	-
F	Chaenactis douglasii	$_{a}$10	$_{a}$4	$_{b}$32	$_{a}$5	$_{a}$3	.08	.01	.00
F	Collinsia parviflora (a)	-	-	-	-	2	-	-	.00
F	Cryptantha sp.	$_{a}$-	$_{a}$5	$_{b}$44	$_{a}$-	$_{a}$9	.19	-	.01
F	Cymopterus longipes	$_{b}$53	$_{b}$55	$_{ab}$23	$_{ab}$28	$_{a}$9	.06	.22	.03
F	Delphinium nuttallianum	$_{b}$17	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Descurainia pinnata (a)	-	-	$_{a}$3	$_{b}$41	$_{a}$5	.00	.15	.01
F	Eriogonum caespitosum	$_{a}$2	$_{b}$16	$_{a}$3	$_{a}$-	$_{a}$2	.00	-	.03
F	Eriogonum cernuum (a)	-	-	$_{b}$21	$_{a}$6	$_{a}$6	.06	.03	.01
F	Erigeron pumilus	-	-	-	1	-	-	.00	-
F	Gayophytum ramosissimum(a)	-	-	-	-	4	-	-	.01
F	Gilia sp. (a)	-	-	$_{b}$13	$_{ab}$5	$_{a}$-	.05	.01	-
F	Lappula occidentalis (a)	-	-	17	11	12	.09	.03	.02
F	Lactuca serriola	-	-	-	-	2	-	-	.00
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$4	$_{a}$-	$_{a}$-	.07	-	.00
F	Navarretia intertexta (a)	-	-	4	-	-	.01	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Penstemon sp.	-	1	-	-	-	-	-	-
F	Phlox hoodii	$_{a}$27	$_{b}$51	$_{ab}$36	$_{ab}$30	$_{ab}$48	.77	.97	.74
F	Phlox longifolia	$_{bc}$48	$_{c}$66	$_{bc}$57	$_{b}$33	$_{a}$1	.18	.09	.00
F	Polygonum douglasii (a)	-	-	4	-	-	.01	-	-
F	Ranunculus testiculatus (a)	-	-	9	69	90	.01	.23	.24
F	Sisymbrium altissimum (a)	-	-	3	-	-	.03	-	-
F	Streptanthus cordatus	8	4	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	-	2	1	-	.01	.00
Total for Annual Forbs		0	0	78	132	137	0.31	0.45	0.37
Total for Perennial Forbs		188	207	224	132	88	1.68	1.84	0.95
Total for Forbs		188	207	302	264	225	2.00	2.30	1.32

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

BROWSE TRENDS --
Management unit 01 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	0	0	2	-	-	.00
B	Artemisia tridentata wyomingensis	90	88	84	14.07	18.53	15.91
B	Chrysothamnus nauseosus consimilis	2	1	0	-	-	-
B	Chrysothamnus viscidiflorus	0	0	3	-	-	.06
B	Chrysothamnus viscidiflorus stenophyllus	81	64	64	5.62	3.02	1.52
B	Juniperus osteosperma	8	7	7	2.50	1.51	3.14
B	Leptodactylon pungens	31	32	40	2.04	2.83	1.22
B	Opuntia sp.	8	3	4	.21	.06	.06
Total for Browse		220	195	204	24.47	25.96	21.91

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 2

Species	Percent Cover '06
Artemisia tridentata wyomingensis	18.00
Chrysothamnus viscidiflorus	.11
Chrysothamnus viscidiflorus stenophyllus	3.13
Juniperus osteosperma	6.33
Leptodactylon pungens	1.86

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 2

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.3	1.8

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 2

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	56	56

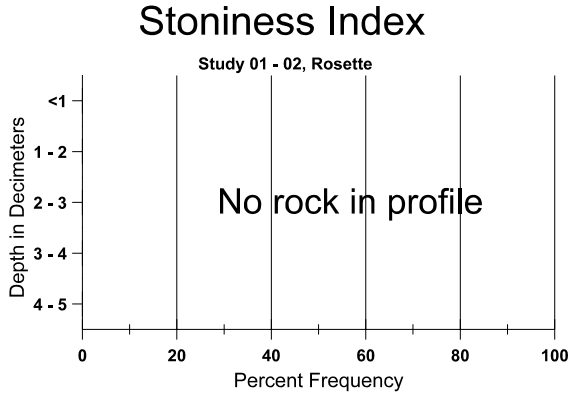
Average diameter (in)	
'01	'06
7.8	5.5

BASIC COVER --
Management unit 01 , Study no: 2

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	4.25	8.25	35.01	42.59	35.93
Rock	0	.50	1.20	.37	.32
Pavement	9.25	4.00	4.63	3.88	5.82
Litter	37.25	26.25	39.15	38.11	47.36
Cryptogams	7.25	11.50	4.57	2.85	5.06
Bare Ground	42.00	49.50	22.06	28.75	19.75

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 02, Rosette

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.3	63.8 (13.6)	7.3	46.6	25.4	28.0	1.5	7.2	236.8	0.72



PELLET GROUP DATA --
Management unit 01 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	19	6	55
Moose	1	-	-
Deer	21	11	22
Cattle	-	-	-

Days use per acre (ha)	
'01	'06
-	-
-	-
26 (65)	25 (61)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**66**	-	-	66	-	-	100	0	-	-	0	10/10
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**40**	-	20	20	-	-	50	0	-	-	0	6/10
Artemisia tridentata wyomingensis												
84	**6332**	66	600	4266	1466	-	41	52	23	1	21	19/20
90	**3799**	66	-	866	2933	-	14	11	77	2	28	27/28
96	**6160**	2620	3040	1320	1800	1780	22	0	29	9	9	25/37
01	**5380**	20	1220	3200	960	1520	1	0	18	7	7	22/27
06	**4180**	2940	300	2420	1460	1720	21	2	35	16	16	23/30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	13/11
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	40	-	-	0	0	0	-	0	17/19
01	**20**	-	-	-	20	-	0	0	100	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**640**	20	100	480	60	-	25	69	9	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
84	**3466**	400	533	2200	733	-	65	4	21	-	15	7/13
90	**4198**	466	1266	1466	1466	-	8	17	35	.95	8	9/8
96	**5900**	1660	1180	4600	120	-	2	0	2	.33	.33	11/18
01	**3160**	80	360	1980	820	540	0	0	26	.63	.63	10/14
06	**2920**	780	220	2240	460	-	6	1	16	2	2	10/13
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	66	-	-	-	-	0	0	-	-	0	-/-
96	**160**	-	60	100	-	-	0	0	-	-	0	-/-
01	**140**	20	60	80	-	-	0	0	-	-	0	-/-
06	**140**	20	40	100	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**465**	133	333	66	66	-	0	0	14	-	0	5/5
96	**2520**	40	260	2240	20	-	0	0	1	.79	.79	12/15
01	**2660**	60	240	2280	140	-	0	0	5	.75	.75	7/8
06	**2700**	360	520	2080	100	40	0	0	4	-	0	6/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
84	**66**	-	-	66	-	-	0	0	0	-	0	6/4
90	**66**	-	-	66	-	-	0	0	0	-	0	6/10
96	**160**	-	20	120	20	-	0	0	13	-	0	4/12
01	**140**	-	-	140	-	20	0	0	0	-	0	-/-
06	**80**	-	-	60	20	-	0	0	25	25	25	5/9
Pinus edulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	20	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 1-4-06

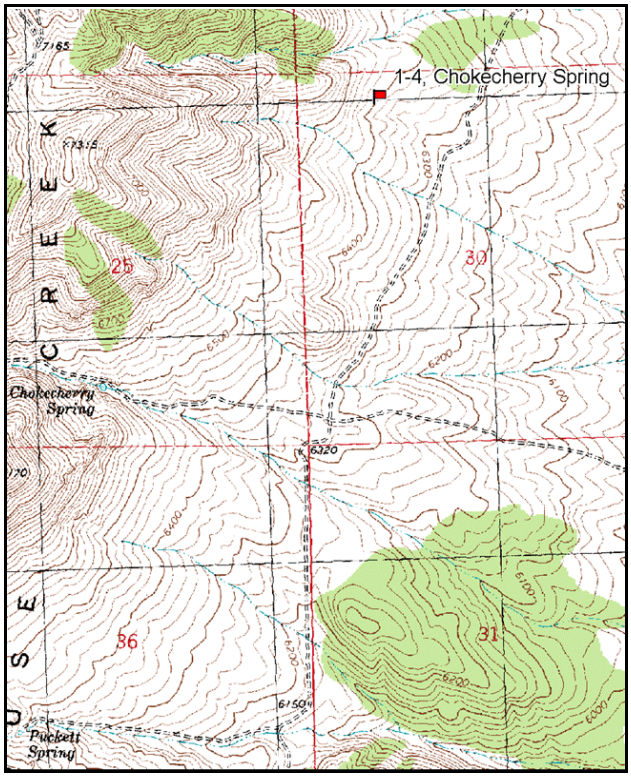
Study site name: Chokecherry Springs . Vegetation type: Mountain Brush .

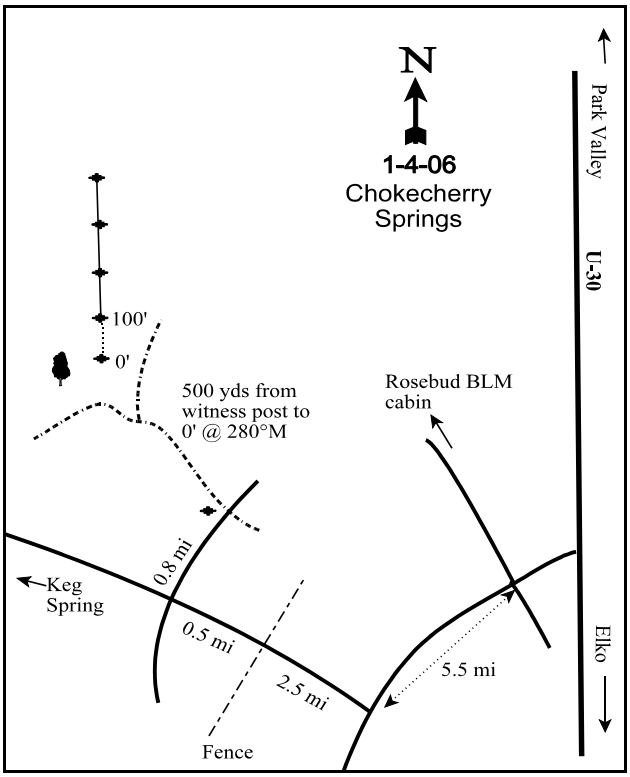
Compass bearing: frequency baseline 345 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed from U-30 towards the Rosebud BLM field station. Bear left at the fork to the BLM station. Travel 2.1 miles to canal and intersection with a sign designating Emigrant Pass Road. Proceed southwest on Emigrant Pass Road 5.5 miles to a fork. Turn right and travel 2.5 miles to a gate. Pass through the gate and proceed 0.5 miles and turn right at a four-way junction. Travel 0.8 miles to a witness post on left side of road and stop. From the witness post, take a bearing of 276 degrees magnetic to a large juniper, just off the left side of the drainage with several young around it. This juniper is located on the slope above the split in the drainage. Walk about 500 yards from the witness post to the large juniper. From this tree, take a bearing of 9 degrees magnetic and walk 9 paces to the 0-foot stake of the baseline, which is marked with browse tag #7910. The baseline runs at 345 degrees magnetic.





Map Name: Emigrant Pass

Diagrammatic Sketch

Township 10N , Range 16W , Section 30

UTM NAD 27, UTM 12T 4604973 N, 272512 E

DISCUSSION

Chokecherry Spring - Trend Study No. 1-4

Study Information

This study is located on the east side of the Grouse Creek Mountains approximately one mile northeast of Chokecherry Spring (elevation: 6,400 feet, slope: 15%, aspect: east). This area is a mountain big sagebrush-grass type which contains a scattered population of antelope bitterbrush. The vegetation and topography are intermediate between the mountain brush type on steeper, higher slopes and the more gentle alluvial slopes to the east. Immediately below and east of the study area, there are broad ridges occupied by black sagebrush with intervening swales containing mostly basin big sagebrush. Elevation and exposure both suggest that the area is not critical deer winter range. The local conservation officer considers the area preferred winter range. A pellet group transect in 2001 estimated 36 deer days use/acre (88 deer days use/ha) and 3 cow days use/acre (7 cow days use/ha). In 2006, 21 deer and 9 cow days use/acre (53 ddu/ha and 22 cdu/ha) were estimated.

Soil

The Bullump series consist of deep, well drained soils that formed in colluvium derived from quartzite, welded tuff, chert, argillite, shale, conglomerate, and rhyolite with a component of loess (USDA-NRCS 2006). The soil texture is a clay loam, but quite rocky, and slightly alkaline (7.7 pH). Average effective rooting depth was estimated at nearly 16 inches. Rock and pavement combine to produce about 10% cover. The area has good litter cover and organic content. Phosphorus could be a limiting factor at only 5.9 ppm where values less than 6 ppm are considered low and may limit plant growth and development (Tiedemann and Lopez 2004). Vegetation cover from shrubs and herbaceous plants are adequate to prevent accelerated erosion. Low to moderate soil movement is occurring by trailing livestock and wildlife. The erosion condition class was determined to be only slight in 2001 and improved to stable in 2006.

Browse

Mountain big sagebrush is the key browse species and has the highest amount of browse cover. The density has been decreasing since 1984. Density decreased from 2,960 plants/acre in 1996 to 1,760 plants/acre in 2006. Sagebrush cover was 13% in 1996, 17% in 2001, and decreased to 10% in 2006. Utilization has been mostly light to moderate. Sagebrush decadence has been relatively moderate at around 25% until 2006 when it increased to 36%. Recruitment has decreased at each reading. Young plants only made up 2% of the population in 2006. Competition with cheatgrass may be limiting sagebrush recruitment. A serious threat to big sagebrush as well as most other browse species, is the winter feeding activities of voles (*Microtus* spp.). A large number of shrubs in the immediate area showed evidence of complete or near compete girdling damage during the 1984 reading. This appears to have commonly occurred during the severe winters of 1982-84. Such damage is especially evident in swales, however, it also occurred within the study area. Some winter injury was noted on some of the sagebrush in 1996, perhaps caused by the deep snows during the 1992-93 winter.

Antelope bitterbrush is another important preferred browses species. It has a semi-erect layering growth form. It made up 20% of the browse cover in 2001 and 2006. This species showed evidence of moderate to heavy deer use as well as rodent damage in 1984 and 1990. Bitterbrush density has varied between 600 and 800 plants/acre from 1996-2006, with cover of about 5%. Stickyleaf low rabbitbrush, an increaser, occurs in moderately high numbers.

Herbaceous Understory

Seven species of perennial grasses have been sampled on this study. In 1996 and 2001 they produced about 9% cover and increased to 13% cover in 2006. Most important is bluebunch wheatgrass followed by subalpine needlegrass, bottlebrush squirrel tail, and Sandberg bluegrass. Almost all of these showed evidence of use by cattle in 1984. Annual cheatgrass is the most widely distributed grass. It occurred in at least 89% of the quadrats since annuals were sampled in the early 1990's. Cheatgrass was most robust in 2001 with over

23% cover, even though this was a dry year. Cover was only 3% in 2006 and sum of nested frequency had significantly declined, although it was still present in 89% of the quadrats.

Forb composition is moderately diverse but not highly productive. The most productive forbs include: arrowleaf balsamroot, stoneseed, silvery lupine, tapertip hawksbeard, and longleaf phlox.

1990 TREND ASSESSMENT

This relatively higher elevation winter range shows the potential for excellent mountain big sagebrush and bitterbrush production. The trend values for these key browse species are slightly down. Both populations have declined in density and show lower numbers of seedlings and young. Utilization of sagebrush is mostly light this year and percent decadence is stable. Bitterbrush has declined 60% in density and half of the plants sampled in 1990 are decadent. The grass trend is up as sum of nested frequency increased 37%. Sum of nested frequency for perennial forbs also increased by 25%.

browse - slightly down (-1) grass - up (+2) forb - up (+2)

1996 TREND ASSESSMENT

Trend for browse is stable. Mountain big sagebrush density has declined slightly, decadence has increased from 22% to 26%, and the proportion of shrubs displaying poor vigor increased slightly (14% to 16%). Trend for antelope bitterbrush is up. Decadence declined from 50% to 0%, with heavy use decreasing from 50% to 3%. The differences in shrub density since 1990 is likely due to the larger, more representative sample used in 1996. The grass trend is up once again. Sum of nested frequency increased by 39%. Cheatgrass is abundant, but no prior data has collected on this species to determine a trend. The forb trend is stable. Sum of nested frequency of perennial forbs remained similar.

winter range condition (DC Index) - fair-good (63) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

2001 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush is slightly down. The density has declined slightly, percent decadence is still fairly high, and young recruitment is poor. There has been a decrease in the sagebrush population of about 15% during each sampling date since 1984. Trend for antelope bitterbrush is stable, but it accounts for only about 20% of the shrub cover with an estimated density of 800 plants/acre. Bitterbrush decadence remains low at 5%. The overall browse trend is slightly down. The grass trend is slightly up. Sum of nested frequency increased 43% for perennial grasses, despite the significant increase of cheatgrass. Cheatgrass is also very robust with over 23% cover. Frequency for perennial and annual forbs remained similar and the trend is stable. The DCI score declined to poor-fair with major increase of cheatgrass.

winter range condition (DC Index) - poor-fair (52) Mid-level potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - stable (0)

2006 TREND ASSESSMENT

The soil trend is stable as ground cover characteristics changed very little. There was a decline of cheatgrass, which increased the amount of bare ground, but this was minimal. The browse trend is down. Mountain big sagebrush density decreased by 30% to 1,760 plants/acre. Decadence increased to 36% from only 21% in 2001. Sagebrush cover declined from 17% to 10%. Recruitment of young plants has decreased as only 2% of the population was classified as young in 2006. Competition with cheatgrass may have lead to this decline of recruitment. Drought conditions may have also contributed to the decline in sagebrush. Bitterbrush density has also declined from 800 plants/acre in 2001 to 600 plants/acre in 2006. Decadence increased from 5% to 20% in 2006. Stickyleaf low rabbitbrush density has declined since 1996. The grass trend is up as perennial

sum of nested frequency increased 25%. This has increased each time the site has been sampled and has increased by about two and a half times since 1984. Cheatgrass decreased significantly and only had about 3% cover, but was still present in 89% of the quadrats. The forb trend is also up as perennials increased and annuals decreased. The DCI score improved to fair-good with major improvements in the herbaceous understory.

winter range condition (DC Index) - fair-good (65) Mid-level potential scale
browse - down (-2) grass - up (+2) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a-	a-	ab12	b17	b30	.59	.51	.83
G	Agropyron spicatum	58	72	50	52	58	2.91	2.30	3.46
G	Bromus tectorum (a)	-	-	b318	c360	a271	6.21	23.46	3.01
G	Festuca ovina	-	1	5	-	-	.19	-	-
G	Oryzopsis hymenoides	4	14	11	10	17	.37	.07	1.00
G	Poa secunda	a22	a35	a58	b140	b170	.99	3.95	5.61
G	Sitanion hystrix	ab17	a10	abc30	bc41	c50	1.18	.81	1.42
G	Stipa thurberiana	a-	a6	b26	ab15	ab19	2.45	.84	.68
Total for Annual Grasses		0	0	318	360	271	6.21	23.46	3.01
Total for Perennial Grasses		101	138	192	275	344	8.69	8.51	13.02
Total for Grasses		101	138	510	635	615	14.90	31.97	16.04
F	Agoseris glauca	a28	a32	a5	a2	b66	.01	.01	.42
F	Allium sp.	b40	a4	ab14	a92	a71	.04	.67	.30
F	Androsace septentrionalis (a)	-	-	-	-	3	-	-	.15
F	Astragalus beckwithii	a4	ab15	c37	bc28	a7	.53	.80	.25
F	Astragalus cibarius	b34	b24	a-	a-	b38	-	-	1.76
F	Balsamorhiza sagittata	4	6	11	6	14	1.29	.68	2.49
F	Castilleja linariaefolia	-	-	-	-	3	-	-	.00
F	Camelina microcarpa (a)	-	-	b76	b74	a23	.19	.81	.07
F	Calochortus nuttallii	-	2	-	5	2	-	.01	.00
F	Chaenactis douglasii	4	2	7	-	-	.01	-	-
F	Cirsium arvense	5	4	4	-	-	.01	-	-
F	Collomia linearis (a)	-	-	b46	a8	a-	.15	.01	-
F	Comandra pallida	a7	a6	ab29	b36	b34	.55	.50	.24
F	Collinsia parviflora (a)	-	-	179	156	159	.93	1.30	.72
F	Crepis acuminata	a2	b33	b17	ab11	ab18	.35	.31	.62
F	Cryptantha sp.	a-	a-	b13	a-	b15	.04	-	.05

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Descurainia pinnata (a)	-	-	-	-	4	-	-	.01
F	Draba sp. (a)	-	-	-	2	-	-	.00	-
F	Epilobium brachycarpum (a)	-	-	-	-	11	-	-	.04
F	Galium aparine (a)	-	-	8	-	-	.04	-	-
F	Gayophytum ramosissimum(a)	-	-	$_{a}$1	$_{b}$51	$_{a}$2	.03	.67	.00
F	Gilia sp. (a)	-	-	-	11	-	-	.01	-
F	Hackelia patens	$_{ab}$19	$_{b}$27	$_{a}$8	$_{a}$1	$_{a}$9	.04	.00	.11
F	Lappula occidentalis (a)	-	-	-	2	5	-	.01	.01
F	Lactuca serriola	2	-	-	-	3	-	-	.01
F	Lithospermum ruderale	1	15	15	7	15	1.20	.29	1.00
F	Lomatium triternatum	9	13	8	4	8	.04	.01	.04
F	Lupinus argenteus	$_{ab}$13	$_{a}$3	$_{b}$23	$_{ab}$17	$_{b}$21	1.33	1.46	1.84
F	Lygodesmia spinosa	$_{ab}$29	$_{b}$47	$_{ab}$37	$_{a}$19	$_{a}$24	.66	.55	.75
F	Machaeranthera spp	$_{a}$-	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	.02	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$32	$_{b}$11	-	.47	.02
F	Oenothera caespitosa	2	2	2	-	-	.03	-	-
F	Penstemon speciosus	-	1	-	-	-	-	-	-
F	Phlox longifolia	$_{a}$60	$_{ab}$89	$_{b}$100	$_{b}$103	$_{b}$97	.51	.80	.69
F	Ranunculus testiculatus (a)	-	-	7	13	-	.01	.02	-
F	Tragopogon dubius	1	5	5	2	6	.04	.01	.07
F	Veronica biloba (a)	-	-	$_{a}$21	$_{a}$20	$_{b}$44	.06	.05	.44
F	Viola sp.	-	-	-	-	3	-	-	.00
Total for Annual Forbs		0	0	338	369	262	1.43	3.39	1.49
Total for Perennial Forbs		264	330	348	333	454	6.75	6.12	10.67
Total for Forbs		264	330	686	702	716	8.19	9.51	12.16

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

BROWSE TRENDS --
Management unit 01 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	70	65	47	13.18	16.61	10.38
B	Chrysothamnus nauseosus consimilis	7	7	3	.79	.96	.81
B	Chrysothamnus viscidiflorus viscidiflorus	77	72	65	10.39	5.98	5.88
B	Juniperus osteosperma	3	6	8	.01	.33	1.06
B	Opuntia sp.	12	8	8	.03	.56	.30
B	Purshia tridentata	28	25	24	3.91	6.42	5.16
B	Symphoricarpos oreophilus	5	10	10	.07	1.43	1.70
Total for Browse		202	193	165	28.41	32.32	25.29

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 4

Species	Percent Cover	
	'01	'06
Artemisia tridentata vaseyana	-	13.11
Chrysothamnus nauseosus consimilis	-	.03
Chrysothamnus viscidiflorus viscidiflorus	-	7.84
Juniperus osteosperma	1.00	2.73
Opuntia sp.	-	.08
Purshia tridentata	-	10.89
Symphoricarpos oreophilus	-	2.96

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 4

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.7	2.1
Purshia tridentata	1.6	1.1

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 4

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	76	86

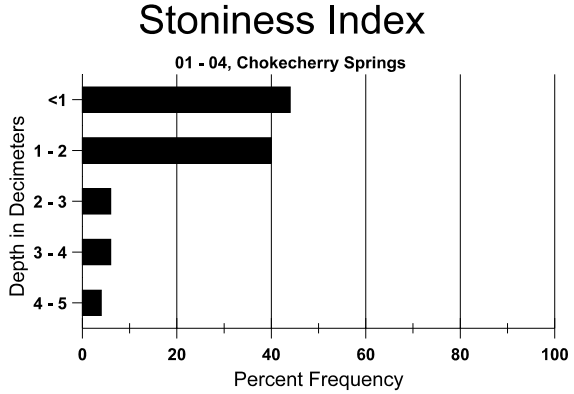
Average diameter (in)	
'01	'06
2.6	4.1

BASIC COVER --
Management unit 01 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.75	11.50	46.40	62.06	50.70
Rock	8.25	9.75	6.39	4.69	2.79
Pavement	14.75	16.50	6.14	4.69	6.46
Litter	58.50	45.25	55.46	44.56	45.93
Cryptogams	0	0	.05	.06	.21
Bare Ground	16.75	17.00	7.03	7.97	12.13

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 04, Chokecherry Springs

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.8	60.6 (16.9)	7.7	41.7	29.0	29.3	2.5	5.9	201.6	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	5	1	18
Deer	11	14	7
Cattle	3	1	3

Days use per acre (ha)	
'01	'06
-	-
36 (88)	21 (53)
3 (7)	9 (22)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**3999**	333	1800	1333	866	-	30	18	22	-	5	34/36
90	**3399**	-	266	2400	733	-	8	2	22	3	14	19/25
96	**2960**	180	340	1840	780	980	9	1	26	14	16	20/32
01	**2520**	-	100	1880	540	840	2	0	21	4	4	22/33
06	**1760**	280	40	1080	640	960	22	2	36	9	10	24/36
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**200**	-	100	60	40	-	0	0	20	-	0	26/36
01	**160**	80	40	100	20	-	25	0	13	-	0	26/26
06	**80**	-	-	80	-	-	0	0	0	-	0	25/33
Chrysothamnus viscidiflorus viscidiflorus												
84	**3932**	-	666	2466	800	-	20	0	20	-	0	28/32
90	**3333**	-	533	1600	1200	-	6	0	36	1	6	15/16
96	**3660**	-	200	3340	120	-	7	.54	3	1	2	14/24
01	**3000**	-	100	2520	380	80	3	0	13	3	3	11/18
06	**2460**	100	160	2000	300	40	0	0	12	2	2	13/22
Juniperus osteosperma												
84	**66**	-	66	-	-	-	0	0	-	-	0	-/-
90	**66**	66	66	-	-	-	0	0	-	-	0	-/-
96	**60**	40	40	20	-	-	0	0	-	-	0	-/-
01	**120**	20	120	-	-	-	0	0	-	-	0	-/-
06	**160**	20	160	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**200**	-	-	200	-	-	0	0	0	-	0	6/5
90	**200**	-	-	200	-	-	0	0	0	-	0	8/17
96	**300**	-	20	260	20	-	0	0	7	-	0	5/15
01	**180**	-	-	180	-	-	0	0	0	-	0	5/10
06	**160**	-	-	160	-	-	0	13	0	-	0	5/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**333**	-	333	-	-	-	20	40	0	-	20	-/-
90	**132**	-	-	66	66	-	50	50	50	-	0	15/35
96	**740**	-	80	660	-	20	35	3	0	-	0	27/54
01	**800**	-	20	740	40	20	45	8	5	-	0	33/57
06	**600**	460	40	440	120	-	43	13	20	3	3	32/58
Symphoricarpos oreophilus												
84	**266**	-	133	133	-	-	25	0	0	-	0	26/65
90	**332**	-	66	200	66	-	0	0	20	-	20	17/52
96	**120**	-	40	80	-	-	33	17	0	-	0	21/47
01	**260**	-	-	260	-	-	0	0	0	-	0	21/49
06	**360**	-	40	300	20	-	0	0	6	-	0	19/45

Trend Study 1-5-06

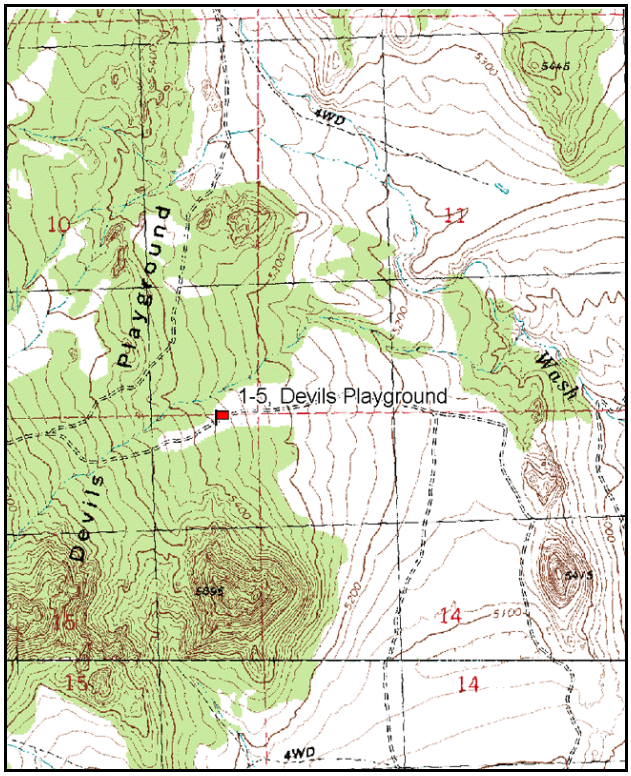
Study site name: Devil's Playground . Vegetation type: Black Sagebrush .

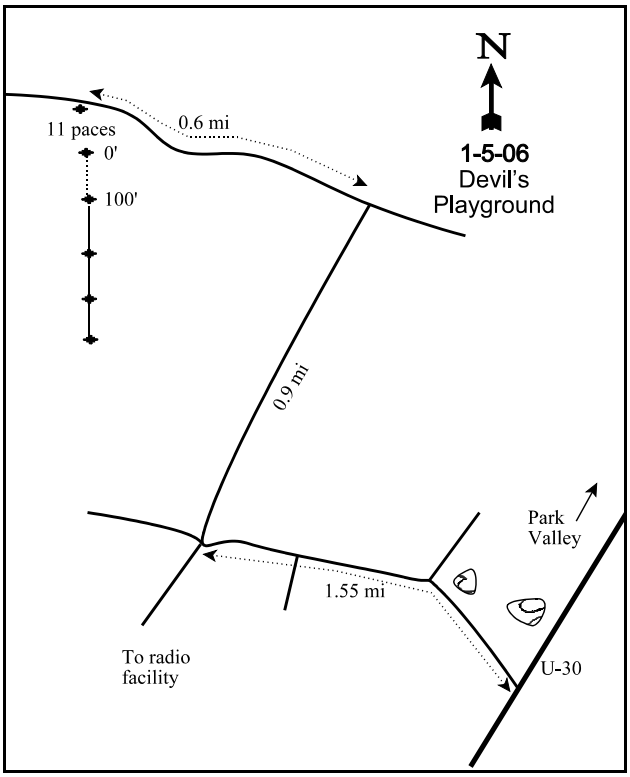
Compass bearing: frequency baseline 173 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed toward Elko, Nevada on U-30 to mile marker 24 and turn right (west). Travel 1.55 miles to a fork and bear right. Bear right and travel 0.9 miles. Turn left (west) and travel 0.6 miles to rock pile and witness post on left side of road. Walk 11 paces southwest from the rock pile to the 0-foot stake of the frequency baseline. The baseline is marked by a red browse tag #708. The azimuth of the baseline is 173 degrees magnetic.





Map Name: Emigrant Pass

Diagrammatic Sketch

Township 9N , Range 16W , Section 15

UTM NAD 27, UTM 12T 4598420 N, 278270 E

DISCUSSION

Devils Playground - Trend Study No. 1-5

Study Information

The Devils Playground study samples an area considered critical deer winter range (elevation: 5,390 feet, slope: 5-10%, aspect: east). The vegetation is dominated by juniper-pinyon woodland with numerous and various sized openings occupied by black sagebrush and Wyoming big sagebrush. Further to the east the vegetation becomes increasingly dominated by black sagebrush in the more shallow soils. To the west and at a higher elevation, juniper-pinyon woodland is associated with significant amounts of sagebrush and bitterbrush. Deer and sheep are the primary forage users. A pellet group transect estimated 15 deer days use/acre (36 ddu/ha) in 2001 and 27 deer, 1 elk, and 5 cow days use/acre (68 ddu/ha, 3 edu/ha, and 13 cdu/ha) in 2006. This area is within the BLM White Lake allotment which allows 1,500 sheep to use the area from December 1 through March 31.

Soil

The soil is in the Scalade series, which consists of shallow soil over a duripan, well drained, moderately permeable soils formed in alluvium derived dominantly from granite, limestone and quartzite with a component of loess and volcanic ash (USDA-NRCS 2006). There are many large granite outcrops. The soil is a coarse textured sandy loam which is light colored on the surface, but much darker below. The soil is moderately alkaline (8.0 pH). Average effective rooting depth was estimated at 27 inches. Phosphorus is low at only 3.5 ppm and may limit plant growth and development (Tiedemann and Lopez 2004). Ground cover from vegetation and litter is moderately poor and there are extensive areas of pavement and bare ground between shrubs and trees. The soil appears highly erodible and erosion would increase if the terrain was steeper. The erosion condition class was determined to be slight in both 2001 and 2006. There are some signs of soil pedestalling and an active gully between lines 2 and 3.

Browse

Browse composition consists chiefly of black sagebrush, interspersed by smaller amounts of narrowleaf low rabbitbrush, prickly phlox, and Wyoming sagebrush. Also present are scattered individuals of Nevada ephedra and spiny hopsage. The black sagebrush density slowly increased from 1984 to 2001, from 4,266 plants/acre to 6,380 plants/acre. In 2006, density had declined to 4,620 plants/acre. Utilization was noted as heavy in 1984 when 80% of the population displayed heavy use. This is probably one of the factors responsible for partial crown death observed in many of the sagebrush, along with winter injury which occurred to most populations of sagebrush during the heavy winters of the early to mid 1980's. Use has been mostly light to moderate since 1990. Percent decadence has moderated somewhat since the initial highs in 1984 and 1990 (56% and 82% respectively) to 29% in 2001 and 33% in 2006. Drought combined with the moderately high density of black sagebrush and excessively drained (xeric) characteristics of the soil are likely responsible for this decadence. Seedlings were very abundant in 2006.

Wyoming big sagebrush has also been sampled. It shows signs of hybridization with black sagebrush. Narrowleaf low rabbitbrush, showed moderate to heavy use in 1984. All other readings show only light use of this less preferred shrub. A few spiny hopsage occur on the site, but none were sampled within the shrub density strips. These shrubs were heavily hedged.

Herbaceous Understory

The herbaceous understory is fairly diverse, but not abundant. Five species of perennial grasses combined to produce about 5% cover in 1996, 8% cover in 2001, and 5% cover in 2006. Dominant species include: bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail. Cheatgrass has increased in abundance and cover with each reading since it was first sampled in 1996. Cover was less than 1% in 1996, increased to 5% in 2001 and 8% in 2006. This could become a fire hazard and create competition for important browse species. Perennial forbs are diverse yet only produce only about 1% cover or less. Most of

these are low growing and of little forage value.

1990 TREND ASSESSMENT
Black sagebrush has increased slightly in density. Recent use was light, compared to heavy use by sheep and deer in previous years. This sagebrush population contains a very high number of decadent plants (82%). It still provides most of the cover on the study, where there is a relatively low density of pinyon and juniper. Surrounding areas support a much higher density of trees, but not usually a closed canopy. There is a vigorous stand of native grasses for a black sagebrush range type. Three out of five perennial grasses increased significantly in nested frequency. Forb frequency decreased, but no one species had a significant decrease.

browse - up (+2) grass - up (+2) forb - slightly down (-1)

1996 TREND ASSESSMENT
The browse trend for the key species, black sagebrush is slightly up. Decadence has declined from an extremely high 82% in 1990 to 26%. Utilization is moderate with heavy use reported on only 14% of the population. Narrowleaf low rabbitbrush, an increaser, appears to have a stable trend. Spiny hopsage, likely the most preferred browse on the site, occurs in small numbers. Trend for grasses is down due to decline in the sum of nested frequency of perennial species. However, only two species declined significantly, bottlebrush squirreltail and Thurber needlegrass. The most abundant perennial species, Sandberg bluegras, declined slightly in nested frequency but the change was not significant. Cheatgrass abundance was low, but no data was collected for annuals in prior readings. Trend for forbs is up with an increase in diversity and sum of nested frequency of perennial species. The Desirable Components Index (see methods) rated this site as fair.

winter range condition (DC Index) - fair (42) Lower potential scale
browse - slightly up (+1) grass - down (-2) forb - up (+2)

2001 TREND ASSESSMENT
The browse trend for the key species, black sagebrush, is stable. Percent decadence has remained relatively low since 1996. Utilization is light to moderate with heavy use reported on only 17% of the population. Vigor is good. The grass trend is slightly down. Trend for perennial grasses is fairly stable, but cheatgrass abundance and cover increased significantly. The trend for perennial forbs is down.

winter range condition (DC Index) - fair (42) Lower potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT
The browse trend is slightly down. Black sagebrush density decreased by 28% and percent decadence increased slightly to 33%. Few young plants were sampled, but seedlings were numerous. Wyoming big sagebrush density has been low but increased by over six times. It appears that many of these plants are a hybrid of black and Wyoming big sagebrush. The combined density of black sagebrush and Wyoming big sagebrush had a 19% decline from 2001-2006. The grass trend is down. Cheatgrass once again increased significantly and cover was nearly 8%, which was more than half of the total grass cover. This could create a fire hazard which would destroy the important browse species. Bluebunch wheatgrass and Thurber needlegrass had lower nested frequencies. The forb trend is also down. Longleaf phlox is one of the few perennials and it had a significantly lower sum of nested frequency. The increase of cheatgrass lowered the DCI score, but it is still fair.

winter range condition (DC Index) - fair (34) Lower potential scale
browse - slightly down (-1) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{ab}$28	$_{c}$56	$_{bc}$46	$_{abc}$35	$_{a}$19	1.00	2.26	1.11
G	Bromus tectorum (a)	-	-	$_{a}$97	$_{b}$284	$_{c}$318	.37	5.21	7.93
G	Oryzopsis hymenoides	$_{a}$4	$_{b}$17	$_{ab}$18	$_{ab}$5	$_{ab}$10	.66	.09	.33
G	Poa secunda	$_{a}$53	$_{c}$162	$_{bc}$148	$_{bc}$142	$_{b}$127	2.90	3.42	2.58
G	Sitanion hystrix	$_{b}$114	$_{b}$100	$_{a}$56	$_{a}$43	$_{a}$37	.66	.40	.72
G	Stipa comata	-	-	-	-	-	-	-	.00
G	Stipa thurberiana	$_{b}$11	$_{bc}$22	$_{a}$-	$_{c}$34	$_{b}$14	-	1.71	.66
G	Vulpia octoflora (a)	-	-	$_{b}$78	$_{c}$145	$_{a}$17	.16	.52	.04
Total for Annual Grasses		0	0	175	429	335	0.53	5.74	7.97
Total for Perennial Grasses		210	357	268	259	207	5.23	7.89	5.43
Total for Grasses		210	357	443	688	542	5.76	13.63	13.40
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$17	$_{a}$-	$_{b}$9	.03	-	.05
F	Arabis sp.	-	-	-	-	3	-	-	.00
F	Astragalus beckwithii	2	7	3	4	-	.04	.15	-
F	Aster sp.	$_{a}$-	$_{a}$-	$_{b}$76	$_{a}$-	$_{a}$-	.16	-	-
F	Astragalus utahensis	10	14	11	2	4	.08	.06	.01
F	Castilleja chromosa	$_{b}$11	$_{ab}$1	$_{ab}$7	$_{a}$-	$_{a}$-	.06	-	-
F	Chaenactis douglasii	$_{b}$22	$_{ab}$4	$_{b}$28	$_{a}$3	$_{a}$6	.08	.00	.01
F	Collinsia parviflora (a)	-	-	-	3	7	-	.00	.01
F	Crepis acuminata	-	-	3	-	1	.03	-	.03
F	Cruciferae	$_{a}$-	$_{a}$-	$_{b}$31	$_{a}$-	$_{a}$-	.07	-	-
F	Cryptantha sp.(a)	-	-	$_{b}$102	$_{a}$31	$_{a}$21	.43	.08	.04
F	Cryptantha sp.	$_{a}$-	$_{a}$4	$_{b}$93	$_{a}$-	$_{a}$-	.36	-	-
F	Delphinium nuttallianum	-	-	3	2	-	.00	.03	-
F	Descurainia pinnata (a)	-	-	$_{ab}$4	$_{b}$11	$_{a}$-	.01	.03	-
F	Eriogonum cernuum (a)	$_{a}$1	$_{ab}$6	$_{b}$10	$_{a}$-	$_{a}$-	.02	-	-
F	Eriogonum ovalifolium	$_{a}$-	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	.05	-	-
F	Eriastrum sparsiflorum (a)	-	-	$_{c}$78	$_{a}$-	$_{b}$25	.17	-	.05
F	Galium aparine (a)	-	-	-	3	-	-	.00	-
F	Gayophytum ramosissimum(a)	-	-	35	18	17	.09	.04	.03
F	Gilia sp. (a)	-	-	$_{b}$21	$_{b}$30	$_{a}$-	.04	.08	-
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$8	$_{ab}$10	-	.02	.02
F	Lomatium sp.	-	-	4	4	-	.00	.16	-
F	Lygodesmia spinosa	-	-	-	-	-	.00	-	-
F	Monoptylon belliodies (a)	-	-	-	-	3	-	-	.01

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Phlox hoodii	-	8	4	1	-	.03	.03	-
F	Phlox longifolia	$_{ab}$35	$_{a}$23	$_{ab}$35	$_{b}$49	$_{a}$21	.10	.40	.05
F	Townsendia sp.	-	2	-	-	-	-	-	-
F	Tragopogon dubius	$_{b}$13	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$-	.03	-	-
Total for Annual Forbs		1	6	250	104	83	0.77	0.27	0.17
Total for Perennial Forbs		93	63	330	65	44	1.17	0.83	0.16
Total for Forbs		94	69	580	169	127	1.94	1.10	0.33

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

BROWSE TRENDS --
Management unit 01 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	86	85	79	11.55	13.55	12.93
B	Artemisia tridentata wyomingensis	7	5	16	.60	.15	1.71
B	Chrysothamnus viscidiflorus stenophyllus	50	45	38	1.50	2.54	1.97
B	Juniperus osteosperma	3	7	6	4.88	3.77	11.05
B	Leptodactylon pungens	10	12	12	.16	.03	.05
B	Opuntia polyacantha	1	3	3	-	.01	.03
B	Pinus monophylla	2	1	3	.00	.38	.63
B	Symphoricarpos oreophilus	1	1	0	-	-	-
Total for Browse		160	159	157	18.70	20.45	28.38

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 5

Species	Percent Cover	
	'01	'06
Artemisia nova	-	13.21
Artemisia tridentata wyomingensis	-	1.96
Chrysothamnus viscidiflorus stenophyllus	-	2.61
Juniperus osteosperma	13.19	11.21
Leptodactylon pungens	-	.10
Pinus monophylla	-	.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 5

Species	Average leader growth (in)	
	'01	'06
Artemisia nova	1.4	0.6

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 5

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	76	43
Pinus monophylla	49	35

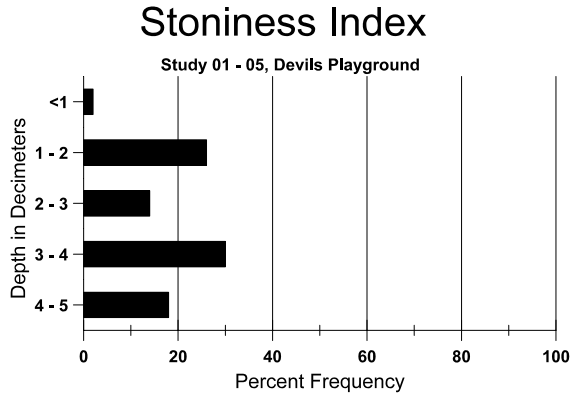
Average diameter (in)	
'01	'06
7.0	8.6
2.1	2.4

BASIC COVER --
Management unit 01 , Study no: 5

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.50	8.25	25.64	38.59	38.29
Rock	.25	.50	1.48	.38	.12
Pavement	20.75	25.00	27.95	32.52	28.31
Litter	39.75	33.00	27.04	29.48	26.11
Cryptogams	1.25	1.50	.72	1.59	.53
Bare Ground	35.50	31.75	19.56	16.53	22.20

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 05, Devils Playground

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
26.2	59.6 (19.7)	8.0	65.7	17.0	17.3	0.98	3.5	92.8	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 5

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	1	-
Rabbit	32	7	65
Elk	2	-	-
Deer	44	24	24
Cattle	-	-	-

Days use per acre (ha)	
'01	'06
-	
-	
-	1 (3)
15 (36)	27 (68)
-	5 (13)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**4266**	-	466	1400	2400	-	17	80	56	-	20	9/16
90	**5266**	66	-	933	4333	-	1	0	82	6	22	10/15
96	**5960**	100	440	3960	1560	740	72	14	26	6	6	9/23
01	**6440**	60	120	4480	1840	580	35	17	29	9	11	10/21
06	**4620**	3040	100	3000	1520	680	6	3	33	22	22	10/22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
84	**332**	66	66	66	200	-	80	20	60	-	0	20/25
90	**332**	-	66	66	200	-	40	0	60	-	0	21/29
96	**260**	-	-	220	40	20	62	0	15	-	0	21/39
01	**100**	-	-	100	-	-	0	0	0	-	0	35/41
06	**660**	340	-	520	140	100	12	3	21	12	12	20/32
Chrysothamnus viscidiflorus stenophyllus												
84	**1932**	133	533	1066	333	-	31	38	17	-	3	10/11
90	**2332**	-	1200	1066	66	-	3	0	3	-	0	15/19
96	**1680**	-	140	1540	-	-	6	0	0	-	0	9/13
01	**1560**	-	100	1140	320	20	4	0	21	4	4	9/14
06	**1460**	-	120	1300	40	20	4	3	3	-	0	10/16
Ephedra nevadensis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	16/17
01	**0**	-	-	-	-	-	0	0	-	-	0	15/10
06	**0**	-	-	-	-	-	0	0	-	-	0	18/23
Grayia spinosa												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	31/35
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	27/31
Juniperus osteosperma												
84	**0**	66	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	-	60	-	-	0	0	-	-	0	-/-
01	**160**	-	40	120	-	-	0	0	-	-	0	-/-
06	**120**	-	20	100	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
84	**532**	-	466	66	-	-	0	0	0	-	0	4/4
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**360**	-	80	240	40	-	0	0	11	-	0	9/11
01	**520**	-	-	420	100	-	0	0	19	-	0	9/12
06	**260**	80	-	240	20	-	0	0	8	-	0	6/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia polyacantha												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**66**	-	66	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	5/7
01	**120**	-	-	120	-	-	0	0	-	-	0	7/9
06	**60**	-	20	40	-	-	0	0	-	-	0	4/9
Pinus monophylla												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	20	20	20	-	-	0	0	-	-	0	-/-
01	**20**	100	20	-	-	-	0	0	-	-	0	10/10
06	**60**	60	40	20	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	100	0	-	-	0	16/23
01	**40**	-	-	40	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 1-6-06

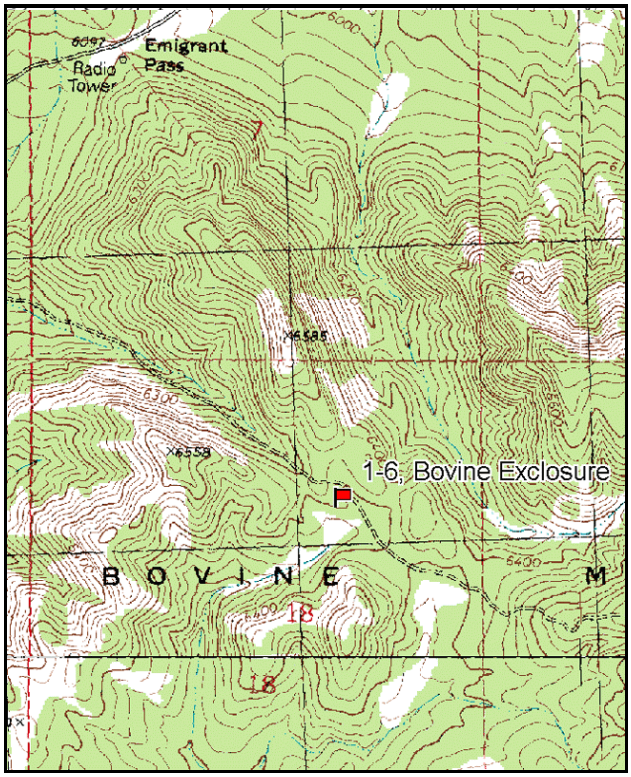
Study site name: Bovine Exclosure . Vegetation type: Big Sagebrush .

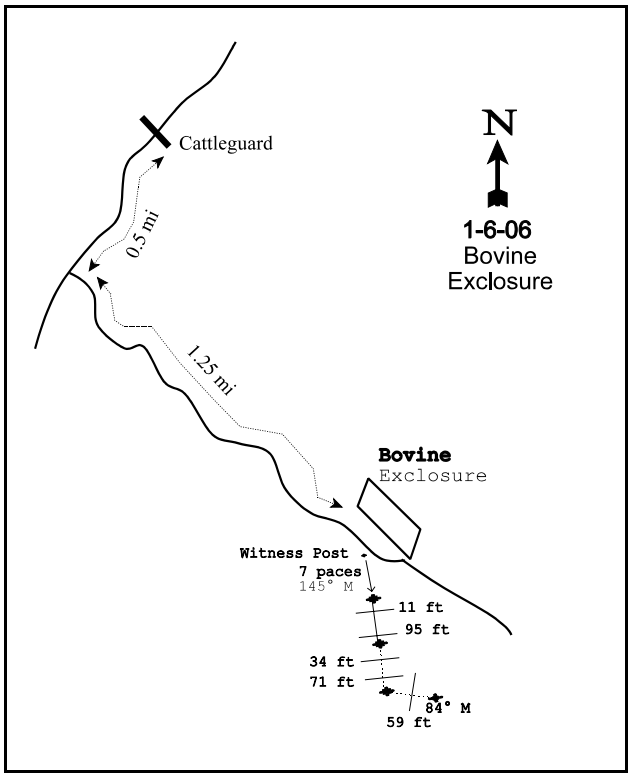
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft). Rebar: belt 4 on 13 ft.

LOCATION DESCRIPTION

Proceed southwest to the summit of Emigrant Pass on Emigrant Pass Road. From the cattleguard at the summit, continue south 0.5 miles to a fork and turn left. Travel 1.25 miles on this road to the Bovine Exclosure where there is a witness post on the right side of the road. From the witness post, follow an azimuth of 145 degrees magnetic for 7 paces to the 0-foot stake of the baseline marked with browse tag #7909. The bearing of the baseline is 165 degrees magnetic. Line 3 changes direction to 59 degrees magnetic.





Map Name: Emigrant Pass

Diagrammatic Sketch

Township 9N , Range 16W , Section 18

UTM NAD 27, UTM 12T 4598188 N, 273130 E

DISCUSSION

Bovine Exclosure - Trend Study No. 1-6

Study Information

This trend study is located immediately south of an exclosure on the north side of the Bovine mountains (elevation: 6,400 feet, slope: 5-10%, aspect: southeast). The vegetation type is sagebrush-grass with scattered or open juniper-pinyon woodland. The nearby exclosure needs repair. This area is in the White Lake sheep allotment which is grazed by sheep from December 1 through March 31. The study is located in a small saddle and thus much of the surrounding area is steeper. Although at a relatively high elevation, the study receives substantial deer use during all but the most severe winters. During the winter of 1983-84, two and a half to three feet of snow covered the area and deer were unable to use the area in midwinter. During most years, the area is available and is considered critical deer winter range. A pellet group transect in 2001 estimated light use with 20 deer days use/acre (50 deer days use/ha). Deer use in 2006 was estimated at 10 days use/acre (25 ddu/ha).

Soil

Soil is loose and coarse textured but apparently quite deep, especially on the more level areas. Soil texture is a loam to clay loam with a soil reaction that is slightly alkaline (7.8 pH). On steeper areas, erosion has resulted in more shallow soils with a lot of exposed rock. Effective rooting depth averages 22 to 24 inches along the original baseline. Two additional 100 foot baselines were added in 1996 to increase the sample size. These two baselines are on more shallow soils with an average effective rooting depth of only 12 to 13 inches. Surface rock cover is also greater. The parent material is granite, which must contain some subsurface fractures because there are some basin big sagebrush growing on these more shallow soils. Ground cover is fair for perennial grasses and litter. The erosion condition class was rated as stable in 2001, but was slight in 2006. Flow patterns, soil movement, and pedestalling were noted. Relative percent bare ground increased from 10 to 22% in 2006. The ratio of bare ground to protective ground cover (vegetation, litter, and cryptogams) decreased from 1:3.5 to 1:2.8.

Browse

Basin big sagebrush, black sagebrush, and antelope bitterbrush are the key browse species. Basin big sagebrush has the highest browse cover and has averaged about 6% cover. Density has continually decreased from 3,199 plants/acre in 1990 to 1,560 plants/acre in 2006. Decadence was very high in 1984 at 63%. Extremely heavy vole damage during the 1983-84 winter was noted on sagebrush and bitterbrush. Decadence averaged about 27% from 1990-2001, but increased to 40% in 2006. Plants classified as dying increased to 32% of the population in 2006. Utilization has been mostly light to moderate.

With the increased sample size used beginning in 1996, more black sagebrush and bitterbrush were picked up in the sample. Black sagebrush density declined 32% from 1996 to 2006 from 1,360 plants/acre to 920 plants/acre. However, black sagebrush cover has remained stable at about 2%. Bitterbrush density also decreased between 1996 and 2006. Density was 260 plants/acre in 1996 and 140 plants/acre in 2006. It appears that older decadent plants died off prior to 2006. Utilization has been moderate to heavy for bitterbrush. Increaser shrubs such as broom snakeweed and narrowleaf low rabbitbrush have remained as minor components of the community.

Point-quarter data estimated Utah juniper density at 87 trees/acre in 2001 and 70 trees/acre in 2006. Sixty four percent of the juniper trees sampled in 2006 were eight feet tall or taller. Single-leaf pinyon density was 27 trees/acre in 2001 and 24 trees/acre in 2006. Pinyon tree height was more variable.

Herbaceous Understory

Six native perennial grasses have been sampled. Perennial grass cover has been good with about 12% cover. Bluebunch wheatgrass and Sandberg bluegrass have been the most abundant. Bluebunch wheatgrass

frequency significantly declined after 1996. Cover declined from 8% in 1996 to 5% in 2006. Sandberg bluegrass has increased in the same time period and nested and quadrat frequency in 2006 was significantly higher than any prior reading. Cover increased from 3% in 1996 to 7% in 2006. Unfortunately, cheatgrass is also abundant. In 2001, nested frequency was significantly higher than 1996 and 2006. Cheatgrass cover was nearly 10% in 2001, but averaged only about 3% in 1996 and 2006. Cheatgrass can be a fire hazard when it is abundant enough to produce continuous fine fuels.

Forb composition features several large showy species and a variety of lower growing forms. Overall forb composition and abundance is fair for most juniper-pinyon sites in this area. Important forbs include: arrowleaf balsamroot, tapertip hawksbeard, two large parsley species, and two species of milkvetch.

1990 TREND ASSESSMENT

Trend for browse is up. Density of big sagebrush increased since 1984 from 1,532 to 3,199 plants/acre. Decadence has declined from 63% in 1984, to 23% in 1990. Seedlings and young plants are abundant and the population appears to be increasing. Hedging is light on the available shrubs and sagebrush canopy cover averages 11%. The point-quarter data estimated 77 junipers per acre, 67% mature trees. The grass component, mainly bluebunch wheatgrass and Sandberg bluegrass, increased significantly in nested frequency, while thickspike wheatgrass decreased significantly during this same period. Perennial forb frequency remained unchanged.

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

1996 TREND ASSESSMENT

Trend for browse is stable. Density estimates are similar for mature and decadent plants compared to 1990 data. The number of seedlings and young declined considerably but there are still enough to maintain the population. The changes in density may also be due to the larger sample size used beginning in 1992, which better estimates shrub populations with clumped and/or discontinuous distributions. Use is currently light to moderate and decadence slightly higher at 27%. Trend for grasses is stable, but the sum of nested frequency for bluebunch wheatgrass declined significantly while the frequency of Sandberg bluegrass remained the same. The forb trend is down. Three of the forb species encountered in 1990 declined significantly in nested frequency. The DCI score is good with good browse conditions and a healthy herbaceous understory.

winter range condition (DC Index) - good (54) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2001 TREND ASSESSMENT

Trend for browse is slightly down. Density estimates for all three preferred browse species decreased. The number of seedlings and young declined considerably for basin big sagebrush. Use is was light to moderate with percent decadence slightly higher for both sagebrush species. Trend for grasses is slightly down. Sum of nested frequency of perennial grasses decreased very slightly, but cheatgrass increased significantly. Sum of nested frequency for bluebunch wheatgrass declined significantly since 1996, while frequency of Sandberg bluegrass remains stable. The forb trend is down again. Sum of nested frequency of perennial forbs declined and has declined with every reading since 1984. The DCI score declined to fair-good due to increased cheatgrass cover.

winter range condition (DC Index) - fair-good (46) Lower potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Density of basin big sagebrush, black sagebrush, and bitterbrush each declined. Decadence for basin big sagebrush increased from 31% to 40%. Pinyon and juniper density has remained stable, but juniper cover increased from 5% in 2001 to nearly 8% in 2006. The grass trend is slightly

up. Perennial and annual grass frequency each returned to levels similar to 1996. Cheatgrass nested frequency was significantly lower than 2001. The forb trend is stable. Forb nested frequency changed very little since 2001 and cover was slightly higher for perennial forbs in 2006. The decline of cheatgrass increased the DCI score to good.

winter range condition (DC Index) - good (57) Lower potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{b}$35	$_{a}$7	$_{a}$10	$_{a}$17	$_{a}$13	.21	.37	.10
G	Agropyron spicatum	$_{ab}$138	$_{c}$207	$_{b}$157	$_{a}$119	$_{a}$100	7.69	6.48	5.00
G	Bromus tectorum (a)	-	-	$_{a}$223	$_{b}$288	$_{a}$237	2.32	9.53	3.75
G	Elymus cinereus	$_{b}$12	$_{a}$2	$_{a}$4	$_{a}$2	$_{ab}$4	.15	.38	.30
G	Oryzopsis hymenoides	$_{a}$-	$_{ab}$1	$_{ab}$8	$_{b}$10	$_{ab}$7	.09	.12	.19
G	Poa secunda	$_{a}$54	$_{b}$145	$_{b}$145	$_{b}$161	$_{c}$204	3.32	4.40	7.21
G	Sitanion hystrix	$_{a}$-	$_{a}$-	$_{b}$16	$_{ab}$5	$_{ab}$5	.24	.41	.03
Total for Annual Grasses		0	0	223	288	237	2.32	9.53	3.75
Total for Perennial Grasses		239	362	340	314	333	11.71	12.18	12.84
Total for Grasses		239	362	563	602	570	14.04	21.72	16.60
F	Agoseris glauca	$_{a}$-	$_{b}$17	$_{a}$5	$_{a}$-	$_{a}$3	.01	-	.04
F	Allium sp.	3	-	-	-	-	-	-	-
F	Arabis sp.	$_{a}$-	$_{ab}$10	$_{b}$24	$_{a}$-	$_{a}$4	.08	.00	.01
F	Astragalus beckwithii	$_{ab}$16	$_{b}$32	$_{a}$7	$_{a}$6	$_{ab}$14	.05	.09	.14
F	Astragalus cibarius	$_{bc}$24	$_{a}$-	$_{a}$2	$_{c}$33	$_{ab}$6	.00	.23	.33
F	Balsamorhiza sagittata	11	5	8	3	11	.87	.72	2.30
F	Caulanthus crassicaulis	-	4	-	-	-	-	-	-
F	Calochortus nuttallii	-	3	-	-	-	-	-	-
F	Chaenactis douglasii	-	-	-	-	6	-	-	.01
F	Collomia linearis (a)	-	-	$_{ab}$11	$_{b}$17	$_{a}$-	.02	.12	-
F	Comandra pallida	-	4	5	9	12	.04	.10	.36
F	Collinsia parviflora (a)	-	-	26	25	25	.06	.11	.06
F	Cordylanthus ramosus (a)	$_{b}$29	$_{a}$-	$_{a}$-	$_{b}$49	$_{a}$-	-	.23	-
F	Crepis acuminata	$_{c}$97	$_{b}$45	$_{a}$9	$_{ab}$21	$_{a}$18	.02	.56	.55
F	Cryptantha sp.	$_{a}$-	$_{a}$-	$_{b}$18	$_{a}$-	$_{a}$4	.06	-	.01
F	Delphinium nuttallianum	$_{b}$52	$_{a}$2	$_{a}$3	$_{a}$1	$_{a}$5	.01	.00	.01
F	Descurainia pinnata (a)	-	-	-	4	-	-	.00	-
F	Eriogonum ovalifolium	-	-	-	2	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Erigeron pumilus	15	10	12	16	4	.09	.29	.06
F	Galium aparine (a)	$_{c}$47	$_{a}$-	$_{b}$10	$_{ab}$3	$_{a}$-	.17	.00	-
F	Gayophytum ramosissimum(a)	-	-	$_{a}$-	$_{a}$-	$_{b}$11	-	-	.02
F	Gilia sp. (a)	-	-	-	8	8	-	.02	.01
F	Hackelia patens	$_{a}$-	$_{c}$23	$_{bc}$17	$_{b}$7	$_{bc}$8	.26	.10	.14
F	Lappula occidentalis (a)	-	-	$_{a}$1	$_{b}$25	$_{ab}$8	.00	.05	.02
F	Lomatium sp.	6	-	-	3	3	-	.06	.15
F	Lomatium triternatum	$_{b}$15	$_{a}$1	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$3	$_{c}$63	$_{b}$32	.00	.16	.07
F	Navarretia intertexta (a)	-	-	$_{b}$20	$_{a}$-	$_{ab}$10	.04	-	.02
F	Penstemon cyananthus	$_{a}$3	$_{b}$33	$_{c}$79	$_{a}$1	$_{a}$10	.43	.00	.08
F	Phlox hoodii	-	-	-	-	2	-	-	.00
F	Phlox longifolia	$_{b}$128	$_{c}$172	$_{a}$57	$_{a}$78	$_{a}$54	.17	.58	.49
F	Schoencrambe linifolia	-	-	-	5	-	-	.01	-
F	Senecio multilobatus	-	-	6	-	6	.06	-	.02
F	Unknown forb-perennial	-	5	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$25	-	-	.10
Total for Annual Forbs		76	0	71	194	119	0.30	0.72	0.31
Total for Perennial Forbs		370	366	252	185	170	2.17	2.78	4.73
Total for Forbs		446	366	323	379	289	2.48	3.50	5.04

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

BROWSE TRENDS --
Management unit 01 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	35	32	25	1.13	2.18	2.44
B	Artemisia tridentata tridentata	57	49	47	4.94	5.21	7.03
B	Chrysothamnus nauseosus consimilis	7	9	6	.36	.53	.30
B	Chrysothamnus viscidiflorus viscidiflorus	8	10	4	.04	.59	.15
B	Gutierrezia sarothrae	8	7	7	.04	.01	.02
B	Juniperus osteosperma	3	6	6	4.12	3.54	5.19
B	Opuntia sp.	1	0	0	.00	-	.03
B	Pinus monophylla	0	2	0	.38	.15	-
B	Purshia tridentata	9	8	5	1.57	1.25	1.53
Total for Browse		128	123	100	12.61	13.48	16.71

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 6

Species	Percent Cover	
	'01	'06
Artemisia nova	-	2.90
Artemisia tridentata tridentata	-	6.84
Chrysothamnus nauseosus consimilis	-	.16
Chrysothamnus viscidiflorus viscidiflorus	-	1.36
Gutierrezia sarothrae	-	.21
Juniperus osteosperma	5.19	7.61
Pinus monophylla	3.00	-
Purshia tridentata	-	1.00

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 6

Species	Average leader growth (in)	
	'01	'06
Artemisia nova	-	1.3
Artemisia tridentata tridentata	1.7	1.7
Purshia tridentata	1.3	1.7

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 6

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	87	70
Pinus monophylla	27	24

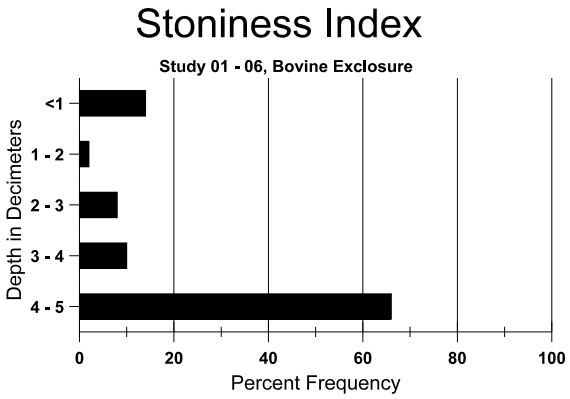
Average diameter (in)	
'01	'06
6.4	6.5
3.2	3.1

BASIC COVER --
Management unit 01 , Study no: 6

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.50	5.75	31.63	42.52	35.96
Rock	.75	1.00	13.21	11.49	10.86
Pavement	18.00	13.75	6.57	10.76	11.02
Litter	55.00	51.50	39.79	42.78	31.26
Cryptogams	2.00	1.75	1.90	2.28	.38
Bare Ground	20.75	26.25	15.44	12.09	25.18

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 06, Bovine Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
17.7	58.5 (17.4)	7.8	36.7	37.0	26.3	2.8	10.1	217.6	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 6

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Sheep	1	-	-	-	-
Rabbit	6	8	28	-	-
Deer	23	9	8	20 (50)	10 (25)
Cattle	-	-	1	-	-

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**199**	433	-	66	133	-	17	0	67	20	67	10/12
90	**166**	-	-	33	133	-	0	0	80	-	0	10/9
96	**1360**	20	140	1120	100	420	34	0	7	-	0	10/18
01	**1220**	20	60	920	240	560	5	0	20	2	2	12/18
06	**920**	-	20	720	180	180	28	0	20	7	7	11/21
Artemisia tridentata tridentata												
84	**1532**	-	133	433	966	-	33	20	63	23	67	15/11
90	**3199**	566	1633	833	733	-	5	0	23	1	3	18/18
96	**2040**	100	340	1140	560	1700	22	3	27	3	3	22/28
01	**1900**	-	100	1220	580	1520	13	1	31	8	8	27/32
06	**1560**	320	20	920	620	1320	36	6	40	32	32	24/41
Chrysothamnus nauseosus consimilis												
84	**33**	-	33	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**180**	-	80	100	-	-	0	0	0	-	22	20/21
01	**240**	-	-	100	140	-	8	8	58	17	17	17/15
06	**160**	-	-	80	80	20	0	0	50	25	25	26/23
Chrysothamnus viscidiflorus viscidiflorus												
84	**232**	-	66	133	33	-	14	14	14	-	0	10/15
90	**399**	-	133	233	33	-	17	0	8	-	0	11/15
96	**220**	-	-	220	-	-	0	0	0	-	0	12/18
01	**380**	60	40	200	140	100	16	0	37	16	16	13/24
06	**120**	-	-	120	-	20	0	0	0	-	0	13/24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**900**	280	280	620	-	-	0	0	0	-	0	5/7
01	**520**	-	-	520	-	-	0	0	0	-	0	4/7
06	**520**	220	20	480	20	40	0	0	4	-	0	4/5
Juniperus osteosperma												
84	**66**	-	-	66	-	-	0	0	0	-	0	69/187
90	**33**	-	-	33	-	-	0	0	0	-	0	236/276
96	**60**	20	-	60	-	-	0	0	0	-	0	-/-
01	**140**	-	80	40	20	-	0	0	14	14	14	4/7
06	**120**	60	80	40	-	-	0	0	0	-	0	-/-
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	6/15
Opuntia sp.												
84	**133**	-	-	133	-	-	0	0	-	-	0	4/8
90	**199**	-	33	166	-	-	0	0	-	-	0	6/15
96	**20**	-	20	-	-	-	0	0	-	-	0	5/13
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	5/13
Pinus monophylla												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**40**	20	40	-	-	-	0	0	-	-	0	-/-
06	**0**	40	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**260**	-	40	180	40	120	38	31	15	8	8	17/39
01	**220**	-	20	180	20	40	18	18	9	-	0	19/38
06	**140**	-	40	100	-	-	14	71	0	-	0	18/40

Trend Study 1-7-06

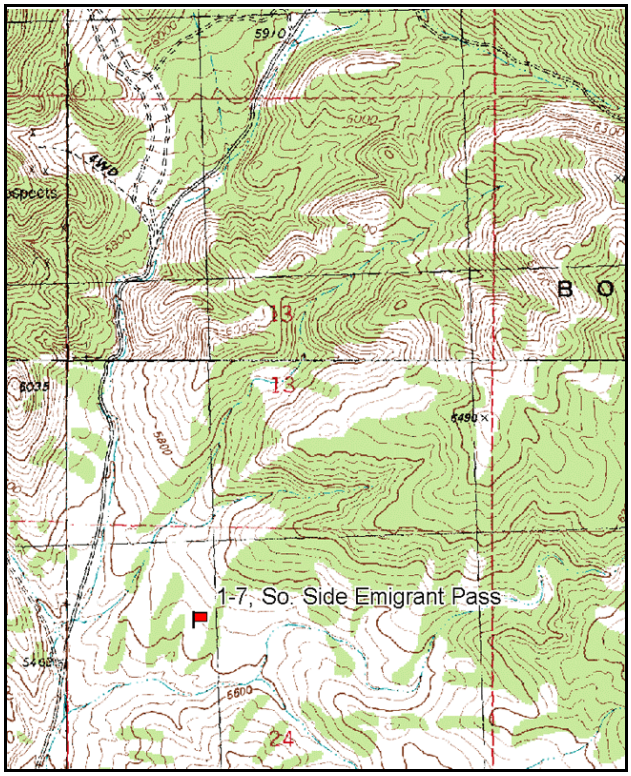
Study site name: South Side Emigrant Pass . Vegetation type: Black Sagebrush .

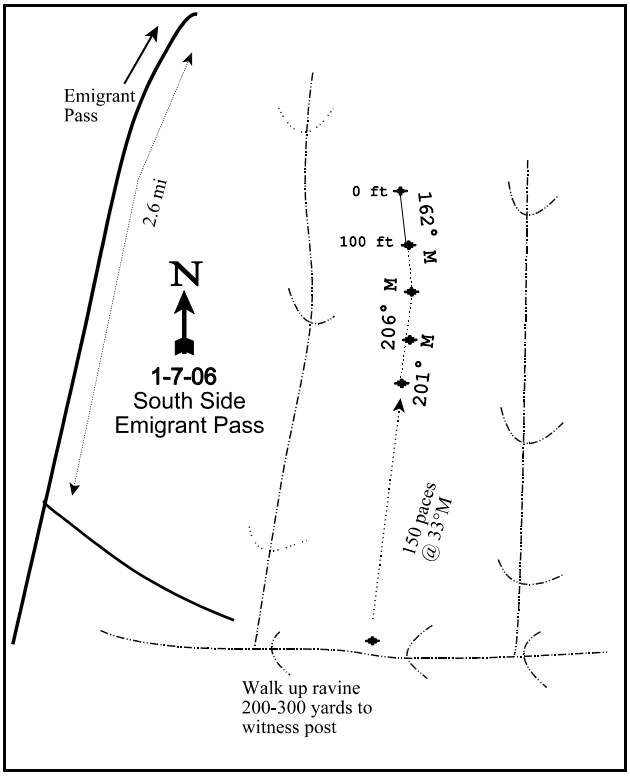
Compass bearing: frequency baseline 162 degrees magnetic.

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

LOCATION DESCRIPTION

From the cattleguard at the summit of Emigrant Pass Road, travel 2.6 miles southwest to a cheatgrass flat on the east side of the road. Turn left crossing the flat and drive east to the wash. Walk up the wash approximately 200-300 yards to a witness post. Take a bearing of 33 degrees magnetic and walk 150 paces up the ridge to the 400-foot stake of the baseline. The 0-foot stake is marked with a red browse tag, #7911. The baseline runs at a bearing of 162 degrees magnetic. The 300-foot baseline runs 206 degrees magnetic. The 400-foot baseline runs 201 degrees magnetic.





Map Name: Bovine

Diagrammatic Sketch

Township 9N , Range 17W , Section 24

UTM NAD 27, UTM 12T 4596664 N, 270911 E

DISCUSSION

South Side Emigrant Pass - Trend Study No. 1-7

Study Information

This trend study samples a black sagebrush ridge within critical deer winter range on Emigrant Pass (elevation: 5,620 feet, slope: 5-15%, aspect: southwest). Shallow draws containing a few junipers are located to either side of the study area. This area only receives 10-12 inches of annual precipitation (USDA et al. 1999). The area is also used as winter sheep range as part of the White Lake allotment. This allotment is grazed from December 1 to March 31. A pellet group transect in 2001 estimated 5 deer days use/acre and 71 elk days use/acre (13 ddu/ha and 175 edu/ha). In 2006, animal use was estimated to be 27 deer days use/acre and 2 cow days use/acre (66 ddu/ha and 4 cdu/ha). Sage grouse pellets were also sampled in 2006.

Soil

The soil is part of the Tosser series, which consists of very deep, well drained, moderately rapidly permeable soils formed in mixed alluvium from limestone, rhyolite and chert on dissected fan terraces, bars and beach plains (USDA-NRCS 2006). The surface is very rocky and appears almost armored with extensive areas of erosion pavement. The soil is relatively shallow with an estimated effective root depth of only about 10 inches. The soil is a sandy-clay with a slightly alkaline soil reaction (7.7 pH). Phosphorus is low (3.9 ppm), which could limit plant growth (Tiedemann and Lopez 2004). Litter cover is scarce and vegetation cover is limited almost exclusively to black sagebrush crowns. Pedestalling around sagebrush plants is common but not extreme. The erosion condition classification was stable in 2001 and slight in 2006 due to moderate pedestalling and soil movement.

Browse

Black sagebrush is the key browse species and has been stable. Black sagebrush cover was 17% in 1996, 19% in 2001, and increased to nearly 24% in 2006. Seedlings and young plants were numerous and decadence was low (9%) in 1996. However, in 2001 seedlings and young decreased substantially and decadence doubled (18%). In 2006 density was slightly lower and decadence increased to 22%. Young plants were rare, but seedlings were extremely numerous. Mature shrubs average less than one foot in height and tend to be evenly spaced. Black sagebrush exhibits good vigor. Shadscale density has declined at each reading. Shadscale density was 920 plants/acre in 1996 and decreased to 680 plants/acre by 2006. Other associated shrub species include: narrowleaf low rabbitbrush, bud sagebrush, and green molly summer cypress.

Herbaceous Understory

Herbaceous plants make up only about 14% of the total vegetation cover. Competition with shrubs for resources limits the amount of herbaceous production. The most abundant species are two low-growing, low value forbs, cryptantha and longleaf phlox. Longleaf phlox is a beneficial species for pre-laying sage grouse hens (Barnett and Crawford 1994). Grasses occur infrequently and produce on average about 2% cover. The most common species are Indian ricegrass, bottlebrush squirreltail, and annual cheatgrass which has significantly increased at each reading. Cheatgrass cover was still low in 2006, at only 1%, but quadrat frequency increased from 36% in 2001 to 88% in 2006.

1990 TREND ASSESSMENT

Trend for browse appears stable even after drought. The shrubs showed mostly light hedging. Canopy cover from black sagebrush averages about 13%. Low rabbitbrush has not increased, although the population remains dominated by young plants. There is a high frequency of forbs, but none of the native species are especially valuable as forage. Herbaceous vegetation is somewhat restricted by the extensive pavement cover on the ground surface. Some soil loss through sheet erosion is evident. Indian ricegrass increased significantly as quadrat frequency increased from 14% to 31% and is the most common grass on the site.

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

1996 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, is stable. Differences in density are likely due to the increased sample size taken in 1996. Utilization is moderate to heavy with 29% of the population displaying heavy use. Vigor is good and decadence has declined from 30% to 9%. The proportion of young plants declined from 41% to 25% and the number of seedlings dropped, but there are still sufficient numbers to maintain the population. Trend for grasses is slightly up with an increase in the sum of nested frequency. Unfortunately cheatgrass was also sampled. The forb trend is up. The dominant forbs, cryptantha and longleaf phlox, both increased significantly in nested frequency values. However, the herbaceous understory is still depleted and in poor condition. The DCI score is rated as good.

winter range condition (DC Index) - good (59) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - up (+2)

2001 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, is stable with a slight increase in density offset with slight increases in percent decadence and an increase in proportion of dead plants within the population. Utilization is mostly light to moderate with good vigor. The proportion of young plants continues to decline for the third reading in a row (1990, 1996, and 2001). There still appears to be sufficient numbers of young and seedlings to maintain the population. Trend for grasses is slightly up. Perennial grasses were more abundant as Sandberg bluegrass and bluebunch wheatgrass increased significantly in sum of nested frequency. Unfortunately Indian ricegrass decreased significantly and cheatgrass increased significantly. The forb trend is down. The dominant forbs include cryptantha, cymopterus, and longleaf phlox. The herbaceous understory is still depleted and in poor condition. The DCI score was still rated as good, but scored lower with higher shrub decadence and fewer young plants.

winter range condition (DC Index) - good (48) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Black sagebrush density declined about 10%. Young plants were rare, but seedlings were very numerous. Decadence was slightly higher from 18% to 22% of the population, but overall vigor remains good. Shadscale is a minor component, but has declined with each reading. Shadscale density has declined 26% since 1996. The grass trend is down. Bluebunch wheatgrass frequency was significantly lower. Cheatgrass significantly increased again. Quadrat frequency was only 21% in 1996 and 36% in 2001, but increased to 88% in 2006. Cover is still low at only 1%. The forb trend is also down as perennial forb nested frequency was lower. The DCI score declined to fair-good with greater shrub decadence, fewer young plants, and increased cheatgrass cover.

winter range condition (DC Index) - fair-good (46) Lower potential scale
browse - slightly down (-1) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a-	a2	a-	b35	a1	.00	.32	.03
G	Bromus tectorum (a)	-	-	a51	b99	c249	.13	.60	1.21
G	Oryzopsis hymenoides	a26	c70	bc54	a20	ab29	.84	.37	.83
G	Poa secunda	a3	a6	ab19	c43	bc28	.23	.74	.39
G	Sitanion hystrix	a15	a9	ab31	b45	b43	.26	.49	.58
Total for Annual Grasses		0	0	51	99	249	0.12	0.60	1.21
Total for Perennial Grasses		44	87	104	143	101	1.34	1.93	1.84
Total for Grasses		44	87	155	242	350	1.47	2.53	3.06
F	Allium sp.	5	-	3	-	-	.00	-	-
F	Astragalus newberryi	a-	a-	b23	a6	a16	.18	.02	.06
F	Astragalus utahensis	ab18	b23	a9	a4	a4	.01	.04	.01
F	Balsamorhiza hookeri	-	-	1	4	3	.00	.03	.15
F	Castilleja chromosa	5	-	-	-	-	.00	-	-
F	Caulanthus crassicaulis	a-	a-	b14	a-	a-	.06	-	-
F	Crepis acuminata	3	-	-	-	-	-	-	-
F	Cryptantha sp.	c116	b58	c92	a18	ab35	.47	.13	.12
F	Cymopterus sp.	a-	a-	a8	b30	a-	.01	.13	-
F	Descurainia pinnata (a)	-	-	-	1	3	-	.00	.00
F	Erigeron argentatus	-	2	1	-	1	.00	-	.01
F	Erigeron sp.	-	-	3	-	-	.03	-	-
F	Eriogonum sp.	-	-	-	-	3	-	-	.00
F	Eriogonum ovalifolium	-	-	3	6	-	.00	.02	-
F	Erigeron pumilus	a-	a-	a3	b39	a-	.00	.29	-
F	Gilia sp. (a)	-	-	b38	b34	a-	.08	.10	-
F	Haplopappus acaulis	a4	b32	ab18	a6	ab19	.08	.03	.24
F	Malcolmia africana	-	-	5	-	-	.01	-	-
F	Phlox hoodii	ab57	b43	ab34	ab28	a23	.37	.22	.23
F	Phlox longifolia	a90	ab124	b133	ab126	a96	.56	.32	.46
F	Ranunculus testiculatus (a)	-	-	2	16	14	.00	.03	.03
F	Sphaeralcea coccinea	-	2	-	-	-	-	-	-
F	Sphaeralcea grossulariifolia	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	40	51	17	0.08	0.13	0.03
Total for Perennial Forbs		299	284	350	267	200	1.84	1.25	1.32
Total for Forbs		299	284	390	318	217	1.93	1.39	1.35

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

BROWSE TRENDS --
Management unit 01 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	99	99	100	17.45	19.28	23.78
B	Atriplex confertifolia	33	24	21	1.37	.95	1.18
B	Chrysothamnus viscidiflorus stenophyllus	75	68	72	2.51	2.30	2.02
B	Ephedra nevadensis	0	22	2	-	.10	-
B	Juniperus osteosperma	0	1	0	-	-	-
B	Kochia americana	23	0	25	.06	-	.29
B	Pinus edulis	0	0	0	-	-	.00
B	Tetradymia nuttallii	14	14	10	.30	1.83	.39
Total for Browse		244	228	230	21.71	24.48	27.70

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 7

Species	Percent Cover '06
Artemisia nova	26.58
Atriplex confertifolia	.16
Chrysothamnus viscidiflorus stenophyllus	3.31
Kochia americana	.08
Tetradymia nuttallii	.13

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 6

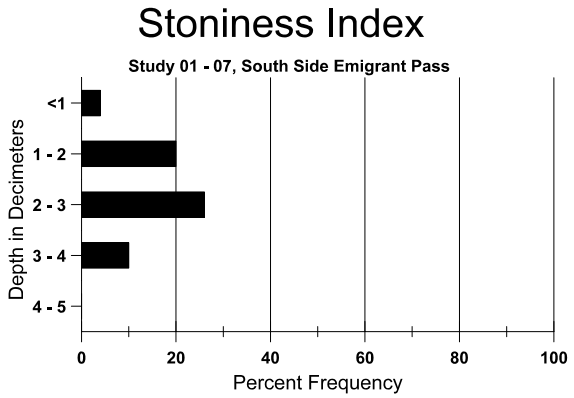
Species	Average leader growth (in)	
	'01	'06
Artemisia nova	0.8	0.6

BASIC COVER --
Management unit 01 , Study no: 7

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.25	9.75	25.04	30.18	30.17
Rock	5.75	11.00	11.69	5.50	8.19
Pavement	62.75	56.00	33.71	46.00	39.92
Litter	23.50	14.75	12.81	13.06	16.79
Cryptogams	1.50	1.50	2.55	2.16	1.70
Bare Ground	3.25	7.00	8.89	11.87	13.94

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 07, South Side Emigrant Pass

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.2	62.8 (9.7)	7.7	55.9	9.1	35.0	1.44	3.9	172.8	0.6



PELLET GROUP DATA --
Management unit 01 , Study no: 7

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	16	5	48
Elk	-	48	1
Deer	17	-	18
Cattle	-	-	-
Sage Grouse	-	-	-

Days use per acre (ha)	
'01	'06
-	-
71 (175)	-
5 (12)	27 (66)
-	2 (4)
-	9 groups/acre

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**10466**	1866	4600	4333	1533	-	49	18	15	-	10	8/11
90	**9665**	2533	3933	2866	2866	-	5	0	30	.41	2	11/14
96	**11500**	340	2880	7620	1000	240	52	29	9	2	2	9/23
01	**12380**	60	560	9580	2240	620	42	10	18	4	4	7/18
06	**11160**	50020	380	8280	2500	720	42	19	22	9	9	9/21
Artemisia spinescens												
84	**1932**	-	600	1266	66	-	31	34	3	-	3	6/8
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	7/13
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Atriplex confertifolia												
84	**2599**	-	733	866	1000	-	49	33	38	.76	26	7/10
90	**1866**	333	66	400	1400	-	0	0	75	12	43	10/8
96	**920**	40	120	760	40	20	41	9	4	-	0	9/15
01	**840**	20	220	240	380	100	0	0	45	19	19	8/12
06	**680**	40	140	460	80	20	6	3	12	3	3	10/16
Chrysothamnus viscidiflorus stenophyllus												
84	**2866**	66	1600	1133	133	-	14	28	5	-	2	7/11
90	**3333**	200	1800	533	1000	-	0	0	30	1	4	11/13
96	**3100**	300	180	2520	400	20	3	0	13	2	3	8/15
01	**2580**	20	100	1540	940	100	2	2	36	10	10	5/10
06	**2940**	180	220	1980	740	60	9	13	25	12	13	7/13
Ephedra nevadensis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	16/19
01	**1120**	20	480	560	80	-	4	0	7	4	4	5/6
06	**40**	-	-	40	-	-	0	100	0	-	0	11/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	20	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	20	-	-	-	0	0	-	-	0	-/-
06	**0**	20	-	-	-	-	0	0	-	-	0	-/-
Kochia americana												
84	**1866**	-	1066	600	200	-	11	14	11	1	11	2/2
90	**400**	-	400	-	-	-	0	0	0	-	0	-/-
96	**960**	100	380	580	-	-	0	0	0	-	0	4/6
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**1340**	120	120	1220	-	-	51	4	0	-	0	5/6
Pinus edulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	20	-	-	-	-	0	0	-	-	0	-/-
Tetradymia nuttallii												
84	**266**	-	66	-	200	-	25	25	75	-	50	-/-
90	**866**	66	333	-	533	-	0	0	62	7	23	-/-
96	**280**	-	-	40	240	120	7	0	86	36	36	16/24
01	**280**	-	20	80	180	220	7	0	64	50	50	13/15
06	**200**	-	20	100	80	80	0	0	40	10	10	17/21

Trend Study 1-8-06

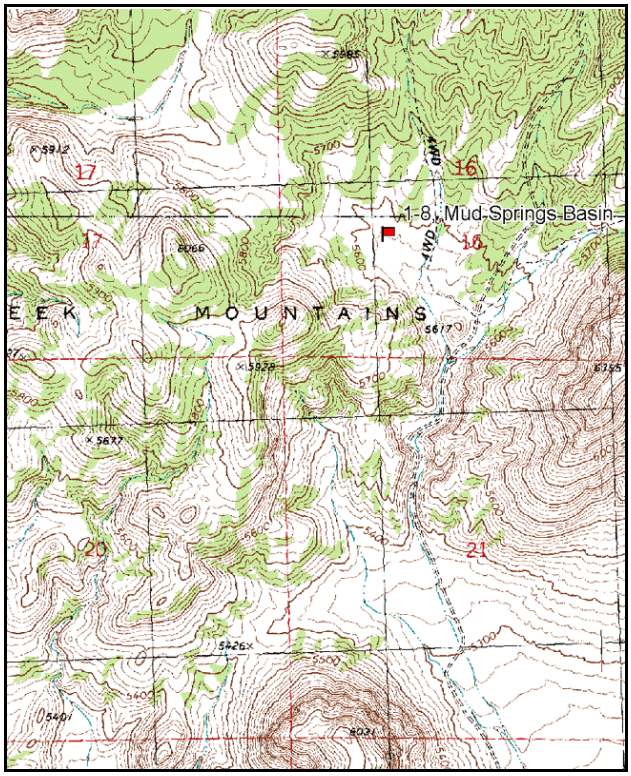
Study site name: Mud Springs Basin . Vegetation type: Big Sagebrush-Grass .

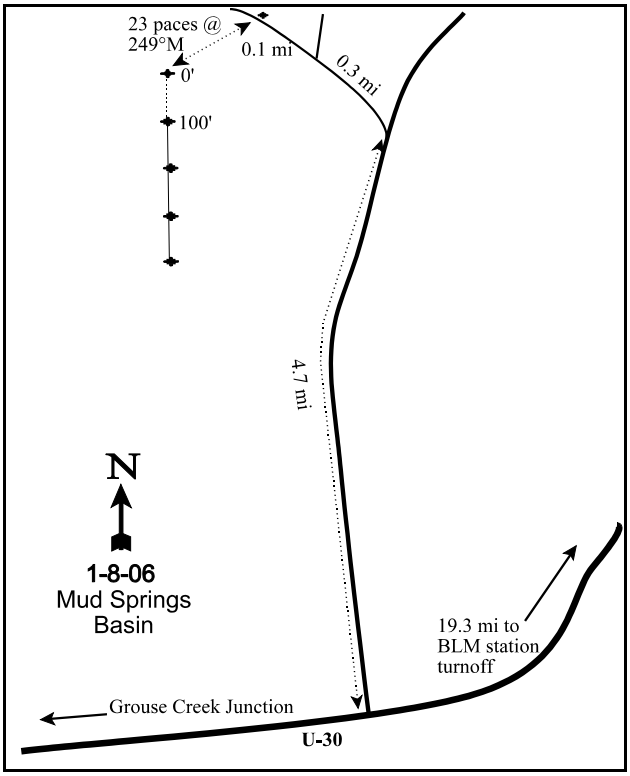
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

On U-30 proceed 19 miles southwest from the Rosebud BLM station turn-off and turn right (north) onto a gravel road just before mile marker 14. Proceed 4.7 miles and take a fork to the left for 0.3 miles. Take a very faint road to the left for 0.1 miles to a witness post on the right side of the road. From the witness post, walk 17 paces on an azimuth of 182 degrees magnetic to the 0-foot stake of the frequency baseline marked by browse tag #7913. Bearing of the baseline is 180 degrees true.
* The old faint road is almost nonexistent. New road goes through belt 2.





Map Name: Lucin NE Diagrammatic Sketch

Township 9N , Range 17W , Section 16 UTM NAD 27, UTM 12T 4597734 N, 266042 E

DISCUSSION

Mud Springs Basin - Trend Study No. 1-8

Study Information

This study (elevation: 5,580 feet, slope: 5%, aspect: southeast) is located approximately two miles southwest of Mud Springs Basin at the south end of the Grouse Creek Mountains. This area is critical deer winter range, which located on state trust lands. The small basin in which the study is located contains numerous small ridges occupied by fingers of juniper and black sagebrush separated by low areas (swales) occupied by the more deep rooted big sagebrush. The study samples a large sagebrush swale because of the importance of sagebrush during the winter. The pellet group transect in 2001 estimated 29 deer days use/acre (73 deer days use/ha). In 2006, 8 deer and 11 cow days use/acre (20 ddu/ha and 27 cdu/ha) were estimated.

Soil

Soil is moderately deep and alluvially deposited with minimal surface rockiness. It is part of the Codquin series (USDA-NRCS 2006). The texture is a loam with a slightly alkaline reaction (7.8 pH). Phosphorus is low at only 6.3 ppm, which may limit plant growth and development (Tiedemann and Lopez 2004). Bare interspaces have pavement covering the surface, but the soil beneath is easily erodible. Ground cover comes principally from sagebrush crowns, native grasses, and cheatgrass. The ratio of bare soil to protective ground cover is fair and the erosion condition class was determined to be moderate in 2001. Most signs of erosion are from pedestalling, flow patterns, and abundant rills. The ample vegetation and litter cover combined with the lack of steep slope prevents more serious soil erosion problems. A number of small drainage channels traverse the area, however none are deep or highly active. Most appear relatively stable. In 2006, the erosion condition class was rated as slight.

Browse

The key browse species is Wyoming big sagebrush. Density was estimated at 5,866 plants/acre in 1984. There was a considerable number of rodent damaged plants encountered that year, but decadence was still relatively low at 14%. The surviving mature and decadent plants received heavy deer use on those portions of the crown which protruded above the snow line. The surviving plants looked ragged, but nonetheless exhibited good vigor when examined in June of 1984. Wyoming big sagebrush density has declined with every reading: 3,732 plants/acre (1990), 3,240 (1996), 2,540 (2001), and 1,300 (2006). Between 2001 and 2006 density declined by nearly half. Decadence increased from 19% in 2001 to 35% in 2006. Plants classified as dying was low until 2001 (13%) and increased in 2006 (22%). Decadent and dying plants have not been replaced. Recruitment has declined with each reading. In 2006, no young plants were sampled, but a few seedlings were sampled. Sagebrush cover was 12% in 1996, 14% in 2001, and dropped to 7% in 2006. Utilization has been mostly light since 1984. The decline of this population of sagebrush is likely due to drought and competition with cheatgrass, which can out compete young and seedling sagebrush plants. Young and Evans (1989) showed that sagebrush recruitment was completely stopped in a cheatgrass-dominated community in northwestern Nevada.

Other shrubs sampled include: prickly phlox, narrowleaf low rabbitbrush, black sagebrush, and Nevada ephedra. Black sagebrush was sampled when the sampling design was expanded in 1996. It has increased in density since 1996. Density of narrowleaf rabbitbrush was very high in 1996 (3,300 plants/acre), but has declined since.

Herbaceous Understory

Native perennial grasses include: western wheatgrass, bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail. These perennial grasses produced nearly 15% cover in 1996, 11% cover in 2001 and 12% cover in 2006, which was 69% of the total grass cover. Cheatgrass has increased from 5% cover in 1996, to 13% in 2001, to 27% cover in 2006. High abundances of cheatgrass can be a fire hazard as well as compete with other desirable species. Cheatgrass was significantly more abundant in 2001 and

remained similar in 2006, but was more robust in 2006 as cover was much higher.

Forb diversity varies each year based on the timing and amounts of precipitation. Species numbers have varied from a high of 29 species in 1996 to a low of only 9 species in 1990. Forbs are not abundant and do not produce high amounts of forage. Musk-mustard (*Chorispora tenella*) is a weedy species that was sampled. It was noted it grows abundantly along the road.

1990 TREND ASSESSMENT
Trend for big sagebrush is down. The density of mature plants declined from 3,066 to 1,400 plants/acre. Density of seedlings and young plants declined as well, but there appears to be sufficient numbers to maintain the population. Utilization of sagebrush was light but decadence increased from 14% to 29%. Trend for both grasses and forbs is up. Two perennial grasses increased significantly in nested frequency. Perennial forbs are also more abundant.

browse - down (-2) grass - up (+2) forb - up (+2)

1996 TREND ASSESSMENT
Trend for the key browse species, Wyoming big sagebrush, is stable. Density of mature plants increased while the number of seedlings and young declined. Some of the differences in shrub densities is likely due to the increased sample size used in 1996. Utilization was mostly light and decadence fell slightly from 29% to 25%. One cause for concern is the increase in density of narrowleaf low rabbitbrush which rose from 199 to 3,300 plants/acre. Trend for grasses is stable. Sum of nested frequency of perennial grasses changed very little. Cheatgrass was sampled, but no prior data was taken on this species to be able to compare changes. The trend for forbs was up once again. Perennial forbs were much more abundant as sum of nested frequency more than doubled. The DCI score rated this site as good-excellent.

winter range condition (DC Index) - good-excellent (63) Lower potential scale
browse - stable (0) grass - stable (0) forb - up (+2)

2001 TREND ASSESSMENT
Trend for the key browse species, Wyoming sagebrush, is slightly down with continuing decreases in density. The proportion of young plants has decreased from 12% to only 3%. Plants classified as dying increased to 13%. Utilization was classified as mostly light. Those classified with poor vigor have increased from 7% to 13%. One cause of concern in 1996 was the increase in density of narrowleaf low rabbitbrush which rose from 199 plants/acre in 1990 to 3,300 plants/acre in 1996. Currently it has decreased by 42% to 1,900 plants/acre. Trend for grasses is slightly down. Perennials remained stable, but cheatgrass increased significantly. The forb trend is down. Perennial forbs were much less abundant. The DCI score declined. Perennial grass cover was lower, cheatgrass cover increased, and perennial forb cover declined.

winter range condition (DC Index) - fair-good (47) Lower potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT
The browse trend is down. Wyoming big sagebrush density and cover declined by nearly half. Decadence increased from 19% to 35% and 22% of the population was classified as dying. There were no young plants sampled. Recruitment may be very poor due to the high competition with cheatgrass. Black sagebrush density has increased slightly, but is still not very abundant. The grass trend is stable. Perennial grasses have only decreased very slightly, while cheatgrass was not significantly more abundant, but was more robust with over 27% cover. The forb trend is slightly down. Perennial forb sum of nested frequency decreased 13% and the weedy, musk-mustard was sampled for the first time. The DCI score declined to poor-fair. Preferred browse cover was down, percent decadence increased, recruitment decreased, and cheatgrass cover was much higher.

winter range condition (DC Index) - poor-fair (27) Lower potential scale
browse - down (-2) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	a-	b16	a-	b30	b12	-	.58	.08
G	Agropyron spicatum	46	84	78	77	80	3.88	3.45	3.53
G	Bromus tectorum (a)	-	-	a154	b268	b295	5.38	12.92	27.35
G	Oryzopsis hymenoides	24	27	34	35	27	2.56	1.57	1.19
G	Poa secunda	a51	b182	b176	b179	b198	6.24	4.49	7.14
G	Sitanion hystrix	b58	b63	b57	a21	a13	1.89	.45	.44
Total for Annual Grasses		0	0	154	268	295	5.38	12.92	27.35
Total for Perennial Grasses		179	372	345	342	330	14.59	10.55	12.40
Total for Grasses		179	372	499	610	625	19.97	23.47	39.75
F	Agoseris glauca	1	-	-	1	2	-	.00	.00
F	Alyssum alyssoides (a)	-	a-	a6	b-	36	.01	-	.17
F	Allium sp.	-	-	-	2	-	-	.00	-
F	Ambrosia artemisifolia	-	2	-	-	-	-	-	-
F	Antennaria rosea	a-	a-	ab6	ab4	b10	.07	.01	.15
F	Androsace septentrionalis (a)	-	-	-	1	-	-	.00	-
F	Arenaria sp.	-	-	-	1	-	-	.00	-
F	Astragalus beckwithii	8	-	6	3	-	.18	.03	-
F	Astragalus cibarius	a5	a6	b32	ab18	b28	.47	.22	.32
F	Astragalus newberryi	-	-	10	-	-	.07	-	-
F	Astragalus utahensis	-	8	1	-	1	.00	-	.00
F	Balsamorhiza hookeri	ab2	a-	b7	ab1	ab2	.30	.00	.06
F	Castilleja chromosa	3	-	-	-	-	-	-	-
F	Calochortus flexuosus	3	-	-	-	-	-	-	-
F	Camelina microcarpa (a)	-	-	c71	b26	a6	.18	.14	.01
F	Chaenactis douglasii	-	-	1	-	-	.00	-	-
F	Chorispora tenella (a)	-	-	4	-	8	.01	-	.07
F	Crepis acuminata	a1	b15	ab10	a1	a2	.25	.00	.16
F	Cryptantha sp.	a-	a-	b32	a-	a-	.35	-	-
F	Descurainia pinnata (a)	-	-	b46	c79	a6	.47	.33	.01
F	Eriogonum ovalifolium	-	-	1	-	-	.00	-	-
F	Erigeron pumilus	a-	a-	b14	b5	ab1	.05	.07	.03
F	Gayophytum ramosissimum(a)	-	-	b19	a-	a-	.04	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Gilia sp. (a)	-	-	8	4	-	.02	.01	-
F	Haplopappus acaulis	$_{a}$-	$_{a}$-	$_{b}$20	$_{a}$-	$_{a}$-	.46	-	-
F	Halogeton glomeratus (a)	-	10	-	-	-	-	-	-
F	Hackelia patens	$_{a}$-	$_{b}$16	$_{c}$71	$_{a}$-	$_{a}$-	.18	-	-
F	Lappula occidentalis (a)	-	-	$_{ab}$29	$_{b}$41	$_{a}$15	.11	.13	.05
F	Mentzelia albicaulis (a)	-	-	$_{ab}$21	$_{b}$-	$_{a}$-	.08	-	-
F	Penstemon cyananthus	-	-	$_{b}$17	$_{a}$-	$_{a}$-	.05	-	-
F	Penstemon sp.	-	-	1	-	-	.00	-	-
F	Phlox hoodii	$_{a}$3	$_{ab}$13	$_{d}$54	$_{cd}$49	$_{bc}$31	.72	.45	.24
F	Phlox longifolia	$_{a}$29	$_{b}$66	$_{a}$30	$_{a}$37	$_{a}$24	.16	.21	.09
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{ab}$7	$_{b}$20	-	.01	.20
F	Sisymbrium altissimum (a)	-	-	$_{b}$14	$_{a}$3	$_{a}$-	.05	.00	-
F	Sphaeralcea grossulariifolia	3	-	-	-	-	-	-	-
F	Stellaria jamesiana	-	-	-	-	2	-	-	.03
F	Taraxacum officinale	-	-	3	-	-	.00	-	-
F	Tragopogon dubius	-	-	3	-	3	.03	-	.01
F	Unknown forb-perennial	$_{a}$-	$_{b}$27	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Veronica biloba (a)	-	-	3	-	8	.01	-	.04
Total for Annual Forbs		0	10	221	161	99	1.00	0.64	0.57
Total for Perennial Forbs		58	153	319	122	106	3.39	1.03	1.11
Total for Forbs		58	163	540	283	205	4.39	1.68	1.69

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

BROWSE TRENDS --
Management unit 01 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	6	15	17	1.54	1.28	1.44
B	Artemisia tridentata wyomingensis	75	65	39	11.66	13.98	7.30
B	Chrysothamnus viscidiflorus stenophyllus	48	39	24	5.67	1.29	.45
B	Juniperus osteosperma	2	1	1	.15	.15	.15
B	Leptodactylon pungens	5	7	8	.33	.48	.12
B	Opuntia polyacantha	0	2	3	.00	.03	.18
Total for Browse		136	129	92	19.35	17.22	9.65

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 8

Species	Percent Cover
	'06
Artemisia nova	1.96
Artemisia tridentata wyomingensis	7.63
Chrysothamnus viscidiflorus stenophyllus	1.41
Juniperus osteosperma	.28
Leptodactylon pungens	.26
Opuntia polyacantha	.15

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 8

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.0	2.1

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 8

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	52	29

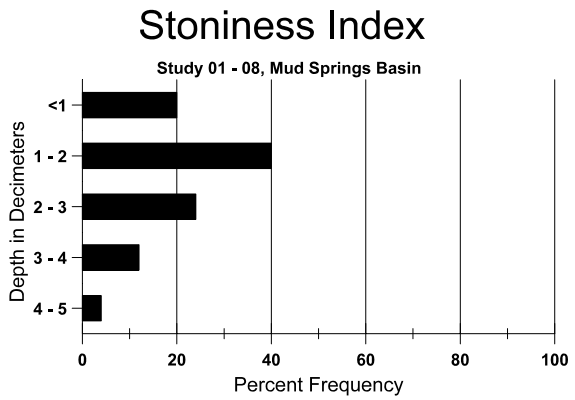
Average diameter (in)	
'01	'06
6.7	9.6

BASIC COVER --
Management unit 01 , Study no: 8

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	7.00	47.15	42.79	52.86
Rock	1.75	1.75	3.30	1.93	1.60
Pavement	12.00	21.25	13.01	12.39	10.67
Litter	70.25	39.00	41.55	31.90	32.35
Cryptogams	1.00	1.25	1.82	2.78	.29
Bare Ground	12.75	29.75	12.91	19.01	18.38

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 08, Mud Springs Basin

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
20.3	56.6 (19.7)	7.8	43.4	32.4	25.3	2.3	6.3	540.8	0.7



PELLET GROUP DATA --
Management unit 01 , Study no: 8

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	10	2	18
Elk	-	1	-
Deer	53	22	3
Cattle	1	-	5
Antelope	-	-	-

Days use per acre (ha)	
'01	'06
-	-
-	-
29 (73)	8 (20)
-	11 (27)
3 (7)	-

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**320**	-	20	80	220	40	19	69	69	31	31	8/25
01	**840**	-	40	460	340	80	0	0	40	12	12	7/22
06	**940**	-	80	780	80	40	0	0	9	9	9	11/23
Artemisia tridentata wyomingensis												
84	**5866**	25333	2000	3066	800	-	42	31	14	1	7	26/34
90	**3732**	466	1266	1400	1066	-	0	0	29	4	14	22/22
96	**3240**	20	380	2060	800	620	3	1	25	7	7	23/37
01	**2540**	60	80	1980	480	1200	6	.78	19	13	13	22/28
06	**1300**	200	-	840	460	1740	5	0	35	22	22	24/33
Atriplex canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	20	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
84	**266**	66	-	266	-	-	100	0	0	-	75	12/14
90	**199**	-	66	133	-	-	0	0	0	-	0	10/9
96	**3300**	-	280	2940	80	20	0	0	2	.60	.60	12/20
01	**1900**	-	180	1140	580	120	0	0	31	11	11	9/14
06	**860**	20	20	840	-	-	0	0	0	-	0	9/16
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	9/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	20	20	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**100**	-	20	80	-	-	0	0	-	-	0	5/11
01	**280**	20	-	280	-	-	0	0	-	-	0	6/7
06	**240**	20	-	240	-	-	0	0	-	-	0	9/9
Opuntia polyacantha												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	5/14
01	**40**	-	-	40	-	-	0	0	-	-	0	3/6
06	**60**	-	-	60	-	-	0	0	-	-	0	5/9

Trend Study 1-10-06

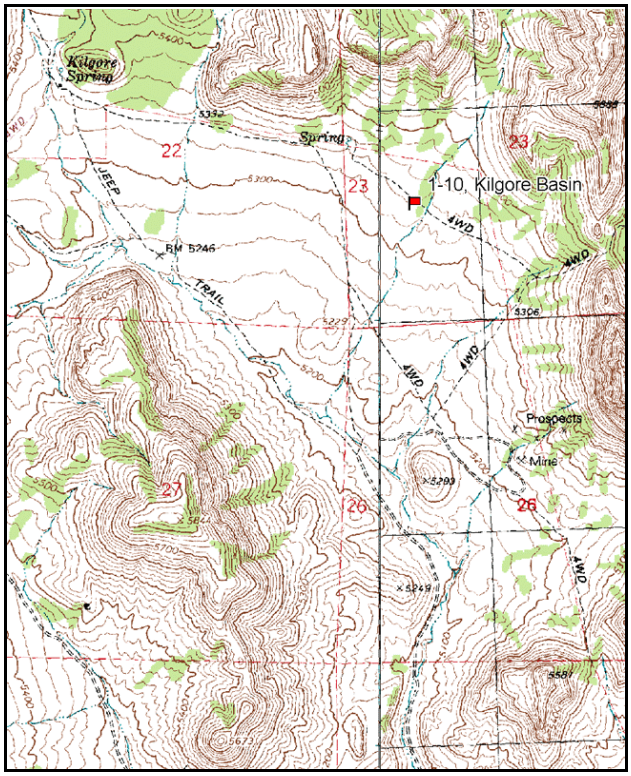
Study site name: Kilgore Basin . Vegetation type: Black Sagebrush .

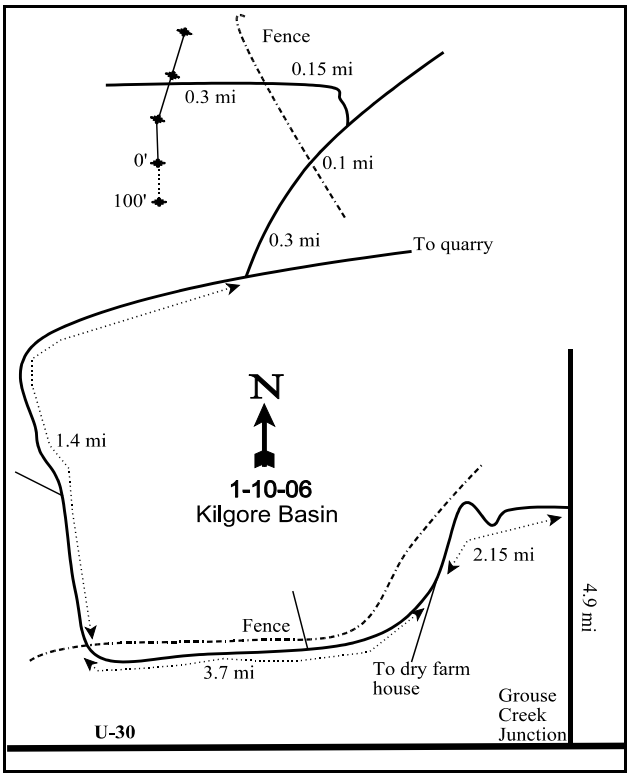
Compass bearing: frequency baseline 155 degrees magnetic.

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

LOCATION DESCRIPTION

From the U-30/Grouse Creek Road junction, proceed north 4.9 miles. Turn left (west) and travel 2.15 miles to a fork that leads to a dry farm. Stay on the main road at this fork (right) and continue 3.7 miles to a gate. Continue 1.2 miles to another fork. Stay right for 0.3 miles then turn left and travel 0.4 miles to a gate. Proceed 0.1 miles to a fork. Turn left here into the P/J and go 0.15 miles to another gate. Continue 0.3 miles to a witness post on the south side of the road. Walk 36 paces from the witness post at a bearing of 148 degrees magnetic to the 0-foot stake of the frequency baseline. This stake marked by a red browse tag #7910. The baseline bearing is 155 degrees magnetic.





Map Name: Lucin NW

Diagrammatic Sketch

Township 9N , Range 19N , Section 23

UTM NAD 27, UTM 12T 4596520 N, 249668 E

DISCUSSION

Kilgore Basin - Trend Study No. 1-10

Study Information

The Kilgore Basin study (elevation: 5,330 feet, slope: 5%, aspect: southwest) is located southwest of Grouse Creek. It samples critical deer winter range. The study lies within a large basin surrounded by low hills that are nearly barren of tree cover. The area is dominated by a uniform, low-growing, evenly spaced stand of black sagebrush. Shrub interspecies are essentially barren of other vegetation. Within the basin, plant diversity is low. The only variation is in small swales where the deeper rooted Wyoming and basin big sagebrush predominates along with a few patches of Utah juniper trees. This area is within the Kilgore allotment (11/01 to 04/30). Deer pellet groups were moderately high with a quadrat frequency of 17% in 1996. A pellet group transect in 2001 estimated 21 deer days use/acre (51 deer days use/ha) and 5 cow days use/acre (13 cow days use/ha). Some sagegrouse droppings were also noted. In 2006, 11 deer and 14 cow days (26 ddu/ha and 34 cdu/ha) were estimated.

Soil

The Plegomir soil series consists of very shallow and shallow over duripan, well drained, moderately permeable soils formed in alluvium from limestone, tuffaceous sandstone, or igneous rock. They are on dissected fan terraces and on sides of small hills (USDA-NRCS 2006). The soil texture is a sandy clay loam with a moderately alkaline soil reaction (8.1 pH). Phosphorus is low (6.3 ppm) and may limit plant growth and development (Tiedemann and Lopez 2004). Effective rooting depth is moderately shallow with an average of about 12 inches. The bulk of the ground surface is occupied by rock and erosion pavement. Apart from shrub crowns there is very little herbaceous cover. Erosion continues at a slow but steady rate in spite of the gentle terrain. Plant pedestalling, exposed plant roots and exposed lichen lines on rocks are all common. The soil erosion condition was determined as stable in 2001 and slight in 2006.

Browse

Black sagebrush dominates the site with scattered narrowleaf low rabbitbrush, shadscale saltbush, winterfat, and spiny hopsage. The population of black sagebrush appears relatively stable, but showed a predominance of decadent plants in 1984 and 1990, but percent decadence has been lower since 1984 and 1990. Density of black sagebrush has averaged about 15,000 plants/acre over the five readings. Density was down slightly in 2006 with a decline in the number of young plants and an increase in the percent of plants classified as dying. Seedlings were very abundant in 2006. Black sagebrush has averaged about 23% cover from 1996-2006. Utilization was heavy in 1984, but has been mostly light to moderate since.

Herbaceous Understory

The herbaceous understory is sparse and has poor species diversity. Most are low-growing xeric species with low palatability. Total herbaceous cover equaled less than 4% cover in 1996 and only 2% total cover in 2001. In 2006, herbaceous cover was up to 8%, but over half of that was from cheatgrass. Perennial grasses include bottlebrush squirreltail, Sandberg bluegrass, and Indian ricegrass. Cheatgrass abundance was low in 1996 and 2001 with average quadrat frequency of 23%, but increased significantly and had 87% quadrat frequency in 2006. Cheatgrass cover increased from less than 1% to nearly 5%, which was 78% of the total grass cover. Forbs include longleaf phlox, milkvetch, and carpet phlox.

1990 TREND ASSESSMENT

Black sagebrush is stable. The high percentage of decadence is normal for high density stands like this one. Decadence has increased from 47% to 66%. This may be caused by drought and intraspecific competition for common but limited resources. Sagebrush canopy cover averages about 21%. These shrubs were severely hedged in the past, but recently there has been lighter utilization and improved growth form. The majority of the mature plants have normal vigor. The grass trend is down. Nested frequency of bottlebrush squirreltail declined and the other two grasses were not sampled. The forb trend is stable.

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

1996 TREND ASSESSMENT

Trend for black sagebrush is slightly up. Sagebrush density has declined a little, but the number of mature plants has doubled, while the percentage of decadent plants has decreased substantially. The difference in density is likely due to the increased sampling size. Utilization is more moderate and vigor good on all but a few of the decadent plants. The grass and forb trends are up as the sum of nested frequency for perennial grasses and forbs has increased.

winter range condition (DC Index) - good (50) Lower potential scale
browse - slightly up (+1) grass - up (+2) forb - up (+2)

2001 TREND ASSESSMENT

Trend for black sagebrush is stable. Total density has increased slightly, percent dead within the population has remained the same, and percent decadence has decreased. Utilization is mostly light at this time. The grass trend is stable. The sum of nested frequency for perennial grasses and cheatgrass has remained unchanged. The forb trend is down as the frequency of perennial forbs has decreased substantially. The DCI score declined due to less perennial grass and forb cover and fewer young shrubs.

winter range condition (DC Index) - fair-good (46) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Black sagebrush density declined by 20%, but is still very high. Percent cover remained unchanged. Decadence did increased from 22% in 2001 to 31% in 2006 and the percent of plants classified as dying increased from 6% to 20%. The grass trend is slightly down. Perennial grass frequency did not change, but cheatgrass nested frequency increased significantly. Cheatgrass cover also increased from less than 1% to nearly 5%, which is by far higher than any other herbaceous species. The forb trend is slightly up. Perennial forbs were more abundant, but not nearly as abundant as they were in 1996. The DCI score declined to fair because percent decadence of black sagebrush increased and cheatgrass increased.

winter range condition (DC Index) - fair-good (46) Lower potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 10

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Bromus tectorum (a)	-	-	$_{a}$53	$_{a}$53	$_{b}$256	.20	.52	4.60
G	Oryzopsis hymenoides	$_{a}$2	$_{a}$-	$_{a}$5	$_{a}$-	$_{b}$23	.31	-	.16
G	Poa secunda	$_{b}$10	$_{a}$-	$_{b}$22	$_{b}$22	$_{b}$19	.30	.11	.12
G	Sitanion hystrix	$_{ab}$73	$_{a}$50	$_{b}$89	$_{b}$97	$_{ab}$80	1.02	.86	.98
G	Vulpia octoflora (a)	-	-	-	4	9	-	.01	.01
Total for Annual Grasses		0	0	53	57	265	0.20	0.53	4.62
Total for Perennial Grasses		85	50	116	119	122	1.63	0.97	1.26
Total for Grasses		85	50	169	176	387	1.83	1.50	5.89
F	Allium sp.	8	-	-	-	-	-	-	-
F	Arabis drummondi	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$1	$_{a}$-	-	.01	-
F	Astragalus beckwithii	$_{ab}$7	$_{ab}$1	$_{c}$29	$_{a}$-	$_{b}$12	.42	-	.12
F	Astragalus utahensis	-	-	-	-	5	-	-	.04
F	Cruciferae	$_{a}$-	$_{a}$-	$_{b}$11	$_{a}$-	$_{a}$-	.03	-	-
F	Cryptantha sp.	$_{a}$-	$_{a}$-	$_{b}$20	$_{a}$-	$_{ab}$8	.05	-	.02
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$14	-	-	.03
F	Eriogonum ovalifolium	-	-	-	-	2	-	-	.00
F	Gilia sp. (a)	-	-	$_{b}$9	$_{a}$-	$_{ab}$7	.03	-	.02
F	Lappula occidentalis (a)	-	-	$_{ab}$11	$_{a}$-	$_{b}$11	.04	-	.03
F	Navarretia intertexta (a)	-	-	$_{b}$19	$_{a}$-	$_{b}$23	.04	-	.06
F	Phlox hoodii	$_{a}$51	$_{b}$87	$_{ab}$61	$_{a}$46	$_{a}$48	.65	.38	1.06
F	Phlox longifolia	$_{bc}$80	$_{ab}$57	$_{c}$94	$_{abc}$51	$_{a}$43	.58	.25	.30
F	Townsendia sp.	-	-	3	-	-	.03	-	-
Total for Annual Forbs		0	0	39	0	55	0.11	0	0.15
Total for Perennial Forbs		158	145	218	98	118	1.77	0.64	1.56
Total for Forbs		158	145	257	98	173	1.88	0.64	1.71

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

BROWSE TRENDS --
Management unit 01 , Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	100	100	100	24.95	21.25	21.95
B	Artemisia tridentata wyomingensis	3	1	0	.03	-	-
B	Atriplex confertifolia	18	10	16	1.43	.22	1.51
B	Ceratoides lanata	0	4	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	76	79	84	5.37	3.79	5.50
B	Ephedra nevadensis	2	1	1	.03	-	.03
B	Grayia spinosa	3	3	2	.30	-	.15
B	Juniperus osteosperma	1	1	1	.15	.03	.15
B	Kochia americana	2	1	4	-	-	.00
B	Opuntia sp.	7	2	2	.00	-	.03
Total for Browse		212	202	210	32.27	25.30	29.33

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 10

Species	Percent Cover '06
Artemisia nova	25.88
Atriplex confertifolia	.70
Chrysothamnus viscidiflorus stenophyllus	4.83
Grayia spinosa	.28
Kochia americana	.15

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 10

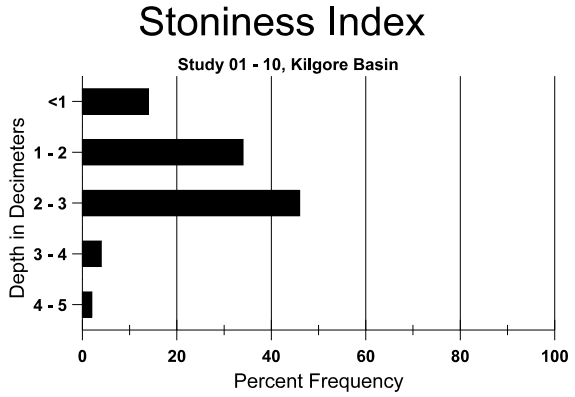
Species	Average leader growth (in)	
	'01	'06
Artemisia nova	0.8	1.0
Atriplex confertifolia	-	2.8

BASIC COVER --
Management unit 01 , Study no: 10

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	0	5.50	36.16	30.06	33.62
Rock	11.00	6.75	11.82	4.40	5.07
Pavement	40.00	55.25	28.72	36.97	38.77
Litter	21.50	13.75	19.58	11.14	19.35
Cryptogams	1.50	1.50	1.84	.89	.98
Bare Ground	26.00	17.25	9.20	22.91	15.21

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 10, Kilgore Basin

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.4	65.0 (10.8)	8.1	48.9	27.1	24.0	1.2	6.3	444.8	0.6



PELLET GROUP DATA --
Management unit 01 , Study no: 10

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	1	12
Elk	1	2	-
Deer	17	13	13
Cattle	1	2	6

Days use per acre (ha)	
'01	'06
-	-
-	-
21 (51)	11 (26)
5 (13)	14 (34)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**15932**	1800	1000	7466	7466	-	0	93	47	-	32	12/21
90	**16199**	933	1533	3933	10733	-	30	36	66	4	28	9/17
96	**13600**	560	1660	8340	3600	880	54	12	26	1	1	8/20
01	**15960**	40	1620	10800	3540	1040	22	.25	22	6	7	9/20
06	**12700**	117660	640	8140	3920	1560	6	.15	31	20	21	8/18
Artemisia tridentata wyomingensis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**80**	-	-	20	60	20	0	75	75	-	0	19/23
01	**20**	-	-	20	-	-	0	0	0	-	0	26/45
06	**0**	-	-	-	-	20	0	0	0	-	0	18/43
Atriplex confertifolia												
84	**1399**	-	66	333	1000	-	67	14	71	-	19	12/12
90	**1399**	-	133	400	866	-	0	10	62	6	24	7/10
96	**740**	40	140	580	20	40	43	8	3	-	0	10/14
01	**360**	40	120	220	20	220	0	6	6	6	6	8/11
06	**560**	20	40	520	-	20	4	0	0	-	0	9/14
Ceratoides lanata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**120**	20	40	80	-	-	0	0	-	-	0	3/3
06	**0**	-	-	-	-	-	0	0	-	-	0	6/8
Chrysothamnus viscidiflorus stenophyllus												
84	**3199**	-	66	1600	1533	-	58	10	48	-	15	6/7
90	**3399**	-	666	2600	133	-	20	0	4	-	0	7/11
96	**4620**	500	80	4500	40	20	3	0	1	-	0	9/15
01	**4060**	20	160	3400	500	60	0	0	12	2	2	9/14
06	**4140**	18020	60	3840	240	-	0	0	6	.48	.96	10/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ephedra nevadensis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	-	40	20	-	33	67	33	-	0	9/13
01	**20**	-	-	20	-	-	0	0	0	-	0	7/15
06	**60**	-	60	-	-	-	0	100	0	-	0	12/16
Grayia spinosa												
84	**66**	-	-	66	-	-	0	100	0	-	100	16/4
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**100**	-	-	40	60	-	100	0	60	60	60	15/33
01	**80**	-	-	60	20	20	0	0	25	-	0	11/10
06	**60**	-	-	60	-	-	0	0	0	-	0	14/26
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	20	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Kochia americana												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	2/4
01	**40**	-	-	40	-	-	0	0	-	-	0	2/7
06	**140**	-	20	120	-	-	29	71	-	-	0	5/6
Opuntia sp.												
84	**66**	-	-	66	-	-	0	0	0	-	0	4/4
90	**132**	-	66	66	-	-	0	0	0	-	0	3/4
96	**140**	-	40	80	20	-	0	0	14	-	0	4/8
01	**40**	-	40	-	-	-	0	0	0	-	0	-/-
06	**40**	-	20	20	-	-	0	0	0	-	0	5/7
Sarcobatus vermiculatus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	21/38
06	**0**	-	-	-	-	-	0	0	-	-	0	39/54

Trend Study 1-11-06

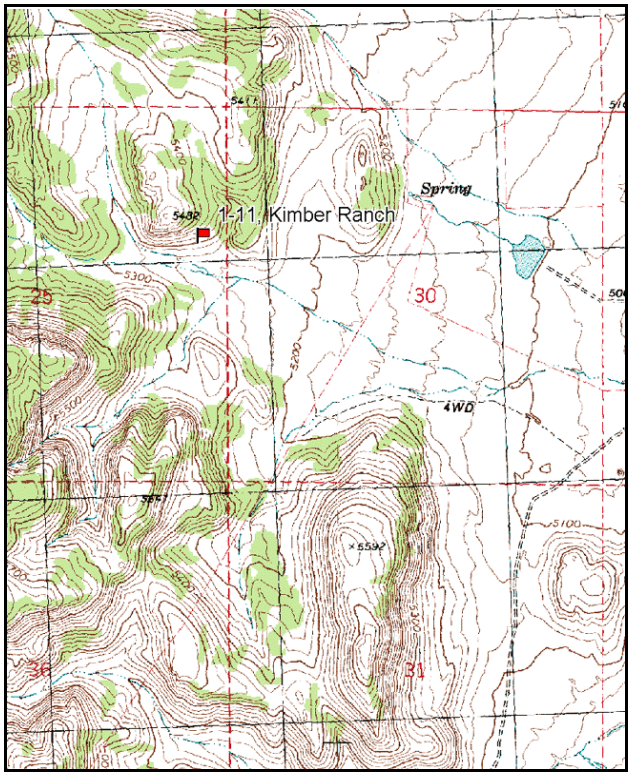
Study site name: Kimber Ranch . Vegetation type: Black Sagebrush .

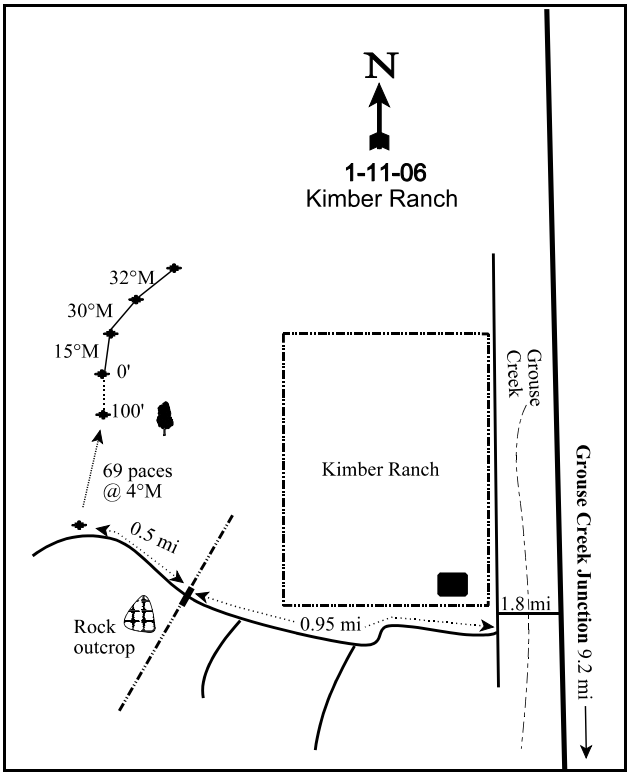
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed on U-30 to Grouse Creek junction, turn right and travel north 9.2 miles. Turn left at the ranch complex and proceed 1.8 miles to the Kimber Ranch. At the ranch house stay left for 0.05 miles. Stay left for another 0.25 miles, then turn right going west for 0.6 miles. Turn right for 0.1 miles to a gate. Continue up the road 0.5 miles to a witness post on the right side of the road. From the witness post walk 69 paces at 4 degrees magnetic to the 100-foot post. The 0-foot stake is 100 feet to the north and is marked by browse-tag #7912.





Map Name: Toms Cabin Spring

Diagrammatic Sketch

Township 10N , Range 19W , Section 25

UTM NAD 27, UTM 12T 4605076 N, 252701 E

DISCUSSION

Kimber Ranch - Trend Study No. 1-11

Study Information

The Kimber Ranch trend study (elevation: 5,300 feet, slope: 20-25%, aspect: south) samples a hillside dominated by black sagebrush southwest of Grouse Creek. The surrounding area is covered with patches of Utah juniper, which provide important thermal and hiding cover for wildlife. Winter use from deer on this black sagebrush type was very heavy in 1984. Additional use can come from cattle and horses. A pellet group transect in 2001 estimated 27 deer days use/acre (66 deer days use/ha) and 2 cow days use/acre (5 cow days use/ha). In 2006, 36 deer and 2 cow days use/acre (89 ddu/ha and 4 cdu/ha) were estimated.

Soil

This soil is part of the Plegomir series, which consists of very shallow soil over duripan, well drained, moderately permeable soils formed in alluvium from limestone, tuffaceous sandstone, or igneous rock. They are on dissected fan terraces and on sides of small hills (USDA-NRCS 2006). Soil texture is a clay loam that has a slightly alkaline soil reaction (7.8 pH). Protective ground cover (vegetation and litter cover) is poor and is comprised primarily of dead cheatgrass litter and shrub crowns with large amounts of rock and pavement. Apart from cheatgrass, herbaceous cover is insufficient. The soil condition class rating was slight in both 2001 and 2006. Relative percent bare ground increased in 2006 from 9% to 20% and pavement cover decreased.

Browse

Browse composition is dominated by a low-growing, evenly spaced stand of black sagebrush. The population was noted as heavily hedged in 1984. Use was moderate in 1996 and light in 2001 and 2006. Since 1996, black sagebrush density has continually declined, 10% in 2001 and 16% in 2006. Decadence increased from 17% of the population in 1996 to 33% in 2006. The percent of the population classified as dying increased to 16% in 2006. The proportion of young plants in the population has been good, but decreased to 8% of the population in 2006. Seedlings were very abundant in 2006, but may have a difficult time persisting with competition from cheatgrass. Young and Evans (1989) showed that sagebrush recruitment was completely stopped in a cheatgrass-dominated community in northwestern Nevada.

Other associated shrubs include Wyoming big sagebrush and shadscale, although together they provide less than 1% total cover. This is a marginal site for Wyoming big sagebrush, because of drought conditions and shallow rocky soils. Utah juniper density was 54 trees/acre in 2001 and increased to 60 trees/acre in 2006. Mean tree diameter was 5.0 inches in 2001 and 6.5 inches in 2006. Seventy five percent of the trees sampled in 2006 were less than eight feet tall.

Herbaceous Understory

The herbaceous understory is composed mainly of grasses. Cheatgrass is the most abundant species. It was sampled in at least 98% of the quadrats since it was first sampled in 1996. It was most abundant in 2001. Cheatgrass cover has averaged about 11% in both 2001 and 2006. Perennial grasses include: bluebunch wheatgrass, Thurber needlegrass, bottlebrush squirreltail, Indian ricegrass, and Sandberg bluegrass. Together these species provide on average only about 2% total cover. Indian ricegrass was significantly more abundant in 2006 than it previously had been. Perennial forbs are even more rare and together provide very little cover. Only seven forb species were sampled in 2006 and none had a higher quadrat frequency than 3%.

1990 TREND ASSESSMENT

Trend for black sagebrush is slightly down. Density has declined slightly and decadent black sagebrush have increased from 34% to 69%. Vigor is poor on 29% of the population. The sagebrush showed light to moderate hedging but had low reproduction potential. Low production would be expected with the drought. The high density of cheatgrass also inhibits sagebrush reproduction and growth. The grass trend is stable. Grasses have been heavily grazed. Cheatgrass is still fairly dense (there are no quantitative measures for

annuals before 1996). The forb trend is down and forbs are very sparse.

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

1996 TREND ASSESSMENT

Browse trend is slightly up due to increased density, improved vigor and reduced decadence (69% to 17%). Trend for grasses is down. Sum of nested frequency of perennial grasses declined 22%. Cheatgrass is also a major component. Sum of nested frequency for bluebunch wheatgrass and Indian ricegrass increased, while frequency of squirreltail and Thurber needlegrass declined. The forb trend is up, but forbs only make up less than 1% total cover.

winter range condition (DC Index) - fair-good (44) Lower potential scale
browse - slightly up (+1) grass - down (-2) forb - up (+2)

2001 TREND ASSESSMENT

Browse trend is slightly down due to a decrease in density. In addition, those plants classified with poor vigor increased and decadence increased (17% to 23%). Trend for grasses is down. Sum of nested frequency of perennial grasses declined 27% and cheatgrass increased significantly. Cheatgrass cover is high at 11%. The forb trend is also down as the few forbs found here were less abundant than in 1996. The DCI declined to fair with increased cheatgrass cover and higher decadence of black sagebrush.

winter range condition (DC Index) - fair (35) Lower potential scale
browse - slightly down (-1) grass - down (-2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Black sagebrush density declined from 7,200 plants/acre in 2001 to 6,040 plants/acre in 2006. Decadence also increased from 23% to 33%. Dry conditions and competition with cheatgrass may have caused this decline. The grass trend is stable. Perennial grass frequency remained stable. Cheatgrass frequency was significantly lower, but still very abundant and was sampled in 98% of the quadrats. Cheatgrass cover did not change. The forb trend is stable. Forbs are very rare. The DCI remained fair.

winter range condition (DC Index) - fair (31) Lower potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 11

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	-	-	-	2	-	-	.00	-
G	Agropyron spicatum	$_{a}$-	$_{b}$9	$_{c}$62	$_{c}$61	$_{c}$50	.73	.74	1.92
G	Bromus tectorum (a)	-	-	$_{a}$321	$_{c}$362	$_{b}$339	3.11	11.06	10.57
G	Oryzopsis hymenoides	$_{a}$4	$_{ab}$21	$_{b}$25	$_{a}$8	$_{b}$34	.34	.10	1.12
G	Poa secunda	6	8	-	10	-	.00	.07	-
G	Sitanion hystrix	$_{c}$79	$_{bc}$58	$_{ab}$43	$_{a}$21	$_{ab}$29	.41	.16	.65
G	Stipa thurberiana	$_{b}$99	$_{b}$106	$_{a}$28	$_{a}$13	$_{a}$6	.21	.16	.37
G	Vulpia octoflora (a)	-	-	$_{b}$22	$_{b}$21	$_{a}$-	.04	.06	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
Total for Annual Grasses		0	0	343	383	339	3.15	11.13	10.57
Total for Perennial Grasses		188	202	158	115	119	1.70	1.23	4.07
Total for Grasses		188	202	501	498	458	4.86	12.37	14.65
F	Antennaria rosea	-	-	-	2	-	-	.03	-
F	Astragalus beckwithii	1	-	4	-	-	.01	-	-
F	Astragalus utahensis	$_{ab}$11	$_{a}$3	$_{b}$23	$_{a}$3	$_{a}$6	.14	.03	.06
F	Balsamorhiza hookeri	-	-	-	1	-	-	.03	.03
F	Castilleja angustifolia	$_{b}$28	$_{a}$-	$_{a}$6	$_{a}$-	$_{a}$1	.02	-	.00
F	Chaenactis douglasii	1	-	-	-	-	-	-	-
F	Crepis acuminata	-	-	-	1	1	-	.03	.00
F	Cryptantha sp.	-	-	3	-	2	.01	-	.00
F	Descurainia pinnata (a)	-	-	$_{a}$3	$_{b}$12	$_{a}$-	.00	.06	-
F	Erigeron aphanactis	4	-	-	-	-	-	-	-
F	Eriogonum caespitosum	5	2	3	-	-	.00	-	-
F	Eriogonum ovalifolium	-	-	-	-	3	-	-	.03
F	Erigeron pumilus	-	-	-	1	-	-	.00	-
F	Gilia sp. (a)	-	-	$_{a}$2	$_{b}$114	$_{a}$-	.00	.34	-
F	Hymenopappus sp.	-	-	8	-	-	.06	-	-
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$9	$_{a}$-	-	.03	-
F	Lygodesmia sp.	-	-	3	-	-	.03	-	-
F	Navarretia intertexta (a)	-	-	2	-	-	.01	-	-
F	Orobanche fasciculata	-	1	6	2	-	.01	.00	-
F	Phlox longifolia	$_{b}$13	$_{ab}$9	$_{ab}$6	$_{ab}$14	$_{a}$3	.02	.03	.00
F	Streptanthus cordatus	-	1	-	-	-	-	-	-
F	Unknown forb-perennial	-	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	7	135	0	0.01	0.43	0
Total for Perennial Forbs		63	17	62	24	16	0.31	0.16	0.15
Total for Forbs		63	17	69	159	16	0.34	0.59	0.15

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

BROWSE TRENDS --
Management unit 01 , Study no: 11

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	98	93	96	14.88	15.18	13.32
B	Artemisia tridentata wyomingensis	0	3	4	-	.53	.71
B	Atriplex confertifolia	15	10	7	1.27	.48	.21
B	Ceratoides lanata	0	0	0	-	-	.00
B	Chrysothamnus viscidiflorus stenophyllus	16	20	18	.42	.46	.64
B	Gutierrezia sarothrae	8	6	1	.00	-	-
B	Juniperus osteosperma	2	3	3	1.62	1.63	1.63
B	Kochia americana	9	9	6	.07	.07	.15
B	Opuntia sp.	0	1	0	.00	-	-
Total for Browse		148	145	135	18.29	18.36	16.68

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 11

Species	Percent Cover	
	'01	'06
Artemisia nova	-	14.61
Artemisia tridentata wyomingensis	-	.61
Atriplex confertifolia	-	.58
Chrysothamnus viscidiflorus stenophyllus	-	1.45
Juniperus osteosperma	2.20	1.66

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 11

Species	Average leader growth (in)	
	'01	'06
Artemisia nova	0.7	0.9
Artemisia tridentata wyomingensis	-	1.1

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 11

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	60	54

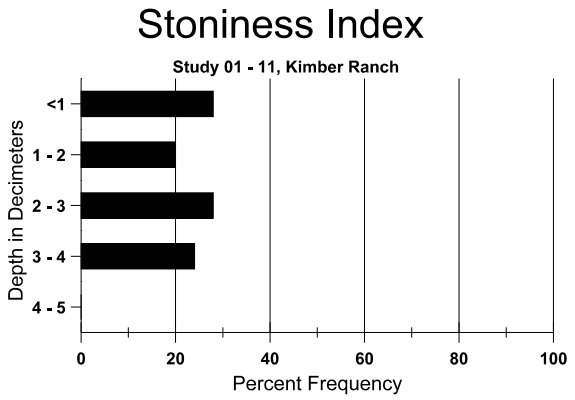
Average diameter (in)	
'01	'06
5.0	6.5

BASIC COVER --
Management unit 01 , Study no: 11

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.75	9.00	25.21	31.16	31.70
Rock	19.50	26.50	17.69	19.26	17.98
Pavement	40.50	43.50	37.90	35.37	21.46
Litter	35.75	17.75	12.99	16.33	19.96
Cryptogams	0	0	.08	.01	.42
Bare Ground	2.50	3.25	6.77	10.06	22.68

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 11, Kimber Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.9	73.0 (10.5)	7.8	42.9	29.1	28.0	1.9	7.0	134.4	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 11

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	6	-	15
Horse	1	-	-
Elk	-	-	2
Deer	17	15	22
Cattle	-	7	1

Days use per acre (ha)	
'01	'06
-	-
-	-
-	-
27 (66)	36 (89)
4 (11)	2 (4)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**5665**	-	866	2866	1933	-	8	88	34	-	15	7/17
90	**5133**	-	400	1200	3533	-	21	0	69	7	29	9/15
96	**7980**	340	900	5760	1320	620	56	2	17	3	3	12/24
01	**7200**	-	1120	4460	1620	440	3	2	23	8	8	9/20
06	**6040**	1760	500	3560	1980	700	10	4	33	16	16	10/23
Artemisia tridentata wyomingensis												
84	**1532**	-	800	466	266	-	22	52	17	-	9	17/21
90	**399**	-	66	133	200	-	0	0	50	-	17	11/14
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**60**	-	-	40	20	-	0	0	33	33	33	24/23
06	**100**	-	-	100	-	-	40	0	0	-	0	18/29
Atriplex confertifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**880**	120	500	380	-	20	16	0	0	-	0	9/17
01	**380**	-	120	140	120	20	0	0	32	21	21	14/26
06	**380**	-	40	320	20	-	0	0	5	5	5	14/23
Chrysothamnus nauseosus hololeucus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	26/51
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus												
84	**1465**	-	66	1066	333	-	36	0	23	-	5	11/15
90	**1000**	-	-	800	200	-	0	0	20	6	20	11/16
96	**420**	40	-	420	-	-	0	0	0	-	0	11/20
01	**520**	-	60	400	60	20	0	0	12	4	4	8/16
06	**480**	-	40	440	-	-	4	0	0	-	0	10/15
Grayia spinosa												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	29/42
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**360**	20	20	340	-	-	0	0	0	-	0	7/9
01	**160**	-	-	80	80	-	0	0	50	38	38	4/5
06	**20**	-	20	-	-	-	0	0	0	-	0	-/-
Juniperus osteosperma												
84	**66**	-	66	-	-	-	0	0	-	-	0	-/-
90	**66**	-	-	66	-	-	0	0	-	-	0	65/55
96	**40**	-	-	40	-	-	0	0	-	-	0	-/-
01	**60**	-	20	40	-	-	0	0	-	-	0	-/-
06	**60**	-	40	20	-	-	0	0	-	-	0	-/-
Kochia americana												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**460**	20	140	300	20	-	4	0	4	-	0	4/6
01	**340**	-	160	180	-	-	0	0	0	-	0	4/4
06	**140**	-	20	120	-	-	0	0	0	-	0	5/5
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**66**	-	66	-	-	-	0	0	-	-	100	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	4/2

Trend Study 1-12-06

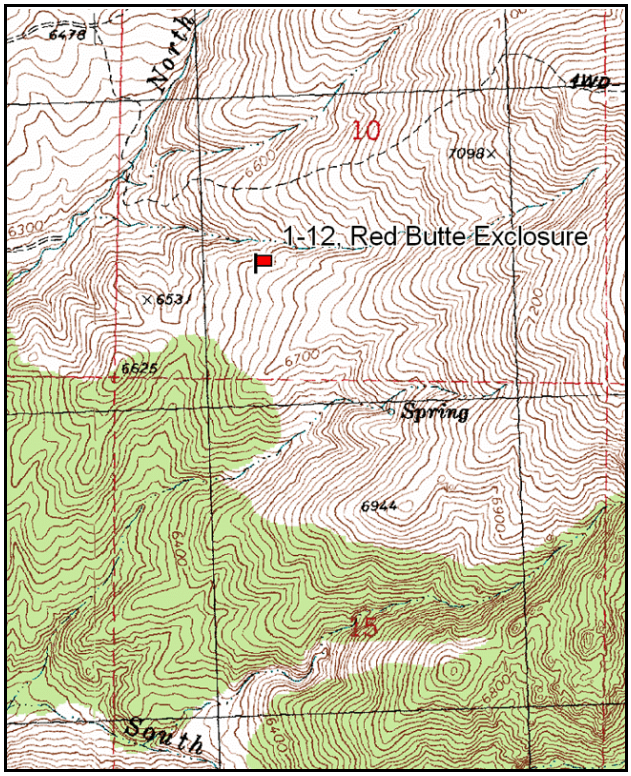
Study site name: Red Butte Exclosure . Vegetation type: Mountain Brush .

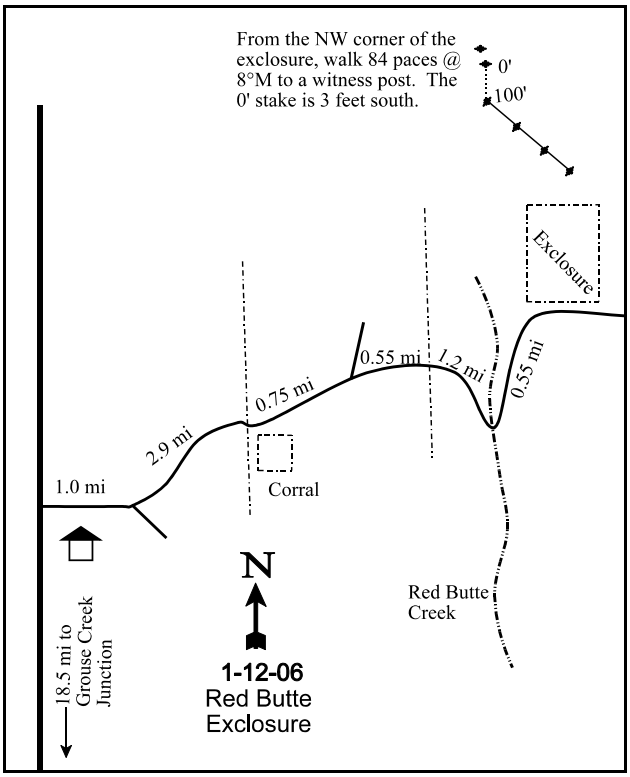
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

A four-wheel drive vehicle is needed to access this study. Proceed about 18.5 miles north from Grouse Creek Junction and turn right onto Ingham Canyon Road. Travel 1.0 miles to the first significant fork and turn left. Proceed 2.9 miles to a fence with a corral on the east side. Continue east and north for 0.75 miles to a fork and turn right. Proceed 0.55 miles to a fence. From the fence go 1.2 miles, staying right, to the bottom of the creek. From the creek, proceed up the dugway 0.55 miles to the southwest corner of the Red Butte exclosure. From the northwest corner of the exclosure, walk 84 paces at 8 degrees magnetic to the 0-foot stake of the baseline, which is marked by browse-tag #7915. Bearing of the baseline is 165 degrees magnetic and turns to 91 degrees magnetic.





Map Name: Ingham Canyon

Diagrammatic Sketch

Township 11N , Range 17W , Section 10

UTM NAD 27, UTM 12T 4618669 N, 268169 E

DISCUSSION

Red Butte Exclosure - Trend Study No. 1-12

Study Information

This study is located on the west slope of the Grouse Creek Mountains adjacent to the Red Butte exclosure (elevation: 6,590 feet, slope: 10-15%, aspect: southwest). This area is considered preferred winter range. During most years, it is used as an area where deer remain in fall and winter as long as snow conditions permit. As snow depths increase, deer migrate further south to lower elevations. This area is also important fawning habitat. The vegetation type is basin big sagebrush-grass with antelope bitterbrush, mountain snowberry, and Saskatoon serviceberry. Deer use appears light, as judged from pellet group frequency and browse utilization. Summer cattle grazing is probably more significant. Cattle were on the area in 1984 and had already made a noticeable impact, especially on grasses and forbs. This area is within the Ingham allotment which is used from May 1 to September 15. A pellet group transect in 2001 estimated light deer use at 21 days use/acre (53 deer days use/ha) and cow use at 2 days use/acre (4 cow days use/ha). Some sage grouse scat was also seen along the baseline but not sampled within the pellet group transect. In 2006, 18 deer days use/acre and 31 cow days use/acre (45 ddu/ha and 75 cdu/ha) were estimated. Cattle were on the study in 2006.

Soil

The soil is part of the Bullump series, which consists of deep, well drained soils that formed in colluvium derived from quartzite, welded tuff, chert, argillite, shale, conglomerate, and rhyolite with a component of loess (USDA-NRCS 2006). The soil is fertile with a sandy loam texture and a moderate amount of surface rock. Soil reaction is neutral (6.8 pH). Effective rooting depth estimates taken in 1996 averaged just over 20 inches. Although numerous areas of bare ground are exposed, the thickness and permanence of vegetation and litter cover on the remaining area has prevented serious soil loss. The ratio of bare soil to protective cover has decreased from 1:4.9 in 1996 to 1:3.5 in 2006. The erosion condition was classified as stable in 2001, but was slight in 2006 due to pedestalling, small rills, and flow patterns.

Browse

Shrubs are abundant and on average account for over 50% of the vegetation cover. The key browse species are basin big sagebrush and bitterbrush, which contribute about half of the browse cover. Big sagebrush appears to be a mix of both basin and mountain big sagebrush. Sagebrush cover has averaged about 8% and density has remained stable at about 1,400 plants/acre since 1996. Density estimates were higher in 1984 and 1990, but these differences are likely due to the smaller sampling size used prior to 1992. Decadence was highest in 1984 and 1990 with over half of the population showing signs of decadence. Percent decadence has been moderate in recent years. Utilization was moderate in 1984 and light in subsequent years.

Antelope bitterbrush cover has averaged about 10% in both 2001 and 2006. Bitterbrush density has averaged nearly 800 plants/acre since 1996. Vigor has been good and 0% of the population was classified as decadent in 2006. Utilization has been mostly moderate to heavy. Mountain snowberry is not a preferred shrub, but is abundant in the area with an average of 8% cover. This population has remained stable. Stickyleaf low rabbitbrush cover has been about 6% and density has declined with each reading.

Herbaceous Understory

Perennial grasses comprise an important part of the understory. Unfortunately, annual cheatgrass is also abundant, but it has declined. Quadrat frequency has changed very little (86% in 1996, 85% in 2001, and 80% in 2006), but nested frequency has declined significantly with each reading. Percent cover has also declined (15%, 11%, 4% respectively). The most abundant perennial species is thickspike wheatgrass, an open sod former that can be grazing tolerant. Sandberg bluegrass is also fairly abundant. Other grass species occur much less frequently but almost all showed evidence of use during past readings.

The study area has a good mixture of forbs that includes a few conspicuous and desirable species in addition to

larger numbers of less desirable ones. Showy forbs include: arrowleaf balsamroot, narrowleaf lomatium, tapertip hawksbeard, and penstemon.

1990 TREND ASSESSMENT

Narrowleaf low rabbitbrush is the most abundant shrub. The big sagebrush population is stable. The sagebrush shows light to moderate hedging but a high amount of decadence (53%). However, this was lower than in 1984 when decadence was estimated at 60%. Bitterbrush has shown little change except that decadence has declined from 50% to 25%. Bitterbrush is more heavily hedged but still maintains good vigor. Low rabbitbrush has not increased. There is a fair diversity of grasses and forbs. The grass trend is up. Thickspike wheatgrass and mutton bluegrass both increased in nested frequency. Sum of nested frequency for forbs was stable. Sum of nested frequency for arrowleaf balsamroot has remained constant while the most numerous forb, longleaf phlox, has increased significantly.

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

1996 TREND ASSESSMENT

Trend for the key browse species is stable with basin big sagebrush and bitterbrush showing basically stable populations. Utilization is mostly light on both species and percent decadence has also declined. Changes in density of these two species is likely due to the larger sample used in 1996. Snowberry appears to have a stable trend also. The increaser, narrowleaf low rabbitbrush, shows a stable trend and the only major change is a reduced decadence rate (27% to 0%). Trend for grasses is down due to a decline in the sum of nested frequency for perennial grasses. Thickspike wheatgrass declined significantly in sum of nested frequency. The forb trend is also down. The majority of the decline in sum of nested frequency is due to significant declines in less desirable forbs including tapertip hawksbeard, larkspur, and longleaf phlox. The DCI score is poor-fair. Perennial grass cover is low and cheatgrass cover is high, which lowers the score.

winter range condition (DC Index) - poor-fair (50) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species, basin big sagebrush and bitterbrush is stable. Utilization is light and percent decadence still remains within satisfactory limits. The increaser, narrowleaf low rabbitbrush, continues to show slight decreases of density. The grass trend is stable. Sum of nested frequency of perennial grasses declined slightly, but cheatgrass also decreased. Cheatgrass still makes up 66% of the grass cover. The forb trend is stable. The majority of the forb cover comes from two species, arrowleaf balsamroot and the annual, blue eyed Mary. Both species have remained stable since 1996. The DCI score remained poor-fair. Shrub decadence was higher.

winter range condition (DC Index) - poor-fair (50) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2006 TREND ASSESSMENT

The soil trend is slightly down. Relative percent bare ground increased from 8% to 15%. The ratio of bare ground to protective ground cover (vegetation, litter, and cryptogams) declined from 1:4.6 to 1:3.5. Litter cover has also declined, likely due to the decrease of cheatgrass. The browse trend is stable. The basin big sagebrush and bitterbrush populations have changed very little. The grass trend is slightly up. Cheatgrass nested frequency declined significantly and cover was much lower. Perennial grass sum of nested frequency was basically unchanged. The forb trend is up. Longleaf phlox and cryptantha were significantly more abundant in 2006. The DCI score improved to fair as cheatgrass cover and shrub decadence improved.

winter range condition (DC Index) - fair (56) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 12

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	bc237	c267	ab185	a176	a150	2.44	3.51	1.66
G	Agropyron spicatum	a-	a-	b21	a-	a4	.56	-	.06
G	Bromus anomalus	-	-	-	3	-	-	.03	-
G	Bromus tectorum (a)	-	-	c320	b273	a224	15.28	10.79	3.85
G	Koeleria cristata	2	-	5	-	2	.18	-	.04
G	Oryzopsis hymenoides	-	-	8	4	-	.04	.03	-
G	Poa fendleriana	a7	b102	a-	a-	a1	-	-	.03
G	Poa secunda	a47	a47	b91	b92	b126	2.19	1.93	2.92
G	Sitanion hystrix	a-	ab1	ab13	ab5	b12	.04	.03	.07
G	Stipa comata	-	1	-	-	-	-	-	-
Total for Annual Grasses		0	0	320	273	224	15.28	10.79	3.85
Total for Perennial Grasses		293	418	323	280	295	5.47	5.54	4.79
Total for Grasses		293	418	643	553	519	20.75	16.34	8.65
F	Agoseris glauca	b66	ab43	ab57	a31	c125	.15	.17	1.56
F	Allium acuminatum	b94	a36	a21	b107	a29	.06	.42	.06
F	Antennaria rosea	-	8	3	-	3	.15	-	.03
F	Arabis sp.	a-	a1	ab10	a-	b17	.02	-	.12
F	Astragalus beckwithii	b13	a-	ab5	ab8	ab6	.03	.21	.03
F	Astragalus cibarius	ab16	b26	ab25	a7	ab17	.18	.07	.31
F	Astragalus convallarius	-	2	-	-	-	-	-	-
F	Balsamorhiza sagittata	60	60	56	45	42	5.59	6.66	8.22
F	Camelina microcarpa (a)	-	-	1	3	3	.00	.00	.00
F	Chenopodium fremontii (a)	-	-	-	1	-	-	.00	-
F	Collomia linearis (a)	-	-	15	19	32	.04	.04	.14
F	Comandra pallida	2	7	1	7	2	.00	.18	.00
F	Collinsia parviflora (a)	-	-	217	230	223	1.45	5.28	.90
F	Cordylanthus ramosus (a)	-	-	-	3	-	-	.15	-
F	Crepis acuminata	b56	b70	a9	a17	a16	.02	.48	.55
F	Cryptantha sp.	a-	a-	b27	a-	b49	.08	-	.12
F	Delphinium nuttallianum	b22	b18	a-	b21	b17	-	.06	.04
F	Descurainia pinnata (a)	-	-	-	2	-	-	.00	-
F	Eriogonum umbellatum	-	6	6	4	3	.18	.03	.15

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Gayophytum ramosissimum(a)	-	-	1	12	8	.00	.04	.02
F	Gilia sp. (a)	-	-	-	-	7	-	.00	.01
F	Haplopappus acaulis	-	-	7	-	2	.03	-	.03
F	Hackelia patens	$_{ab}$11	$_{ab}$13	$_{ab}$16	$_{a}$1	$_{b}$19	.14	.03	.62
F	Holosteum umbellatum (a)	-	-	3	-	-	.00	-	-
F	Lappula occidentalis (a)	-	-	-	2	3	-	.00	.00
F	Lithophragma parviflora	-	-	-	-	11	-	-	.05
F	Lithospermum ruderale	-	-	-	3	-	-	.01	-
F	Lomatium triternatum	$_{ab}$21	$_{ab}$24	$_{a}$3	$_{b}$24	$_{ab}$23	.01	.22	.32
F	Lupinus argenteus	-	-	-	1	-	-	.03	-
F	Machaeranthera spp	-	-	4	-	-	.01	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$92	$_{b}$61	-	.72	.13
F	Nemophila breviflora (a)	-	-	-	-	3	-	-	.03
F	Phlox longifolia	$_{c}$154	$_{d}$217	$_{ab}$81	$_{a}$54	$_{bc}$122	.56	.46	1.25
F	Polygonum douglasii (a)	-	-	$_{b}$46	$_{a}$-	$_{b}$46	.10	-	.17
F	Ranunculus testiculatus (a)	-	-	2	-	3	.00	-	.00
F	Sedum lanceolatum	-	-	6	-	1	.01	-	.00
F	Tragopogon dubius	-	-	-	3	-	.00	.03	-
F	Unknown forb-perennial	$_{ab}$4	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	.07	-	-
F	Veronica biloba (a)	-	-	$_{a}$3	$_{a}$8	$_{b}$42	.00	.06	.46
F	Viguiera multiflora	-	-	8	11	-	.04	.04	-
Total for Annual Forbs		0	0	288	372	431	1.62	6.33	1.89
Total for Perennial Forbs		519	531	358	344	504	7.39	9.16	13.50
Total for Forbs		519	531	646	716	935	9.02	15.50	15.40

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

BROWSE TRENDS --
Management unit 01 , Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	3	1	1	.30	.00	-
B	Artemisia tridentata tridentata	48	51	51	9.52	8.38	7.52
B	Chrysothamnus nauseosus consimilis	2	1	1	.15	-	.15
B	Chrysothamnus viscidiflorus viscidiflorus	76	73	62	6.46	6.42	5.61
B	Eriogonum microthecum	2	2	2	.15	.15	-
B	Opuntia sp.	49	45	52	3.35	2.71	2.36
B	Purshia tridentata	31	31	31	6.71	10.81	9.68
B	Symphoricarpos oreophilus	53	50	51	6.17	8.47	8.93
Total for Browse		264	254	251	32.82	36.95	34.27

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 12

Species	Percent Cover
	'06
Artemisia tridentata tridentata	11.23
Chrysothamnus viscidiflorus viscidiflorus	7.50
Opuntia sp.	1.70
Purshia tridentata	11.16
Symphoricarpos oreophilus	14.63

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 12

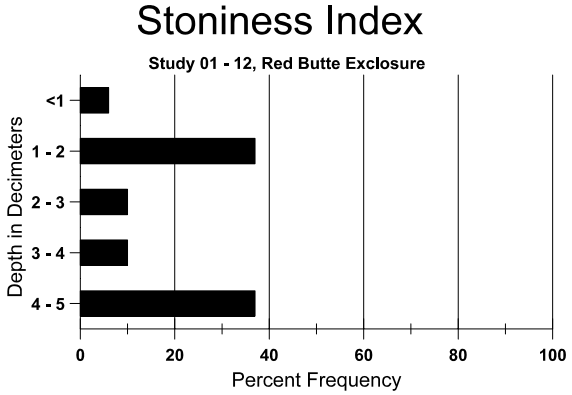
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata tridentata	2.9	1.5
Purshia tridentata	0.9	0.6

BASIC COVER --
Management unit 01 , Study no: 12

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	11.50	56.69	62.91	51.35
Rock	1.75	1.00	4.32	3.58	3.66
Pavement	3.00	2.50	4.30	4.63	8.68
Litter	59.25	54.25	59.50	47.27	36.26
Cryptogams	2.50	.75	.34	.25	.76
Bare Ground	30.50	30.00	6.39	10.42	17.04

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 12, Red Butte Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
20.3	52.6 (17.1)	6.8	68.6	15.4	16.0	2.6	20.7	201.6	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 12

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	2	12
Deer	6	7	11
Cattle	4	4	7

Days use per acre (ha)	
'01	'06
-	-
21 (53)	18 (45)
2 (4)	31 (75)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**266**	-	266	-	-	-	0	0	0	-	0	-/-
96	**60**	-	-	20	40	-	0	33	67	-	0	24/26
01	**20**	-	-	20	-	-	100	0	0	-	0	27/26
06	**20**	-	-	20	-	-	0	0	0	-	0	32/33
Artemisia tridentata tridentata												
84	**2332**	666	266	666	1400	-	43	6	60	-	23	33/33
90	**2532**	-	266	933	1333	-	13	3	53	-	3	24/30
96	**1440**	80	220	880	340	520	15	0	24	8	8	28/35
01	**1320**	-	60	800	460	420	2	0	35	12	12	28/37
06	**1400**	2700	120	880	400	540	11	4	29	13	14	32/43
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**100**	-	-	100	-	-	0	0	0	-	0	21/20
01	**40**	-	-	40	-	-	0	0	0	-	0	21/30
06	**20**	-	-	-	20	-	0	0	100	100	100	26/27
Chrysothamnus viscidiflorus viscidiflorus												
84	**4066**	133	1133	1600	1333	-	20	0	33	-	2	11/10
90	**3932**	266	1666	1200	1066	-	12	7	27	-	5	15/17
96	**3640**	-	340	3300	-	-	2	0	0	-	0	17/27
01	**2940**	20	120	2400	420	60	1	0	14	4	5	15/19
06	**2240**	-	120	1940	180	40	0	0	8	.89	.89	17/25
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	5/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	-	60	-	-	33	0	-	-	0	10/11
01	**40**	-	-	40	-	-	0	0	-	-	0	10/17
06	**40**	-	-	40	-	-	50	0	-	-	0	13/15
Opuntia sp.												
84	**1600**	-	-	1600	-	-	0	0	0	-	0	4/3
90	**799**	200	266	333	200	-	8	0	25	-	33	4/10
96	**1820**	-	100	1660	60	-	0	0	3	3	5	5/16
01	**2080**	-	200	1780	100	20	0	0	5	4	4	4/12
06	**2140**	-	40	2020	80	-	0	0	4	2	2	5/16
Purshia tridentata												
84	**266**	-	-	133	133	-	25	75	50	-	25	11/13
90	**266**	-	-	200	66	-	0	0	25	-	0	13/17
96	**780**	-	60	680	40	60	36	3	5	3	3	24/47
01	**720**	-	60	440	220	60	53	17	31	-	0	30/62
06	**860**	480	-	860	-	80	35	40	0	-	0	31/53
Symphoricarpos oreophilus												
84	**4466**	-	3800	666	-	-	0	0	0	-	0	17/46
90	**532**	266	66	466	-	-	25	0	0	-	0	10/15
96	**3820**	140	1520	2240	60	-	2	1	2	.52	.52	17/38
01	**2820**	-	440	2360	20	20	.70	0	1	.70	.70	19/38
06	**2960**	-	680	2180	100	20	0	3	3	-	0	19/36

Trend Study 1-13-06

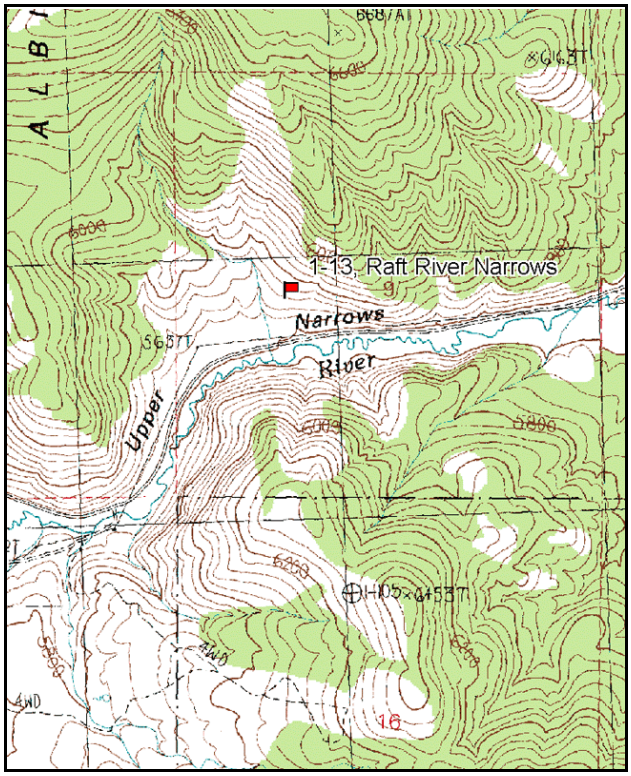
Study site name: Raft River Narrows . Vegetation type: Big Sagebrush .

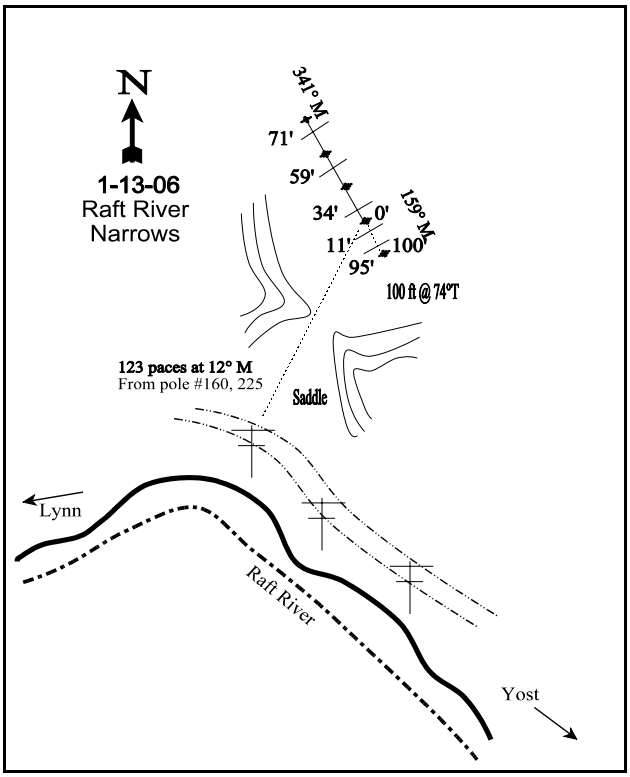
Compass bearing: frequency baseline 160 degrees magnetic.

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

LOCATION DESCRIPTION

From Lynn proceed to the bridge over the Raft River just before the Upper Narrows. Proceed east 0.95 miles from the bridge to a set of double power poles (#'s 160 and 225). From the northernmost pole, walk 123 paces at 13 degrees magnetic, to the 0-foot stake of the frequency baseline, marked with browse tag #7917. The bearing of the baseline is 160 degrees magnetic. The rest of the baseline runs 341 degrees magnetic from the 0 foot baseline stake.





Map Name: Buck Hollow, Utah-Idaho Diagrammatic Sketch

Township 14N , Range 16W , Section 9 UTM NAD 27, UTM 12T 4647835 N, 276805 E

DISCUSSION

Raft River Narrows - Trend Study No. 1-13

Study Information

This study is located on important winter range on a Wyoming big sagebrush-grass vegetation type (elevation: 5,700 feet, slope: 30-35%, aspect: southwest). Part of the study was burned in 2000 as part of a backfire that was intended to stop a wildfire from crossing Raft River Canyon. As a result, the first 100 feet of the baseline was burned. The area is in the Junction Creek allotment. Cattle were observed grazing along the river bottom when the transect was established in 1984, but no sign of livestock grazing was noted on the steeper slopes. A pellet group transect in 2001 estimated 11 deer days use/acre (28 deer days use/ha). In 2006, 27 deer days use/acre (66 ddu/ha) and 1 cow day use/acre (2 cdu/ha) were estimated.

Soil

The Solak soil series consists of shallow, somewhat excessively drained, moderately permeable soils that formed in residuum and colluvium weathered from conglomerate composed of sandstone, quartzite, and limestone (USDA-NRCS 2006). Soils are rocky on the surface and throughout the profile. Soil texture is a sandy clay loam and reaction is moderately alkaline (8.2 pH). Phosphorus is low (3.6 ppm), which can limit normal plant growth and development (Tiedemann and Lopez 2004). Effective rooting depth is fairly shallow at 9 inches. However, the underlying parent material must contain numerous fractures to allow the deeper rooted Wyoming big sagebrush to establish. The soil is easily disturbed on the 30-35% slope. However, protective ground cover is sufficient to control erosion. A uniform litter cover composed primarily of dead cheatgrass seems effective in enhancing penetration of water into the soil and thus reducing runoff. The erosion condition was classified as stable in 2001 and 2006.

Browse

Browse composition is dominated by Wyoming big sagebrush, which contributed 15% cover in 1996 and about 9% cover in 2001 and 2006. Sagebrush were very heavily hedged in 1984 with 92% of the population showing heavy use. During the 1990 reading, density and percent decadence remained similar, yet use was mostly light to moderate. In 1996, the original baseline was lengthened from 100 ft to 400 ft. This increased sample estimated a much larger density for Wyoming big sagebrush at 15,500 plants/acre (2,499 plants/acre in 1990), 84% of which were young plants. Seedlings were also extremely numerous (14,200 plants/acre). In 2001, young plants were less numerous and the fire had killed part of the population. Density declined to 7,020 plants/acre. Young plants were still very common (47% of the population). In 2006, the total density of sagebrush was lower as the number of young plants declined, but total number of mature and decadent plants was higher (3,720 plants/acre to 4,540 plants/acre in 2006). Decadence increased from 7% in 2001 to 18% in 2006. Basin big sagebrush dominates the flat areas down slope where the soil is significantly deeper.

Greasewood is also found in greater numbers at the bottom of the hill, but some plants have been sampled up-slope. Narrowleaf low rabbitbrush was very numerous, but density has declined since 1996. Other less abundant shrubs include shadscale, broom snakeweed, and threadleaf rubber rabbitbrush.

Herbaceous Understory

The herbaceous understory is depleted. Cheatgrass is the most abundant species. Data for annual species were first collected in 1996, but the presence of cheatgrass was noted in 1984 and 1990. Since 1996, cheatgrass nested frequency has significantly increased in both 2001 and 2006. Cheatgrass cover also increased each year (3% in 1996, 13% in 2001, and 17% in 2006). This high amount of cheatgrass is a fire hazard, which would cause the destruction of sagebrush and other perennial species. Perennial grasses are not abundant. Sandberg bluegrass is the most abundant perennial grass and nested frequency increased significantly between 1996 and 2006. Forbs are very sparse.

1990 TREND ASSESSMENT
Density and age class structure of the key browse species (Wyoming big sagebrush) appears stable. Utilization is light to moderate and percent decadence has declined slightly. Narrowleaf low rabbitbrush decreased in density. The grass trend is slightly up as one of four sampled species significantly increased. The forb trend is also slightly up with an increase in the number of perennial forbs. The understory remains in a depleted and poor condition with very high densities of cheatgrass.

browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

1996 TREND ASSESSMENT
Trend for the Wyoming big sagebrush is up. Density increased while heavy use and decadence declined. Seedlings and young are abundant indicating a dynamic reproductive potential. Some of the change in density may be partially due to the lengthening of the baseline which increased the area sampled. Density of mature plants increased from 1,133 plants/acre to 1,780. Vigor is good on most plants. Trend for the undesirable narrowleaf low rabbitbrush appears stable. Trend for grasses is slightly up. Sum of nested frequency increased. Some of this change maybe the expanded sampling area. Annual cheatgrass is still dominant providing 63% of the grass cover. The forb trend is up. Forbs are rare, but frequency has increased. The DCI score is good, but perennial grasses and forbs are lacking.

winter range condition (DC Index) - good (54) Lower potential scale
browse - up (+2) grass - slightly up (+1) forb - up (+2)

2001 TREND ASSESSMENT
Trend for Wyoming big sagebrush is down due to the decrease in density of young plants (13,080 to 3,300 plants/acre) and after part of the study burned in 2000. Sagebrush cover declined from 15% to 10%. Utilization is now entirely classified as light. Decadence is low at only 7% and vigor is good on almost all plants. The undesirable narrowleaf low rabbitbrush now appears at its lowest density since 1984. Trend for grasses is slightly down. Perennial grasses have remained stable, but cheatgrass has significantly increased in nested frequency and cover increased from 3% to 13%. The forb trend is down as perennial forbs decreased substantially since 1996. The DCI score declined to fair due to the loss of sagebrush cover after the fire and the increase of cheatgrass cover.

winter range condition (DC Index) - fair (37) Lower potential scale
browse - down (-2) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT
The soil trend is stable. Ground cover characteristics have changed very little and the erosion condition class rating was stable. The browse trend is slightly down. Overall sagebrush density declined from 7,020 plants/acre in 2001 to 4,920 plants/acre in 2006, but much of this decline is due to the decline of the number of young shrubs. The decline in young recruitment may coincide with the increase in cheatgrass which competes with seedlings and young sagebrush. The density of mature and decadent plants actually increased from 3,720 plants/acre to 4,540 plants/acre. The number of decadent plants increased from 480/acre to 880/acre. Sagebrush cover was 9% in 2006. The grass trend is stable. Sum of nested frequency for perennial grasses increased. Sandberg bluegrass has significantly increased since 1996. Unfortunately, cheatgrass has also significantly increased. It was sampled in 100% of the quadrats. Cover has also increased to 17%. The forb trend is stable, although the weedy, annual species tumble mustard was sampled for the first time and was sampled in 37% of the quadrats. The DCI score was lower as sagebrush recruitment was lower and percent decadence was higher.

winter range condition (DC Index) - fair (28) Lower potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 13

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	8	10	12	19	25	.31	.28	1.02
G	Bromus tectorum (a)	-	-	287	334	364	3.48	13.07	16.60
G	Oryzopsis hymenoides	a5	ab8	ab11	ab9	b16	.07	.45	1.91
G	Poa secunda	a3	b35	b44	bc55	c72	.68	.53	2.32
G	Sitanion hystrix	16	13	35	14	12	.56	.11	.16
G	Stipa comata	a-	a-	b16	b17	b15	.31	.64	.63
G	Vulpia octoflora (a)	-	-	b11	a-	b16	.07	-	.04
Total for Annual Grasses		0	0	298	334	380	3.55	13.07	16.64
Total for Perennial Grasses		32	66	118	114	140	1.94	2.02	6.06
Total for Grasses		32	66	416	448	520	5.50	15.10	22.71
F	Alyssum alyssoides (a)	-	-	a11	a5	b132	.02	.01	2.73
F	Arabis sp.	-	3	4	-	-	.01	-	-
F	Astragalus beckwithii	a6	a4	b19	a3	a6	.22	.00	.48
F	Astragalus sp.	-	-	-	-	1	-	-	.15
F	Castilleja chromosa	-	-	5	1	4	.06	.00	.00
F	Caulanthus crassicaulis	-	-	2	-	-	.03	-	-
F	Castilleja linariaefolia	-	-	-	-	3	-	-	.00
F	Chaenactis douglasii	a1	a16	b36	a4	a9	.16	.03	.05
F	Collinsia parviflora (a)	-	-	4	-	6	.01	-	.01
F	Cryptantha sp.	-	-	9	-	-	.04	-	-
F	Delphinium nuttallianum	-	-	-	1	-	-	.00	-
F	Descurainia pinnata (a)	-	-	a23	b100	a8	.07	1.49	.03
F	Eriogonum caespitosum	-	3	5	-	-	.04	-	-
F	Eriogonum ovalifolium	-	-	-	-	2	-	-	.06
F	Erigeron pumilus	a1	a-	b11	ab6	ab4	.10	.03	.03
F	Gayophytum ramosissimum(a)	-	-	-	3	-	-	.00	-
F	Gilia sp. (a)	-	-	a7	b106	a-	.02	.43	-
F	Lappula occidentalis (a)	-	-	15	26	29	.03	.12	.08
F	Lactuca serriola	-	-	ab1	b11	a-	.00	.10	-
F	Machaeranthera canescens	-	-	3	-	4	.00	-	.01
F	Microsteris gracilis (a)	-	-	-	-	4	-	-	.01
F	Oenothera caespitosa	-	-	5	-	-	.03	-	-
F	Phlox hoodii	5	5	9	6	-	.15	.06	-
F	Sisymbrium altissimum (a)	-	-	a-	a-	b78	-	-	.31
F	Tragopogon dubius	-	-	1	-	-	.00	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
Total for Annual Forbs		0	0	60	240	257	0.15	2.05	3.18
Total for Perennial Forbs		13	31	110	32	33	0.89	0.24	0.82
Total for Forbs		13	31	170	272	290	1.05	2.29	4.00

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

BROWSE TRENDS --
Management unit 01 , Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	96	60	61	14.67	9.76	9.03
B	Atriplex confertifolia	2	3	2	-	-	-
B	Chrysothamnus nauseosus consimilis	0	0	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	91	37	42	7.21	.36	1.00
B	Leptodactylon pungens	1	0	0	-	-	-
B	Opuntia sp.	16	8	8	1.12	.41	.00
B	Sarcobatus vermiculatus	2	2	2	.15	.63	.63
Total for Browse		208	110	115	23.16	11.17	10.68

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 13

Species	Percent Cover '06
Artemisia tridentata wyomingensis	9.55
Chrysothamnus viscidiflorus stenophyllus	1.41
Sarcobatus vermiculatus	1.54

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 13

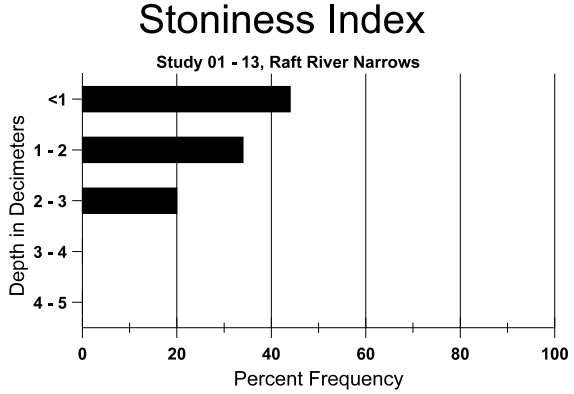
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.3	0.9

BASIC COVER --
Management unit 01 , Study no: 13

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.00	5.50	30.90	29.56	37.43
Rock	18.25	24.50	26.53	21.75	21.67
Pavement	10.50	31.00	8.90	19.43	9.73
Litter	56.50	31.75	29.68	21.09	28.21
Cryptogams	.50	2.25	2.19	3.12	3.04
Bare Ground	12.25	5.00	12.53	10.47	8.54

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 13, Raft River Narrows

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.6	59.6 (7.8)	8.2	46.5	23.4	30.0	1.7	3.6	441.6	1.9



PELLET GROUP DATA --
Management unit 01 , Study no: 13

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	4	6	11
Deer	15	2	19
Cattle	-	-	4

Days use per acre (ha)	
'01	'06
-	-
11 (28)	27 (66)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tripartita tripartita												
84	**199**	-	-	166	33	-	0	100	17	-	0	13/17
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata wyomingensis												
84	**2599**	-	166	1100	1333	-	8	92	51	2	9	26/42
90	**2499**	66	166	1133	1200	-	15	4	48	4	20	27/31
96	**15500**	14200	13080	1780	640	500	2	.12	4	.51	.64	24/37
01	**7020**	40	3300	3240	480	1860	.28	0	7	3	3	23/27
06	**4920**	80	380	3660	880	720	35	20	18	7	9	22/26
Atriplex confertifolia												
84	**33**	-	-	33	-	-	0	0	0	-	0	9/9
90	**33**	-	-	-	33	-	0	0	100	-	0	-/-
96	**40**	-	20	20	-	-	0	0	0	-	0	13/21
01	**60**	-	-	60	-	-	0	0	0	-	0	10/13
06	**40**	-	-	40	-	-	0	0	0	-	0	12/20
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	36/40
01	**0**	-	-	-	-	-	0	0	-	-	0	25/32
06	**0**	-	-	-	-	-	0	0	-	-	0	19/26
Chrysothamnus viscidiflorus stenophyllus												
84	**7333**	66	1300	2600	3433	-	46	12	47	.54	2	7/9
90	**6666**	33	500	4100	2066	-	0	0	31	.90	8	8/10
96	**6360**	640	1420	3900	1040	-	4	0	16	4	4	12/19
01	**1120**	-	80	540	500	660	0	0	45	30	30	8/11
06	**1400**	20	120	1120	160	100	3	0	11	7	7	11/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
84	**600**	-	500	100	-	-	0	0	-	-	0	3/2
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	9/10
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**166**	-	-	166	-	-	0	0	0	-	0	6/7
90	**500**	33	200	300	-	-	0	0	0	-	0	5/9
96	**340**	20	40	260	40	-	0	0	12	6	6	4/14
01	**160**	-	20	120	20	140	0	0	13	-	0	4/9
06	**160**	-	20	120	20	20	0	0	13	-	13	4/9
Sarcobatus vermiculatus												
84	**33**	-	-	-	33	-	100	0	100	-	0	-/-
90	**33**	-	-	33	-	-	0	0	0	-	0	35/35
96	**40**	-	-	40	-	-	0	0	0	-	0	36/62
01	**40**	-	20	20	-	-	0	0	0	-	0	-/-
06	**40**	-	-	40	-	-	0	0	0	-	0	39/48

Trend Study 1-14-06

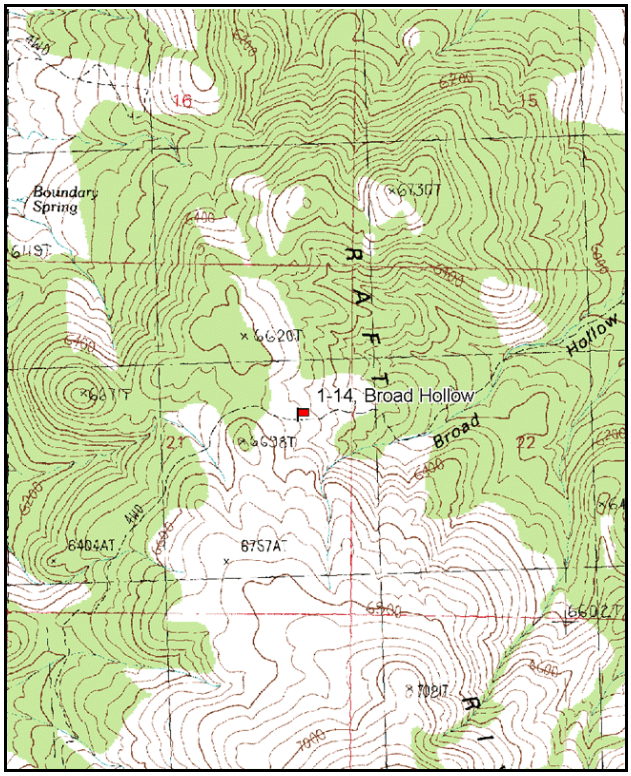
Study site name: Broad Hollow . Vegetation type: Mountain Brush .

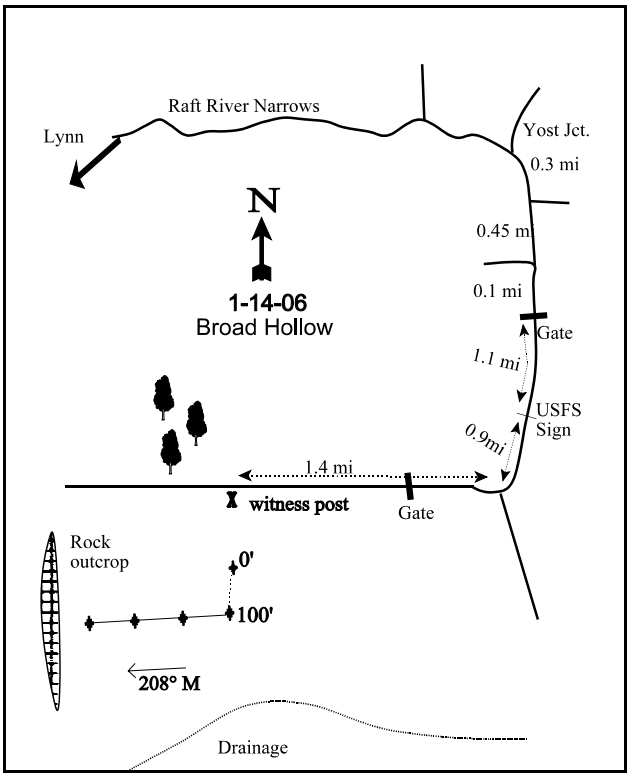
Compass bearing: frequency baseline 160 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of U-30 and the Morris Ranch Road, proceed 29.2 miles to Yost junction, passing through Lynn and crossing the Raft River. Turn right and proceed past the creek and the cattleguard for 0.3 miles. Turn right and travel 0.45 miles and take the left fork (right fork leads to a bridge). Proceed 0.1 miles and pass through the gate, continue 1.1 miles to the Forest Service fence and sign. Continue 0.9 miles, turn right and proceed 1.4 miles to a witness post on left (road is steep, winding and rough). From the rock pile, walk five paces at a bearing of 137 degrees magnetic, to the 0-foot stake of the baseline marked by browse tag #7916. Bearing of the baseline is 160 degrees magnetic. From the 100-foot baseline stake, the baseline doglegs and runs 208 degrees magnetic.





Map Name: Buck Hollow, Utah-Idaho Diagrammatic Sketch

Township 14N , Range 16W , Section 21 UTM NAD 27, UTM 12T 4644711 N, 277642 E

DISCUSSION

Broad Hollow - Trend Study No. 1-14

Study Information

This study is located on Forest Service land northeast of Lynn on preferred winter range in upper Broad Hollow (elevation: 6,500 feet, slope: 10-20%, aspect: southeast). The vegetation is dominated by a mix of mountain brush species. Utah junipers may have been more dominant prior to 1984 when the study was established. There is evidence of a fire prior to that time, which reduced junipers in the area. Another fire burned the upper half of the transect sometime in late 1996 or 1997. The area is grazed by 933 cows and calfs in the Broad Hollow pasture of the West End allotment. In 2006 it was grazed from July 7-17. A pellet group transect in 2001 estimated 29 deer days use/acre (71 deer days use/ha) and 11 cow days use/acre (27 cow days use/ha). One pellet group was thought to be from an elk. In 2006, 31 deer days use/acre (76 ddu/ha) and 1 cow day use/acre (2 cdu/ha) were estimated.

Soil

The Parkay soil series consists of deep and very deep, well drained soils that formed in alluvium, colluvium, or residuum derived from intermediate and basic igneous rocks (USDA-NRCS 2006). The effective rooting depth is almost 16 inches. It has a sandy loam texture and a neutral soil reaction (7.2 pH). Phosphorus is marginal at 9.1 ppm, which may limit normal plant growth and development (Tiedemann and Lopez 2004). The soil surface is quite rocky in places. Vegetation and litter cover are adequate to protect the soil from erosion except in some of the larger shrub interspaces where bare soil can be found. The erosion condition was classified as stable in 2001, but was slight in 2006. Surface litter movement and pedestalling were noted in 2006.

Browse

As is typical of mountain brush types, browse composition consists of several preferred forage species. The key browse species are antelope bitterbrush, serviceberry, and mountain big sagebrush. Serviceberry occurs in relatively low numbers. Cover has averaged about 2%. Utilization was extremely heavy in 1990, mostly moderate in 1996, light in 2001, and light to moderate in 2006. Bitterbrush cover has averaged about 4% since 1996. Density was 900 plants/acre in 1996, but declined to 540 plants/acre in 2001 after a fire burned about half of the study area. Density was 560 plants/acre in 2006. Utilization has been mostly moderate, with some heavy use. Decadence has remained low and vigor good.

Mountain big sagebrush cover was over 9% in 1996, but dropped after the fire to about 7.5% in both 2001 and 2006. Sagebrush density was 2,880 plants/acre in 1996, which dropped by about half to 1,400 plants/acre in 2001. In 2006, sagebrush density again declined by 20% to 1,120 plants/acre. Recruitment declined and decadence increased from 11% to 23%. Utilization has been mostly light.

Stickyleaf low rabbitbrush is an abundant increaser shrub. The density has declined at each reading, but was still abundant in 2006 with nearly 10% cover, which was highest for any shrub species. Mountain snowberry is also very abundant. Cover has averaged about 8% from 1996-2006. Snowberry density increased after the fire, as this species is fire tolerant and resprouts.

Herbaceous Understory

The herbaceous understory has a diverse composition which provides substantial ground cover. Unfortunately, annual cheatgrass was the most abundant species. The nested frequency value for cheatgrass significantly declined after 1996 and cover declined from 12% to about 6%. It is widely distributed across the area as 97% of the quadrats sampled cheatgrass in 2006. Among perennial grasses, the most prevalent are thickspike wheatgrass and Sandberg bluegrass. Other grasses include: Indian ricegrass, bottlebrush squirreltail, bluebunch wheatgrass, needle-and-thread, and occasional clumps of Great Basin wildrye. Forbs are also productive and include several desirable species. Important forbs include: arrowleaf balsamroot,

narrowleaf lomatium, cryptantha, sulfur eriogonum, and tapertip hawksbeard. Arrowleaf balsamroot is the dominant forb, making up most of the forb cover each sampling period. Utilization of grasses and forbs is light.

1990 TREND ASSESSMENT

The key browse species, sagebrush, bitterbrush, and serviceberry, show evidence of moderate to heavy hedging. Vigor is good, but the populations of these shrubs all appear to be slightly decreasing. Snowberry and low rabbitbrush densities have also declined slightly. Overall, trend for browse is considered slightly down. The herbaceous understory has a high species diversity with six species of perennial grasses and 15 species of perennial forbs encountered. The grass trend is up. The increase of Sandberg bluegrass was very large. Sum of nested frequency of forbs declined slightly, but only yellow salsify had a significant decline. The forb trend is stable.

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

1996 TREND ASSESSMENT

The browse trend is slightly up with increased densities and decreases in percent decadence for the key browse species, serviceberry, mountain big sagebrush, and antelope bitterbrush. Utilization is mostly light to moderate. The changes in density and basic ground cover characteristics may also be due to changes in methodology. The trend for grasses is stable. There was a slight declined of sum of nested frequency of perennial grasses, but this may be due to the increased sampling area. Annual cheatgrass dominates, but no prior data was collected for annual species. The forb trend is slightly up as perennial forbs were much more abundant. The DCI score is fair. High amounts of cheatgrass are detrimental to this site.

winter range condition (DC Index) - fair (58) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - slightly up (+1)

2001 TREND ASSESSMENT

The browse trend is down with decreases in density for both sagebrush and bitterbrush after the fire. Percent decadence also increased for both of these species. Cover for sagebrush and bitterbrush also declined. Snowberry density increased after the fire. Trend for grasses is up. Thickspike wheatgrass, a rhizomatous species, responded well to the fire and significantly increased in nested frequency. All other perennials remained unchanged. Cheatgrass sum of nested frequency declined significantly. Forbs are down. Three perennial forbs were significantly less abundant and annual forb sum of nested frequency increased by 72%. The DCI score increased despite the loss of some preferred browse cover. Cheatgrass cover was lower and perennial grass cover increased.

winter range condition (DC Index) - good-excellent (79) Mid-level potential scale
browse - down (-2) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Mountain big sagebrush density declined 20% (1,400 to 1,120 plant/acre). Decadence increased (11% to 23%) and the percentage of young plants in the population declined. Bitterbrush density was virtually unchanged (540 to 560 plants/acre) and decadence decreased from 11% to 7%. The grass trend is slightly down. Thickspike wheatgrass nested frequency declined significantly to a similar abundance to 1996. No other species had a significant change. The forb trend is up. Perennial forb nested frequency was nearly three times higher than in 2001. The DCI score declined to fair. Shrub decadence increased, while recruitment and perennial grass cover decreased.

winter range condition (DC Index) - fair (63) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 14

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a152	a135	a131	b194	a146	1.80	6.03	1.59
G	Agropyron spicatum	ab9	a-	b21	b14	b11	.47	.18	.51
G	Bromus tectorum (a)	-	-	b363	a290	a302	12.29	6.40	6.71
G	Elymus cinereus	3	-	1	1	4	.03	.15	.24
G	Melica bulbosa	-	-	-	3	4	-	.03	.01
G	Oryzopsis hymenoides	a1	ab4	b15	a-	ab3	.54	.01	.03
G	Poa fendleriana	b27	ab20	a2	a-	a3	.00	-	.03
G	Poa secunda	a55	b174	b150	b204	b173	3.32	8.05	8.18
G	Sitanion hystrix	4	1	9	-	-	.02	-	-
G	Stipa comata	ab26	b42	a10	a16	a9	.28	.56	.48
G	Vulpia octoflora (a)	-	-	3	-	-	.00	-	-
Total for Annual Grasses		0	0	366	290	302	12.30	6.40	6.71
Total for Perennial Grasses		277	376	339	432	353	6.48	15.02	11.08
Total for Grasses		277	376	705	722	655	18.78	21.43	17.79
F	Agoseris glauca	ab39	a12	b52	a10	b45	.11	.03	.21
F	Alyssum alyssoides (a)	-	-	a10	b51	a21	.02	.26	.04
F	Arabis sp.	A3	a4	b27	a4	a5	.08	.03	.03
F	Astragalus beckwithii	5	3	3	-	1	.18	-	.00
F	Astragalus utahensis	-	2	-	-	-	-	-	-
F	Balsamorhiza sagittata	a9	ab11	c35	bc28	c33	3.65	4.26	5.84
F	Calochortus nuttallii	-	3	-	-	-	-	-	-
F	Chaenactis douglasii	6	6	4	-	2	.01	-	.00
F	Chenopodium leptophyllum(a)	-	-	a-	a-	b8	-	-	.03
F	Collomia linearis (a)	-	-	2	6	-	.00	.01	-
F	Comandra pallida	-	-	5	3	3	.01	.00	.00
F	Collinsia parviflora (a)	-	-	a155	b221	ab191	.47	2.85	.88
F	Crepis acuminata	ab54	b66	ab43	ab39	a34	.51	1.16	.73
F	Cryptantha sp.	a-	a-	b55	a-	c123	.15	-	.43
F	Descurainia pinnata (a)	-	-	4	9	3	.01	.17	.01
F	Eriogonum umbellatum	b12	ab7	a1	a3	a3	.03	.03	.00
F	Galium bifolium (a)	-	-	-	-	6	-	-	.01
F	Gayophytum ramosissimum(a)	-	-	a1	a4	b31	.00	.01	.06
F	Hackelia patens	a3	ab17	ab18	a3	b31	1.07	.07	1.09
F	Lathyrus brachycalyx	-	-	-	1	-	-	.00	-
F	Lappula occidentalis (a)	-	-	a10	b27	ab16	.02	.11	.04

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Lepidium sp. (a)	-	-	3	-	-	.00	-	-
F	Lithospermum ruderale	-	-	-	-	3	-	-	.01
F	Lomatium triternatum	3	2	-	4	-	-	.03	-
F	Machaeranthera canescens	-	-	3	-	2	.03	-	.00
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$9	$_{b}$13	-	.02	.05
F	Navarretia intertexta (a)	-	-	-	1	-	-	.00	-
F	Phlox hoodii	5	1	-	-	-	-	-	-
F	Phlox longifolia	12	5	7	3	4	.01	.01	.01
F	Polygonum douglasii (a)	-	-	$_{a}$5	$_{a}$-	$_{b}$43	.01	-	.08
F	Ranunculus testiculatus (a)	-	-	3	3	6	.00	.01	.03
F	Senecio multilobatus	-	3	1	-	-	.15	-	-
F	Tragopogon dubius	$_{b}$18	$_{a}$3	$_{a}$-	$_{a}$2	$_{a}$-	-	.00	-
Total for Annual Forbs		0	0	193	331	338	0.55	3.45	1.25
Total for Perennial Forbs		169	145	254	100	289	6.02	5.65	8.39
Total for Forbs		169	145	447	431	627	6.58	9.11	9.64

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

BROWSE TRENDS --
Management unit 01 , Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	5	11	5	2.00	1.87	2.84
B	Artemisia tridentata vaseyana	70	35	35	9.48	7.55	7.53
B	Chrysothamnus nauseosus consimilis	0	0	0	-	-	.15
B	Chrysothamnus viscidiflorus viscidiflorus	78	78	77	6.49	7.71	9.85
B	Eriogonum microthecum	1	2	2	.03	-	-
B	Leptodactylon pungens	4	4	2	.30	.18	.30
B	Opuntia sp.	53	58	57	4.37	2.50	3.59
B	Purshia tridentata	28	21	17	4.19	3.54	5.03
B	Symphoricarpos oreophilus	35	35	41	7.39	9.31	8.52
Total for Browse		274	244	236	34.27	32.70	37.84

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 14

Species	Percent Cover '06
Amelanchier utahensis	2.91
Artemisia tridentata vaseyana	7.75
Chrysothamnus viscidiflorus viscidiflorus	11.28
Opuntia sp.	2.54
Purshia tridentata	5.33
Symphoricarpos oreophilus	19.31

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 14

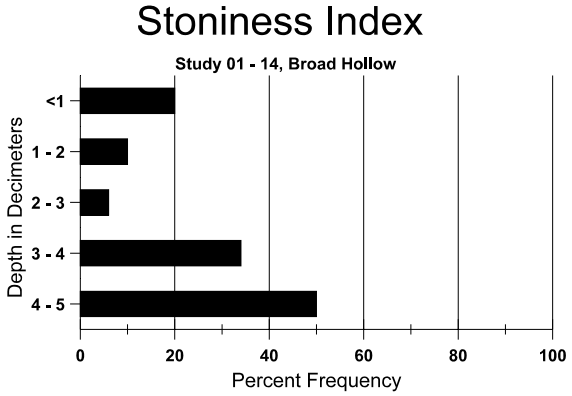
Species	Average leader growth (in)	
	'01	'06
Amelanchier utahensis	2.7	3.1
Artemisia tridentata wyomingensis	1.5	0.9
Purshia tridentata	1.2	0.8

BASIC COVER --
Management unit 01 , Study no: 14

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.00	13.00	49.77	56.67	55.03
Rock	7.00	6.50	2.10	1.54	2.07
Pavement	1.00	1.00	1.33	.85	2.25
Litter	62.50	46.25	62.24	50.53	38.86
Cryptogams	1.00	2.50	1.36	1.20	1.83
Bare Ground	26.50	30.75	10.75	15.88	20.92

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 14, Broad Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.52	59.0 (3.9)	7.2	63.7	19.0	17.3	1.6	9.1	121.6	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 14

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	17	6	50
Elk	-	-	1
Deer	32	17	10
Cattle	3	2	3

Days use per acre (ha)	
'01	'06
-	-
1 (2)	-
29 (71)	31 (76)
11 (27)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
84	**133**	-	-	133	-	-	100	0	0	-	0	31/32
90	**66**	-	-	66	-	-	0	100	0	-	100	33/28
96	**100**	-	-	100	-	-	80	0	0	-	0	43/62
01	**340**	140	240	100	-	20	6	0	0	-	0	50/55
06	**100**	-	-	80	20	20	40	0	20	20	20	50/57
Artemisia tridentata vaseyana												
84	**1465**	733	666	733	66	-	50	5	5	-	0	14/19
90	**1332**	-	600	466	266	-	35	15	20	-	0	16/17
96	**2880**	140	540	2200	140	220	10	0	5	-	0	21/32
01	**1400**	-	240	1000	160	840	9	3	11	4	4	22/33
06	**1120**	60	100	760	260	440	25	5	23	2	2	24/39

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	21/30
01	**0**	-	-	-	-	-	0	0	-	-	0	31/43
06	**0**	-	-	-	-	-	0	0	-	-	0	31/39
Chrysothamnus viscidiflorus viscidiflorus												
84	**7066**	600	1200	4866	1000	-	16	0	14	1	8	17/26
90	**5598**	66	1066	2066	2466	-	18	6	44	.71	5	16/14
96	**4700**	-	680	3840	180	40	4	0	4	-	0	16/22
01	**4100**	-	100	3800	200	120	0	0	5	-	0	14/19
06	**3420**	240	80	2960	380	40	.58	.58	11	4	4	15/23
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	5/9
01	**60**	-	-	60	-	-	0	0	-	-	0	9/14
06	**40**	-	-	40	-	-	0	0	-	-	0	7/17
Leptodactylon pungens												
84	**866**	-	200	666	-	-	0	0	0	-	0	10/12
90	**665**	-	66	533	66	-	0	0	10	-	10	5/9
96	**140**	-	-	140	-	-	0	0	0	-	0	11/13
01	**120**	-	-	120	-	-	0	0	0	-	0	8/9
06	**80**	140	40	20	20	-	0	0	25	-	0	7/11
Opuntia sp.												
84	**1000**	-	-	1000	-	-	0	0	0	-	0	3/8
90	**1866**	-	600	1200	66	-	0	0	4	-	18	4/17
96	**2520**	-	160	2120	240	40	0	0	10	4	4	4/17
01	**4340**	-	620	3380	340	-	0	0	8	6	6	4/13
06	**2660**	-	20	2600	40	20	0	0	2	2	2	4/17
Purshia tridentata												
84	**999**	-	266	533	200	-	53	27	20	2	7	20/31
90	**665**	66	266	333	66	-	60	30	10	-	0	19/20
96	**900**	20	100	780	20	20	31	24	2	-	0	23/43
01	**540**	-	80	400	60	100	56	22	11	7	7	24/53
06	**560**	60	20	500	40	160	36	32	7	4	4	27/51

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
84	**2533**	-	733	1800	-	-	18	0	0	-	0	23/23
90	**1799**	66	266	1133	400	-	4	4	22	1	4	19/29
96	**1420**	60	240	1120	60	-	3	0	4	1	1	27/47
01	**1820**	80	440	1380	-	-	0	0	0	-	0	26/45
06	**1960**	-	280	1580	100	-	2	0	5	-	0	25/46
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	14/36
01	**0**	-	-	-	-	-	0	0	-	-	0	17/35
06	**0**	-	-	-	-	-	0	0	-	-	0	12/33

Trend Study 1-15-06

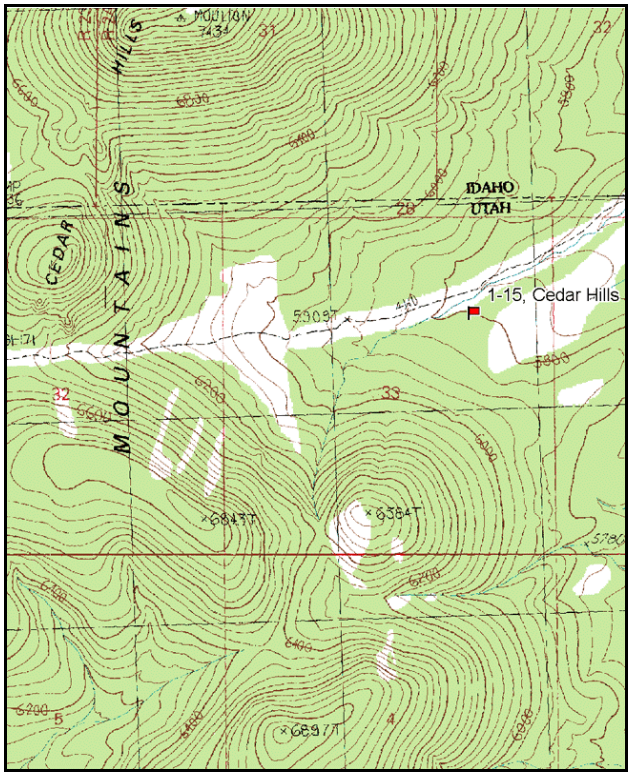
Study site name: Cedar Hills . Vegetation type: Pinyon-Juniper .

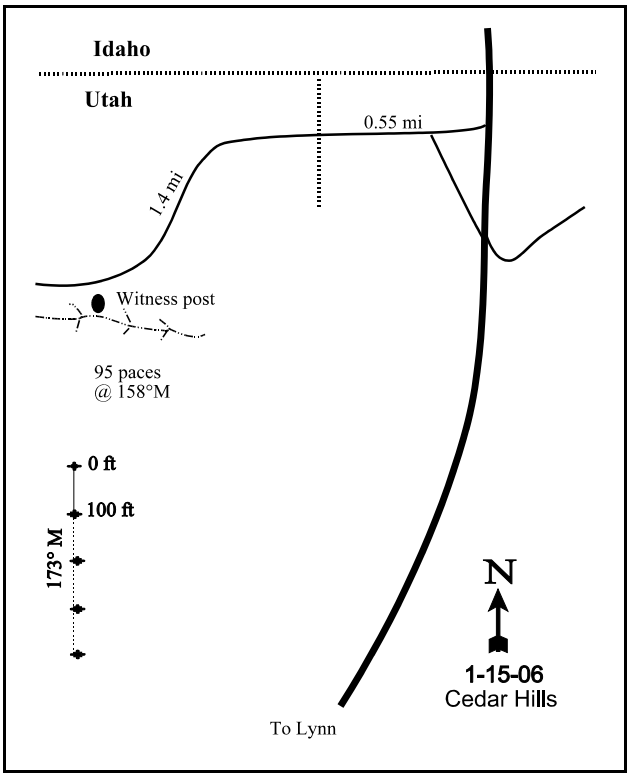
Compass bearing: frequency baseline 173 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Lynn, drive north to the Utah-Idaho border to a cattleguard. From the cattleguard at the border, follow a faint road along a fence (on south side) for 0.55 miles to a gate. Go through the next seeded pasture 0.65 miles and continue as the road turns away from the fence. Proceed 0.75 miles to a small rock pile and a witness post on the south side of the road. Cross the drainage walking about 95 paces southeast to the 0-foot stake off the baseline in the trees. The 0-foot baseline stake is labeled with browse tag #49.





Map Name: Buck Hollow, Utah-Idaho Diagrammatic Sketch

Township 15N , Range 16W , Section 33 UTM NAD 27, UTM 12T 4651431 N, 277675 E

DISCUSSION

Cedar Hills - Trend Study No. 1-15

Study Information

This trend study is located west of Yost in the Albion Mountains in an area called Cedar Hills (elevation: 5,800 feet, slope: 3-7%, aspect: north) on the Utah-Idaho border. The area was dominated by pinyon and juniper and the study was established in 1990 to provide baseline data for a proposed habitat improvement project. The area was to be chained and seeded, but the treatment never happened. In 2000 a large wildfire burned the area, which changed the area from tree dominance to herbaceous species. It is apparent that the burned area was aerially seeded, but no method was used to cover seed. Seed mix information was not available. The area is managed by the BLM and is allotted for spring and fall cattle use as part of the Junction Creek allotment. There is only light deer use. A pellet group transect in 2001 indicated no use by wildlife or livestock. In 2006, 1 deer and 30 cow days use/acre (2 ddu and 73 cdu/ha) were estimated.

Soil

The Solak soil series consists of shallow, somewhat excessively drained, moderately permeable soils that formed in residuum and colluvium weathered from conglomerate and is composed of sandstone, quartzite, and limestone (USDA-NRCS 2006). The soil is a fine-textured clay loam, with an effective rooting depth of 13 inches. The soil reaction is slightly alkaline (7.8 pH). When soil samples were taken in 1996, phosphorus was marginal at only 6.7 ppm, which could be limiting for plant growth and development (Tiedemann and Lopez 2004). There was abundant litter cover under the trees until the wildfire went through the area. Percent bare soil was high one year after the burn (72%), but was much lower in 2006 (18%). Cryptogamic cover was reduced from 13% to zero in 2001. The erosion condition was classified as moderate in 2001, with erosion limited only by the gentle terrain, but was stable in 2006 as herbaceous species had established to protect the soil.

Browse

Singleleaf pinyon and Utah juniper dominated the area prior to the fire. Point-quarter data in 1996 estimated 318 pinyon/acre (70% were seedlings) and 407 juniper/acre (only 15% were seedlings and young trees). Pinyon average diameter was 5 inches and juniper was 4 inches. Overhead canopy cover of pinyon and juniper was estimated using line intercept, at 35% which can suppresses understory species abundance and productivity (Tausch and West 1994). The wildfire in 2000 eliminated all juniper and pinyon trees.

Mountain big sagebrush was the most abundant browse species prior to the fire. Sagebrush cover was about 1% in 1996 and density was 1,160 plants/acre. Density had declined since 1990. Dead plants were very numerous in 1996 as well. Utilization was light during all sampling years. Decadence was very high in 1990 at 87% of the population and then had dropped to 45% in 1996, which is still high. The poor vigor was likely due to competition from the pinyon-juniper overstory. In 2001, no shrub species were sampled. In 2006, 120 sagebrush plants/acre were sampled. These were all classified as mature and provided as much cover as was sampled in 1996, about 1%. Seedlings were also very abundant in 2006. Without competition from pinyon and juniper trees, sagebrush plants were much larger in 2006 than they were in 1996.

Herbaceous Understory

Prior to the fire the herbaceous understory was fair for a pinyon-juniper dominated site. Sandberg bluegrass was the most abundant grass in 1996. Thickspike wheatgrass and bluebunch wheatgrass were also common prior to the fire. Thickspike wheatgrass responded very well to the fire. Nested frequency significantly increased in both 2001 and 2006. Quadrat frequency increased from 36% (1990) and 21% (1996) prior to the fire to 53% (2001) and 85% (2006). Cover increased from less than 1% pre-burn, to 3% one year after the burn to 29% six years after the burn. Seeded species that were sampled in 2006 include: crested wheatgrass, Russian wildrye, Indian ricegrass, and Canby bluegrass (*Poa canbyi*). Canby bluegrass is often taxonomically lumped together with Sandberg bluegrass (*Poa secunda*). We chose to sample these two varieties separately to

track the success of the seeded grass and the response of the residual Sandberg bluegrass. Canby bluegrass is similar to Sandberg bluegrass, but is taller and more robust. Crested wheatgrass was the most abundant seeded species in 2006 (11% quadrat frequency and 1% cover). Unfortunately, cheatgrass was sampled for the first time in 2006. Quadrat frequency was 32% and cover was 3%. Forbs are diverse. At least four different milkvetch species have been sampled. Hood's phlox was abundant prior to the fire, but was rare in 2006. Blue flax was sampled in 2006 and may have been seeded after the fire.

1996 TREND ASSESSMENT
Trend for mountain big sagebrush is in an overall state of decline but shows some improvements since 1990. Density has declined 48% since the last reading due to a reduction in decadent plants. Reproduction is limited. Without some sort of treatment, all of the sagebrush will eventually die out from competition with the overstory of trees and drought. Trend is considered down. The trend for grasses is stable. Sum of nested frequency of grasses changed very little. The forb trend is up. Perennial forbs were much more abundant.

winter range condition (DC Index) - very poor (23) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - up (+2)

2001 TREND ASSESSMENT
Trend for mountain big sagebrush is down with all of it lost to the fire. Trends for grasses and forbs are also down with nested values for both grasses and forbs being severely depressed after the fire. The DCI score also declined, with the decline in browse and herbaceous vegetation.

winter range condition (DC Index) - very poor (9) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

2006 TREND ASSESSMENT
The browse trend is slightly up. Mountain big sagebrush is slowly recovering. Seedlings were abundant, so there is potential for population growth. The grass trend is up. Residual species like thickspike wheatgrass and Sandberg bluegrass increased significantly and are abundant. Seeded grasses also established. Cheatgrass was sampled for the first time, but the abundance of perennial grasses should minimize the effect of cheatgrass. Perennial forbs were more abundant in 2006 than in 2001, but not as abundant as 1996. The DCI improved from very poor-poor with the increase of grasses and forbs. Browse is important for winter range and is lacking, which lowers the rating.

winter range condition (DC Index) - poor (39) Mid-level potential scale
browse - slightly up (+1) grass - up (+2) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 15

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	a-	a-	a-	b26	-	-	1.18
G	Agropyron dasystachyum	a76	a60	b135	c292	.76	3.40	29.27
G	Agropyron spicatum	a37	b71	a12	a24	.48	.33	4.19
G	Bromus tectorum (a)	-	-	-	87	-	-	3.37
G	Elymus junceus	-	-	-	2	-	-	.15

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Oryzopsis hymenoides	-	-	-	3	-	-	.18
G	Poa canbyi	-	-	-	6	-	-	.30
G	Poa secunda	$_{c}$256	$_{c}$269	$_{a}$66	$_{b}$116	4.23	.47	1.98
G	Sitanion hystrix	-	2	-	3	.01	-	.15
Total for Annual Grasses		0	0	0	87	0	0	3.37
Total for Perennial Grasses		369	402	213	472	5.49	4.21	37.43
Total for Grasses		369	402	213	559	5.49	4.21	40.81
F	Agoseris glauca	$_{a}$-	$_{a}$2	$_{a}$5	$_{b}$44	.00	.04	.20
F	Alyssum alyssoides (a)	-	$_{a}$-	$_{a}$-	$_{b}$146	-	-	.73
F	Allium sp.	-	-	-	4	-	-	.01
F	Antennaria rosea	$_{a}$1	$_{b}$10	$_{a}$-	$_{a}$-	.08	-	-
F	Arabis sp.	$_{a}$3	$_{b}$19	$_{a}$-	$_{a}$1	.04	-	.00
F	Astragalus beckwithii	$_{a}$-	$_{c}$116	$_{a}$-	$_{b}$35	2.27	-	1.70
F	Astragalus calycosus	-	-	-	2	-	-	.00
F	Astragalus cibarius	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$53	-	-	1.19
F	Astragalus convallarius	-	3	-	-	.00	-	-
F	Astragalus sp.	6	11	7	-	.08	.02	-
F	Astragalus utahensis	$_{a}$3	$_{b}$21	$_{a}$6	$_{a}$5	.13	.01	.03
F	Castilleja chromosa	-	4	-	-	.01	-	-
F	Caulanthus crassicaulis	-	-	-	-	.00	-	-
F	Camelina microcarpa (a)	-	$_{a}$-	$_{a}$-	$_{b}$40	-	-	.18
F	Chenopodium album (a)	-	-	3	-	-	.00	-
F	Chaenactis douglasii	$_{a}$10	$_{a}$13	$_{a}$4	$_{b}$35	.05	.01	.26
F	Chenopodium leptophyllum(a)	-	-	-	4	-	-	.01
F	Collinsia parviflora (a)	-	$_{a}$87	$_{b}$127	$_{c}$225	.18	.65	1.72
F	Crepis acuminata	$_{a}$3	$_{ab}$9	$_{ab}$6	$_{b}$16	.10	.02	.42
F	Cryptantha sp.	$_{Ab}$7	$_{ab}$5	$_{a}$-	$_{b}$16	.04	-	.03
F	Descurainia pinnata (a)	-	-	1	4	-	.03	.01
F	Epilobium brachycarpum (a)	-	$_{a}$-	$_{a}$-	$_{b}$81	-	-	.25
F	Erigeron sp.	2	6	-	-	.04	-	-
F	Erigeron pumilus	-	1	-	1	.00	-	.00
F	Fritillaria atropurpurea	-	-	5	1	-	.01	.00
F	Gayophytum ramosissimum(a)	-	-	-	8	-	-	.04
F	Haplopappus acaulis	$_{b}$9	$_{c}$25	$_{a}$-	$_{a}$-	.38	-	-
F	Hackelia patens	-	-	1	-	-	.00	-
F	Lappula occidentalis (a)	-	-	-	5	-	-	.01

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	Lactuca serriola	a-	a-	a-	b71	-	-	.23
F	Linum lewisii	-	-	-	9	-	-	.21
F	Mentzelia albicaulis (a)	-	-	-	1	-	-	.00
F	Microsteris gracilis (a)	-	a-	a-	b13	-	-	.02
F	Penstemon sp.	ab2	b14	a-	b8	.43	-	.22
F	Phlox hoodii	b111	c178	a3	a3	3.77	.00	.01
F	Senecio multilobatus	ab14	b29	a3	b21	.07	.00	.39
F	Sisymbrium altissimum (a)	-	a-	a-	b30	-	-	.19
F	Taraxacum officinale	-	-	1	-	-	.00	-
F	Townsendia sp.	-	4	-	-	.01	-	-
F	Zigadenus paniculatus	a-	a-	b20	a5	.01	.37	.03
Total for Annual Forbs		0	87	131	557	0.18	0.68	3.19
Total for Perennial Forbs		171	470	61	330	7.55	0.50	5.00
Total for Forbs		171	557	192	887	7.73	1.19	8.19

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

BROWSE TRENDS --
Management unit 01 , Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	35	0	4	1.05	-	1.02
B	Chrysothamnus nauseosus	0	0	2	-	-	.03
B	Chrysothamnus nauseosus consimilis	1	0	0	.03	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	7	0	4	.04	-	.03
B	Juniperus osteosperma	34	0	0	9.75	-	-
B	Opuntia sp.	1	0	0	-	-	-
B	Pinus monophylla	9	0	0	1.65	-	-
B	Symphoricarpos oreophilus	7	0	4	.30	.00	.41
Total for Browse		94	0	14	12.84	0.00	1.50

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 15

Species	Percent Cover '06
Artemisia tridentata vaseyana	1.11
Chrysothamnus viscidiflorus viscidiflorus	.28
Symphoricarpos oreophilus	.03

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 15

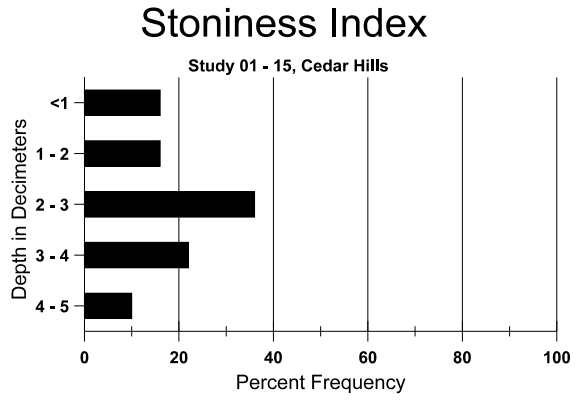
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	-	3.0

BASIC COVER --
Management unit 01 , Study no: 15

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	4.00	26.79	6.07	48.36
Rock	1.50	.71	.24	.93
Pavement	11.25	9.01	13.58	3.52
Litter	54.75	40.83	11.15	38.81
Cryptogams	7.75	12.89	0	1.12
Bare Ground	20.75	9.32	72.24	17.68

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 15, Cedar Hills

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.7	57.4 (13.0)	7.8	30.7	40	29.3	3.0	6.7	390.4	0.6



PELLET GROUP DATA --
Management unit 01 , Study no: 15

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	14	-	4
Deer	4	-	2
Cattle	-	-	7

Days use per acre (ha)	
'01	'06
-	-
-	1 (2)
-	30 (73)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
90	**2232**	-	33	266	1933	-	1	0	87	34	57	20/18
96	**1160**	-	100	540	520	1860	7	0	45	21	22	15/18
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**120**	2280	-	120	-	-	0	0	0	-	0	31/31
Chrysothamnus nauseosus												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**80**	-	80	-	-	-	0	0	-	-	0	22/26
Chrysothamnus nauseosus consimilis												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	20	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
90	**666**	-	200	33	433	-	0	0	65	18	30	7/8
96	**200**	-	40	160	-	-	0	0	0	-	0	7/7
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**120**	-	-	120	-	-	0	0	0	-	0	13/16
Juniperus osteosperma												
90	**499**	-	33	433	33	-	0	0	7	-	7	108/61
96	**900**	-	160	720	20	20	0	0	2	2	2	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	5/9
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pinus monophylla												
90	**66**	166	-	66	-	-	0	0	-	-	0	157/97
96	**180**	180	100	80	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
90	**33**	-	-	33	-	-	0	0	-	-	0	6/9
96	**160**	20	120	40	-	-	0	0	-	-	0	11/17
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**140**	-	80	60	-	-	0	0	-	-	0	12/22

Trend Study 1-16-06

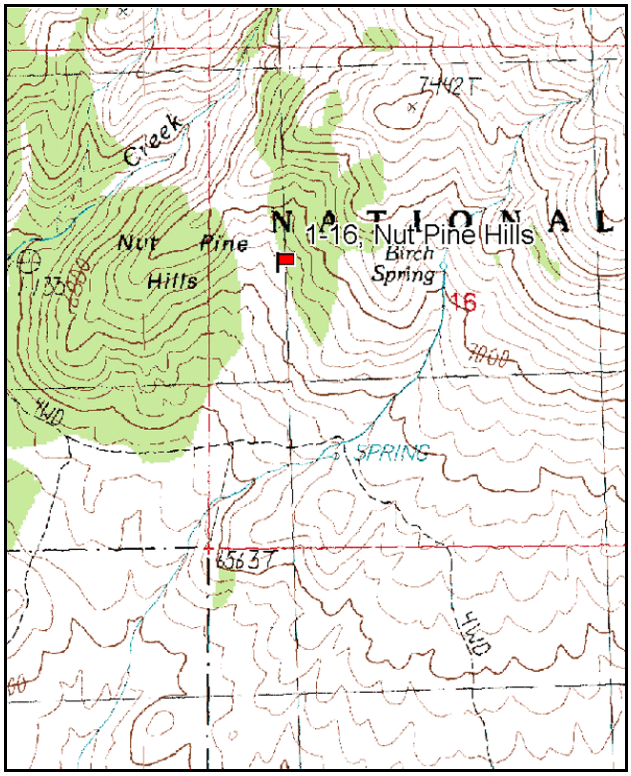
Study site name: Nut Pine Hills . Vegetation type: Mountain Brush .

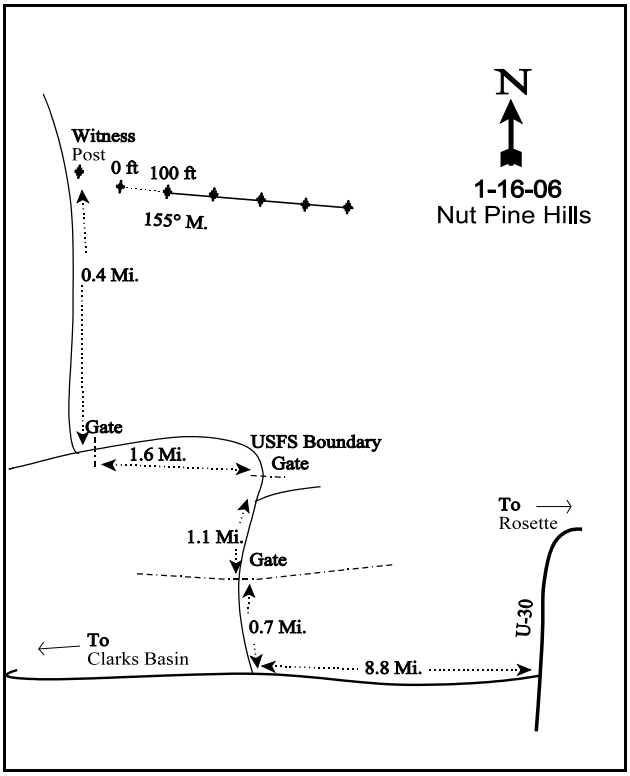
Compass bearing: frequency baseline 155 degrees magnetic.

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

LOCATION DESCRIPTION

From U-30, travel up the road to Clark's Basin for 8.8 miles. Turn right and travel 0.7 miles to a gate. Continue 1.1 miles to a gate marking the forest boundary. Continue 1.6 miles to another gate. Just after the gate turn right and proceed 0.4 miles to a witness post. The zero foot stake is just east of the witness post.





Map Name: Dennis Hill

Diagrammatic Sketch

Township 13N , Range 15W , Section 16

UTM NAD 27, UTM 12T 4636341 N, 285977 E

DISCUSSION

Nut Pine Hills - Trend Study No. 1-16

Study Information

The Nut Pine Hills trend study (elevation: 6,850 feet, slope: 20-23%, aspect: southwest) monitors important deer winter range on the south slope of the Raft River mountains. The area supports a mixed mountain brush community type with scattered pinyon and juniper trees. The area is administered by the Sawtooth National Forest. Deer also use this area in the spring. Deer were flushed from the site when it was being established in 1996. Pellet group frequency of deer was moderately high in 1996. Cattle also use this area as part of the Rosette allotment and Nut Pine Hills pasture. This allotment is grazed by cattle. The pellet group transect in 2001 estimated 38 deer days use/acre and 4 cow days use/acre (94 ddu/ha and 9 cdu/ha). Most of the deer pellet groups were fresh, indicating mostly spring and early summer use. In 2006, 78 deer and 8 cow days use/acre (193 ddu/ha and 20 cdu/ha) were estimated.

Soil

The Fontreen soil series consists of very deep, well drained soils, moderately rapidly permeable soils that formed in alluvium and colluvium from limestone, sandstone, chert, and shale (USDA-NRCS 2006). The soil is moderately deep with a sandy clay loam texture. Reactivity is moderately alkaline (8.1 pH). Phosphorus is marginal (8.5 ppm), which may limit normal plant growth and development (Tiedemann and Lopez 2004). Effective rooting depth was estimated at 19 inches, but depth must be more restricted in some areas where black sagebrush occur. Vegetation and litter cover are abundant which adequately protect the soil from serious erosion. Pavement is concentrated on the surface in isolated open interspaces. Rocks are common throughout the profile. A soil condition class rating classified erosion as slight in 2006.

Browse

The site is dominated by browse species. Sixteen shrub or tree species have been sampled. Key species include: serviceberry, mountain big sagebrush, and antelope bitterbrush. Serviceberry density has averaged about 700 plants/acre and 6% cover since 1996. Vigor has been good and percent decadence moderate. Utilization has been light to moderate. Mountain big sagebrush density has increased from 1,140 plants/acre in 1996 to 1,640 plants/acre in 2006 and cover has increased from 4% to 7%. Utilization has been light and vigor good. Antelope bitterbrush is abundant and accounted for about a third of the shrub cover. Bitterbrush density has changed very little since 1996 with an average of 1,400 plants/acre and 13% cover.. Utilization has been mostly moderate to heavy, yet vigor has been good and percent decadence low.

Snowberry is also very abundant and has provided about a third of the browse cover. Utilization of less preferred shrubs has been light. Other shrubs found include small numbers of black sagebrush, threadleaf rubber rabbitbrush, stickyleaf low rabbitbrush, slenderbush eriogonum, broom snakeweed, chokecherry, wax currant, woods rose and gray horsebrush. A few tree size and high-lined curlleaf mahogany are found in the area, but have not been sampled. Juniper cover was 4% in 2006, estimated with the line intercept method. Juniper density increased from 49 trees/acre in 2001 to 81 trees/acre in 2006.

Herbaceous Understory

Grasses are diverse with nine perennial species sampled. The more abundant species include: thickspike wheatgrass, bluebunch wheatgrass, and Sandberg bluegrass. Annual cheatgrass brome is present but only in very small numbers, producing <1% cover. Forbs are also abundant with 34 perennial and nine annual species sampled. Several useful species are present, including: paintbrush, sulfur eriogonum, lambstongue groundsel, and lobeleaf groundsel. These and other forbs provide useful spring forage for big game.

2001 TREND ASSESSMENT

The browse component continues to dominate the site and provides useful forage for wintering big game. The three key species, serviceberry, mountain big sagebrush, and antelope bitterbrush appear to have stable trends

with good reproductive potentials, relatively low decadence, and good vigor. Utilization of bitterbrush is moderate to heavy but not to the point that it reduces vigor. The herbaceous understory is very diverse with some useful species present. The grass trend is up. The sum of nested frequency for perennial grasses has increased and cheatgrass decreased significantly. The forb trend is down. Perennial forbs decreased. The DCI score increased to excellent with greater grass cover.

1996 winter range condition (DC Index) - good (71) Mid-level potential scale
2001 winter range condition (DC Index) - excellent (86) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly up. Serviceberry and bitterbrush have remained stable and healthy. Mountain big sagebrush density has increased 44% since 1996. Sagebrush cover has also increased slightly. Vigor has also been good. The grass trend is stable. There has been no change in perennial grass abundance. Cover was lower in 2006, but this may be due to timing of precipitation. The forb trend is up. Five perennial forb species were significantly more abundant in 2006 than in 2001. Forbs are abundant and robust. The DCI score declined from excellent-good due to lower perennial grass cover.

winter range condition (DC Index) - good (70) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 16

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	140	186	181	.88	3.29	1.18
G	Agropyron spicatum	141	123	104	2.15	5.65	2.59
G	Bromus tectorum (a)	$_{b}$47	$_{a}$11	$_{a}$2	.16	.19	.00
G	Carex sp.	-	-	2	-	-	.03
G	Elymus cinereus	10	-	3	.04	.15	.03
G	Koeleria cristata	22	10	18	.37	.39	.22
G	Oryzopsis hymenoides	1	6	12	.03	.18	.33
G	Poa fendleriana	$_{b}$97	$_{a}$27	$_{a}$8	1.71	.76	.33
G	Poa pratensis	$_{a}$-	$_{b}$43	$_{b}$53	-	.81	.44
G	Poa secunda	$_{a}$21	$_{b}$123	$_{b}$97	.40	3.27	1.62
Total for Annual Grasses		47	11	2	0.15	0.18	0.00
Total for Perennial Grasses		432	518	478	5.61	14.51	6.81
Total for Grasses		479	529	480	5.76	14.70	6.82
F	Achillea millefolium	-	6	-	-	.06	-
F	Agoseris glauca	$_{b}$68	$_{a}$5	$_{b}$46	.15	.02	.34
F	Antennaria rosea	-	-	4	-	-	.01
F	Arabis sp.	5	-	8	.01	-	.02
F	Astragalus beckwithii	4	3	4	.00	.06	.00

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Astragalus newberryi	6	-	-	.01	-	-
F	Aster sp.	$_{A}$17	$_{b}$38	$_{a}$12	.10	.44	.02
F	Astragalus utahensis	3	-	2	.03	-	.00
F	Castilleja linariaefolia	4	-	-	.03	-	-
F	Calochortus nuttallii	3	-	4	.00	-	.00
F	Chaenactis douglasii	$_{b}$22	$_{a}$8	$_{a}$1	.06	.01	.00
F	Cirsium sp.	8	10	13	.06	.22	.19
F	Collomia linearis (a)	$_{b}$16	$_{b}$22	$_{a}$-	.03	.03	-
F	Comandra pallida	$_{b}$105	$_{a}$57	$_{a}$58	.49	.61	1.00
F	Collinsia parviflora (a)	$_{c}$131	$_{b}$59	$_{a}$17	.43	.38	.03
F	Crepis acuminata	31	17	24	.12	.53	.56
F	Cryptantha sp.	$_{B}$22	$_{a}$5	$_{ab}$9	.22	.01	.02
F	Delphinium nuttallianum	9	2	-	.04	.00	-
F	Descurainia pinnata (a)	$_{b}$16	$_{a}$-	$_{a}$-	.05	-	-
F	Epilobium brachycarpum (a)	-	-	2	-	-	.00
F	Erysimum asperum	3	-	9	.01	-	.04
F	Eriogonum cernuum (a)	10	-	-	.02	-	-
F	Erigeron pumilus	1	-	-	.00	-	-
F	Eriogonum umbellatum	46	27	37	1.25	.87	1.27
F	Haplopappus acaulis	16	12	17	.37	.18	.14
F	Hackelia patens	$_{b}$69	$_{a}$15	$_{b}$58	.91	.17	2.07
F	Ipomopsis congesta	$_{b}$21	$_{a}$-	$_{b}$20	.09	-	.18
F	Lesquerella sp.	5	-	-	.01	-	-
F	Linum lewisii	-	-	3	-	-	.04
F	Lithospermum ruderale	25	20	21	.41	.69	1.04
F	Lomatium sp.	21	16	13	.41	.40	.46
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$26	$_{a}$-	-	.05	-
F	Penstemon sp.	-	-	4	-	-	.03
F	Phlox austromontana	44	33	33	.30	.61	.36
F	Phlox longifolia	$_{b}$86	$_{a}$31	$_{a}$18	.18	.07	.04
F	Polygonum douglasii (a)	7	2	2	.01	.00	.00
F	Ranunculus testiculatus (a)	-	1	-	-	.00	-
F	Senecio integerrimus	20	8	9	.40	.36	.07
F	Senecio multilobatus	$_{b}$59	$_{a}$19	$_{b}$53	.29	.22	.71
F	Stellaria sp.	-	-	3	-	-	.01
F	Taraxacum officinale	5	4	3	.00	.03	.03

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Unknown forb-annual (a)	$_{b}$8	$_{a}$-	$_{a}$-	.02	-	-
F	Viola sp.	$_{ab}$21	$_{a}$6	$_{b}$29	.07	.02	.19
F	Zigadenus paniculatus	-	2	-	-	.03	-
Total for Annual Forbs		188	110	21	0.56	0.47	0.04
Total for Perennial Forbs		749	344	515	6.09	5.67	8.94
Total for Forbs		937	454	536	6.65	6.14	8.98

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

BROWSE TRENDS --
Management unit 01 , Study no: 16

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	32	28	24	3.92	7.59	5.63
B	Artemisia nova	12	6	5	.01	.03	.15
B	Artemisia tridentata vaseyana	41	45	45	4.09	6.84	7.25
B	Chrysothamnus nauseosus consimilis	5	3	4	.00	.38	.41
B	Chrysothamnus viscidiflorus lanceolatus	45	36	39	1.56	1.24	1.77
B	Eriogonum microthecum	23	15	15	.32	.24	.49
B	Gutierrezia sarothrae	11	4	3	.12	.15	-
B	Juniperus osteosperma	4	2	5	.71	.71	1.41
B	Mahonia repens	4	4	5	.04	.04	.18
B	Opuntia sp.	3	1	3	.03	-	-
B	Prunus virginiana	2	0	2	-	-	-
B	Purshia tridentata	48	46	44	11.98	16.20	12.44
B	Ribes cereum cereum	0	0	1	-	-	-
B	Rosa woodsii	2	3	2	-	.30	.33
B	Symphoricarpos oreophilus	72	69	70	13.26	16.46	12.03
B	Tetradymia canescens	34	33	26	.67	.60	.53
Total for Browse		338	295	293	36.76	50.82	42.65

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 16

Species	Percent Cover	
	'01	'06
Amelanchier utahensis	-	6.23
Artemisia nova	-	.03
Artemisia tridentata vaseyana	-	9.19
Chrysothamnus nauseosus consimilis	-	.76
Chrysothamnus viscidiflorus lanceolatus	-	2.46
Juniperus osteosperma	3.40	4.11
Pinus monophylla	.40	.53
Purshia tridentata	-	18.08
Rosa woodsii	-	.05
Symphoricarpos oreophilus	-	18.51
Tetradymia canescens	-	.63

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 16

Species	Average leader growth (in)	
	'01	'06
Amelanchier utahensis	1.0	1.6
Artemisia tridentata vaseyana	1.5	1.4
Purshia tridentata	1.0	2.9

POINT-QUARTER TREE DATA --
Management unit 01 , Study no: 16

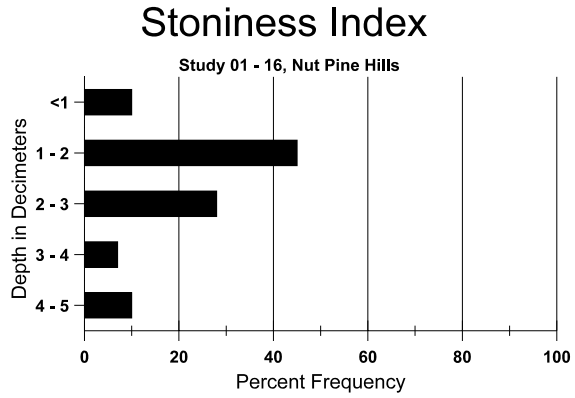
Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	49	84	6.3	10.1
Pinus monophylla	78	21	8.5	11.7

BASIC COVER --
Management unit 01 , Study no: 16

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	43.29	62.09	53.11
Rock	2.98	1.24	1.80
Pavement	3.84	6.13	13.86
Litter	45.58	47.65	41.45
Cryptogams	.13	.03	.09
Bare Ground	12.81	13.35	12.71

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 16, Nut Pine Hills

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
19.1	51.4 (17.6)	8.1	50.9	25.1	24.0	2.1	8.5	544.0	1.1



PELLET GROUP DATA --
Management unit 01 , Study no: 16

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	3	20
Deer	22	9	18
Cattle	6	2	4

Days use per acre (ha)	
'01	'06
-	-
38 (94)	78 (193)
4 (9)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
96	**860**	-	220	560	80	80	40	14	9	-	0	36/42
01	**660**	20	120	420	120	140	12	24	18	6	6	38/42
06	**680**	40	180	320	180	140	9	6	26	3	3	44/46
Artemisia nova												
96	**320**	-	60	120	140	120	38	38	44	13	13	7/13
01	**220**	-	40	160	20	-	0	0	9	-	0	7/12
06	**160**	-	-	120	40	-	0	0	25	-	0	5/11
Artemisia tridentata vaseyana												
96	**1140**	20	140	960	40	280	19	4	4	-	0	19/29
01	**1480**	20	80	1300	100	140	8	0	7	-	1	24/29
06	**1640**	20	80	1380	180	100	16	0	11	6	6	23/34
Chrysothamnus nauseosus consimilis												
96	**120**	-	20	40	60	-	0	0	50	33	33	26/33
01	**60**	-	-	-	60	-	0	0	100	67	67	29/49
06	**120**	-	20	60	40	-	0	0	33	33	33	31/37
Chrysothamnus viscidiflorus lanceolatus												
96	**1480**	80	260	1160	60	-	3	0	4	1	1	16/20
01	**1160**	-	20	1100	40	-	0	0	3	3	3	14/18
06	**1200**	-	40	1120	40	20	0	0	3	2	2	14/22
Eriogonum microthecum												
96	**660**	20	100	560	-	-	0	0	0	-	0	5/8
01	**440**	-	60	340	40	-	0	0	9	-	0	5/9
06	**340**	-	-	260	80	-	6	0	24	6	6	6/11
Gutierrezia sarothrae												
96	**1180**	180	400	760	20	20	0	0	2	-	0	4/4
01	**380**	-	160	220	-	60	0	0	0	-	0	3/5
06	**80**	-	-	60	20	-	0	0	25	25	25	6/10
Juniperus osteosperma												
96	**140**	-	80	60	-	-	0	0	-	-	0	-/-
01	**40**	20	20	20	-	-	0	0	-	-	0	-/-
06	**100**	20	40	60	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
96	**360**	-	360	-	-	-	0	0	-	-	0	3/3
01	**180**	-	80	100	-	-	0	0	-	-	0	2/2
06	**260**	-	-	260	-	-	0	0	-	-	0	2/4
Opuntia sp.												
96	**100**	-	-	80	20	-	0	0	20	-	0	5/16
01	**20**	-	-	20	-	-	0	0	0	-	0	4/10
06	**60**	-	-	60	-	-	0	0	0	-	0	4/15
Prunus virginiana												
96	**40**	-	40	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**60**	-	-	20	40	-	0	0	67	-	0	-/-
Purshia tridentata												
96	**1480**	100	120	1320	40	60	39	55	3	1	1	23/49
01	**1440**	40	100	1260	80	100	21	35	6	3	4	25/48
06	**1320**	80	80	1120	120	100	44	20	9	6	6	29/58
Ribes cereum cereum												
96	**0**	-	-	-	-	-	0	0	-	-	0	4/62
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	55/61
Rosa woodsii												
96	**60**	20	20	40	-	-	0	100	-	-	0	10/4
01	**80**	-	20	60	-	-	0	0	-	-	0	17/18
06	**80**	-	-	80	-	-	0	0	-	-	0	29/10
Symphoricarpos oreophilus												
96	**4840**	80	1100	3740	-	-	7	0	0	-	0	18/29
01	**3980**	-	640	3280	60	-	0	0	2	-	0	19/32
06	**5700**	-	1380	4140	180	-	0	3	3	2	2	19/29
Tetradymia canescens												
96	**1040**	20	280	700	60	-	0	0	6	-	0	8/11
01	**1020**	-	80	920	20	20	0	0	2	-	0	9/10
06	**720**	-	100	340	280	20	0	0	39	11	11	11/16

Trend Study 1-17-06

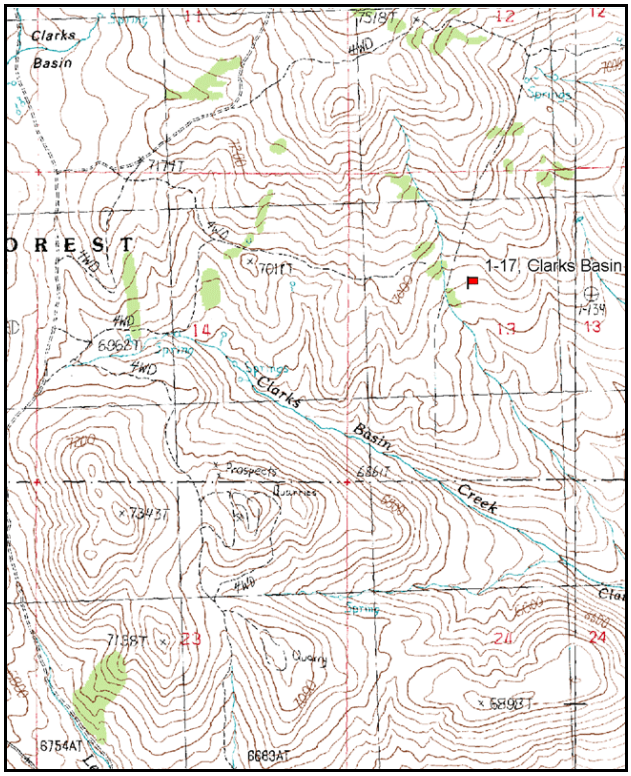
Study site name: Clark's Basin . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 100 degrees magnetic.

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

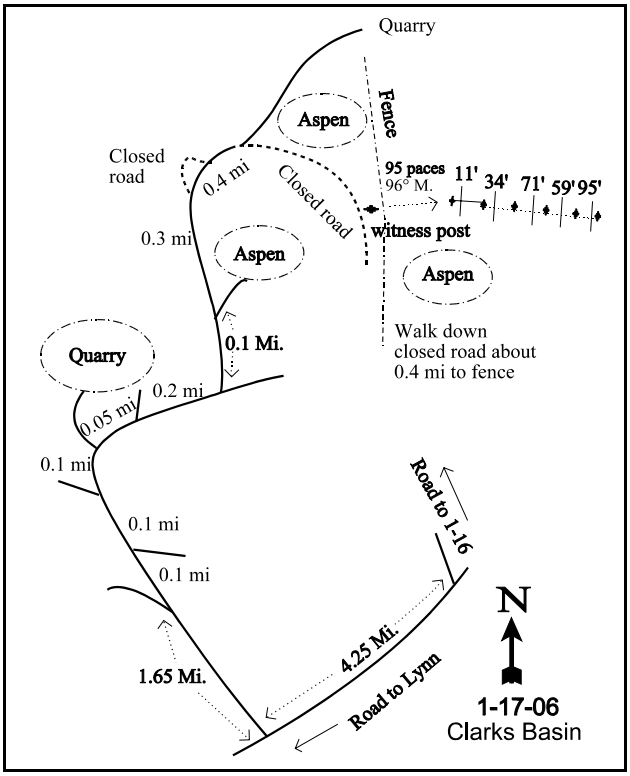
LOCATION DESCRIPTION

From U-30, travel up the road towards Lynn to Clark's Basin for 13.05 miles. Take a right and drive 1.65 miles to a fork in the road. Stay right and continue for another 0.35 on the main road to a quarry. Stay right (far right) and continue for 0.2 miles. Take a left, proceed 0.4 miles to a wet meadow and a spring where the road has a been moved. Go through the stream and continue 0.4 miles to a spot where the road has been closed. From here walk down the hill on the old closed road about 0.4 miles to a witness post near the fence. From the witness post, walk 95 paces at a bearing of 96 degrees magnetic to the 0-foot baseline stake marked by browse tag #443. The baseline runs 100 degrees magnetic.



Map Name: Lynn Reservoir

Township 13N , Range 16W , Section 14



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4636539 N, 281537 E

DISCUSSION

Clark's Basin - Trend Study No. 1-17

Study Information

This trend study was established in 1996 and samples a mixed mountain brush community (elevation: 6,860 feet, slope: 3-5%, aspect: south) near an aspen clone in the Clark's Basin area. The area is administered by the Sawtooth National Forest and is considered important fawning habitat for deer. The study is located on a bench between a ridge to the north and Clark's Basin Creek to the south. This area is grazed by livestock as part of the Rosette allotment. The fence just to the west of the site divides this allotment from the Clark's Basin allotment. A total of 2,000 sheep are allotted from May 16 to July 11. Cattle are allotted from June 16 to July 3. Water is readily available in nearby springs and livestock water developments. A pellet group transect in 2001 estimated 34 deer days use/acre and 2 cows days use/acre (84 ddu/ha and 5 cdu/ha). In 2006, 31 deer, 11 cow, and 6 sheep days use/acre (76 ddu/ha, 27 cdu/ha, and 15 sdu/ha) were estimated.

Soil

The Bullump soil series consist of deep and very deep, well drained soils that formed in colluvium derived from quartzite, welded tuff, chert, argillite, shale, conglomerate, and rhyolite with a component of loess (USDA-NRCS 2006). Soil texture is a clay loam with a neutral reaction (6.8 pH). Effective rooting depth is a little over 20 inches. Erosion is not a problem due to the abundant herbaceous cover and little exposed bare soil. The erosion condition was classified as stable in 2001 and 2006.

Browse

The site is a mixed mountain brush type with a good grass and forb understory, which can provide important early summer forage for deer. Several preferred browse species occupy the site including: serviceberry, black sagebrush, basin big sagebrush, antelope bitterbrush, and woods rose. The dominant browse is mountain big sagebrush, which provides about 20% cover. Mountain big sagebrush density was estimated at 3,180 plants/acre in 2001 and 2006. Decadence increased from 2% of the population in 1996 to 8% in 2001 to 19% in 2006. Utilization was light each time the study was sampled. There was a high number of dead sagebrush along the first 200 feet of the baseline which appear to have died several years ago. This area is characterized as a wet meadow, where it is difficult for sagebrush to grow.

Serviceberry displays moderate to heavy use. Decadence was moderately high at 41% in 1996, but improved to only 7% in 2001 and zero plants were classified as decadent in 2006. Serviceberry provides on average about 3% cover. Antelope bitterbrush density has increased from 440 plants/acre in 2001 to 640 plants/acre in 2006. Bitterbrush cover has averaged about 2%. Utilization of these shrubs has been moderate to heavy. Decadence has decreased from 33% in 1996 to 0% in 2006.

Some black sagebrush occurs in patches along sampling belts 3 and 4 with an estimated density of about 2,200 plants/acre, with about 3% cover. Less preferred browse include: rubber rabbitbrush, mountain low rabbitbrush, creeping barberry, snowberry, and gray horsebrush.

Herbaceous Understory

The herbaceous understory is diverse and abundant. Nine perennial grass, two sedge, and one rush species have been sampled. The dominant species include thickspike wheatgrass, Kentucky bluegrass, and Sandberg bluegrass. Thickspike wheatgrass nested frequency declined significantly in 2006 and cover decreased from 7% to 3%. Bluebunch wheatgrass significantly declined between 1996 and 2006. Baltic rush was first sampled in 2006. This is an increaser species, which could be an indication of over use on this wet meadow.

Forbs are extremely diverse with at least 56 species sampled. Perennial forbs have produced about 13% cover in 2001 and 2006. Several useful species occur including: paintbrush, silvery lupine, lambstongue groundsel, sulfur eriogonum, and Penstemon.

2001 TREND ASSESSMENT

The five preferred browse species make up on average 92% of the total browse cover. The overall trend for browse is stable. The herbaceous understory continues to be diverse and abundant. The grass trend is stable. The sum of nested frequency for perennial grasses show a very slight increase, however Sandberg bluegrass decreased while Kentucky bluegrass increased. This could be a sign of heavy grazing as Kentucky bluegrass increases with grazing. The forb trend is slightly down, as the sum of nested frequency of perennial forbs decreased. The DCI score is excellent, with an abundant and healthy browse component along with an abundance of grasses and forbs.

1996 winter range condition (DC Index) - excellent (86) Mid-level potential scale
2001 winter range condition (DC Index) - excellent (88) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is stable. Density and cover for preferred species has remained stable. Percent decadence has increased for black sagebrush and mountain big sagebrush, but are still only moderate. Bitterbrush density has increased and vigor is good. The grass trend is slightly down. Sum of nested frequency for perennial species has decreased 12%. Also, increaser species like Kentucky bluegrass and a rush species are more dominant than they were in 1996 when the study was established. The forb trend is slightly up with increased abundance of perennials. Povery weed (*Iva axillaris*) was sampled for the first time. This is also an increaser under grazing. The DCI score decreased to good with a decrease of perennial grass cover.

winter range condition (DC Index) - good (75) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 17

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{ab}$279	$_{b}$299	$_{a}$233	6.03	7.03	2.67
G	Agropyron spicatum	$_{b}$46	$_{ab}$24	$_{a}$22	1.37	1.22	.60
G	Bromus tectorum (a)	17	25	17	.06	.06	.03
G	Carex douglasii	$_{b}$52	$_{a}$25	$_{ab}$28	1.12	1.00	.18
G	Carex sp.	-	8	3	-	.18	.18
G	Elymus cinereus	-	4	2	-	.98	.38
G	Juncus balticus	$_{a}$-	$_{a}$-	$_{b}$24	-	-	.62
G	Koeleria cristata	4	9	14	.06	.21	.16
G	Melica bulbosa	4	5	17	.04	.06	.21
G	Poa bulbosa	-	2	1	-	.03	.00
G	Poa fendleriana	6	14	3	.16	.35	.07
G	Poa pratensis	$_{a}$49	$_{b}$159	$_{b}$150	1.04	5.79	3.45
G	Poa secunda	$_{b}$216	$_{a}$148	$_{a}$116	4.51	3.81	1.31
Total for Annual Grasses		17	25	17	0.06	0.06	0.03
Total for Perennial Grasses		656	697	613	14.36	20.69	9.86

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
Total for Grasses		673	722	630	14.42	20.75	9.89
F	Achillea millefolium	$_{a}$62	$_{a}$53	$_{b}$78	.57	.79	1.31
F	Agoseris glauca	$_{b}$112	$_{a}$48	$_{b}$87	.69	.40	.61
F	Allium sp.	$_{a}$22	$_{b}$92	$_{b}$79	.06	.42	.19
F	Antennaria rosea	-	1	6	-	.03	.06
F	Arabis sp.	8	-	6	.02	-	.02
F	Astragalus beckwithii	1	3	-	.03	.04	.00
F	Astragalus cibarius	8	18	6	.39	.08	.07
F	Astragalus convallarius	-	2	8	-	.15	.07
F	Aster sp.	178	192	166	2.19	5.29	3.84
F	Astragalus sp.	5	-	3	.06	-	.03
F	Balsamorhiza sagittata	-	-	-	-	-	.03
F	Castilleja linariaefolia	1	6	-	.03	.30	-
F	Calochortus nuttallii	4	-	-	.01	-	-
F	Cirsium sp.	$_{a}$3	$_{ab}$11	$_{b}$25	.07	.31	.19
F	Collomia linearis (a)	$_{b}$85	$_{a}$24	$_{ab}$49	.20	.06	.12
F	Comandra pallida	$_{a}$15	$_{b}$50	$_{a}$23	.06	.66	.20
F	Collinsia parviflora (a)	$_{c}$287	$_{b}$228	$_{a}$121	2.28	2.41	.39
F	Crepis acuminata	3	8	12	.00	.07	.56
F	Crepis intermedia	$_{b}$10	$_{a}$-	$_{a}$-	.05	-	-
F	Cryptantha sp.	$_{ab}$7	$_{a}$-	$_{b}$15	.01	-	.03
F	Cymopterus sp.	12	-	3	.04	-	.03
F	Cynoglossum officinale	1	-	-	.03	-	-
F	Delphinium nuttallianum	7	17	9	.02	.06	.02
F	Delphinium occidentale	$_{a}$2	$_{a}$1	$_{b}$18	.03	.00	.14
F	Epilobium brachycarpum (a)	$_{a}$-	$_{a}$-	$_{b}$122	-	-	2.23
F	Equisetum sp.	4	3	4	.01	.00	.01
F	Eriogonum umbellatum	16	12	1	.12	.39	.15
F	Galium bifolium (a)	-	-	11	-	-	.07
F	Gayophytum ramosissimum(a)	$_{a}$-	$_{b}$23	$_{a}$-	-	.04	-
F	Geranium sp.	1	1	2	.01	.03	.00
F	Gilia sp. (a)	-	1	-	-	.00	-
F	Hackelia patens	10	2	4	.04	.03	.33
F	Hymenoxys acaulis	$_{b}$41	$_{b}$35	$_{a}$-	.39	.93	-
F	Hydrophyllum capitatum	$_{a}$-	$_{a}$-	$_{b}$45	-	-	.66
F	Iva axillaris	$_{a}$-	$_{a}$-	$_{b}$13	-	-	.49

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Lithophragma parviflora	-	-	4	-	-	.00
F	Lithospermum ruderale	-	-	4	-	-	.19
F	Lomatium triternatum	$_{a}$2	$_{b}$16	$_{a}$-	.01	.30	-
F	Lupinus argenteus	$_{a}$4	$_{a}$6	$_{b}$21	.19	.40	.62
F	Machaeranthera spp	$_{b}$53	$_{a}$3	$_{a}$-	.10	.00	-
F	Microsteris gracilis (a)	$_{a}$-	$_{c}$87	$_{b}$9	-	.18	.02
F	Nemophila breviflora (a)	$_{a}$-	$_{a}$-	$_{b}$28	-	-	.32
F	Penstemon humilis	7	6	12	.01	.16	.12
F	Phlox longifolia	68	75	68	.36	.27	.26
F	Polygonum douglasii (a)	$_{a}$9	$_{a}$10	$_{b}$110	.02	.02	.33
F	Schoencrambe linifolia	-	1	-	-	.03	-
F	Senecio integerrimus	$_{ab}$77	$_{a}$40	$_{b}$79	1.19	.62	1.73
F	Sedum lanceolatum	-	-	3	-	-	.00
F	Senecio multilobatus	-	2	-	-	.00	-
F	Taraxacum officinale	$_{ab}$30	$_{b}$43	$_{a}$14	.16	.21	.05
F	Tragopogon dubius	3	2	-	.01	.18	-
F	Trifolium sp.	-	4	-	-	.00	-
F	Unknown forb-annual (a)	3	-	-	.15	-	-
F	Unknown forb-perennial	32	-	-	.22	-	-
F	Veronica biloba (a)	$_{a}$3	$_{a}$29	$_{b}$148	.03	.13	.93
F	Viguiera multiflora	$_{b}$70	$_{a}$3	$_{a}$-	.14	.03	-
F	Viola sp.	$_{b}$15	$_{a}$6	$_{c}$33	.35	.01	.18
F	Wyethia amplexicaulis	4	3	1	.18	.18	.00
F	Zigadenus paniculatus	14	12	11	.12	.23	.32
Total for Annual Forbs		387	402	598	2.69	2.85	4.42
Total for Perennial Forbs		912	777	863	8.04	12.67	12.59
Total for Forbs		1299	1179	1461	10.73	15.53	17.01

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

BROWSE TRENDS --
Management unit 01 , Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	16	15	15	1.56	2.82	2.72
B	Artemisia nova	16	21	26	3.40	4.13	2.21
B	Artemisia tridentata vaseyana	76	73	73	17.25	20.02	20.17
B	Chrysothamnus nauseosus	2	3	1	-	.03	.03
B	Chrysothamnus viscidiflorus lanceolatus	38	39	40	1.82	1.41	2.70
B	Mahonia repens	3	8	15	.01	.87	.96
B	Purshia tridentata	18	19	26	1.07	1.78	2.07
B	Rosa woodsii	10	12	11	.51	.87	.60
B	Symphoricarpos oreophilus	58	56	64	6.44	4.87	5.77
B	Tetradymia canescens	3	3	2	-	.38	-
Total for Browse		240	249	273	32.10	37.22	37.26

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 17

Species	Percent Cover '06
Amelanchier utahensis	3.25
Artemisia nova	4.59
Artemisia tridentata vaseyana	25.10
Chrysothamnus nauseosus	.15
Chrysothamnus viscidiflorus lanceolatus	2.00
Mahonia repens	.45
Purshia tridentata	5.15
Rosa woodsii	.33
Symphoricarpos oreophilus	8.55

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 17

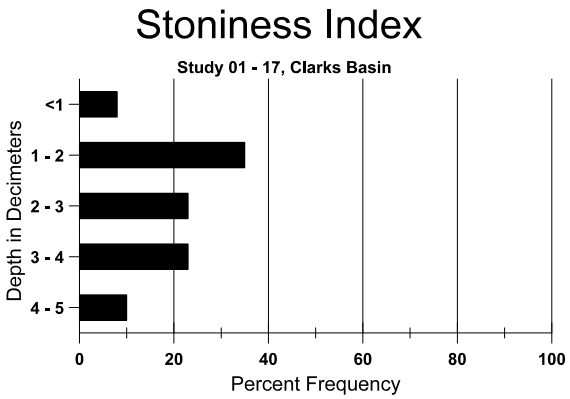
Species	Average leader growth (in)	
	'01	'06
Amelanchier utahensis	2.1	2.1
Artemisia tridentata vaseyana	2.0	1.5
Purshia tridentata	2.9	0.8

BASIC COVER --
Management unit 01 , Study no: 17

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	55.89	68.40	56.25
Rock	2.41	2.63	2.47
Pavement	2.48	2.58	2.78
Litter	52.18	51.50	40.47
Cryptogams	.31	.22	.10
Bare Ground	9.58	7.31	14.65

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 17, Clarks Basin

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
20.5	50.0 (19.7)	6.8	31.7	35	33.3	3.3	24.2	553.6	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 17

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	1	9
Elk	-	-	1
Deer	4	10	13
Cattle	6	2	4
Sheep	-	-	-

Days use per acre (ha)	
'01	'06
-	-
-	-
34 (84)	31 (76)
2 (5)	11 (27)
-	6 (15)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
96	**340**	-	80	120	140	-	65	18	41	18	18	27/32
01	**300**	-	80	200	20	-	27	27	7	-	0	34/39
06	**300**	280	60	240	-	-	33	20	0	-	0	37/42
Artemisia nova												
96	**1560**	-	80	1440	40	40	72	14	3	3	3	9/19
01	**2200**	240	120	1920	160	80	0	0	7	4	4	8/18
06	**2160**	2140	540	1120	500	140	8	.92	23	10	10	10/19
Artemisia tridentata vaseyana												
96	**3500**	100	300	3120	80	640	26	.57	2	.57	.57	20/30
01	**3180**	300	300	2620	260	280	.62	.62	8	.62	3	22/33
06	**3180**	780	280	2280	620	480	8	4	19	9	10	23/35
Chrysothamnus nauseosus												
96	**40**	-	-	20	20	-	50	50	50	-	0	15/19
01	**80**	-	20	60	-	-	0	25	0	-	0	20/21
06	**40**	-	-	-	40	-	0	0	100	100	100	-/-
Chrysothamnus viscidiflorus lanceolatus												
96	**1600**	40	140	1360	100	-	19	0	6	-	0	13/18
01	**1520**	20	100	1260	160	20	0	0	11	-	0	12/15
06	**1440**	-	100	1240	100	-	0	0	7	3	3	13/20
Eriogonum microthecum												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	6/17
Mahonia repens												
96	**100**	-	-	100	-	-	0	0	-	-	0	3/4
01	**1820**	-	360	1460	-	-	0	0	-	-	0	6/7
06	**2620**	-	-	2620	-	-	0	0	-	-	0	5/5
Purshia tridentata												
96	**420**	-	20	260	140	-	38	48	33	14	14	17/28
01	**440**	-	80	280	80	-	36	45	18	5	5	19/40
06	**640**	60	-	640	-	-	28	66	0	-	0	19/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ribes sp.												
96	**0**	-	-	-	-	-	0	0	-	-	0	11/26
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Rosa woodsii												
96	**780**	-	520	260	-	-	0	0	0	-	0	19/17
01	**1020**	-	480	540	-	-	0	0	0	-	0	15/13
06	**640**	-	220	400	20	-	3	0	3	-	0	22/21
Symphoricarpos oreophilus												
96	**2920**	200	720	2100	100	40	17	1	3	.68	.68	16/27
01	**2060**	40	300	1560	200	60	.97	0	10	6	6	14/26
06	**3660**	-	1080	2520	60	-	0	0	2	.54	.54	14/26
Tetradymia canescens												
96	**100**	-	-	100	-	-	60	0	0	-	0	15/18
01	**140**	-	40	60	40	-	0	0	29	14	14	10/12
06	**60**	120	-	40	20	-	0	0	33	-	0	13/19

Trend Study 1-18-06

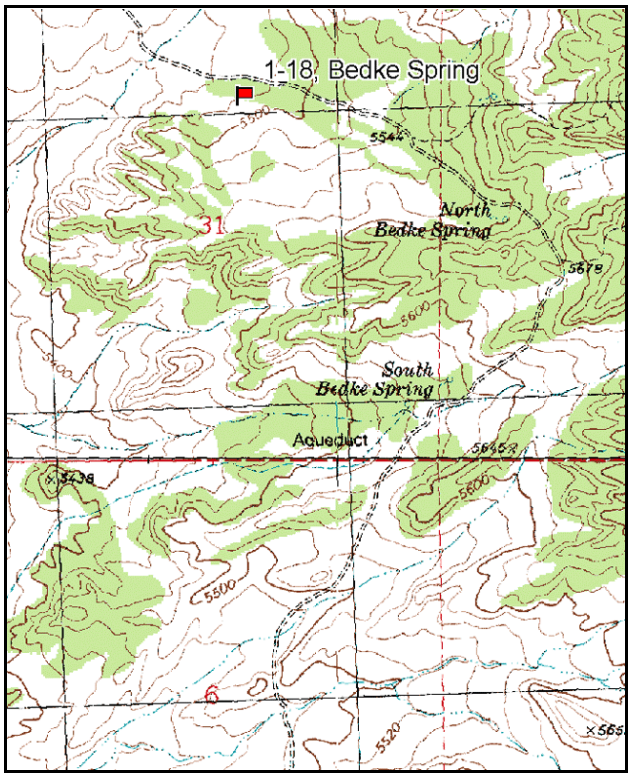
Study site name: Bedke Spring . Vegetation type: Big Sagebrush .

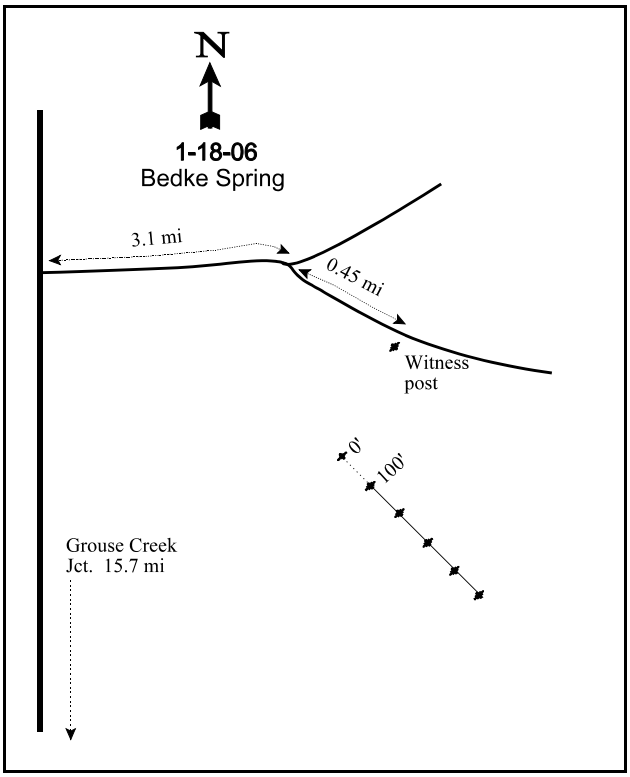
Compass bearing: frequency baseline: 110 degrees magnetic.

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

LOCATION DESCRIPTION

From the Grouse Creek Junction on U-30 travel north for 15.7 miles. Turn right and travel east for 3.1 miles. Stay right and continue 0.45 miles to a witness post on the right hand side of the road. The baseline is approximately 300 feet in a southerly direction on a small bench. The baseline runs 110 degrees magnetic.





Map Name: Ingham Canyon Diagrammatic Sketch

Township 11N , Range 17W , Section 31 UTM NAD 27, UTM 12T 4613021 N, 263661 E

DISCUSSION

Bedke Spring - Trend Study No. 1-18

Study Information

This trend study samples a Wyoming big sagebrush flat surrounded by juniper and pinyon located just west of North Bedke Spring (elevation: 5,500 feet, slope: 3-5%, aspect: northwest). The area is managed by the BLM. Cattle use the area during the spring as part of the Red Butte allotment. A pellet group transect in 2001 estimated 2 deer and 11 cow days use/acre (5 ddu/ha and 27 cdu/ha). In 2006, 5 elk, 6 deer, and 15 cow days use/acre (12 edu/ha, 15 ddu/ha, and 36 cdu/ha) were estimated. Quadrat frequency of rabbit pellets was very high in 2006.

Soil

The Puett soil series consists of shallow, well drained soils that formed in residuum and colluvium derived from tuff and tuffaceous sedimentary rocks (USDA-NRCS 2006). Effective rooting depth was estimated at 18 inches using a soil pentrometer. Soil texture is a clay loam with few rocks on the surface or within the profile. Soil reaction is slightly alkaline (7.7 pH). Phosphorus is low (5.4 ppm), which may limit plant growth (Tiedemann and Lopez 2004). The soil is light colored in the interspaces with little organic matter buildup in the surface horizon. There are large areas of unprotected bare soil. Water movement is evident on the surface and soil is pedestalled underneath shrubs. There are no active gullies and erosion is not severe due to the gentle slope. The erosion condition class was determined to be slight to moderate in 2001 and slight in 2006.

Browse

Wyoming big sagebrush is the dominant browse species, but has been in a state of decline from 1996 to 2006. Sagebrush cover was 8% in 1996, but declined to about 5% by 2006. Density has also declined from 3,360 plants/acre in 1996 to 2,060 plants/acre in 2006. Decadence has increased from 26% to 41% of the population. In 2006, a quarter of the plants sampled were classified as dying. Utilization has been light each time the area was sampled. The decline of this population of sagebrush is likely due to drought and winter injury. Winter injury occurs when water in the cell freezes and ruptures the cell membrane during a cold spell in early fall or spring (Walser et al. 1990). Another injury classified as winter injury is when the plant breaks dormancy during a warm spell in February or March and there is no moisture available to the plant due to drought or frozen ground, which causes the death of the sagebrush crown (Nelson and Tiernan 1983). Winter injury was quite common across the state during the winter of 2002-2003.

Other shrubs contributing additional forage include shadscale, black sagebrush, and a few scattered spiny hopsage. Utilization of these shrubs is light with the exception of a few heavily hedged spiny hopsage which occur in very low numbers.

Narrowleaf low rabbitbrush (an increaser) is very abundant. Cover was 7% in 1996, but dropped to 3% in 2001 and 2% in 2006. Density was 6,600 plants/acre in 1996, but dropped to about 3,800 plants/acre in 2001 and 2006. Black greasewood and threadleaf rubber rabbitbrush are increasers, but not abundant.

Herbaceous Understory

The herbaceous understory is fairly well developed for a Wyoming big sagebrush community. Perennial grasses are fairly diverse and on average produce about 7% cover. The most abundant perennial species consist of Sandberg bluegrass, bottlebrush squirreltail, and bluebunch wheatgrass. Since the establishment of this study in 1996, western wheatgrass abundance has increased and bottlebrush squirreltail abundance has decreased. Annual cheatgrass produced less than 1% total cover in 1996, but nested frequency was significantly higher in 2001 and cover was about 3%. In 2006, cheatgrass cover was up to 7%, which was nearly half of the total grass cover. Cheatgrass quadrat frequency has increased from 36% in 1996, to 84% in 2001, to 93% in 2006. The forb composition is also diverse with 23 perennial and 12 annual species sampled since 1996. Hoods phlox is the most abundant forb, producing on average 7% cover.

2001 TREND ASSESSMENT

The browse trend is slightly down. Wyoming big sagebrush, the key species, has declined. Density dropped from 3,360 plants/acre to 2,540 plants/acre. Decadence increased from 26% to 35% of the population. Recruitment is fair (17% of population classified as young) and utilization light. Shadscale density increased 43% and cover increased from 0.3% to 1.2%. The population of the increaser, narrowleaf low rabbitbrush, appears to be decreasing (down by 42%) with decadence increasing from 2% to 43%. The herbaceous understory is fairly diverse and abundant for a Wyoming big sagebrush type. The grass trend is slightly down. The sum of nested frequency for perennial grasses declined by about 10% and cheatgrass significantly increased. The forb trend is down as perennial forbs have declined, while sum of nested frequency of annuals have increased. The DCI score was slightly higher in 2001 due to a greater percentage of young shrubs.

1996 winter range condition (DC Index) - fair-good (45) Lower potential scale
2001 winter range condition (DC Index) - good (49) Lower potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is down. Wyoming big sagebrush continued to decline. Density was down by 19%, while decadence increased again, from 35% to 41%. A quarter of the population was classified as dying and young plants were less numerous. Drought and winter injury have likely caused the decline of this sagebrush population. Shadscale was also less abundant in 2006. The grass trend is stable. The abundance of both perennial species and cheatgrass changed very little, although cheatgrass cover was higher. The forb trend is also stable. The DCI score declined due to increased decadence and cheatgrass cover.

winter range condition (DC Index) - fair (43) Lower potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 18

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	7	11	14	.30	.10	.72
G	Agropyron smithii	a30	a21	b85	.19	.12	.82
G	Agropyron spicatum	a51	b89	a22	.72	1.11	.73
G	Bromus tectorum (a)	a115	b310	b351	.30	3.50	7.17
G	Elymus sp.	10	-	-	.12	-	-
G	Festuca sp.	2	-	-	.03	-	-
G	Poa fendleriana	2	-	-	.03	-	-
G	Poa secunda	216	218	247	2.92	4.32	5.17
G	Sitanion hystrix	b135	a71	a55	1.19	.89	1.11
Total for Annual Grasses		115	310	351	0.30	3.50	7.17
Total for Perennial Grasses		453	410	423	5.51	6.55	8.56
Total for Grasses		568	720	774	5.82	10.05	15.73
F	Agoseris glauca	-	-	3	-	-	.03
F	Allium acuminatum	1	13	11	.00	.03	.02

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Alyssum alyssoides (a)	-	-	6	-	-	.01
F	Antennaria rosea	a-	a-	b12	-	-	.25
F	Arabis sp.	5	1	-	.04	.03	-
F	Astragalus beckwithii	21	43	33	.12	.59	.65
F	Astragalus cibarius	b35	a7	b41	.20	.05	1.43
F	Astragalus purshii	b13	a5	b19	.14	.00	.16
F	Aster scopulorum	-	-	1	-	-	.00
F	Castilleja angustifolia	2	-	3	.03	-	.03
F	Camelina microcarpa (a)	a-	a3	b66	-	.01	.34
F	Chaenactis douglasii	b23	a3	a7	.05	.00	.04
F	Collomia linearis (a)	4	-	-	.01	-	-
F	Collinsia parviflora (a)	b32	a10	ab19	.10	.02	.06
F	Cordylanthus ramosus (a)	2	-	3	.00	-	.00
F	Crepis acuminata	-	1	-	-	.00	-
F	Cryptantha sp.	b12	a-	a1	.06	-	.00
F	Delphinium nuttallianum	-	4	3	-	.01	.00
F	Descurainia pinnata (a)	a11	b122	a5	.01	.42	.01
F	Erigeron sp.	a-	a6	b14	-	.18	.11
F	Eriogonum ovalifolium	1	3	-	.00	.00	-
F	Erigeron pumilus	b50	a10	a5	.34	.02	.01
F	Eriogonum umbellatum	-	1	2	-	.00	.03
F	Gilia sp. (a)	a2	b29	a3	.01	.10	.00
F	Lathyrus brachycalyx	-	1	-	-	.00	-
F	Lappula occidentalis (a)	a22	b77	b48	.06	.13	.16
F	Lomatium sp.	-	-	-	-	-	.01
F	Microsteris gracilis (a)	a-	b33	c114	-	.08	.79
F	Penstemon cyananthus	b24	a-	a4	.25	-	.04
F	Phlox hoodii	240	240	217	6.65	8.27	6.41
F	Phlox longifolia	b67	ab52	a32	.32	.45	.31
F	Ranunculus testiculatus (a)	11	196	183	.01	1.57	1.25
F	Tragopogon dubius	-	-	1	-	-	.03
F	Unknown forb-annual (a)	4	-	-	.03	-	-
F	Unknown forb-perennial	-	4	-	-	.01	-
F	Veronica biloba (a)	-	-	3	-	-	.01
Total for Annual Forbs		88	470	450	0.26	2.34	2.65
Total for Perennial Forbs		494	394	409	8.22	9.67	9.60

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
Total for Forbs		582	864	859	8.48	12.01	12.25

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

BROWSE TRENDS --
Management unit 01 , Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	1	3	0	.76	.03	-
B	Artemisia tridentata wyomingensis	76	70	60	7.83	6.91	4.90
B	Atriplex confertifolia	23	33	35	.31	1.22	2.46
B	Chrysothamnus nauseosus consimilis	2	1	1	-	.03	.38
B	Chrysothamnus viscidiflorus stenophyllus	86	70	74	7.31	3.35	2.33
B	Grayia spinosa	0	1	0	.30	-	-
B	Opuntia sp.	7	14	15	.15	.06	.09
B	Sarcobatus vermiculatus	2	2	3	.38	.78	1.00
Total for Browse		197	194	188	17.04	12.40	11.19

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 18

Species	Percent Cover '06
Artemisia tridentata wyomingensis	6.06
Atriplex confertifolia	2.90
Chrysothamnus nauseosus consimilis	.75
Chrysothamnus viscidiflorus stenophyllus	3.65
Opuntia sp.	.15
Sarcobatus vermiculatus	.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 18

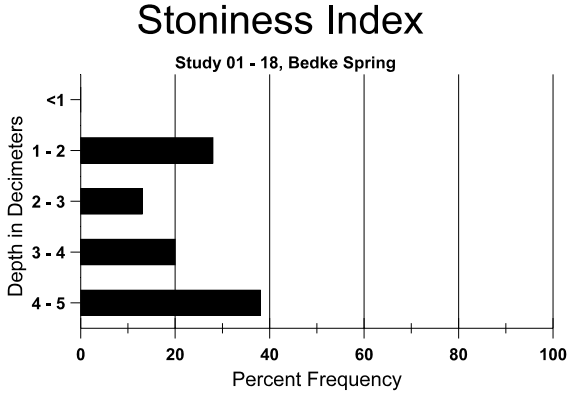
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.3	0.8

BASIC COVER --
Management unit 01 , Study no: 18

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	29.98	34.56	38.54
Rock	2.48	.67	.64
Pavement	6.25	10.18	7.13
Litter	28.97	22.69	24.74
Cryptogams	7.75	12.10	7.60
Bare Ground	27.96	31.32	38.42

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 18, Bedke Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
18.0	57.2 (16.6)	7.7	36.7	30.0	33.3	2.2	5.4	387.2	0.6



PELLET GROUP DATA --
Management unit 01 , Study no: 18

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	7	2	49
Elk	3	-	-
Deer	6	1	10
Cattle	1	3	3

Days use per acre (ha)	
'01	'06
-	-
-	5 (12)
2 (5)	6 (15)
11 (27)	15 (36)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
96	**40**	-	-	20	20	80	100	0	50	-	0	10/26
01	**60**	-	-	40	20	80	0	0	33	-	0	13/24
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata wyomingensis												
96	**3360**	20	200	2300	860	1040	13	0	26	4	5	22/31
01	**2540**	40	420	1240	880	1100	5	0	35	13	14	22/28
06	**2060**	-	160	1060	840	1680	8	0	41	25	25	21/25
Atriplex confertifolia												
96	**1160**	200	880	280	-	-	2	0	0	-	0	8/10
01	**2020**	20	780	1200	40	-	0	0	2	-	0	8/15
06	**1620**	-	140	1280	200	-	0	0	12	6	10	12/22
Chrysothamnus nauseosus consimilis												
96	**40**	-	20	20	-	-	0	0	-	-	0	21/31
01	**20**	-	-	20	-	-	0	0	-	-	0	24/49
06	**20**	-	-	20	-	-	0	0	-	-	0	28/50
Chrysothamnus viscidiflorus stenophyllus												
96	**6600**	20	220	6220	160	-	.60	0	2	-	.30	11/15
01	**3820**	340	220	1940	1660	320	0	0	43	14	14	9/13
06	**3840**	360	200	3400	240	20	9	2	6	.52	.52	9/13
Grayia spinosa												
96	**0**	-	-	-	-	-	0	0	-	-	0	18/40
01	**20**	-	20	-	-	-	0	0	-	-	0	15/25
06	**0**	-	-	-	-	-	0	0	-	-	0	17/40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
96	**140**	-	40	100	-	-	0	0	0	-	0	5/9
01	**300**	40	40	260	-	-	0	0	0	-	0	4/7
06	**320**	20	20	280	20	-	0	0	6	-	6	5/13
Sarcobatus vermiculatus												
96	**80**	-	80	-	-	-	0	0	-	-	0	26/33
01	**60**	-	40	20	-	-	0	0	-	-	0	38/57
06	**80**	-	40	40	-	-	0	0	-	-	0	21/32

Trend Study 1-19-06

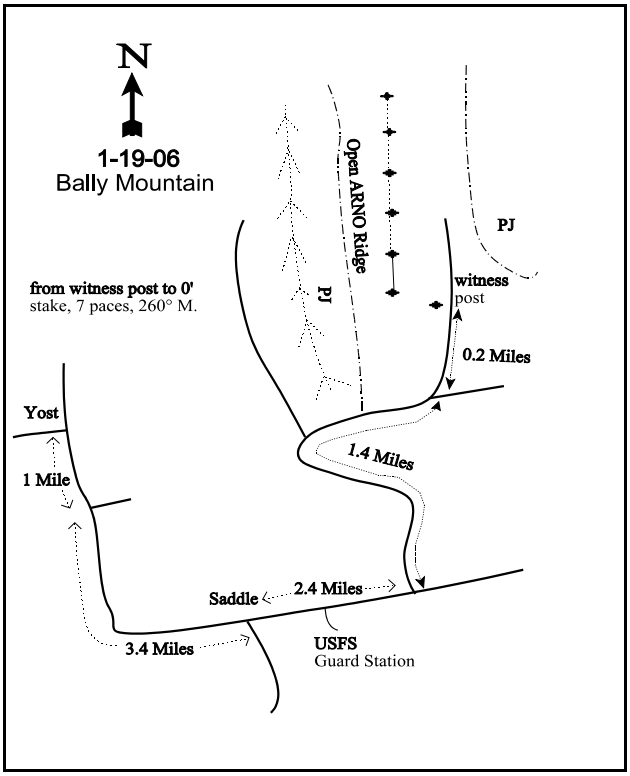
Study site name: Bally Mountain . Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

From the yield sign east of the town of Yost, travel south and then west towards Bally Mountain for 1.0 miles. Stay right and continue for 3.4 miles. Stay left and travel 2.4 miles. Take a left for 1.4 miles then go right for 0.2 miles to the witness post. From the witness post to the 0 foot stake, walk 7 paces at 260 degrees magnetic. The baseline runs 0 degrees magnetic. The 0 foot stake is marked with browse tag #135.



Map Name: Standrod Diagrammatic Sketch

Township 15N , Range 25E , Section 4 UTM NAD 27, UTM 12T 4649407 N, 296607 E

DISCUSSION

Bally Mountain - Trend Study No. 1-19

Study Information

This trend study samples a open west facing ridge (elevation: 7,040 feet, slope: 19-25%, aspect: west) on Bally Mountain. This area is within the Raft River Division of the Sawtooth National Forest. In the fall of 2003, this area was burned as part of the Bally Mountain Prescribed Fire. The purpose of the burn was to reduce natural fuels build-up of Juniper canopy; improve watershed conditions by reducing juniper encroachment; improve plant vigor and bio-diversity of flora to produce 600 to 800 lbs/acre of forage for ungulates; improve winter range for mule deer; and create greater diversity of flora and fauna (USDA-FS 2005). The open ridge top where the study is located was surrounded by pinyon, juniper, and curlleaf mountain mahogany prior to the fire. The fire burned across the ridge and the surrounding forested areas, but a few patches of trees survived. Cattle also graze the area and a trail runs down the ridge. It is in the Clear Creek allotment and One mile/Bally pasture, which is grazed by cattle. The burned area was rested from grazing from 2004-2006. A pellet group transect in 2001 estimated 6 deer days use/acre (15 deer days use/ha) and 10 cow days use/acre (25 cow days use/ha). In 2006, 5 deer days use/acre (12 ddu/ha) were estimated.

Soil

The Clavicon soil series consists of moderately deep, well drained, moderately permeable soils formed in colluvium and residuum from limestone and dolomite. These soils are on mountainsides (USDA-NRCS 2006). The soil texture is a clay loam with a soil reaction that is slightly alkaline (7.7 pH). Percent organic matter was 5% in 1996. Effective rooting depth was about 13 inches. Phosphorus was low (6.0 ppm), which may limit plant growth and development (Tiedemann and Lopez 2004). The soil profile is rocky throughout with mostly gravel and some cobble size rocks. Due to the abundant vegetation and litter cover, erosion is not a problem. The erosion condition class was determined to be stable in 2001 and 2006.

Browse

This open ridge was dominated by a low growing population of black sagebrush. In 1996 and 2001 black sagebrush density averaged 25,710 plants/acre with 82% classified as mature. The prescribed fire burned quite evenly across the open ridge and reduced black sagebrush density to 2,920 plants/acre. Cover was reduced from about 18% to only 2%. The average size of mature plants has been about six inches in height and 12 inches in width. Utilization was mostly moderate in 1996, but has been light since. Vigor has been good. Black sagebrush abundance will likely increase as it recovers from the fire.

Broom snakeweed was very abundant in 1996 and in 2001 with over 10,000 plants/acre, but in 2006 only 380 plants/acre were sampled. Cover was over 3% in 1996 and only about 0.3% in 2006.

Herbaceous Understory

The herbaceous understory is abundant. Five perennial grasses combined to produce 12% cover in 1996, 23% in 2001, and increased to 40% in 2006 after the fire. Bluebunch wheatgrass, Sandberg bluegrass, and prairie junegrass provide nearly all of the total grass cover. Bluebunch wheatgrass nested frequency significantly increased in 2001. Cover increased from 6% to 16%. After the fire and while the area was rested from livestock grazing, cover was nearly 26% and nested frequency was unchanged. Prairie Junegrass nested frequency significantly increased after the burn. Cover was nearly 8% in 2006. This palatable and preferred species may have also benefitted from the lack of grazing.

Forbs are diverse and abundant. However, most of the common forbs are low value, low growing species which include: Fendler sandwort, Torrey milkvetch, stemless goldenweed, desert phlox, and dandelion. Forb nested frequency was higher after the fire in 2006 than in 2001, but not as high as 1996.

2001 TREND ASSESSMENT

Black sagebrush is abundant with adequate numbers of seedlings and young to maintain the population. Browse trend is stable. The herbaceous understory is diverse and in good condition for this vegetation type. The grass trend is stable since 1996 as the sum of nested frequency value for the grasses has remained almost the same. The forb trend is down. The nested frequency value for forbs has decreased.

1996 winter range condition (DC Index) - good-excellent (80) Mid-level potential scale
2001 winter range condition (DC Index) - excellent (83) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is down. The prescribed fire killed most of the black sagebrush, but small patches remain. The grass trend is slightly up. Prairie junegrass nested frequency increased significantly. This may be a response to the fire or to the lack of grazing, or both. The forb trend is slightly up. The nested frequency of perennial forbs increased 17%. Fendler sandwort, Lewis flax, and dandelion all increased significantly. The DCI score is down after the destruction of most browse on the ridge.

winter range condition (DC Index) - poor (43) Mid-level potential scale
browse - down (-2) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 19

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	-	-	6	-	-	.18
G	Agropyron spicatum	$_{a}$334	$_{b}$367	$_{b}$359	6.34	16.36	25.72
G	Bromus tectorum (a)	3	8	3	.00	.01	.00
G	Koeleria cristata	$_{a}$64	$_{a}$100	$_{b}$188	1.12	2.23	7.99
G	Oryzopsis hymenoides	$_{b}$14	$_{a}$-	$_{a}$3	.25	-	.03
G	Poa secunda	301	259	277	4.57	4.67	5.64
G	Sitanion hystrix	2	-	-	.00	-	-
Total for Annual Grasses		3	8	3	0.00	0.00	0.00
Total for Perennial Grasses		715	726	833	12.30	23.27	39.57
Total for Grasses		718	734	836	12.31	23.28	39.57
F	Achillea millefolium	4	4	7	.03	.15	.06
F	Agoseris glauca	2	8	3	.00	.04	.03
F	Alyssum alyssoides (a)	-	-	1	-	-	.00
F	Antennaria rosea	6	10	12	.06	.05	.28
F	Arabis sp.	37	10	10	.08	.03	.06
F	Arenaria fendleri	$_{b}$160	$_{a}$84	$_{b}$161	.97	.38	2.21
F	Astragalus calycosus	$_{c}$117	$_{a}$51	$_{b}$84	1.52	.27	.33
F	Aster sp.	24	6	6	.06	.15	.38
F	Castilleja angustifolia	$_{b}$11	$_{b}$17	$_{a}$5	.02	.33	.04

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Castilleja linariaefolia	$_{b}$36	$_{b}$55	$_{a}$-	.17	.51	-
F	Calochortus nuttallii	-	-	5	-	-	.01
F	Chenopodium fremontii (a)	-	3	10	-	.00	.04
F	Cirsium sp.	3	4	6	.01	.01	.16
F	Comandra pallida	2	6	3	.00	.01	.04
F	Collinsia parviflora (a)	$_{b}$275	$_{b}$293	$_{a}$117	1.78	2.56	.22
F	Cordylanthus ramosus (a)	7	-	-	.01	-	-
F	Crepis intermedia	2	-	-	.00	-	-
F	Cryptantha sp.	$_{b}$21	$_{a}$-	$_{a}$2	.13	-	.01
F	Cymopterus sp.	4	-	7	.00	-	.05
F	Descurainia pinnata (a)	-	-	1	-	-	.00
F	Draba sp. (a)	-	-	1	-	-	.00
F	Erigeron pumilus	$_{b}$54	$_{a}$24	$_{a}$14	.26	.07	.26
F	Haplopappus acaulis	$_{b}$88	$_{a}$50	$_{a}$33	2.61	.75	.78
F	Lappula occidentalis (a)	$_{b}$30	$_{a}$1	$_{c}$76	.20	.00	.33
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$27	-	-	.05
F	Lesquerella sp.	4	11	1	.00	.02	.00
F	Linum lewisii	$_{b}$55	$_{a}$6	$_{b}$46	.26	.04	.51
F	Lithospermum ruderale	-	-	1	-	-	.00
F	Lomatium sp.	5	7	-	.03	.02	-
F	Machaeranthera canescens	4	-	1	.00	-	.00
F	Microsteris gracilis (a)	-	4	6	-	.00	.01
F	Penstemon sp.	2	-	-	.00	-	-
F	Phlox austromontana	$_{c}$238	$_{b}$183	$_{a}$149	5.08	3.70	2.54
F	Phlox longifolia	$_{a}$-	$_{ab}$6	$_{b}$11	-	.01	.07
F	Ranunculus testiculatus (a)	$_{a}$13	$_{a}$19	$_{b}$71	.16	.19	.27
F	Senecio multilobatus	$_{b}$48	$_{a}$25	$_{ab}$38	.28	.14	.45
F	Taraxacum officinale	$_{ab}$92	$_{a}$69	$_{b}$119	.50	.64	1.24
F	Tragopogon dubius	$_{b}$18	$_{a}$6	$_{ab}$3	.06	.03	.03
F	Viola sp.	-	3	3	-	.00	.00
Total for Annual Forbs		325	320	283	2.16	2.77	0.91
Total for Perennial Forbs		1037	645	757	12.22	7.41	9.68
Total for Forbs		1362	965	1040	14.39	10.18	10.59

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

BROWSE TRENDS --
Management unit 01 , Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	100	100	26	14.38	17.74	2.26
B	Artemisia tridentata vaseyana	1	2	1	-	-	-
B	Cercocarpus ledifolius	1	1	0	-	-	-
B	Chrysothamnus nauseosus consimilis	24	24	9	.82	1.19	.51
B	Chrysothamnus viscidiflorus stenophyllus	1	1	2	-	-	.01
B	Eriogonum microthecum	15	21	9	.01	.04	.03
B	Gutierrezia sarothrae	98	86	12	3.24	1.33	.30
B	Pediocactus simpsonii	4	0	2	.01	-	-
B	Pinus monophylla	2	1	1	-	-	-
B	Tetradymia canescens	1	1	3	-	-	-
Total for Browse		247	237	65	18.48	20.31	3.13

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 19

Species	Percent Cover '06
Artemisia nova	2.18
Artemisia tridentata vaseyana	.40
Chrysothamnus nauseosus consimilis	.50
Eriogonum microthecum	.13
Gutierrezia sarothrae	.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 19

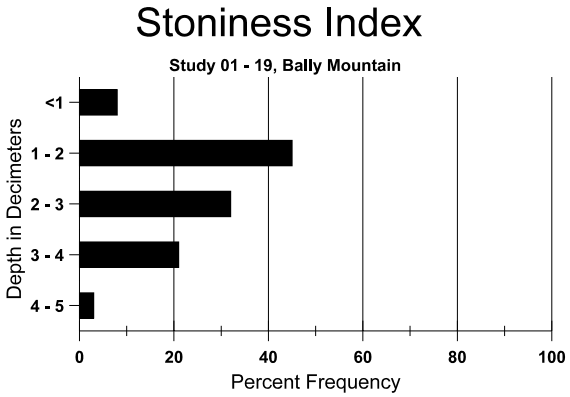
Species	Average leader growth (in)	
Artemisia nova	0.7	-

BASIC COVER --
Management unit 01 , Study no: 19

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	44.50	63.04	50.23
Rock	6.55	1.45	5.07
Pavement	11.31	11.48	17.12
Litter	29.17	23.38	18.61
Cryptogams	2.90	2.75	.96
Bare Ground	5.23	9.27	19.50

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 19, Bally Mountain

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.4	52.6 (14.5)	7.8	26.7	42.0	31.3	5.0	6.0	297.6	0.7



PELLET GROUP DATA --
Management unit 01 , Study no: 19

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	1	4
Deer	13	2	3
Cattle	3	2	-

Days use per acre (ha)	
'01	'06
-	-
6 (15)	5 (12)
10 (25)	-

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	5/10
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
96	**26540**	380	5100	20400	1040	380	76	3	4	.82	.82	5/15
01	**24880**	180	1700	21420	1760	240	3	0	7	1	1	6/12
06	**2920**	-	160	2580	180	520	34	5	6	1	1	5/12
Artemisia tridentata vaseyana												
96	**20**	-	20	-	-	-	0	0	-	-	0	8/19
01	**40**	-	-	40	-	-	0	0	-	-	0	9/19
06	**20**	-	-	20	-	-	0	100	-	-	0	23/43
Cercocarpus ledifolius												
96	**20**	-	20	-	-	-	0	100	-	-	0	-/-
01	**20**	-	20	-	-	-	100	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus consimilis												
96	**620**	-	140	380	100	-	32	13	16	6	6	17/24
01	**720**	-	240	200	280	40	0	0	39	17	19	19/23
06	**220**	-	20	200	-	40	18	0	0	-	0	14/19
Chrysothamnus viscidiflorus stenophyllus												
96	**20**	-	-	20	-	-	0	0	0	-	0	6/10
01	**20**	20	-	-	20	-	0	0	100	-	0	-/-
06	**60**	-	-	60	-	-	0	0	0	-	0	8/10
Eriogonum microthecum												
96	**500**	-	160	340	-	-	20	0	-	-	0	6/10
01	**980**	-	200	780	-	-	0	0	-	-	0	6/10
06	**240**	-	60	180	-	-	0	0	-	-	0	4/7
Gutierrezia sarothrae												
96	**19520**	1160	5540	13560	420	340	0	0	2	.51	.51	3/4
01	**11080**	340	1320	9400	360	20	0	0	3	2	2	3/5
06	**380**	100	-	340	40	-	0	0	11	11	11	4/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
96	**80**	-	-	80	-	-	0	0	-	-	0	1/2
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**40**	-	-	40	-	-	0	0	-	-	0	1/2
Pinus monophylla												
96	**40**	20	40	-	-	-	0	0	-	-	0	-/-
01	**20**	40	20	-	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	17/33
Tetradymia canescens												
96	**20**	-	-	20	-	-	0	0	-	-	0	11/17
01	**20**	-	-	20	-	-	0	0	-	-	0	14/20
06	**60**	-	40	20	-	-	0	0	-	-	0	9/10

Trend Study 1-22-06

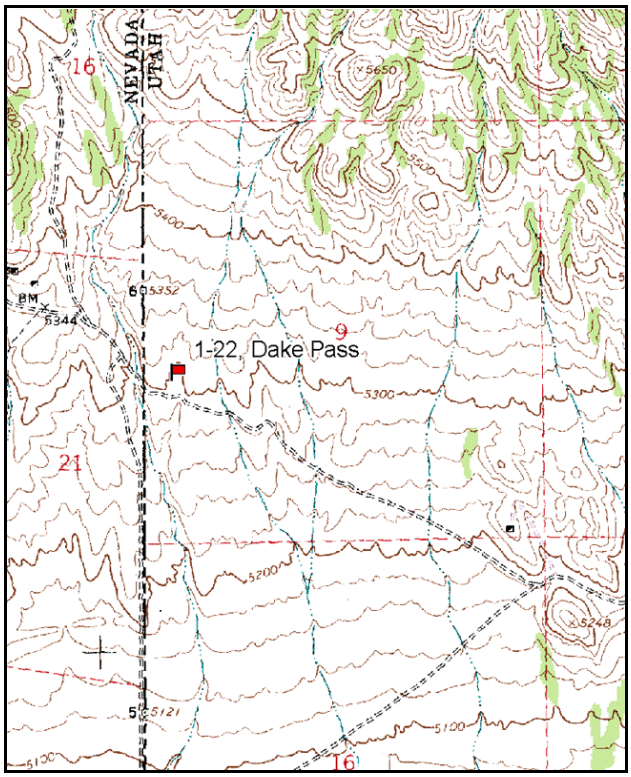
Study site name: Dake Pass . Vegetation type: Black Sagebrush .

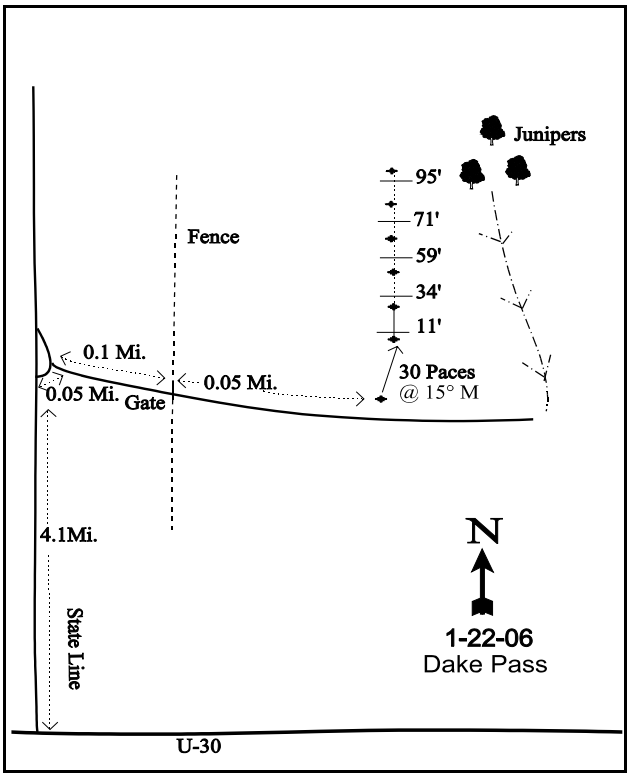
Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

From U-30 at the Utah/Nevada state line, near mile marker 0, turn right and travel 4.1 miles to an intersection. Take a right at the intersection and travel 0.15 to a gate. From the gate drive 0.05 miles to a witness post on the left hand side of the road. From the witness post walk 30 paces at 15 degrees magnetic to the 0-foot baseline stake. The baseline runs 0 degrees magnetic.





Map Name: Jackson Spring

Diagrammatic Sketch

Township 8N , Range 19W , Section 9

UTM NAD 27, UTM 12T 4590307 N, 246104 E

DISCUSSION

Dake Pass - Trend Study No. 1-22

Study Information

The Dake Pass study (elevation: 5,300 feet, slope: 3-5%, aspect: south) samples a salt desert shrub community just west of the Utah-Nevada state line. The site is characterized by gentle low ridges dominated by black sagebrush and shallow drainage depressions with deeper soils. This area is utilized by deer and elk as winter range. It is also an important sage grouse strutting area. A large number of sage grouse droppings were noted on the next ridge to the east in 2001. Deer and elk pellets were encountered when the transect was setup, but more appeared to be outside of the sampled area. This area is within the U & I allotment. It is grazed by cattle from November 1 to March 31. A pellet group transect read in 2001 estimated 19 elk days use/acre (46 edu/ha). In 2006, 12 elk and 9 cow days use/acre (30 edu/ha and 23 cdu/ha) were sampled. An estimate of 26 sage grouse pellet groups/acre were also sampled.

Soil

The Tosser soil series consists of very deep, well drained, moderately rapidly permeable soils formed in mixed alluvium from limestone, rhyolite and chert on dissected fan terraces, bars and beach plains (USDA-NRCS 2006). The effective rooting depth is only 10 inches. The soil is light colored, with considerable surface rock and pavement cover. Soil texture is a clay loam with a moderately alkaline soil reaction (8.2 pH). Phosphorus is marginal at 9.3 ppm, which may limit normal plant growth and development (Tiedemann and Lopez 2004). There are large open areas between individual shrubs, but little bare soil is exposed due to the abundance of pavement-rock cover (~30%). The soil profile is rocky throughout, yet no hardpan was noted. Aside from the gradual movement of soil from the low ridges, there is no accelerated erosion occurring and the erosion condition class was determined as stable in 2001. In 2006, erosion was classified as slight due to some surface litter movement, pedestalling, and a few small rills.

Browse

Black sagebrush is the most abundant species, but there are several other palatable browse species including: bud sagebrush, shadscale, winterfat, Nevada ephedra, and spiny hopsage. All provide additional forage for wintering big game. Black sagebrush cover has been about 13% on average, which is more than half of the total shrub cover. Density has fluctuated slightly with each reading (7,580 plant/acre in 1996, 8,360 in 2001, and 6,920 in 2006), but there have been no major changes. Utilization was mostly moderate in 1996 and mostly light in 2001 and 2006. Decadence has been moderate at 33% in 1996 and 27% in both 2001 and 2006. Recruitment has been fair at each reading. Seedlings were extremely abundant in 2006. The average annual leader growth was poor in 2001 (0.6 inches), but was higher in 2006 (1.1 inches).

Other preferred browse occur at much lower densities. Bud sagebrush density has decreased since the establishment of the study in 1996 (1,080 plants/acre in 1996, 780 in 2001, and 400 in 2006). Shadscale density has also declined from 4,800 plants/acre in 1996 to 3,200 plants/acre in 2006. Utilization has been light. Winterfat density has increased during the same time period (60 plants/acre in 1996 to 1,000 in 2006). Ephedra and spiny hopsage occur infrequently. Other less desirable shrubs include narrowleaf low rabbitbrush and Nuttal horsebrush.

Herbaceous Understory

The herbaceous understory is not particularly abundant. Only three perennial grass species have been sampled: Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail. Squirreltail nested frequency significantly declined in 2006. Cheatgrass was sampled in 8% of the quadrats in 1996; this doubled to 16% in 2001. In 2006, quadrat frequency increased to 99% and cheatgrass cover increased from less than 1% to nearly 13%. Cheatgrass nested frequency increased significantly in both 2001 and 2006. This high amount of cheatgrass could lead to a devastating fire or poor reproduction of shrubs. Forbs are diverse, however most have low forage value. Hoods phlox is the most abundant forb.

2001 TREND ASSESSMENT

The key browse is black sagebrush. It appears to have a stable population even with the 9% increase in its population. This is offset by moderately high decadence (27%). There are adequate numbers of young. The other preferred browse species, which are a minor component of the browse population, also appear to have stable populations. The grass trend is stable. Perennial grass frequency was unchanged. Cheatgrass increased, but is still very sparse. The forb trend is down. Nested frequency was significantly lower for four perennial species. The DCI score has remained unchanged.

1996 winter range condition (DC Index) - good (63) Lower potential scale
2001 winter range condition (DC Index) - good (57) Lower potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Black sagebrush density declined 17%, but was only about 6% lower than the 1996 density. Percent decadence is moderate and has not changed. Bud sage, shadscale, and spiny hopsage have all had declines in density. Winterfat is the only preferred species that has been increasing. Drought conditions and competition with cheatgrass may be causes for these declines. The grass trend is down. Nested frequency for perennial grasses declined 15%, while cheatgrass increased significantly. Cheatgrass is now very abundant. The forb trend is up. Nested frequency increased 36% in 2006. The DCI score decreased due to the increase of cheatgrass.

winter range condition (DC Index) - fair-good (46) Lower potential scale
browse - slightly down (-1) grass - down (-2) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 22

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Bromus tectorum (a)	$_{a}$27	$_{b}$51	$_{c}$406	.04	.20	12.83
G	Oryzopsis hymenoides	49	63	57	.64	2.33	1.38
G	Poa secunda	136	118	133	2.87	2.54	3.89
G	Sitanion hystrix	$_{b}$129	$_{b}$126	$_{a}$71	2.46	3.64	1.14
Total for Annual Grasses		27	51	406	0.04	0.20	12.83
Total for Perennial Grasses		314	307	261	5.98	8.52	6.42
Total for Grasses		341	358	667	6.02	8.72	19.26
F	Agoseris glauca	3	-	-	.00	-	-
F	Arabis sp.	$_{b}$10	$_{a}$-	$_{a}$-	.02	-	-
F	Astragalus sp.	-	-	1	-	-	.00
F	Astragalus utahensis	$_{b}$12	$_{a}$-	$_{ab}$4	.03	-	.06
F	Caulanthus crassicaulis	4	-	1	.38	-	.00
F	Collinsia parviflora (a)	14	-	5	.02	-	.01
F	Cryptantha sp.	$_{b}$33	$_{a}$-	$_{b}$27	.42	-	.09
F	Cymopterus sp.	-	1	-	-	.00	-
F	Descurainia pinnata (a)	$_{a}$2	$_{a}$15	$_{b}$33	.00	.04	.08

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Erigeron sp.	-	-	1	-	-	.00
F	Eriogonum ovalifolium	1	-	-	.00	-	-
F	Erigeron pumilus	2	-	-	.00	-	-
F	Gilia sp. (a)	$_{a}$5	$_{a}$3	$_{b}$21	.01	.00	.05
F	Halogeton glomeratus (a)	1	-	-	.00	-	-
F	Lappula occidentalis (a)	15	4	13	.05	.01	.02
F	Mentzelia albicaulis (a)	6	-	1	.03	-	.00
F	Navarretia intertexta (a)	7	-	3	.01	-	.00
F	Phlox hoodii	$_{b}$107	$_{a}$50	$_{a}$49	2.47	.55	.62
F	Phlox longifolia	$_{a}$27	$_{ab}$51	$_{b}$57	.15	.22	.34
F	Sphaeralcea grossulariifolia	1	1	-	.03	.00	-
F	Townsendia sp.	3	-	-	.01	-	-
Total for Annual Forbs		50	22	76	0.14	0.05	0.17
Total for Perennial Forbs		203	103	140	3.55	0.78	1.13
Total for Forbs		253	125	216	3.70	0.84	1.31

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

BROWSE TRENDS --
Management unit 01 , Study no: 22

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	87	92	88	14.13	13.55	12.41
B	Artemisia spinescens	19	15	8	.55	.19	.45
B	Atriplex confertifolia	56	53	51	4.50	2.28	2.72
B	Ceratoides lanata	3	13	16	.03	.27	.65
B	Chrysothamnus viscidiflorus stenophyllus	35	39	36	1.76	1.27	2.41
B	Ephedra nevadensis	9	8	10	.21	.64	.63
B	Grayia spinosa	10	9	9	2.70	2.33	2.45
B	Kochia americana	17	0	0	.75	-	-
B	Pediocactus simpsonii	3	2	3	.00	.00	-
B	Tetradymia nuttallii	5	2	1	.30	.06	-
Total for Browse		244	233	222	24.95	20.63	21.74

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 22

Species	Percent Cover '06
Artemisia nova	12.31
Artemisia spinescens	.06
Atriplex confertifolia	4.03
Ceratoides lanata	.40
Chrysothamnus viscidiflorus stenophyllus	2.18
Ephedra nevadensis	.56
Grayia spinosa	2.18
Tetradymia nuttallii	.30

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 22

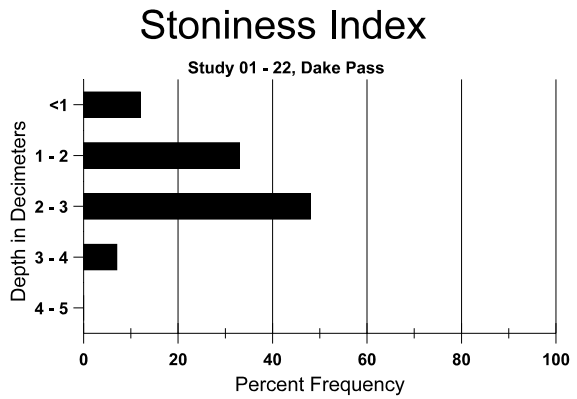
Species	Average leader growth (in)	
Artemisia nova	0.6	1.1
Ceratoides lanata	-	3.2

BASIC COVER --
Management unit 01 , Study no: 22

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	33.97	32.38	38.72
Rock	5.53	2.96	3.77
Pavement	27.12	30.03	27.08
Litter	33.09	17.84	28.57
Cryptogams	2.29	3.89	1.95
Bare Ground	4.20	17.40	13.35

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 22, Dake Pass

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.2	60.8 (10.6)	8.2	42.7	28.0	29.3	1.8	9.3	380.8	0.8



PELLET GROUP DATA --
Management unit 01 , Study no: 22

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	13
Elk	1	9	12
Deer	1	-	1
Cattle	-	-	1

Days use per acre (ha)	
'01	'06
-	-
19 (46)	12 (30)
-	-
-	9 (23)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
96	**7580**	5660	800	4300	2480	1720	55	21	33	7	7	11/23
01	**8360**	360	1280	4800	2280	1620	2	.95	27	12	12	9/18
06	**6920**	113560	520	4520	1880	2520	5	0	27	16	16	10/19
Artemisia spinescens												
96	**1080**	20	260	540	280	20	11	24	26	19	22	5/13
01	**780**	-	60	480	240	60	13	18	31	18	18	6/8
06	**400**	20	-	380	20	20	35	5	5	-	0	5/8
Artemisia tridentata wyomingensis												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	30/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex confertifolia												
96	**4800**	1660	1400	2840	560	260	7	8	12	2	3	9/15
01	**3480**	20	800	2100	580	320	0	0	17	5	5	7/12
06	**3200**	100	460	2500	240	80	1	0	8	3	3	9/16
Ceratoides lanata												
96	**60**	-	20	40	-	-	0	67	0	-	0	7/12
01	**680**	20	180	500	-	-	3	0	0	-	0	5/8
06	**1000**	40	160	800	40	-	30	60	4	-	0	7/10
Chrysothamnus viscidiflorus stenophyllus												
96	**1120**	400	40	1000	80	20	7	0	7	-	2	10/16
01	**1240**	40	160	900	180	-	0	0	15	8	8	9/16
06	**1440**	780	40	1280	120	40	3	3	8	1	1	10/15
Ephedra nevadensis												
96	**280**	-	60	220	-	-	29	36	0	-	0	18/29
01	**160**	-	-	120	40	-	50	50	25	-	0	15/25
06	**260**	-	20	160	80	-	0	69	31	8	31	15/23
Grayia spinosa												
96	**260**	-	-	200	60	20	15	8	23	8	31	23/34
01	**380**	-	-	280	100	-	0	0	26	-	0	16/25
06	**320**	-	-	260	60	20	13	0	19	13	13	20/29
Kochia americana												
96	**1360**	40	60	1280	20	-	13	0	1	1	1	6/11
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Leptodactylon pungens												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	7/14
Opuntia sp.												
96	**0**	-	-	-	-	-	0	0	-	-	0	4/13
01	**0**	-	-	-	-	-	0	0	-	-	0	5/10
06	**0**	-	-	-	-	-	0	0	-	-	0	5/16
Pediocactus simpsonii												
96	**60**	-	-	60	-	-	0	0	-	-	0	0/2
01	**40**	-	-	40	-	-	0	0	-	-	0	1/2
06	**60**	-	40	20	-	20	0	0	-	-	0	1/2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia nuttallii												
96	**140**	-	40	60	40	-	0	0	29	14	14	13/18
01	**40**	-	-	-	40	60	0	0	100	100	100	11/12
06	**20**	-	-	20	-	40	0	0	0	-	0	14/20

Trend Study 1-23-06

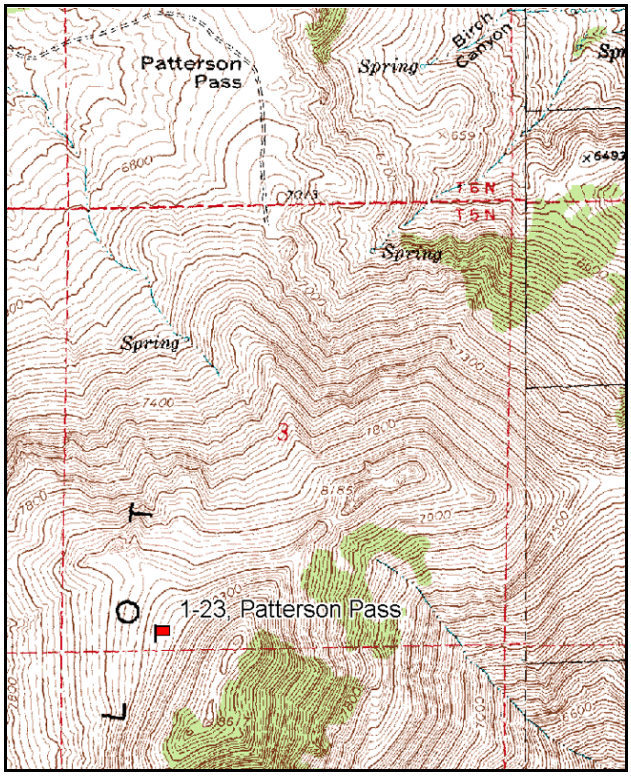
Study site name: Patterson Pass . Vegetation type: Big Sagebrush .

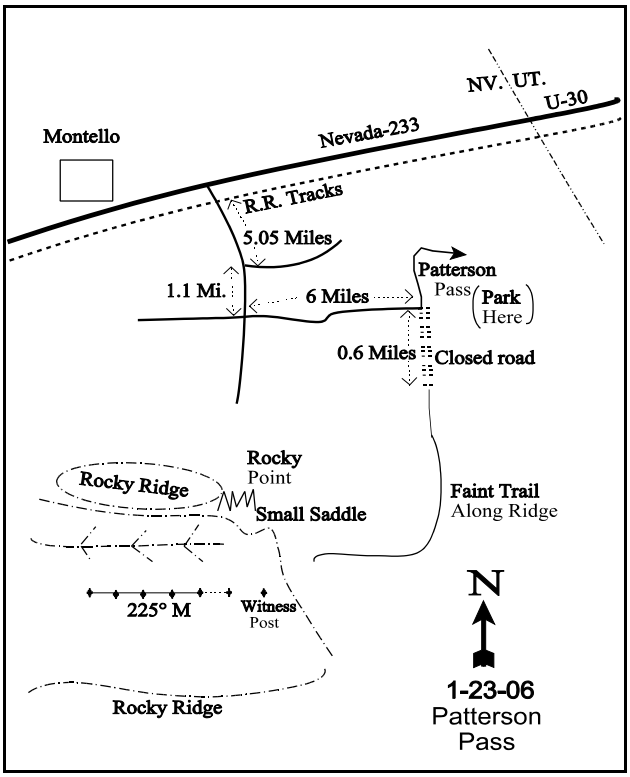
Compass bearing: frequency baseline 225 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 1 on 1 ft., belt 2 on 15 ft., belt 3 on 0 ft., belt 4 on 1 ft., belt 5 on 0 ft.

LOCATION DESCRIPTION

Drive 0.5 miles past mile marker 25 on Nevada State Road 233. Turn left and cross tracks and continue straight for 5.05 miles. At this point there will be a road going to the left. Stay right and continue 1.1 miles to a four way intersection. Take a left turn and drive 6 miles to Patterson Pass. Park here. Walk up a closed road for 0.6 miles to a faint trail. From here walk on the trail up the ridge to a saddle. Stay high on the slope. The witness post is in the saddle about 400 ft. from the rocky slope to the east. The 0-foot baseline stake is just a few paces west of the witness post. The baseline runs 225 degrees magnetic.





Map Name: Patterson Pass Diagrammatic Sketch

Township 5N , Range 19W , Section 3 UTM NAD 27, UTM 12T 4562113 N, 246992 E

DISCUSSION

Patterson Pass - Trend Study No. 1-23

Study Information

The Patterson Pass study (elevation: 8,220 feet, slope: 15-25%, aspect: southwest) was established in 1996 to monitor important habitat for elk on the Pilot Mountains along the Utah-Nevada border. The study area is above Patterson Pass and is remote and accessible only by foot. This area receives concentrated use by elk. Small numbers of deer pellet groups have also been sampled. Chuckers were heard on the nearby rocky slopes in 1996. The area is within the Lucin-Pilot allotment which is grazed by cattle and sheep. Livestock do not appear to utilize the steeper slopes where the transect is located. A pellet group transect in 2001 estimated 47 elk days use/acre (116 elk days use/ha). Only 1 deer pellet group was encountered. In 2006, elk use was estimated at 40 days use/acre (99 edu/ha). One deer day use/acre (3 ddu/ha) was also estimated. Two cow elk were seen in the area when the site was read on June 6, 2001 and again in 2006. It was apparent from pellet groups that elk use the area throughout the spring and summer. Bedding areas were also noted and it appeared that some sagebrush plants were used as antler rubs.

Soil

The Lundy soil series consists of shallow, well drained, moderate to moderately rapidly permeable soils on hillsides, ridges and mountainsides. These soils formed in residuum and colluvium from limestone and shale (USDA-NRCS 2006). The average effective rooting depth is almost 10 inches. The soil is a clay loam with a neutral soil reaction (6.7 pH). It is extremely rocky with numerous large rocks and boulders on the surface and throughout the profile. Rooting depth is limited in some areas where black sagebrush occurs in isolated pockets, but the deeper rooted mountain big sagebrush, which dominates the site, would indicate a deeper soil. Protective ground cover, in the form of vegetation and litter cover, is abundant and well dispersed. Accelerated erosion is not a problem and the erosion condition class was determined to be stable in 2001 and 2006.

Browse

The site is dominated by mountain big sagebrush. It has accounted for more than half of the browse cover. Mountain big sagebrush cover has averaged about 20% for all readings. Black sagebrush is also abundant. Cover has averaged about 6%. It appears that there is hybridization between these two species. The combined densities of these plants were 7,160 plants/acre (1996), 7,900 (2001), and 7,820 (2006). Decadence of mountain big sagebrush increased slightly in 2006 from 15% to 27%. Utilization has been light at this high elevation. Seedlings and young plants have been adequate to maintain the population. Additional forage is provided by slenderbush eriogonum and a few scattered wax current.

The increaser, mountain low rabbitbrush, is fairly abundant but density has been declining (4,100 plants/acre in 1996, 3,280 in 2001, and 2,760 in 2006). Cover has averaged about 4%.

Herbaceous Understory

The herbaceous understory is abundant and diverse. Twelve different grass species have been sampled. Sheep fescue has been the most abundant species and has averaged about 14% cover. Spike fescue, mutton bluegrass, and Sandberg bluegrass are also common. Bluebunch wheatgrass is less abundant and significantly decreased in nested frequency between 1996 and 2006. Several useful forb species are present including: silvery lupine, bluebell, lambstongue groundsel, and hooker balsamroot. Utilization was noted in 1996 on lambstongue and bluebell.

2001 TREND ASSESSMENT

The key browse species, mountain big sagebrush and black sagebrush, are stable with vigorous populations. Mountain low rabbitbrush has actually decreased in abundance, with a population that continues to be mostly mature. The herbaceous understory is abundant and provides good forage for elk and deer. The trend for

grasses is slightly down as the sum of nested frequency for perennial grasses has decreased about 12%. The forb trend is slightly up. Nested frequency for perennial forbs increased 18%.

1996 winter range condition (DC Index) - excellent (89) Mid-level potential scale
2001 winter range condition (DC Index) - excellent (86) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is stable. The combined density of mountain big sagebrush and black sagebrush changed very little. Percent decadence was slightly higher for mountain big sagebrush, but the population is still vigorous and abundant. Mountain low rabbitbrush density declined by 16%. This species is an undesirable increaser. The grass trend is stable. Bluebunch wheatgrass has decreased, but Sandberg bluegrass has increased. The forb trend is slightly down. Nested frequency for perennial forbs decreased 13%. The biggest decreased came from longleaf phlox. The DCI score declined due to higher shrub decadence.

winter range condition (DC Index) - good-excellent (81) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 23

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{b}$43	$_{ab}$24	$_{a}$6	.32	.78	.18
G	Elymus cinereus	5	5	5	.63	.85	.63
G	Festuca ovina	292	287	281	12.97	15.92	12.14
G	Koeleria cristata	-	2	-	-	.30	-
G	Leucopoa kingii	110	84	98	2.50	4.80	3.96
G	Melica bulbosa	-	-	1	-	-	.15
G	Poa fendleriana	47	63	49	.77	1.99	1.08
G	Poa pratensis	1	-	-	.03	-	-
G	Poa secunda	$_{c}$95	$_{a}$35	$_{b}$67	1.07	.29	1.22
G	Sitanion hystrix	3	-	-	.00	-	-
G	Stipa columbiana	-	5	-	-	.03	-
G	Stipa lettermani	11	28	14	.08	.63	.39
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		607	533	521	18.40	25.61	19.77
Total for Grasses		607	533	521	18.40	25.61	19.77
F	Agoseris glauca	83	106	69	.60	.93	1.27
F	Arabis sp.	-	7	3	-	.01	.00
F	Astragalus beckwithii	-	2	-	-	.01	-
F	Astragalus utahensis	1	-	-	.00	-	-
F	Balsamorhiza hookeri	5	5	12	.01	.06	.89

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Castilleja linariaefolia	-	-	-	-	.00	-
F	Comandra pallida	7	13	17	.07	.18	.54
F	Collinsia parviflora (a)	$_{b}$198	$_{a}$106	$_{a}$95	.86	.75	.27
F	Crepis acuminata	7	4	-	.02	.06	-
F	Haplopappus acaulis	2	2	-	.15	.03	-
F	Hackelia patens	33	11	19	.44	.39	.75
F	Lithophragma parviflora	$_{a}$-	$_{a}$-	$_{b}$27	-	-	.22
F	Lomatium sp.	-	4	-	-	.03	-
F	Lupinus argenteus	150	153	126	4.57	5.04	5.90
F	Lygodesmia spinosa	2	-	-	.03	-	-
F	Mertensia oblongifolia	71	70	88	.77	.72	1.38
F	Microsteris gracilis (a)	-	1	-	-	.00	-
F	Penstemon sp.	3	-	-	.00	-	-
F	Phlox hoodii	-	-	3	-	-	.00
F	Phlox longifolia	$_{b}$188	$_{b}$155	$_{a}$66	.81	1.10	.33
F	Polygonum douglasii (a)	6	2	6	.04	.00	.01
F	Potentilla pennsylvanica	50	57	48	.61	.90	1.85
F	Ranunculus jovis	$_{a}$-	$_{b}$134	$_{b}$107	-	1.41	.82
F	Senecio integerrimus	$_{a}$77	$_{a}$60	$_{b}$132	1.22	2.09	6.34
F	Senecio multilobatus	$_{a}$-	$_{b}$17	$_{a}$-	-	.76	-
F	Sisymbrium altissimum (a)	4	-	-	.03	-	-
F	Taraxacum officinale	31	34	11	.35	.28	.11
Total for Annual Forbs		208	109	101	0.93	0.76	0.29
Total for Perennial Forbs		710	834	728	9.69	14.07	20.45
Total for Forbs		918	943	829	10.63	14.84	20.74

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

BROWSE TRENDS --
Management unit 01 , Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	34	27	33	6.58	3.99	8.43
B	Artemisia tridentata vaseyana	85	87	78	17.79	21.00	20.52
B	Chrysothamnus viscidiflorus lanceolatus	74	64	67	4.60	4.03	3.13
B	Eriogonum microthecum	38	29	36	1.36	.90	1.89
B	Pediocactus simpsonii	3	1	1	-	-	.15
B	Ribes cereum cereum	0	0	1	-	.38	.38
Total for Browse		234	208	216	30.35	30.31	34.51

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 23

Species	Percent Cover '06
Artemisia nova	13.10
Artemisia tridentata vaseyana	26.56
Chrysothamnus viscidiflorus lanceolatus	4.21
Eriogonum microthecum	1.48
Ribes cereum cereum	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 23

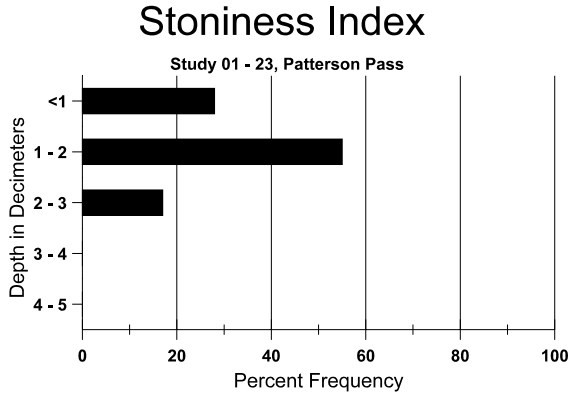
Species	Average leader growth (in)	
Artemisia nova	-	1.1
Artemisia tridentata vaseyana	1.3	1.9

BASIC COVER --
Management unit 01 , Study no: 23

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	55.85	64.50	65.55
Rock	12.85	9.43	11.84
Pavement	.60	.32	2.00
Litter	61.70	52.75	34.43
Cryptogams	.00	.04	.01
Bare Ground	3.30	2.31	4.65

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 23, Patterson Pass

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.8	53.0 (8.8)	6.7	40.6	33.4	26.0	5.4	36.2	444.8	0.5



PELLET GROUP DATA --
Management unit 01 , Study no: 23

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	14
Grouse	-	1	-
Elk	58	25	34
Deer	4	1	2

Days use per acre (ha)	
'01	'06
-	-
-	-
47 (116)	40 (99)
1 (2)	1 (3)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
96	**2100**	180	260	1660	180	120	39	.95	9	-	0	11/25
01	**1900**	-	60	1760	80	20	0	0	4	1	1	11/20
06	**2980**	8540	280	2580	120	160	0	0	4	.67	.67	11/21
Artemisia tridentata vaseyana												
96	**5060**	340	860	3420	780	400	27	11	15	3	4	19/33
01	**6000**	60	580	4540	880	420	8	0	15	3	9	19/32
06	**4840**	1940	120	3420	1300	460	9	.41	27	12	13	20/33
Chamaebatiaria millefolium												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	44/81
Chrysothamnus nauseosus												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	24/17
Chrysothamnus viscidiflorus lanceolatus												
96	**4100**	20	460	3200	440	-	4	0	11	3	7	11/16
01	**3280**	-	300	2500	480	20	.60	0	15	5	5	9/16
06	**2760**	-	160	2460	140	-	0	0	5	-	0	9/15
Eriogonum microthecum												
96	**1320**	-	200	1120	-	-	12	0	0	-	0	6/12
01	**1120**	-	-	1120	-	-	0	0	0	-	0	6/13
06	**1380**	-	20	1320	40	-	4	0	3	-	0	6/14
Pediocactus simpsonii												
96	**80**	-	-	80	-	-	50	0	-	-	0	7/6
01	**20**	-	-	20	-	-	0	0	-	-	0	3/3
06	**20**	-	-	20	-	-	0	0	-	-	0	4/5
Ribes cereum cereum												
96	**0**	-	-	-	-	-	0	0	0	-	0	3/94
01	**0**	-	-	-	-	-	0	0	0	-	0	37/103
06	**20**	-	-	-	20	-	0	0	100	100	100	34/81

Trend Study 1-24-06

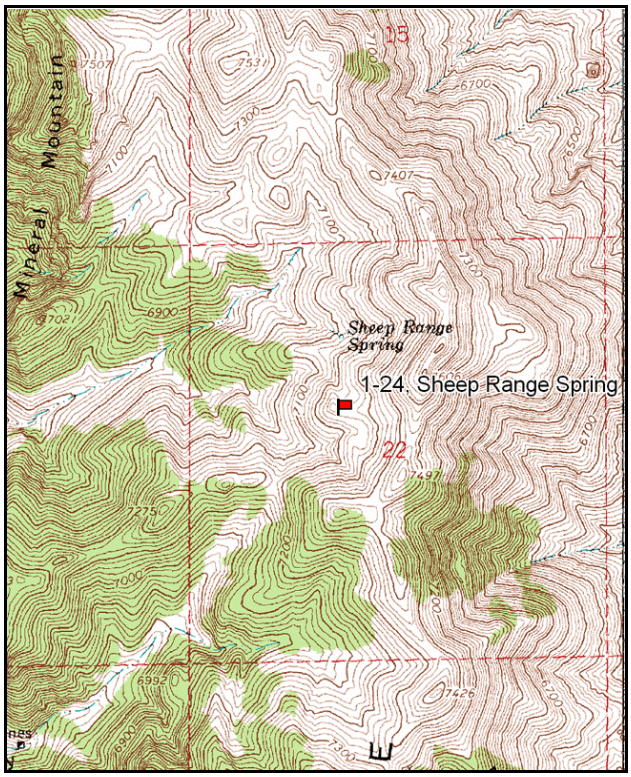
Study site name: Sheep Range Spring . Vegetation type: Big Sagebrush .

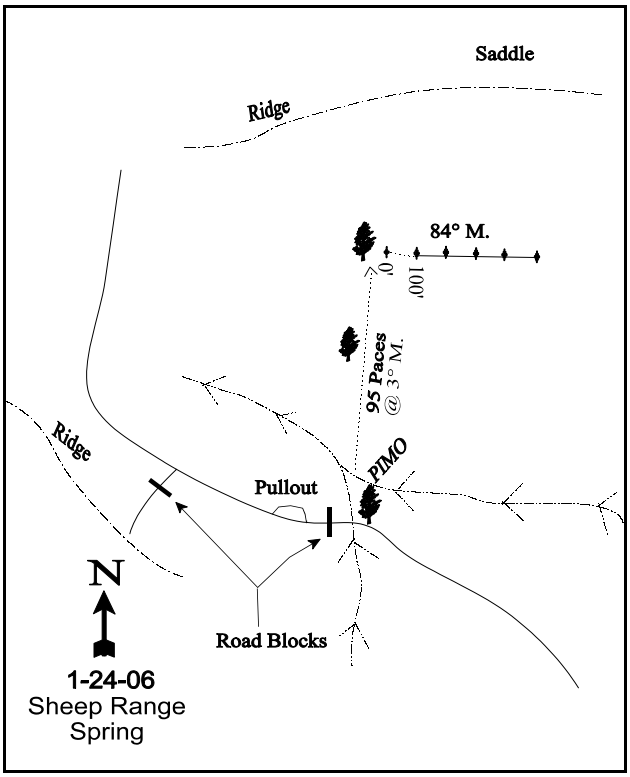
Compass bearing: frequency baseline 84 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 4 on 21 ft.

LOCATION DESCRIPTION

From Grouse Creek Junction, travel south for 5.4 miles to the railroad tracks. Continue straight for 0.6 miles to the TL Bar Beefmaster Ranch. Take the left fork and travel 5 miles to a fork in the road. Take a right turn and travel 2.1 miles to a four way intersection. Continue straight (stay right) for 2.7 miles to Governors Spring. Take a left at Governors Spring and drive 1.0 mile. Take a right and travel down hill for 1.0 mile. Take the left fork and continue for 1.6 miles to an intersection. From the intersection take the left and continue 1.1 miles where there will be a road going up a steep hill to the right. Stay left and travel 0.1 miles to the end of the road. From the PIMO walk 120 paces at 3 degrees magnetic to the 0-foot baseline stake (near a PIMO). The baseline runs 84 degrees magnetic.





Map Name: Patterson Pass

Diagrammatic Sketch

Township 6N , Range 19W , Section 22

UTM NAD 27, UTM 12T 4567893 N, 247428 E

DISCUSSION

Sheep Range Spring - Trend Study No. 1-24

Study Information

The Sheep Range Spring study (elevation: 7,260 feet, slope: 20-30%, aspect: south) was established in 1996 to monitor preferred habitat used by elk in the Pilot Mountains. The study samples a sagebrush-grass covered east-west running ridge. This area is within the Lucin-Pilot allotment which is assigned for summer cattle use and spring sheep use. Elk pellet groups were abundant in 1996 with some recent groups. Two cow elk were also seen in the area during study establishment. Deer pellet groups were also encountered in small numbers. Two sage grouse were seen in 1996. Deer and elk likely utilize this area during the summer as well as normal winters. A pellet group transect in 2001 estimated 5 deer days use/acre (13 deer days use/ha) and 22 elk days use/acre (56 elk days use/ha). In 2006, 8 deer, 21 elk, 3 cow, and 3 sheep days use/acre (20 ddu/ha, 51 edu/ha, 7 cdu/ha, and 8 sdu/ha) were estimated.

Soil

The Lundy soil series consists of shallow, well drained, moderate to moderately rapidly permeable soils on hillsides, ridges and mountainsides. These soils formed in residuum and colluvium from limestone and shale (USDA-NRCS 2006). The soil is extremely rocky under the first few inches of soil and rock and pavement are abundant on the surface. Effective rooting depth is estimated at about 10 inches along the first 300 feet of the baseline, but is noticeably deeper (22 inches) along the last 200 feet. The average effective rooting depth is almost 15 inches. Soil texture is a loam to clay loam with a neutral soil reaction (7.2 pH). Percent bare ground increased from 7% to 19% in 2006. Litter cover declined from 50% to 31%. Some of this decline may be due to the decrease of cheatgrass. The ratio of protective cover also decreased in 2006. The soil erosion condition class was determined to be slight in both 2001 and 2006. The soil appears to have adequate protective cover of vegetation and litter. There are many mining claims in the area, but most do not appear active.

Browse

The study area is surrounded by ridges dominated by black sagebrush. The baseline was placed on a ridge with deeper soils and more grass and forb cover. The browse component is dominated by mountain big sagebrush and is intermixed with black sagebrush in some of the areas with the more shallow soils. Mountain big sagebrush density (plants/acre) has decreased: 2,200 (1996), 2,080 (2001), and 1,840 (2006). It appears that mountain big sagebrush plants have gotten larger as cover has increased (7% in 1996 to 12% in 2006), but density has decreased. Average height of mature plants increased from 20 inches in 1996 to 24 inches in 2006. Crown width increased from 31 inches to 39 inches during the same period. Density (plants/acre) of black sagebrush has varied: 1,020 (1996), 500 (2001), and 740 (2006). Utilization has been mostly light for each species, vigor good, and decadence low. Young plants were less abundant after 1996. Some of the decadent and dead mountain big sagebrush were found in areas with the more shallow soils where black sagebrush is more prevalent.

The most abundant shrub is the increaser, mountain low rabbitbrush. However, it contributes only about a third of the browse cover. Density has averaged about 3,400 plants/acre. The majority of the population consists of mature plants. These shrubs show no utilization. Other shrubs sampled include rubber rabbitbrush and slenderbush eriogonum.

Herbaceous Understory

The herbaceous understory is abundant. The most common perennial grasses are thickspike wheatgrass, bluebunch wheatgrass, and Sandberg bluegrass. Bluebunch wheatgrass was most abundant in 2001 and cover was highest for perennial grasses in 2001. Cheatgrass was quite common in both 1996 and 2001, but was not sampled in 2006. It is unknown if the disappearance of cheatgrass was caused by a fungus or some other cause. Forbs produce about 1/3 of the vegetation cover. A total of 22 perennial forb species have been

sampled. The dominant perennial species consist of arrowleaf balsamroot, silvery lupine, longleaf phlox, stickseed, and two milkvetch species. Some of the arrowleaf balsamroot was infested with bugs which caused yellow spots on the leaves in 1996.

2001 TREND ASSESSMENT

Mountain big sagebrush continues to be stable. Utilization is light, vigor good, and percent decadence low. The grass trend is up and the forb trend is slightly up. The sum of nested frequency values for both perennial grasses and forbs increased slightly in 2001. Nested frequency of cheatgrass declined significantly since 1996. Forbs are still abundant with several preferred summer forage species for deer and elk.

1996 winter range condition (DC Index) - good (69) Mid-level potential scale
2001 winter range condition (DC Index) - good (69) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is stable. Total sagebrush cover has increased while the combined density of mountain big sagebrush and black sagebrush has remained unchanged. Percent decadence has slightly increased for mountain big sagebrush, but remains fair. The grass trend is slightly up. Perennial grass abundance increased by about 7% and cheatgrass was not sampled. Cheatgrass quadrat frequency was 70% in 2001 and 0% in 2006. The forb trend is down. Eleven perennial forbs had significantly lower nested frequencies. The DCI score was unchanged. Shrub decadence increased, but cheatgrass disappeared.

winter range condition (DC Index) - good (71) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 01 , Study no: 24

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{a}$122	$_{b}$42	$_{a}$165	2.07	.93	2.68
G	Agropyron spicatum	$_{a}$106	$_{b}$192	$_{a}$112	2.09	8.69	5.00
G	Bromus tectorum (a)	$_{c}$307	$_{b}$263	$_{a}$-	5.48	4.08	-
G	Poa fendleriana	1	3	4	.00	.00	.03
G	Poa secunda	195	237	225	7.08	12.14	7.38
G	Stipa lettermani	3	-	-	.03	-	-
Total for Annual Grasses		307	263	0	5.48	4.08	0
Total for Perennial Grasses		427	474	506	11.30	21.78	15.10
Total for Grasses		734	737	506	16.78	25.87	15.10
F	Agoseris glauca	$_{b}$50	$_{b}$94	$_{a}$13	.17	.36	.03
F	Allium sp.	$_{a}$1	$_{b}$50	$_{a}$-	.00	.23	-
F	Arabis sp.	-	-	5	-	.00	.01
F	Astragalus beckwithii	$_{b}$27	$_{a}$3	$_{a}$-	.25	.03	-
F	Astragalus cibarius	$_{b}$62	$_{b}$60	$_{a}$3	.46	1.21	.15
F	Aster scopulorum	-	-	11	-	-	.09

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Balsamorhiza hookeri	21	16	19	.23	1.02	.51
F	Balsamorhiza sagittata	$_{b}$130	$_{b}$114	$_{a}$81	12.23	9.21	9.23
F	Camelina microcarpa (a)	$_{b}$19	$_{a}$1	$_{a}$-	.03	.03	-
F	Collomia linearis (a)	$_{a}$3	$_{b}$57	$_{a}$-	.01	.14	-
F	Comandra pallida	18	32	40	.10	.45	.78
F	Collinsia parviflora (a)	$_{b}$160	$_{c}$295	$_{a}$-	.62	1.75	-
F	Crepis acuminata	$_{ab}$9	$_{b}$14	$_{a}$6	.05	.17	.04
F	Erigeron pumilus	$_{a}$-	$_{b}$14	$_{a}$-	-	.10	-
F	Eriogonum villiflorum	$_{a}$-	$_{b}$16	$_{a}$-	-	.42	-
F	Haplopappus acaulis	2	-	10	.03	-	.07
F	Hackelia patens	$_{b}$38	$_{b}$14	$_{a}$25	.71	.11	.97
F	Hydrophyllum capitatum	25	49	-	.20	.53	-
F	Lappula occidentalis (a)	6	-	3	.01	-	.03
F	Lithospermum ruderale	1	1	3	.00	.15	.31
F	Lomatium sp.	-	11	-	-	.16	-
F	Lupinus argenteus	$_{b}$33	$_{b}$34	$_{a}$5	.92	.86	.09
F	Machaeranthera grindelioides	2	3	-	.03	.00	-
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$217	$_{a}$-	-	1.17	-
F	Navarretia intertexta (a)	2	-	-	.00	-	-
F	Phlox longifolia	$_{b}$162	$_{b}$125	$_{a}$73	.82	1.00	.23
F	Polygonum douglasii (a)	3	-	4	.00	-	.01
F	Ranunculus testiculatus (a)	-	1	-	-	.00	-
F	Senecio integerrimus	$_{a}$4	$_{b}$16	$_{a}$3	.03	.17	.06
F	Viola sp.	-	3	8	-	.00	.04
Total for Annual Forbs		193	571	7	0.68	3.10	0.03
Total for Perennial Forbs		585	669	305	16.28	16.23	12.64
Total for Forbs		778	1240	312	16.97	19.34	12.68

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

BROWSE TRENDS --
Management unit 01 , Study no: 24

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	24	15	22	2.42	1.89	1.78
B	Artemisia tridentata vaseyana	64	62	58	7.43	11.06	12.13
B	Chrysothamnus nauseosus consimilis	1	1	0	-	-	-
B	Chrysothamnus viscidiflorus lanceolatus	63	62	65	6.23	6.55	4.41
B	Eriogonum microthecum	3	1	2	.03	.00	.06
B	Pediocactus simpsonii	0	0	1	-	-	-
Total for Browse		155	141	148	16.13	19.52	18.39

CANOPY COVER, LINE INTERCEPT --
Management unit 01 , Study no: 24

Species	Percent Cover '06
Artemisia nova	3.16
Artemisia tridentata vaseyana	16.71
Chrysothamnus viscidiflorus lanceolatus	6.93

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 01 , Study no: 24

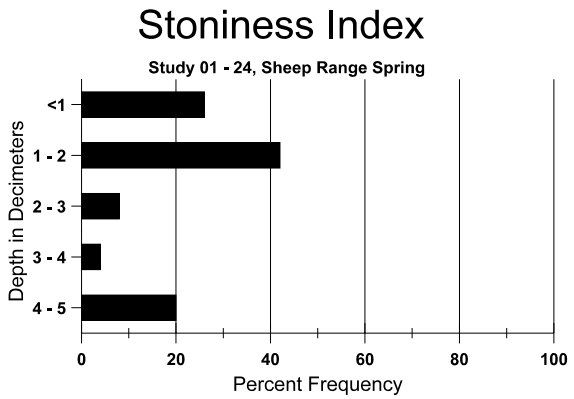
Species	Average leader growth (in)	
Artemisia nova	-	0.9
Artemisia tridentata vaseyana	1.8	1.3

BASIC COVER --
Management unit 01 , Study no: 24

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	49.35	61.50	43.90
Rock	6.65	4.62	5.19
Pavement	7.63	8.09	14.84
Litter	53.22	50.44	30.63
Cryptogams	.04	.04	0
Bare Ground	6.47	7.08	18.91

SOIL ANALYSIS DATA --
Herd Unit 01, Study no: 24, Sheep Range Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.8	53.6 (13.3)	7.2	40.4	34.1	27.4	2.9	21.1	425.6	0.8



PELLET GROUP DATA --
Management unit 01 , Study no: 24

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	1
Elk	40	11	16
Deer	9	1	1
Cattle	-	-	1
Sheep	-	-	-

Days use per acre (ha)	
'01	'06
-	-
22 (55)	21 (51)
5 (13)	8 (20)
-	3 (7)
-	3 (8)

BROWSE CHARACTERISTICS --
Management unit 01 , Study no: 24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
96	**1020**	-	80	800	140	60	12	0	14	-	0	10/26
01	**500**	-	20	420	60	-	0	0	12	4	8	10/25
06	**740**	340	40	600	100	20	0	3	14	8	11	9/23
Artemisia tridentata vaseyana												
96	**2200**	20	400	1460	340	840	10	.90	15	5	5	20/31
01	**2080**	-	100	1640	340	300	3	0	16	5	5	24/37
06	**1840**	3560	40	1400	400	220	8	0	22	8	9	24/39

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus consimilis												
96	**20**	-	20	-	-	-	0	0	-	-	0	26/29
01	**20**	-	-	20	-	-	0	0	-	-	0	27/58
06	**0**	-	-	-	-	-	0	0	-	-	0	34/49
Chrysothamnus viscidiflorus lanceolatus												
96	**3600**	20	700	2620	280	-	.55	0	8	.55	4	15/25
01	**3340**	40	100	2940	300	20	0	0	9	-	0	13/20
06	**3160**	-	120	2740	300	40	1	0	9	2	2	10/20
Eriogonum microthecum												
96	**180**	-	-	160	20	-	11	0	11	-	0	3/10
01	**20**	-	-	20	-	-	0	0	0	-	0	3/6
06	**40**	-	-	40	-	-	0	0	0	-	0	3/7
Pediocactus simpsonii												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	1/2

SUMMARY

WILDLIFE MANAGEMENT UNIT - 1 - BOX ELDER

Nineteen trend studies were sampled in 2006. Monitoring for this unit has occurred in 1984, 1990, 1996, 2001, and 2006. The original studies were established in 1984 and others were established in 1990 and 1996.

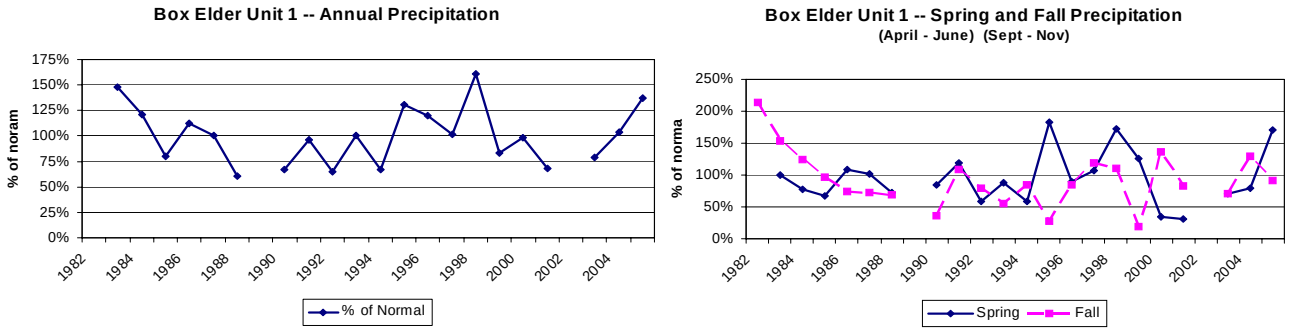


Figure 1. Percent of total annual precipitation (left) and percent of spring and fall precipitation (right) for Box Elder Unit 1, from weather stations at Grouse Creek and Rosette (Utah Climate Summaries 2006).

Precipitation data from Grouse Creek and Rosette from 1982 to 2006 show alternating periods of wet and dry cycles (Utah Climate Summaries 2006). Drought conditions (less than 75% of normal annual precipitation) were found in 1988, 1990, 1992, 1994 and 2001 (Figure 1). Data were incomplete for 1989 and 2002, but these years were considered drought years in other areas of the state. Spring precipitation (April-June) was less than 75% normal precipitation in seven years: 1985, 1988, 1992, 1994, 2000, 2001, and 2003 (Figure 1). Spring precipitation is critical for herbaceous plants and shrub recruitment. Drought conditions for multiple years plays a role in the decline of range conditions.

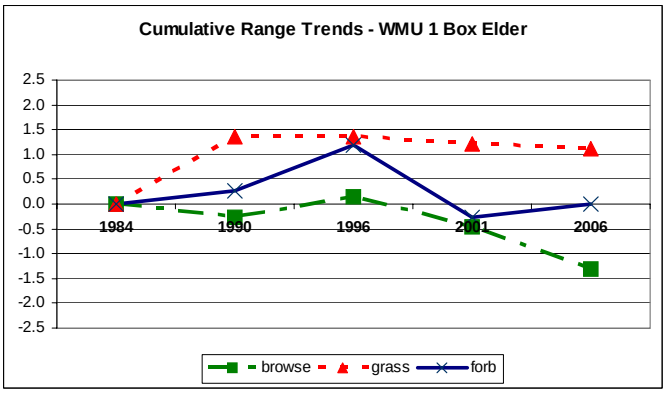


Figure 2

The cumulative browse trend (Figure 2) shows declining browse conditions since 1996. The average browse trend was -0.6 in 2001 and -0.9 in 2006. This decline is due to fire, drought, increased decadence, and lack of recruitment of key species.

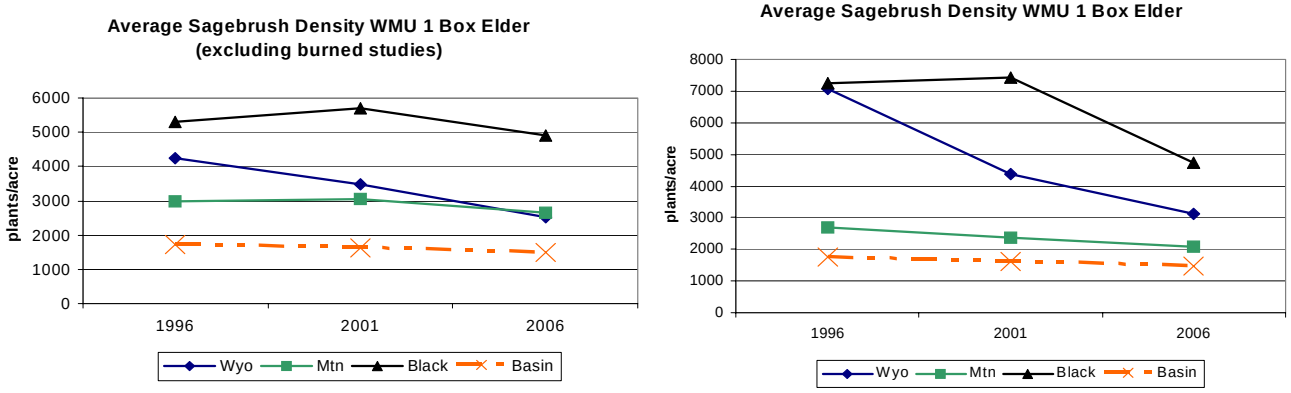


Figure 3. Average density of sagebrush species and subspecies from 1996 to 2006 across unit 1. Four burned studies not included (left) and all studies (right).

Excluding burned studies (Raft River Narrows, Broad Hollow, Cedar Hills, and Bally Mountain), each species or subspecies of sagebrush has showed a slightly declining density since 1996 (Figure 3). Fires have had major impact on sagebrush density (Figure 3), but have also been beneficial for the herbaceous understory at Cedar Hills and Bally Mountain.

Sagebrush decadence increased for Wyoming big sagebrush and mountain big sagebrush in 2006 (Figure 4). Drought conditions and increased competition of cheatgrass has likely led to this decrease in vigor of sagebrush. Average sagebrush cover (Figure 5) has remained stable from 1996 to 2006 for all species or subspecies except for Wyoming big sagebrush. The average cover for four Wyoming big sagebrush studies declined from 12.3% in 2001 to 9.3% in 2006.

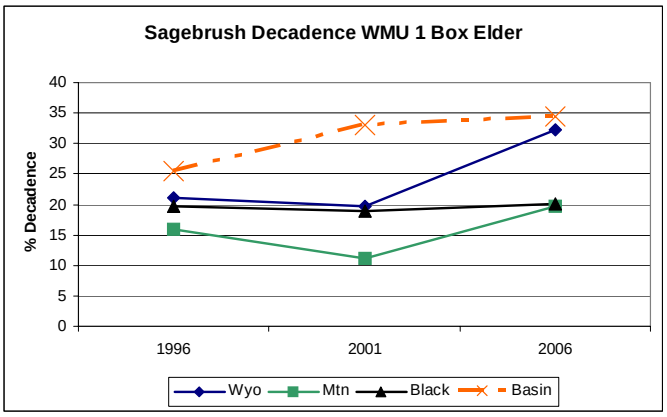


Figure 4. Average percent decadence for big sagebrush subspecies and black sagebrush across unit 1 from 1996 to 2006.

Grass trends improved from 1984 to 1990. After 1990, the grass trends (Figure 2) have declined very slightly as cheatgrass nested frequency and abundance has increased (Figure 6). Cheatgrass nested frequency significantly increased on nine studies in 2001 and on seven studies in 2006. Four studies in 2001 and five studies in 2006 showed significant decreases of cheatgrass. Median cheatgrass cover increased in 2001 from less than 1% to nearly 4% (Figure 7).

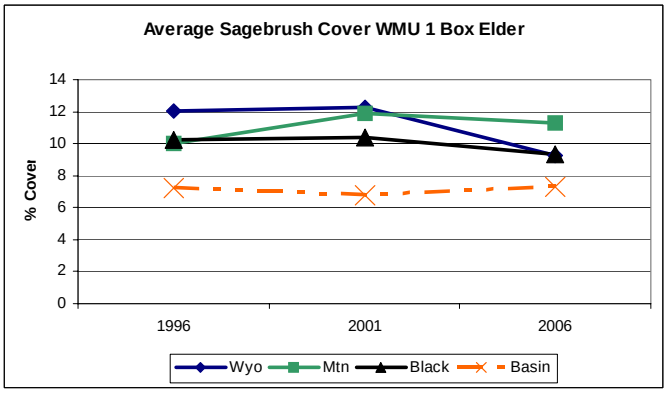


Figure 5. Average sagebrush cover for big sagebrush subspecies and black sagebrush across unit 1 from 1996 to 2006.

Perennial grass nested frequency has remained stable from 1996 to 2006 (Figure 6), but median perennial grass cover increased in 2001 from 6% in 1996 to 8.5% and remained at 8.5% in 2006 (Figure 7).

The forb trends improved in 1990 and 1996, but declined sharply in 2001 with an average trend of -1.5. Forb trends improved in 2006 with an average trend of 0.3 (Figure 2). The median sum of nested frequency for perennial forbs decreased 47% in 2001, but increased slightly in 2006 (Figure 6).

The unit wide average Desirable Components Index rating (Figure 8) has declined from good in 1996 to fair in 2006 for both lower and mid-level ecological types. Increases is shrub decadence and decreases in shrub recruitment are the main factors for this decline.

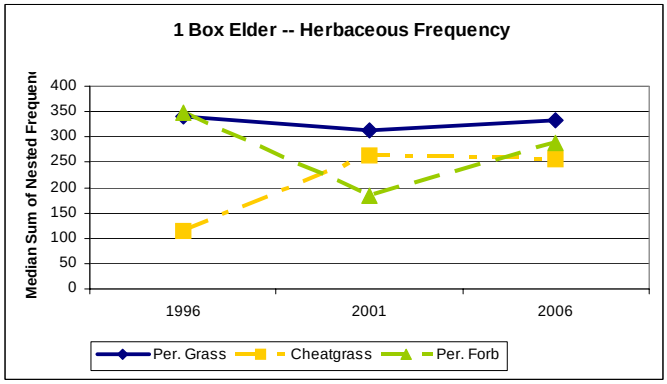


Figure 6. Median nested frequency for perennial grasses, cheatgrass, and perennial forbs for unit 1 from 1996 to 2006.

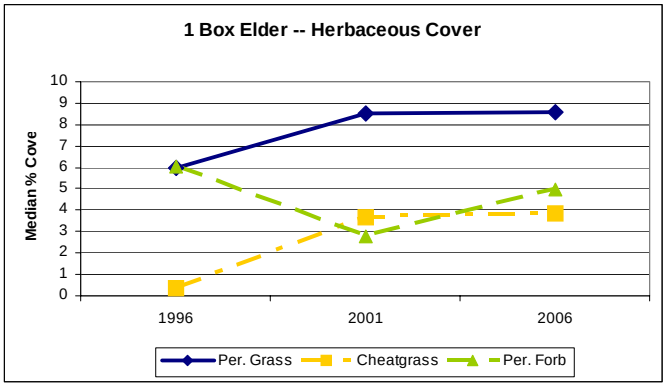


Figure 7. Median percent cover of perennial grasses, cheatgrass, and perennial forbs for unit 1 from 1996 to 2006.

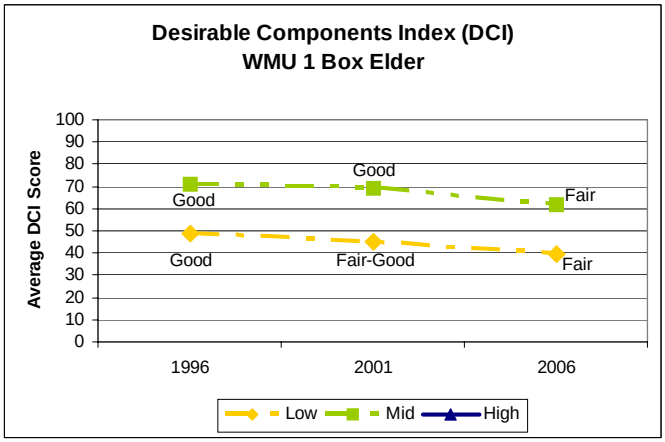
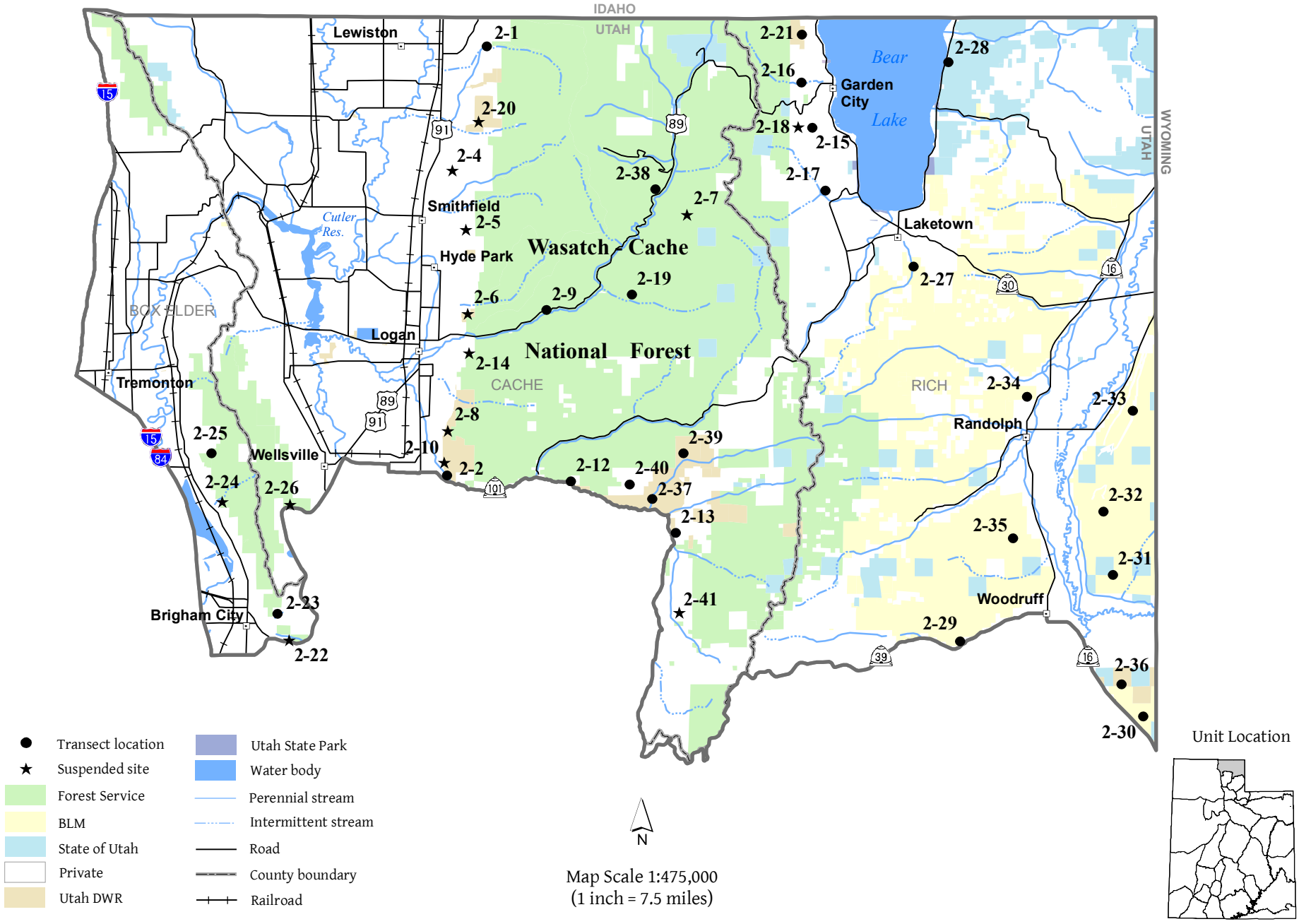


Figure 8. Average Desirable Components Index (DCI) ratings for Unit 1 from 1996 to 2006.

Management Unit 2



WILDLIFE MANAGEMENT UNIT 2 - CACHE

Boundary Description

Cache, Rich, Weber, and Box Elder counties - Boundary begins at the Utah-Idaho state line and I-15; south on I-15 to US-91; northeast on US-91 to SR-101; east on SR-101 to Hardware Ranch and USFS Road 054 (Ant Flat); south on USFS 054 to SR-39; east on SR-39 to SR-16; southeast on SR-16 to the Utah-Wyoming state line; north along this state line to the Utah-Idaho state line; west along this state line to I-15.

Unit 2 Description

Overall, unit 2 can be divided into three main areas which are isolated, to some extent, from one another. The first part is the Wellsville Mountains and their northern extension, Clarkston Mountain. The eastern half, mostly agricultural land in Cache Valley, is not used much by wintering deer. The second area is Cache Valley with its summer range on the Cache National Forest to the east. Big game summer on the forest and use the winter ranges in the canyons and upper benches of the valley. The third area is Rich County, which includes a vast area of private and public range land on the east side of the Cache National Forest, extending to the Wyoming state line. Prior to 1993, these three areas were managed as separate deer herd units. In 1993, these areas were combined into Wildlife Management Unit 2.

The Wellsville Mountains have remained relatively inaccessible because of the steep topography. Rising abruptly from the valley floor, the ridge of the Wellsville Mountains reaches over 9,300 feet in elevation. The upper limit for normal winter range is generally 7,000 feet, but in severe winters that limit drops to about 6,000-6,500 feet. In some canyons the upper limit drops to 6,000 feet and excludes the north slopes. Box Elder Canyon reaches a low limit at 5,400 feet. The lower limit follows an elevation of 4,400 feet. Most deer summer on the east side of the Wellsville Mountains and migrate to the west side each fall for winter range. Coldwater Canyon is the most notable concentration area for deer and there is some migration from the Mantua-Willard herd unit. Most deer that winter on Clarkston Mountain, summer on the Caribou National Forest in Idaho. Other big game species found on the Wellsville mountains include introduced Rocky Mountain bighorn sheep and a few elk. Neither species is numerous, but should be considered in management decisions, especially concerning grazing. Land development and associated habitat loss is still the most critical problem facing Wildlife Management in this area.

The majority of the deer range, along with the largest deer herd, are within the Cache County portion of the unit. Most of this herd summers at higher elevations in the Wasatch-Cache National Forest, west of the Wasatch range summit. The majority of the winter range is also on Forest Service land. The south-facing slopes of Blacksmith Fork, Logan, Dry, Providence, and Millville canyons are all important wintering areas. The lower winter range limits are restricted by the upper limits of the towns and cities of Cove, Richmond, Smithfield, Hyde Park, North Logan, Logan, Providence, Millville, Nibley, and Hyrum. These limits to the winter range also include the deer-proof fence above agricultural land between Hyrum and Logan. Between Hyde Park and the Idaho border, the lower third of the winter range is located on private land and is threatened by increased cultivation and subdivision developments.

The Rich County portion of the Cache deer herd unit, located on the east face of the Wasatch Range, is topographically similar to the west face. However, the drainages of Swan Creek, Garden City Canyon, Jebo Canyon, Cottonwood Canyon, and Temple Canyon are not as deep as those on the west face. Elevation ranges between 5,900 feet at Bear Lake and 9,114 feet on Swan Peak. Randolph and Woodruff are the principle municipalities located in Rich County. These towns are located on a strip of private land along the Bear River. Much of the lower country is privately owned and is grazed or farmed. Estimates are that 74,560 acres (33%) of the winter range is private land (Jense et al. 1985). A much higher percentage of the severe winter range is private. The BLM owns a majority of the winter range, controlling much of the land in the central part of the unit and the Crawford Mountains to the east. The upper limits of the winter range begin at about 8,000 feet at the Idaho border and gradually descend to 6,000 feet at Cottonwood Canyon. The lower limits generally

follow the 6,000-foot contour.

Big Game Trends

The current management objective is to maintain a target winter herd of 25,000 wintering deer and maintain a buck/doe ratio of 13 bucks to 100 does and a fawn/doe ratio of 82 fawns to 100 does (Hersey and McLaughlin 2005). To meet this objective, a projected yearly harvest of about 3,300 bucks will be required. Antlerless deer harvest will be adjusted yearly to meet population objectives.

Current management objectives for elk are to maintain a target population of 2,300 wintering elk with a bull-to-cow ratio of 8 bulls to 100 cows. Fifty percent of the bulls are to be 2½ years of age or older (Hersey and McLaughlin 2005).

Trend Study Description

A total of 29 study sites were established in the unit in 1984 and read again in 1990 and 1996. During the 1990 season, 5 new studies were added. All of these were reread in 1996 along with 5 additional new studies. In 2001, 31 trend studies were monitored, while 8 studies were suspended. In 2006, 26 studies were monitored, while 6 more studies were suspended and will be reevaluated during the next rotation. Coldwater WMA was established 1998 and was monitored in 2006. All of the studies sample big game winter range.

Trend Study 2-1-06

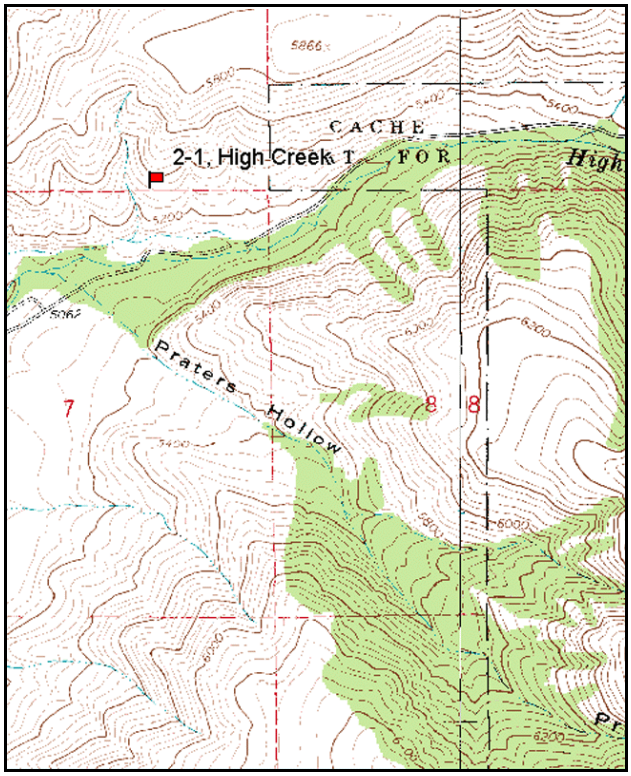
Study site name: High Creek . Vegetation type: Big Sagebrush .

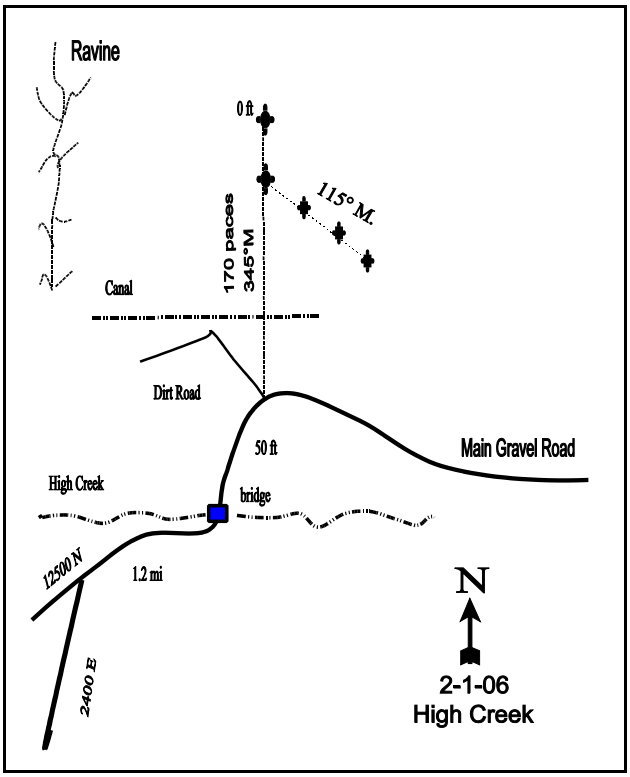
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 12500 North and 2400 East in Richmond, proceed northeast for 1.2 miles and cross High Creek. Just beyond this crossing (north) a dirt road heads off to the northeast. From this intersection, walk 170 paces at a bearing of 345 degrees magnetic to the 100-foot stake of the frequency baseline. Walk 100 feet beyond this stake to the 0-foot stake, marked with browse-tag #7929. The baseline runs at 165 degrees magnetic. The baseline doglegs after 100 feet and runs in a direction of 115 degrees magnetic.





Map Name: Richmond

Diagrammatic Sketch

Township 14N , Range 2E , Section 6

UTM NAD 27, UTM 12T 4647239 N, 436682 E

DISCUSSION

High Creek - Trend Study No. 2-1

Study Information

This study is located on the north side of High Creek and samples critical winter range on the northernmost part of the herd unit near the Idaho border (elevation: 5,300 feet, slope: 35-40%, aspect: south). The hillside on which the study is located contains many open areas dominated by annual and perennial weeds. Deer and elk pellet groups were infrequent in the past, entirely absent in 1996, and in low numbers in 2001 and 2006. Pellet group data in 2001 was estimated at 10 deer and 2 cow days use/acre (25 ddu/ha, 5 cdu/ha). Pellet group data in 2006 was even less at 3 deer and 2 cow days use/acre (7 ddu/ha and 5 cdu/ha).

Soil

Soil is moderately shallow with a clay loam texture and is part of the Richmond soil series (USDA-NRCS 2006). Parent material is limestone. Rocks are common on the surface (25-35%) and in the profile. They consist of both large limestone cobble and smaller gravel sized rock. Water infiltration rates should be rapid. Effective rooting depth was estimated at nearly 10 inches in 1996, but the high amount of rock in the profile restricted accurate penetrometer readings. Rooting depth is not overly restrictive since the area contains a moderately dense stand of mountain big sagebrush. Protective ground cover is abundant, but comes largely from weedy plant cover and litter. No active erosion has been observed and the erosion condition class was determined to be stable in 2001 and 2006.

Browse

The browse composition consists of a fairly dense stand of mountain big sagebrush with a few remnant antelope bitterbrush. The mountain big sagebrush population tends to be clumped. The clumping and relatively small sample size overestimated density in 1984 and 1990 at 4,132 plants/acre and 3,666 plants/acre, respectively. Density has declined every reading and reached it lowest in 2006 at 1,580 plants/acre. There was a 60% decline in mature and decadent plants from 2001 to 2006 and over 50% of the 2006 population was classified as young. Seedlings were also abundant in 2006. Cover declined from 13% in 2001 to 6% in 2006. Drought conditions (less than 75% of normal) were experience in 3 consecutive years, 2001-2003, which may explain the decrease in sagebrush density and cover. Decadence has remained fairly constant at about 20% since 1996. In 1996, some of the decadent shrubs appeared to have partial crown death; this is possibly due to winter injury or some other natural event (drought), not heavy browsing. Utilization was heavy in 1984, but has been mostly light since. Annual leader growth averaged 1.5 inches in 2001 and 2.2 inches in 2006.

Antelope bitterbrush occurs as scattered mature plants. No seedling or young bitterbrush plants have been sampled since the study was established in 1984. Density has fluctuated slightly, but has remained around 220 mature plants/acre since 1996. Utilization was reported to be heavy in 1984 and 1990 and has been moderate to heavy since 1996 with normal vigor. Average leader growth was estimated at only 1 inch in 2001, but increased to 3.3 inches in 2006 with above normal precipitation.

Herbaceous Understory

The herbaceous understory is abundant, but is dominated by annual grasses and weedy forbs. Cheatgrass is the most abundant species and has averaged 22% cover since 1996, which is a fire hazard. Only three perennial grasses, bluebunch wheatgrass, Sandberg bluegrass, and bulbous bluegrass were sampled. Bulbous bluegrass acts more like a winter annual than a perennial and its nested frequency has increased significantly each reading since 1996. Sandberg bluegrass and bluebunch wheatgrass are more preferred and together they produced 3% cover in 1996 and less than 1.5% in 2001 and 2006.

The forb composition is dominated by annual and weedy species that typically act as invaders or increasers on disturbed areas. Dominant species include ragweed, willowweed, storksbill, curlycup gumweed, and bindweed. Noxious weeds include dyer's woad and bindweed, both of which were first sampled in 2006.

Leafy spurge was not sampled, but was observed in 2006.

1990 TREND ASSESSMENT

The population density of big sagebrush declined by 11% in 1990. However, the proportion of young plants in the population increased from 19% in 1984 to 35%. Sagebrush canopy cover averages 17%. Decadence increased to 13%, although utilization was light. Vigor is poor on 26% of the population. The remnant bitterbrush occurs in small numbers which has been heavily utilized. This shrub is considered a very minor component of the community. Trend for browse is considered slightly down. Trend for grasses is stable. There was a small increase in perennial grass nested frequency, but grasses are a very minor component. Trend for forbs is slightly up. Perennial forb nested frequency decreased by half, but was due to a decline in western ragweed, a native undesirable species. A total of 20 forbs were sampled and 9 had increased quadrat frequencies. Both sego lily and an aster declined significantly. The understory remains dominated by undesirable weeds and annual species.

browse - slightly down (-1) grasses - stable (0) forbs - slightly up (+1)

1996 TREND ASSESSMENT

The browse trend appears stable. Density remains similar to 1990 estimates with the exception of a decline in the number of young plants. Utilization is mostly light with vigor improved from 1990 observations. Decadence increased slightly (13% to 18%). One cause for concern is the apparent lack of seedling and young plants, which is combined with the abundant annual grasses and weedy forbs composition. These winter annuals and weeds provide considerable competition to the establishment of sagebrush seedlings. They also provide a high amount of fine fuels which increases the hazard of wildfire that would eliminate sagebrush from the area. The trend for grasses is slightly up. Sandberg bluegrass nested frequency increased significantly since 1990 and bluebunch wheatgrass increased significantly since 1984. Perennial grasses remain a minor component of the understory. Annual grasses were included in the sample for the first time and they are very abundant. Bulbous bluegrass also increased significantly in nested frequency. The trend for forbs is down. The study is still dominated by weedy forbs and 5 of the 15 species sampled in 1990 declined significantly in nested frequency. The Desirable Components Index rated this study as very poor due to high cover of annual grasses.

winter range condition (DC Index) - very poor (21) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush is down. The population density has declined by 29%. Utilization is mostly light with vigor good, and percent decadence is moderately low at 22%. Recruitment in the form of seedlings and young is still poor due to the herbaceous understory that is dominated by cheatgrass and weedy biennial forbs. Sagebrush classified as dying are more numerous than the young plants that are needed to replace them. This was also the case in 1996 and it appears that the population is in a state of decline due to lack of young recruitment. Trend for grasses is stable, but is still in poor condition. Sum of nested frequency for perennial grasses increased due to a significant increase in bulbous bluegrass, a low value species. Cheatgrass still dominates the study and provides 71% of the grass cover and 54% of the total herbaceous cover. Trend for forbs is slightly up, although the composition continues to be poor and is dominated by weedy annual and biennial species. The Desirable Components Index rated this study as very poor due to high cover of annual grasses.

winter range condition (DC Index) - very poor (21) Mid-level potential scale
browse - down (-2) grasses - stable (0) forbs - slightly up (+1)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is slightly down. Bitterbrush density has not changed much since 1996. Mountain big sagebrush continues to decline. The density of the mature and decadent age classes dropped by 58% since 2001. The young age class increased substantially and accounted for 56% of the population. Seedlings were also abundant, with young and seedlings showing signs of replacing the plants that died. Trend for grasses is stable. Perennial grasses, excluding bulbous bluegrass, sum of nested frequency declined, but continue to be a very minor component. Annual grasses remain abundant, while bulbous bluegrass nested frequency increased significantly again. Trend for forbs is slightly down. Perennial forbs, though poor in composition, increased in nested frequency. Prickley lettuce was the main species that increased. Bindweed and dyer's woad are listed in Utah as noxious weeds and both were sampled for the first time in 2006. Both are very difficult to eradicate due to long and deep taproots. The Desirable Components Index rated this study as very poor due to high cover of annual grasses.

winter range condition (DC Index) - very poor (28) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 1

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a9	ab25	b31	b34	b37	2.02	1.15	1.12
G	Bromus brizaeformis (a)	-	-	c85	b38	a10	.77	.12	.05
G	Bromus japonicus (a)	-	-	b158	a68	b111	4.85	.72	1.04
G	Bromus tectorum (a)	-	-	306	371	361	23.27	24.90	17.63
G	Poa bulbosa	a-	ab3	b26	c88	d141	.83	4.37	7.85
G	Poa secunda	a-	a-	b13	b16	ab7	.84	.43	.07
Total for Annual Grasses		0	0	549	477	482	28.90	25.74	18.72
Total for Perennial Grasses		9	28	70	138	185	3.69	5.96	9.05
Total for Grasses		9	28	619	615	667	32.60	31.70	27.77
F	Agoseris glauca	b17	ab16	a-	a-	a4	-	-	.06
F	Allium acuminatum	6	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a95	b194	a92	.22	1.63	.22
F	Ambrosia psilostachya	c284	ab15	a16	ab35	b45	.69	.64	1.48
F	Artemisia ludoviciana	7	6	4	14	7	.15	.74	.47
F	Astragalus sp.	-	4	-	-	-	-	-	-
F	Balsamorhiza sagittata	-	-	-	-	-	-	.15	.00
F	Unknown boraginaceae (a)	-	-	a-	a-	b12	-	-	.03
F	Camelina microcarpa (a)	-	-	-	-	3	-	-	.00
F	Calochortus nuttallii	b24	a-	a-	b30	b7	-	.19	.02
F	Cirsium undulatum	-	4	-	-	-	-	-	-
F	Convolvulus arvensis	-	-	-	-	6	-	-	1.00
F	Collinsia parviflora (a)	-	-	a-	a1	b56	-	.00	.21

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Crepis acuminata	-	5	7	3	8	.27	.04	.21
F	Epilobium brachycarpum (a)	-	$_{b}$127	$_{b}$119	$_{a}$63	$_{c}$179	1.78	.25	4.28
F	Erodium cicutarium (a)	-	-	$_{a}$30	$_{b}$193	$_{b}$158	.35	6.77	3.65
F	Galium aparine (a)	-	-	6	7	3	.18	.04	.00
F	Grindelia squarrosa	$_{a}$-	$_{a}$-	$_{a}$5	$_{ab}$17	$_{b}$26	.21	.87	1.82
F	Hackelia patens	$_{a}$2	$_{b}$12	$_{a}$1	$_{a}$-	$_{a}$-	.03	-	-
F	Helianthus annuus (a)	-	$_{b}$30	$_{a}$-	$_{a}$6	$_{a}$6	.00	.06	.18
F	Holosteum umbellatum (a)	-	-	-	-	7	-	-	.04
F	Isatis tinctoria	-	-	-	-	1	-	-	.01
F	Lappula occidentalis (a)	-	-	10	-	-	.02	-	-
F	Lactuca serriola	$_{a}$-	$_{bc}$47	$_{ab}$28	$_{a}$4	$_{c}$61	.72	.02	.59
F	Lomatium grayi	$_{b}$27	$_{c}$30	$_{ab}$4	$_{ab}$6	$_{a}$-	.04	.03	-
F	Lupinus argenteus	$_{a}$2	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$2	-	.43	.83
F	Machaeranthera spp	$_{b}$92	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Microsteris gracilis (a)	-	-	-	4	37	-	.01	.12
F	Oenothera caespitosa	$_{b}$15	$_{b}$16	$_{a}$-	$_{a}$-	$_{a}$-	.00	-	.00
F	Phacelia hastata	$_{a}$7	$_{b}$24	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Phlox longifolia	3	-	-	9	1	-	.01	.00
F	Polygonum douglasii (a)	-	-	8	20	8	.02	.06	.01
F	Ranunculus testiculatus (a)	-	-	-	5	1	-	.01	.00
F	Rumex crispus	-	-	-	-	-	-	-	.00
F	Tragopogon dubius	$_{a}$16	$_{b}$58	$_{ab}$37	$_{a}$31	$_{a}$26	.76	.41	.68
F	Veronica biloba (a)	-	-	$_{a}$12	$_{c}$169	$_{b}$73	.04	1.68	.45
F	Zigadenus paniculatus	$_{a}$1	$_{a}$-	$_{a}$1	$_{b}$20	$_{b}$19	.03	.26	.25
Total for Annual Forbs		0	157	280	662	635	2.64	10.53	9.25
Total for Perennial Forbs		503	237	103	181	213	2.92	3.82	7.46
Total for Forbs		503	394	383	843	848	5.56	14.36	16.72

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

BROWSE TRENDS --
Management unit 02 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	62	54	40	12.29	13.07	6.26
B	Purshia tridentata	8	6	7	1.85	1.24	1.33
Total for Browse		70	60	47	14.14	14.32	7.60

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 1

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	4.41
Purshia tridentata	2.58

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 1

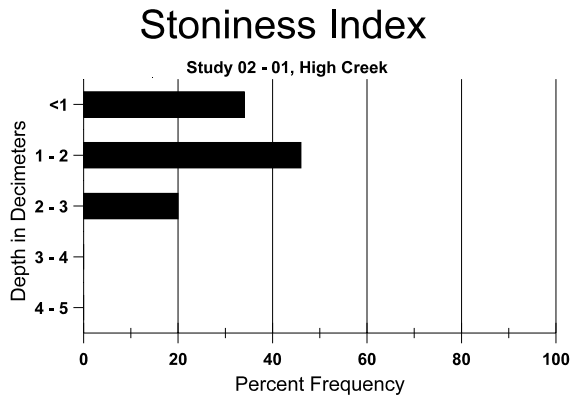
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.5	2.2
Purshia tridentata	1.1	3.3

BASIC COVER --
Management unit 02 , Study no: 1

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	6.50	56.92	57.89	49.27
Rock	37.00	49.25	19.50	19.99	22.76
Pavement	21.00	11.50	6.28	3.97	11.58
Litter	30.25	21.00	56.94	34.85	29.68
Cryptogams	1.50	0	.07	.04	.00
Bare Ground	8.00	11.75	.72	3.32	3.17

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 01, High Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.7	69.6 (10.5)	7.2	42.9	29.1	28.0	2.2	16.3	150.4	0.5



PELLET GROUP DATA --
Management unit 02 , Study no: 1

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	2
Deer	-	2	5
Cattle	-	2	-

Days use per acre (ha)	
'01	'06
-	-
10 (25)	3 (7)
2 (5)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**4132**	33	800	3166	166	-	23	76	4	-	2	25/30
90	**3666**	-	1300	1900	466	-	4	0	13	2	26	24/36
96	**2400**	40	40	1920	440	860	21	4	18	6	9	26/38
01	**1700**	20	20	1300	380	620	15	5	22	5	5	29/44
06	**1580**	580	880	400	300	760	3	0	19	8	8	28/47
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	11/19
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**220**	-	-	220	-	120	73	0	-	-	0	31/72
01	**140**	-	-	140	-	-	29	71	-	-	0	26/66
06	**220**	-	-	220	-	-	45	55	-	-	0	25/43

Trend Study 2-2-06

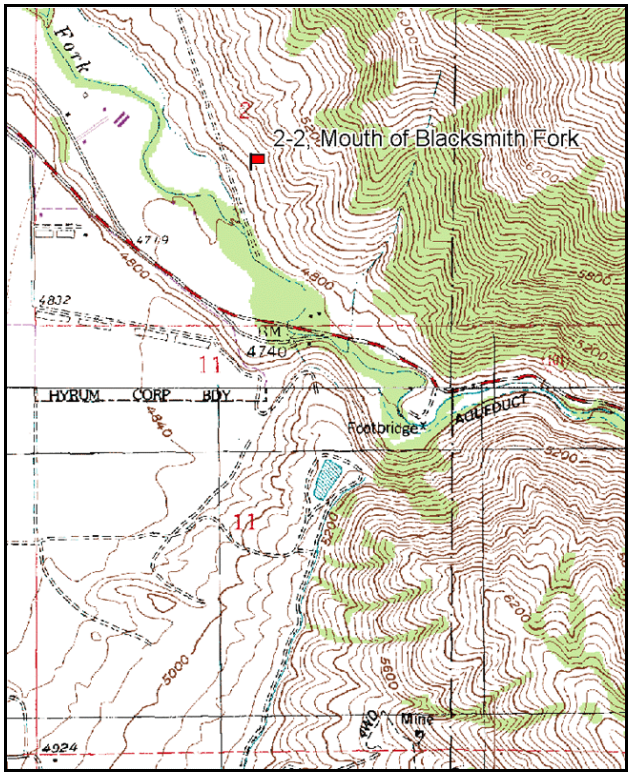
Study site name: Mouth of Blacksmith Fork . Vegetation type: Big Sagebrush .

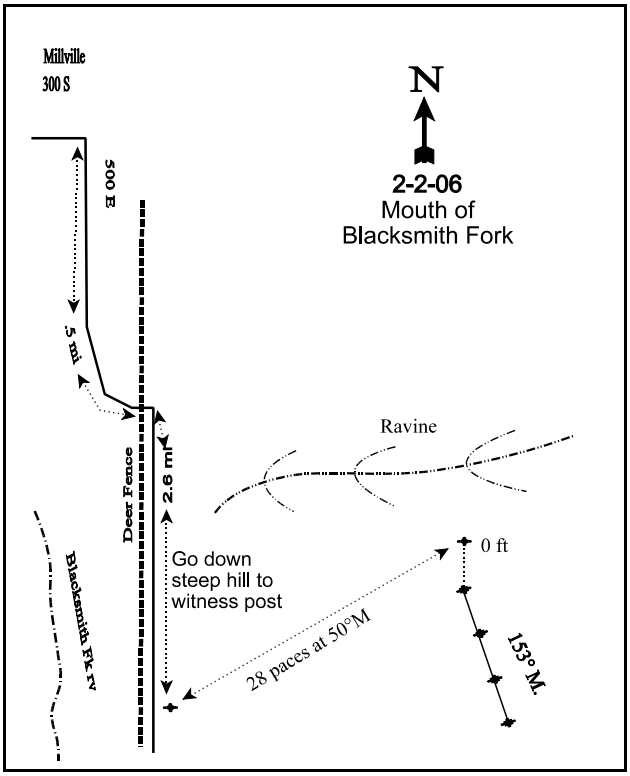
Compass bearing: frequency baseline 159 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed south 0.5 miles from the intersection of 300 South and 500 East in Millville. At the intersection just east of the deer fence, proceed south for 2.6 miles and stop at a witness post, which is at the top of the hill. From the witness post, walk 100 feet at 50 degrees magnetic to the 0-foot stake of the baseline marked by browse tag #90. The baseline runs at a bearing of 159 degrees magnetic. The baseline doglegs after 100 feet and runs 151 degrees magnetic.





Map Name: Logan

Diagrammatic Sketch

Township 10N , Range 1E , Section 2

UTM NAD 27, UTM 12T 4609060 N , 433136 E

DISCUSSION

Mouth of Blacksmith Fork - Trend Study No. 2-2

Study Information

This study is located slightly north of where the Blacksmith Fork river enters the Cache Valley (elevation: 4,800 feet, slope: 30%, aspect: southwest). The study sits on a narrow bench about 200 feet above a big game fence which runs along the east edge of the valley. The vegetation type is basin big sagebrush with a remnant stand of perennial grass and an overabundance of annual grasses, annual forbs, and perennial weeds. The area has been heavily utilized in the past. A pellet group transect read in 2001 estimated only 2 deer days use/acre (5 ddu/ha). Pellet group data in 2006 was estimated at 1 elk, 32 deer, and 1 cow days use/acre (2 edu/ha, 79 ddu/ha, and 2 cdu/ha). In 2006, multiple bedding areas and 4 deer carcasses were observed.

Soil

Soil is classified in the Sterling soil series (USDA-NRCS 2006), a category with moderately rapid permeability. Rooting depth can reach 60 inches, but more often is restricted to the upper 16 inches of the soil profile. Effective rooting depth was estimated at 16 inches. The soil is moderately alkaline (pH 7.9) and calcareous in the upper horizons, but becomes strongly so in the subsoil. Soils have a loam texture with rocks common on the surface and throughout the profile. Erosion potential is medium to high (Erickson and Mortensen 1974). There is some evidence of soil movement, but ground cover percentages indicate no meaningful changes in the soil condition. The erosion condition class was determined to be stable in 2001 and 2006 due to the abundance of herbaceous vegetation and litter cover.

Browse

The key browse species is basin big sagebrush. Some mountain big sagebrush grows on the nearby slopes, but the majority of the sagebrush along the bench is the more deeply rooted basin big sagebrush. The population was extremely decadent (92%), heavily browsed (100%), and generally in poor vigor during the 1984 reading. Since then, browsing has been light to moderate with good vigor. Density has increased from 799 plants/acre in 1984 to 1,860 plants/acre in 2001. A 23% decrease was observed in 2006, dropping to 1,440 plants/acre. Cover in 1996 and 2001 was estimated at 10-11%, but actually increased in 2006 to 16% despite the decrease in density. Starting in 1996, a larger sample size was taken, which gives better estimates of density in clumped and discontinuous distributions. Recruitment from young plants was abundant in 1990 and 1996, but very little recruitment was observed in 2001 or 2006. The abundant herbaceous understory dominated by annuals may be suppressing big sagebrush and bitterbrush seedling from establishing (Hall et al. 1999). Decadence has increased from 8% in 1996 to 17% in 2006, although this is still within expected levels. Shrubs such as antelope bitterbrush and Utah juniper occur occasionally, but were not sampled even with the larger sample. Broom snakeweed is minimal at less than 1% cover.

Herbaceous Understory

The herbaceous composition is dominated by annual grasses and biennial/perennial weeds. Among the grasses, the annuals cheatgrass and jointed goatgrass are especially prevalent. Cheatgrass cover has fluctuated from 15% in 2001 to 5% in 2006. Jointed goatgrass has steadily increased from 8% in 1996 to a high of 26% in 2006. It appears that cheatgrass is being outcompeted by jointed goatgrass and bulbous bluegrass. The abundance of these annual grasses leaves the area susceptible to a devastating fire which would eliminate the sagebrush. Less abundant are bluebunch wheatgrass, Sandberg bluegrass, prairie Junegrass, and red three-awn, a warm season increaser. The poor value bulbous bluegrass is also abundant and has remained similar to 2001 observation.

The forb component consists largely of annual mustards, ragweed, storksbill, and yellow salsify. Ragweed alone made up 58% of the forb cover in 1996. Apart from the low frequency and cover values of white sweet clover and alfalfa, the forb composition is nearly valueless and indicative of very poor range condition.

1990 TREND ASSESSMENT
Basin big sagebrush has shown a slight increase in density (17%) since 1984. Decadence has gone from 92% down to 31%, while the young class currently makes up 31% of the population. This population remains a moderately hedged, low density sagebrush community. The grass trend is down. Bluebrunch wheatgrass decreased significantly in nested frequency, while jointed goatgrass increased significantly. Trend for forbs is down. Dyers woad increased significantly in nested frequency, while yellow salsify decreased. Actually, only 6 out of 20 forbs increased in nested and quadrat frequency and 4 of those were weedy increasers.

browse - slightly up (+1) grasses - down (-2) forbs - down (-2)

1996 TREND ASSESSMENT
Trend for browse is slightly up with a 43% increase in density of basin big sagebrush. Some of the increase is due to the larger sample size used in 1996. However, utilization is light, vigor is good, and decadence is low at 8%. Much of the dead sagebrush within the population appear to be the result of the harsh winters of the early 1980's (heavy use and winter injury) combined with drought. Trend for grasses is down. The herbaceous composition is extremely poor, with 74% of the herbaceous cover made up of annual weeds. The grass composition is totally dominated by undesirable species which include jointed goatgrass, rattlesnake brome, Japanese brome, cheatgrass, annual rye, and bulbous bluegrass. Preferred perennial grasses averaged only 2% cover. Trend for forbs is slightly down. The forb composition is also poor and dominated by weedy annual, biennial, and perennial species. Common ragweed is the most abundant species. It accounts for 58% of the forb cover, and showed a notable increase in its nested frequency since 1990. Conversely, dyers woad declined significantly in nested frequency, while that of white sweetclover increased. With the high amounts of fine fuel (weedy species), one wildfire could remove all of the critical winter browse (basin big sagebrush) from the area. The Desirable Components Index rated this study as very poor due to high cover of annual grasses.

winter range condition (DC Index) - very poor (30) Mid-level potential scale
browse - up (+2) grasses - down (-2) forbs - slightly down (-1)

2001 TREND ASSESSMENT
Trend for basin big sagebrush is slightly up with an increase in density. Use is mostly light with normal vigor and percent decadence is low at 13%. The only downward trend parameter is the decline in young and seedling sagebrush. Trend for grasses is down. Sum of nested frequency of perennial grasses increased slightly since 1996. However, the majority of the rise is the result of a significant increase in the poor value bulbous bluegrass. Jointed goatgrass and cheatgrass also increased significantly. These three species account for 89% of the grass cover and 74% of the total herbaceous cover. Trend for forbs is down. Sum of nested frequency of perennial forbs declined in frequency. The most abundant forbs consist of pale alyssum, ragweed, and storksbill. The only positive aspects of the forb composition is the significant decline in the nested frequency of dyer's woad and the stable frequency of alfalfa. The Desirable Components Index rated this study as very poor due to the continuous increase in the cover and nested frequency of annual grasses.

winter range condition (DC Index) - very poor (17) Mid-level potential scale
browse - slightly up (+1) grasses - down (-2) forbs - down (-2)

2006 TREND ASSESSMENT
Trend for basin big sagebrush is slightly down. Density has decreased by 23% since 2001, although cover increased from 11% to 16%. Plants are continuing to get larger, but recruitment from young plants has been minimal the last two readings. The dense understory of annual grasses is most likely preventing seedling and young recruitment. Trend for grasses is stable. Cheatgrass nested frequency actually decreased significantly, while jointed goatgrass remained similar to 2001. However, jointed goatgrass increased in cover from 15% in 2001 to 26% in 2006. Annual rye nested frequency increased significantly and bulbous bluegrass cover

increased from 8% in 2001 to 11% in 2006. Trend for forbs is stable. Sum of nested frequency of perennial forbs changed very little in 2006. Annual forbs sum of nested frequency decreased. The Desirable Components Index rated this study as very poor due to the high cover and nested frequency of annual grasses.

winter range condition (DC Index) - very poor (22) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Aegilops cylindrica (a)	a3	b81	c148	d229	d274	7.88	15.26	26.07
G	Agropyron spicatum	b46	a15	a21	a17	a17	.73	.28	.16
G	Aristida purpurea	3	-	-	-	-	-	-	-
G	Bromus brizaeformis (a)	-	-	b48	b45	a11	.19	.18	.04
G	Bromus japonicus (a)	-	-	c338	b73	a12	16.71	.32	.02
G	Bromus tectorum (a)	-	-	b262	c313	a183	8.07	14.82	4.94
G	Carex sp.	-	-	-	4	-	-	.38	-
G	Elymus cinereus	-	-	-	8	3	-	.27	.03
G	Koeleria cristata	5	-	-	-	-	-	-	-
G	Poa bulbosa	a-	a-	b58	c171	c193	1.49	7.62	10.55
G	Poa pratensis	-	-	-	3	-	-	.03	-
G	Poa secunda	a12	ab34	a14	b62	b50	.03	.78	1.10
G	Secale cereale (a)	-	a8	bc114	b89	c135	2.77	2.48	5.12
Total for Annual Grasses		3	89	910	749	615	35.64	33.08	36.20
Total for Perennial Grasses		66	49	93	265	263	2.25	9.36	11.84
Total for Grasses		69	138	1003	1014	878	37.90	42.44	48.05
F	Agoseris glauca	1	5	3	-	4	.00	-	.01
F	Allium acuminatum	b22	a-	a-	a-	a-	-	-	-
F	Alyssum alyssoides (a)	-	-	a47	b106	a21	.21	.33	.04
F	Ambrosia psilostachya	d261	bc94	c114	ab57	a44	3.92	2.25	1.77
F	Artemisia ludoviciana	1	3	-	-	-	-	-	-
F	Asclepias asperula	a-	b8	ab5	b11	ab6	.54	.23	.98
F	Astragalus utahensis	ab6	b8	a-	a-	a-	-	-	-
F	Balsamorhiza sagittata	1	-	-	-	-	-	-	-
F	Calochortus nuttallii	1	-	3	3	8	.01	.03	.02
F	Cirsium undulatum	b22	a1	a1	a2	a-	.00	.15	-
F	Comandra pallida	3	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	-	4	-	-	.01
F	Crepis acuminata	5	7	-	2	1	-	.00	.03

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Cryptantha sp.	-	-	-	-	2	-	-	.03
F	Epilobium brachycarpum (a)	-	-	$_{b}$70	$_{a}$6	$_{a}$-	.29	.01	-
F	Erodium cicutarium (a)	-	-	$_{a}$8	$_{b}$141	$_{a}$19	.07	4.19	.43
F	Gilia sp. (a)	-	-	3	8	-	.00	.01	-
F	Grindelia squarrosa	-	-	3	-	-	.03	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{c}$101	$_{b}$60	-	.29	.14
F	Isatis tinctoria	$_{a}$1	$_{c}$46	$_{b}$27	$_{ab}$6	$_{ab}$6	.19	.01	.09
F	Lactuca serriola	-	6	2	6	2	.00	.02	.03
F	Linum lewisii	1	-	-	-	-	-	-	-
F	Lithospermum ruderale	$_{a}$-	$_{b}$6	$_{a}$-	$_{a}$-	$_{a}$-	.03	-	-
F	Lomatium grayi	5	-	-	-	-	-	-	-
F	Melilotus alba	$_{a}$9	$_{a}$1	$_{b}$28	$_{a}$-	$_{a}$-	.30	-	-
F	Medicago sativa	15	19	16	22	26	.45	.74	.96
F	Petradoria pumila	2	-	-	-	-	-	-	-
F	Phlox longifolia	-	-	5	-	-	.01	-	-
F	Ranunculus testiculatus (a)	-	-	-	6	6	-	.01	.01
F	Tragopogon dubius	$_{c}$191	$_{ab}$35	$_{b}$60	$_{a}$8	$_{a}$15	.71	.16	.06
F	Unknown forb-perennial	-	-	-	-	3	-	-	.15
F	Veronica biloba (a)	-	-	-	-	6	-	-	.01
F	Zigadenus paniculatus	-	-	-	4	-	-	.00	-
Total for Annual Forbs		0	0	128	368	116	0.57	4.86	0.65
Total for Perennial Forbs		547	239	267	121	117	6.22	3.63	4.16
Total for Forbs		547	239	395	489	233	6.80	8.50	4.82

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

BROWSE TRENDS --
Management unit 02 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata tridentata	50	52	46	9.85	10.98	15.73
B	Gutierrezia sarothrae	7	9	6	.03	.69	.03
Total for Browse		57	61	52	9.89	11.67	15.76

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 2

Species	Percent Cover '06
Artemisia tridentata tridentata	17.25
Gutierrezia sarothrae	.55

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 2

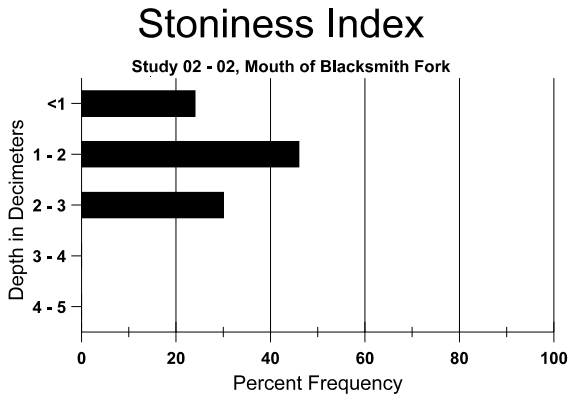
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata tridentata	2.1	2.0

BASIC COVER --
Management unit 02 , Study no: 2

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.00	11.00	59.50	69.97	64.77
Rock	16.00	20.75	6.88	3.52	4.32
Pavement	14.00	3.50	2.87	4.34	5.37
Litter	58.00	51.75	71.15	55.77	45.77
Cryptogams	1.00	0	0	0	0
Bare Ground	9.00	13.00	.41	.26	.55

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 02, Mouth of Blacksmith Fork

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.9	75.6 (16.5)	7.9	33.3	40.7	26.0	2.7	7.3	188.8	0.8



PELLET GROUP DATA --
Management unit 02 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Elk	1	-	1
Deer	1	2	16
Cattle	1	1	-

Days use per acre (ha)	
'01	'06
-	1 (2)
2 (5)	32 (79)
2 (4)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
84	**799**	-	-	66	733	-	0	100	92	-	13	32/40
90	**966**	-	300	366	300	-	24	3	31	2	24	25/27
96	**1680**	220	440	1100	140	520	6	0	8	1	1	32/52
01	**1860**	-	20	1600	240	280	16	0	13	4	5	31/41
06	**1440**	-	-	1200	240	220	36	10	17	3	3	34/51
Gutierrezia sarothrae												
84	**99**	-	-	66	33	-	67	0	33	-	0	19/22
90	**899**	-	66	833	-	-	0	0	0	-	0	18/16
96	**620**	-	280	340	-	-	0	0	0	-	0	14/19
01	**560**	-	-	560	-	-	4	0	0	-	0	12/18
06	**140**	-	-	140	-	-	0	0	0	-	0	13/17
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**33**	-	-	33	-	-	0	0	-	-	0	6/8
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 2-9-06

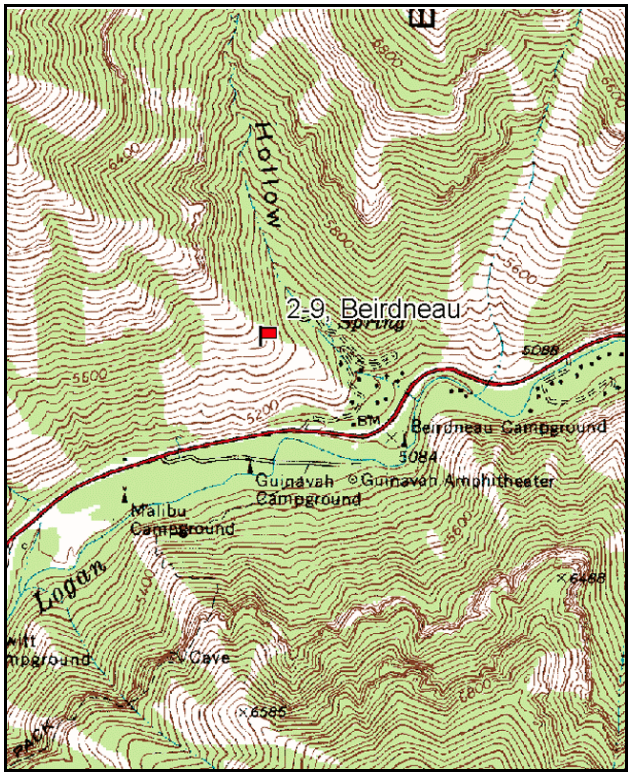
Study site name: Beirdneau . Vegetation type: Bitterbrush .

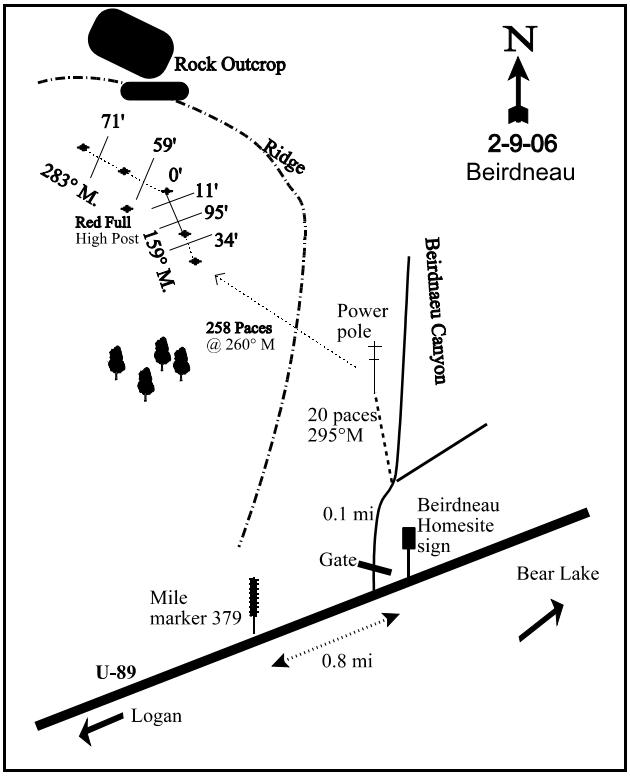
Compass bearing: frequency baseline 159 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed up Logan Canyon to mile marker 379 and begin to note mileage. Continue 0.8 miles to the Forest Service sign "Beirdneau Summer Home Sites." Turn left here and proceed 0.1 miles to a fork and stop. Walk to the power pole on the left at a bearing of 295 degrees magnetic and about 20 paces. Take a bearing of 260 degrees magnetic from the pole and walk 285 paces to the 0-foot stake of the baseline marked by browse tag #7928. The baseline runs at 159 degrees magnetic. The second stake is placed 50 feet down the slope at the same bearing. The third and fourth stake are placed 100 feet apart above the 0-foot baseline stake at a bearing of 283 degrees magnetic.





Map Name: Mt. Elmer

Diagrammatic Sketch

Township 12N , Range 2E , Section 23

UTM NAD 27, UTM 12T 4623776 N, 441999 E

DISCUSSION

Beirdneau - Trend Study No. 2-9

Study Information

This study is located slightly north of the Beirdneau cabin area in Logan Canyon (elevation: 5,400 feet, slope: 55%, aspect: south). The area is considered a normal deer winter range that possesses a good mix of mountain big sagebrush and antelope bitterbrush, interspersed with juniper. Wildlife use was heavy in 1984, but has been light to moderate since. A pellet group transect read in 2001 estimated 17 deer and 3 elk days use/acre (41 ddu/ha and 8 edu/ha). Pellet group data in 2006 was estimated at 25 deer and 14 elk days use/acre (61 ddu/ha and 35 edu/ha). In 2006, a deer carcass was located near the transect and grouse pellets were seen.

Soil

The soil is a moderately deep (14 inches), rocky, and well-drained. It appears that some of the soil has been colluvially deposited and/or weathered-in-place from limestone parent material. Texture is a clay loam and is moderately alkaline (pH of 7.9). Vegetation and litter cover appear adequate to control runoff from all but the highest intensity summer storms. Vegetation cover decreased slightly, while bareground increased from 4% relative cover in 2001 to 11% in 2006. An erosion condition class was determined to be slight during the 2001 reading, but stable in 2006.

Browse

Browse composition consists of a mixture of bitterbrush and mountain big sagebrush. Bitterbrush has demonstrated moderate to heavy hedging since 1984. Prior to 1984, a die-off of bitterbrush and sagebrush was reported to have affected 10% to 20% of the population. Rodent activity in 1983-85 may have contributed to the die-off, as well as disease and insect infestation. Bitterbrush density was estimated at about 600 plants/acre in 1984 and 1990. In 1996, bitterbrush density was 380 plants/acre after sampling techniques were altered and the sample size was increased. Density rose to 560 plants/acre in 2001, then decreased by 68% to its lowest level of 180 plants/acre in 2006. The growth from may make it difficult to distinguish different individuals. Cover of bitterbrush changed very little. No seedlings and very few young plants have been encountered in all readings since 1984. High annual grass cover may be suppressing seedling and young plants from establishing (Hall et al. 1999). Bitterbrush cover was estimated at 9% in 1996 and 6% in 2001 and 2006. Decadence has declined from a high of 78% in 1984 to 11% in 2006. Annual leader growth averaged 3 inches in 2001 and 3.7 inches in 2006.

Mountain big sagebrush density was estimated at 1,199 plants/acre in 1984, but has steadily declined to 220 plants/acre in 2006. Sagebrush decadence has averaged over 50% since 1984, except in 2001 when it dropped to 27%. Decadence increased to 64% in 2006 and 36% of the population was classified as dying. Seedling and young recruitment have been a minor component of the population during each reading. Utilization has been light to moderate since 1990, but was heavy in 1984. Annual leader growth averaged 2.4 inches in 2006.

Herbaceous Understory

Grasses and forbs are irregularly distributed, but provide good cover. Composition is poor, because of the predominance of weedy annuals. Cheatgrass and Japanese brome cover averaged 26% in 1996 and 2001, but decreased to only 3% in 2006, but quadrat frequency for both species was still moderately high.. Bluebunch wheatgrass and bulbous bluegrass are the only moderately abundant perennial grasses. The forb component has fair diversity and quality. The most common forbs include yellow salsify, spring parsley, alfalfa, and yellow sweetclover. Most forbs showed some evidence of use in 1984. Annual and biennial weeds are common and include dyer's woad, a noxious weed in Utah.

1990 TREND ASSESSMENT

The trend for key browse, bitterbrush and mountain big sagebrush, was stable. The most preferred browse, bitterbrush, has increased in density while sagebrush has declined slightly. Both sagebrush and bitterbrush

tend to have a moderately hedged growth form. Canopy cover from bitterbrush was estimated at 6%, while sagebrush averaged only 1% cover. Trend for grasses is stable. Cheatgrass and Japanese brome are the most prevalent grass species. Bluebunch wheatgrass is still quite common. Trend for forbs is down. Overall, perennial forb nested frequency increased, but the increase is mainly from three weedy species: dyer's woad, houndstongue, and prickly lettuce.

browse - stable (0) grasses - stable (0) forbs - down (-2)

1996 TREND ASSESSMENT

The sagebrush and bitterbrush die-off, which started in the early 1980's, appears to have stabilized. Mountain big sagebrush is lightly utilized with improved vigor and declining decadence. Bitterbrush is moderately utilized with good vigor and no decadent plants sampled. No seedlings or young have been sampled during any reading. Trend for browse is considered stable with the decline in density counterbalanced by the lighter use and improved vigor. Some of the lower population estimates can also be attributed to the larger sample now being taken, which gives better estimates for populations that are discontinuous and/or clumped. Trend for grasses is stable. Sum of nested frequency for perennial grasses increased since 1990, but this increase comes largely from the appearance of bulbous bluegrass. Bluebunch wheatgrass remained similar to 1990. Annual grasses (cheatgrass and Japanese brome) were also included in the sample for the first time and they are very abundant. Trend for forbs is slightly down. Nested frequency for dyer's woad increased significantly since 1990. Both prickly lettuce and hondstongue decreased significantly, but preferred species like false dandelion and low penstemon also decreased in nested frequency. Yellow sweet clover increased significantly in nested frequency and cover was at a high of 5%. Annual forbs and grasses were first sampled in 1996 and dominate the herbaceous understory. The Desirable Components Index rated this study as very poor due to the high cover and nested frequency of annual grasses.

winter range condition (DC Index) - very poor (24) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for the key browse species, bitterbrush and mountain big sagebrush, is considered stable. Bitterbrush shows moderate use, good vigor, and 21% decadence. Mountain big sagebrush numbers only 300 plants/acre. It displays light to moderate use, good vigor, and a declining decadence rate (44% to 27%). Trend for grasses is stable. The primary perennial grasses, bluebunch wheatgrass and bulbous bluegrass, have remained similar to previous estimates. Annual grasses have changed in composition from predominately Japanese brome to cheatgrass since 1996, but percent cover of annual grasses have remained similar. Trend for forbs is stable. The perennial forbs, yellow sweet clover and yellow salsify, have declined significantly in nested frequency. Dyer's woad also decreased significantly in nested frequency. The Desirable Components Index rated this study as very poor due to the high cover and nested frequency of annual grasses.

winter range condition (DC Index) - very poor (17) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse species, bitterbrush and mountain big sagebrush, is slightly down. Bitterbrush density decreased from 560 plants/acre to 180 plants/acre, but identifying individuals may have been difficult. Bitterbrush cover remained similar. Use on bitterbrush also increased from moderate in 2001 to moderate-heavy in 2006. Mountain big sagebrush also decreased in density. Decadence increased from 27% to 64% and 36% of the population was classified as dying. Trend for grasses is slightly up. Bluebunch wheatgrass has remained similar to estimates in 2001, but annual grass cover decreased from 27% in 2001 to 3% in 2006. Nested frequency of cheatgrass decreased significantly in 2006, but still has the potential to come back. Trend for forbs is slightly up. Both yellow sweet clover and alfalfa increased significantly in nested frequency.

Dyer's woad has continually decreased with each reading since 1996. The Desirable Components Index rated this study as very poor due to the decrease in browse cover and increase in decadence. The score increased due to the decrease in annual grass cover.

winter range condition (DC Index) - very poor (33) Mid-level potential scale
browse - slightly down (-1) grasses - slightly up (+1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 9

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	125	105	108	95	117	2.99	3.35	3.79
G	Agropyron trachycaulum	-	-	7	-	-	.06	-	-
G	Bromus brizaeformis (a)	-	-	$_{a}$2	$_{b}$10	$_{a}$1	.00	.05	.00
G	Bromus japonicus (a)	-	-	$_{b}$343	$_{a}$152	$_{a}$148	17.68	2.40	1.63
G	Bromus tectorum (a)	-	-	$_{b}$204	$_{c}$302	$_{a}$177	8.41	24.20	1.76
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{bc}$83	$_{b}$73	$_{c}$103	2.65	2.36	2.41
G	Poa pratensis	4	10	-	-	4	-	-	.00
G	Poa secunda	$_{a}$-	$_{b}$10	$_{ab}$3	$_{b}$19	$_{ab}$6	.04	.09	.04
Total for Annual Grasses		0	0	549	464	326	26.10	26.65	3.40
Total for Perennial Grasses		129	125	201	187	230	5.74	5.82	6.26
Total for Grasses		129	125	750	651	556	31.85	32.48	9.66
F	Achillea millefolium	$_{b}$14	$_{a}$-	$_{a}$-	$_{ab}$8	$_{ab}$5	-	.21	.06
F	Agoseris glauca	$_{ab}$14	$_{b}$26	$_{a}$1	$_{a}$1	$_{ab}$10	.00	.03	.10
F	Allium acuminatum	$_{c}$45	$_{bc}$29	$_{a}$6	$_{bc}$26	$_{ab}$14	.04	.17	.11
F	Alyssum alyssoides (a)	-	-	$_{b}$137	$_{b}$151	$_{a}$35	.39	.71	.07
F	Artemisia ludoviciana	4	3	10	6	14	.26	.30	1.54
F	Astragalus beckwithii	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	$_{a}$2	-	-	.03
F	Aster chilensis	$_{b}$49	$_{b}$40	$_{a}$2	$_{a}$4	$_{a}$4	.00	.01	.09
F	Astragalus sp.	-	-	-	-	-	-	-	.03
F	Astragalus utahensis	1	3	2	1	1	.00	.03	.03
F	Balsamorhiza sagittata	5	5	3	5	2	.53	.22	.60
F	Camelina microcarpa (a)	-	-	-	6	5	-	.01	.01
F	Chaenactis douglasii	-	1	-	-	-	-	-	-
F	Cirsium undulatum	2	5	5	-	7	.33	-	.21
F	Comandra pallida	8	-	2	-	-	.03	-	-
F	Collinsia parviflora (a)	-	-	-	-	3	-	-	.00
F	Crepis acuminata	-	-	-	1	2	-	.02	.03
F	Cymopterus sp.	97	118	107	125	131	2.99	6.04	7.21
F	Cynoglossum officinale	$_{a}$5	$_{c}$27	$_{a}$2	$_{ab}$11	$_{bc}$28	.00	.12	1.25

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Epilobium brachycarpum (a)	-	-	$_{b}$46	$_{a}$24	$_{b}$38	.22	1.66	.24
F	Erodium cicutarium (a)	-	-	-	-	-	-	-	.15
F	Galium aparine (a)	-	-	$_{b}$36	$_{a}$-	$_{c}$59	.40	-	.36
F	Gilia aggregata	-	4	-	-	-	-	-	-
F	Hackelia patens	$_{a}$1	$_{a}$10	$_{a}$-	$_{b}$47	$_{a}$13	-	.79	.13
F	Holosteum umbellatum (a)	-	-	5	6	-	.01	.03	-
F	Isatis tinctoria	$_{a}$-	$_{c}$23	$_{b}$65	$_{c}$25	$_{c}$5	1.33	1.20	.11
F	Lappula occidentalis (a)	-	-	-	1	-	-	.00	-
F	Lactuca serriola	-	67	28	99	118	.15	.93	2.84
F	Lepidium densiflorum (a)	-	-	-	-	3	-	-	.03
F	Linum lewisii	20	22	29	15	21	.37	.16	.33
F	Lithospermum ruderale	10	8	9	11	7	.54	.58	.45
F	Melilotus officinalis	$_{a}$2	$_{a}$15	$_{b}$100	$_{a}$4	$_{c}$68	5.01	.19	1.26
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$24	-	-	2.07
F	Microsteris gracilis (a)	-	-	-	-	8	-	-	.02
F	Penstemon humilis	$_{ab}$2	$_{b}$10	$_{a}$1	$_{ab}$3	$_{ab}$5	.03	.06	.12
F	Phlox hoodii	$_{b}$12	$_{b}$13	$_{a}$-	$_{a}$-	$_{ab}$2	-	-	.03
F	Ranunculus testiculatus (a)	-	-	-	-	1	-	-	.00
F	Tragopogon dubius	$_{b}$159	$_{b}$163	$_{b}$156	$_{a}$102	$_{ab}$124	2.96	1.90	1.79
F	Trifolium sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{c}$32	$_{b}$9	-	.45	.02
F	Unknown forb-perennial	-	-	1	-	-	.06	-	-
F	Veronica biloba (a)	-	-	$_{a}$31	$_{b}$103	$_{b}$76	.11	.60	.63
F	Zigadenus paniculatus	-	-	-	-	1	-	-	.00
Total for Annual Forbs		0	0	255	291	228	1.15	3.03	1.54
Total for Perennial Forbs		450	605	529	526	617	14.70	13.46	20.50
Total for Forbs		450	605	784	817	845	15.85	16.49	22.05

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

BROWSE TRENDS --
Management unit 02 , Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	14	14	9	2.04	1.60	1.67
B	Chrysothamnus viscidiflorus viscidiflorus	4	5	2	.30	.15	.15
B	Gutierrezia sarothrae	10	11	3	.43	.51	.15
B	Juniperus scopulorum	1	0	0	.85	-	-
B	Purshia tridentata	17	20	8	9.03	6.37	5.82
B	Symphoricarpos oreophilus	10	9	10	1.38	1.96	1.77
Total for Browse		56	59	32	14.05	10.60	9.57

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 9

Species	Percent Cover	
	'01	'06
Artemisia tridentata vaseyana	-	1.61
Chrysothamnus viscidiflorus viscidiflorus	-	.20
Gutierrezia sarothrae	-	.11
Juniperus scopulorum	1.00	-
Purshia tridentata	-	9.35
Symphoricarpos oreophilus	-	2.70

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 9

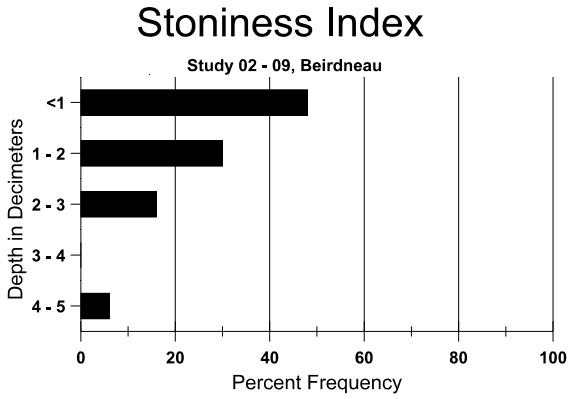
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	-	2.4
Purshia tridentata	3.0	3.7

BASIC COVER --
Management unit 02 , Study no: 9

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.25	14.50	54.68	54.55	41.26
Rock	20.25	9.00	12.78	11.34	10.78
Pavement	19.50	31.00	5.56	16.53	16.43
Litter	48.00	39.00	48.74	43.50	31.27
Cryptogams	.25	0	.20	.07	0
Bare Ground	10.75	6.50	6.39	5.70	11.91

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 09, Beirdneau

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.8	64.6 (15.8)	7.9	26.7	38.0	35.3	3.2	8.7	211.2	0.5



PELLET GROUP DATA --
Management unit 02 , Study no: 9

Type	Quadrat Frequency		
	'96	'01	'06
Elk	-	-	6
Deer	1	6	8

Days use per acre (ha)	
'01	'06
3 (8)	14 (35)
17 (41)	25 (61)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	42/53
Artemisia tridentata vaseyana												
84	**1199**	-	66	333	800	-	6	94	67	-	17	22/27
90	**733**	-	-	333	400	-	9	0	55	3	18	24/32
96	**360**	-	20	180	160	300	33	0	44	6	6	23/40
01	**300**	-	-	220	80	360	13	0	27	-	0	30/45
06	**220**	-	-	80	140	100	45	9	64	36	36	28/40
Chrysothamnus nauseosus albicaulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	45/61
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	54/72
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**199**	66	133	66	-	-	0	0	0	-	0	25/30
96	**100**	-	20	80	-	-	0	0	0	-	0	28/41
01	**140**	-	-	120	20	-	0	0	14	-	0	24/21
06	**60**	-	-	60	-	-	0	0	0	-	0	16/28
Gutierrezia sarothrae												
84	**1866**	-	466	1400	-	-	0	0	-	-	0	15/19
90	**66**	-	-	66	-	-	0	0	-	-	0	9/14
96	**400**	-	-	400	-	-	0	0	-	-	0	14/17
01	**580**	-	-	580	-	-	0	0	-	-	0	13/17
06	**60**	-	-	60	-	-	0	0	-	-	0	14/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
84	**599**	-	-	133	466	-	0	100	78	-	0	45/53
90	**666**	-	-	466	200	-	50	0	30	3	10	63/92
96	**380**	-	-	380	-	100	74	5	0	-	0	52/88
01	**560**	-	20	420	120	80	75	11	21	-	0	58/93
06	**180**	-	-	160	20	60	33	44	11	-	0	53/81
Symphoricarpos oreophilus												
84	**333**	-	200	133	-	-	40	0	0	-	0	32/31
90	**733**	-	333	400	-	-	0	0	0	-	0	16/28
96	**240**	-	60	160	20	-	8	0	8	-	17	24/51
01	**200**	160	-	200	-	-	0	0	0	-	0	30/57
06	**300**	-	-	300	-	-	7	0	0	-	0	29/49

Trend Study 2-12-06

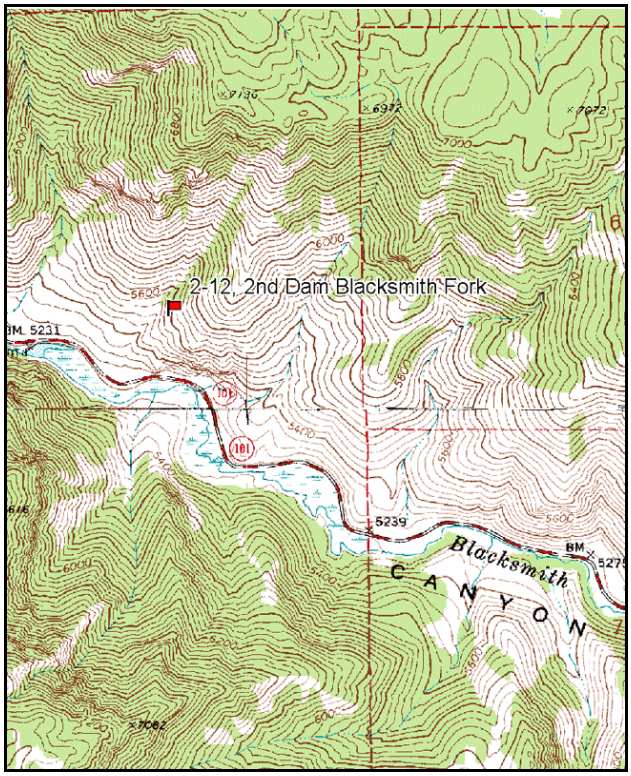
Study site name: Second Dam Blacksmith Fork . Vegetation type: Big Sagebrush .

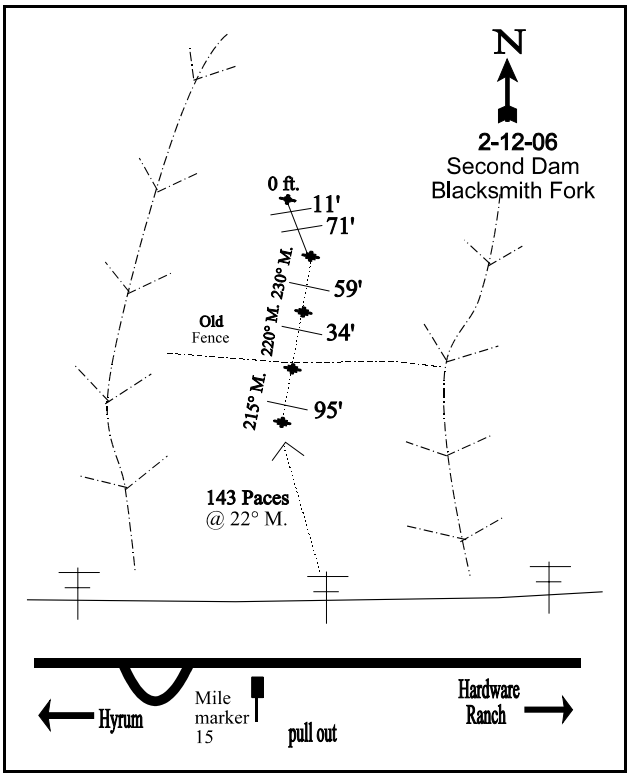
Compass bearing: frequency baseline 151 degrees magnetic.

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

LOCATION DESCRIPTION

In Hyrum, proceed east up Blacksmith Fork Canyon (U-101) to mile marker 15. Continue 200 feet to the pull-out before mile marker 15. Look for a power pole north of the east of the pull-out. From the pole, take a azimuth of 22 degrees magnetic and walk 143 paces to the 400-foot baseline stake marked by browse tag #7985. The baseline bearing is 151 degrees magnetic. Note: due to the rocky terrain the 100-foot stake is actually at the 95 foot mark; adjust the tape and belts accordingly. Line 2 runs 230 degrees magnetic. Line three runs 220 degrees magnetic. Line 4 runs 215 degrees magnetic.





Map Name: Logan Peak

Diagrammatic Sketch

Township 10N , Range 2E , Section 1

UTM NAD 27, UTM 12T 4608526 N, 444151 E

DISCUSSION

Second Dam Blacksmith Fork - Trend Study No. 2-12

Study Information

This study samples critical deer winter range north of the second reservoir in Blacksmith Fork Canyon (elevation: 5,600 feet, slope: 35-40%, aspect: south). It is dominated by mountain big sagebrush and bitterbrush community with scattered junipers. Deer utilize the area during all but the most severe winters. Hedging was heavy in the past, although deer and elk pellet groups have occurred at low frequencies since 1996. A pellet group transect read in 2001 estimated 6 elk and 12 deer days use/acre (15 edu/ha & 30 ddu/ha). Pellet group data from 2006 was estimated at 16 elk and 16 deer days use/acre (40 edu/ha and 40 ddu/ha).

Soil

The soil survey goes into very little detail, simply classifying the area in the Rock Land series (USDA-NRCS 2006). This category includes steep mountain slopes with significant areas of exposed bedrock and very shallow soils derived primarily from limestone and quartzite. Soils show little development and tend to erode easily because of the steep slopes if not protected by vegetation cover. The soil is moderately shallow due to underlying limestone and effective rooting depth was estimated just over 8 inches. Rock and pavement cover on the surface is abundant and consists of dark colored limestone, which can elevate daytime ground surface temperatures. The soil reaction is slightly alkaline (7.4 pH). There is little bare ground exposed and erosion does not appear to be a problem. The erosion condition class was classified as stable in 2001 and 2006.

Browse

Browse composition consists of a low density of mountain big sagebrush with an associated sparse population of antelope bitterbrush. Density of mountain big sagebrush was estimated at 933 plants/acre in 1984 and has declined each reading to 160 plants/acre in 2006. Decadence has been high every sampling year, averaging 60% of the population. Plants classified as dying increased from none in 1984 to a high of 63% in 2006. Seedling and young recruitment have been minimal and do not appear to be replacing the dying plants. Utilization has varied each sampling year from heavy in 1984 to light-moderate most other years. Annual leader growth averaged 2.8 inches in 2001 and 2.9 inches in 2006.

Bitterbrush displayed a stable density at nearly 200 plants/acre from 1984 through 1996, but declined to 100 plants/acre in 2001 and 2006. Use was moderate to heavy in 1984, 2001, and 2006, but light to moderate in 1990 and 1996. Decadence has varied each sampling year with a high of 67% of the population in 1984. It has then alternated from 33% in 1990 to 0% in 1996, back to 40% in 2001 and then to 0% in 2006. Reproduction is limited with only a few young observed in 1996 and no seedlings encountered during any of the other 4 readings. Annual leader growth averaged 4 inches in 2001 and 2006.

Other species such as Saskatoon Serviceberry, blueberry elder, Rocky Mountain maple, true mountain mahogany, and Rocky Mountain juniper provide a desirable variety of forage, but are of minor importance because of their limited abundance.

Herbaceous Understory

Bluebunch wheatgrass is the dominant perennial grass and its nested frequency has remained similar since 1984. Cover averaged 6-7% in 1996 and 2001, but nearly doubled in 2006 to 11%. Other perennial grasses include: prairie Junegrass, Kentucky bluegrass, bulbous bluegrass, and Sandberg bluegrass. Japanese brome has continually decreased since 1996, while cheatgrass increased significantly in 2001 and produced 19% cover (up from 4% in 1996). Cheatgrass cover declined in 2006 to 8% and the nested frequency decreased significantly. Unfortunately cheatgrass is still widely distributed across the site with a quadrat frequency of 88% in 2006.

Forbs are diverse, yet contain few valuable perennial species. The majority are annuals or weedy biennials

and perennials. Common species include pale alyssum, arrowleaf balsamroot, rock goldenrod, gray lomatium, and, yellow salsify. Dyer's woad, a state listed noxious weed, was sampled in small numbers in 1990 and 1996, but has not been sampled since. It was observed on the study in 2001 and 2006

1990 TREND ASSESSMENT
Trend for browse is down. Density of mountain big sagebrush decreased from 933 plants/acre in 1984 to 633 plants/acre in 1990. It was only lightly hedged compared to the heavy use in 1984. No young plants were found and there is an excessively high percentage of decadent sagebrush (68%) in the population. Sagebrush canopy cover averaged 6%. The bitterbrush population showed very little change, except a decrease in utilization. Trend for grasses is up. Perennial grass nested frequency increased 49%, due to an increase in Sandberg bluegrass. Trend for forbs is stable. Perennial forbs changed very little from 1984 reading.

browse - down (-2) grasses - up (+2) forbs - stable (0)

1996 TREND ASSESSMENT
Mountain big sagebrush still has a high percent decadence, poor vigor, and little reproduction. Antelope bitterbrush displays a stable trend with a decline in percent decadence (33% to 0%) and light to moderate use. Overall browse trend is considered slightly down due to the condition of the sagebrush population and the high density of broom snakeweed. Trend for grasses is stable. Sum of nested frequency of perennial grasses has remained similar to 1996 levels. Annual grass data were collected for the first time in 1996 and were abundant. Trend for forbs is up. Sum of nested frequency of perennial forbs increased, due largely to an increase in nested frequency of yellow salsify. However, the forb composition is still poor with few valuable forage species. The Desirable Components Index rated this study as poor due to low browse cover, high browse decadence, and high annual grass cover.

winter range condition (DC Index) - poor (38) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - up (+2)

2001 TREND ASSESSMENT
Trend for the key browse species, mountain big sagebrush and bitterbrush, appears to be declining. Bitterbrush displays heavier use compared to 1996. Vigor is normal, but decadence has increased since 1996 to 40%. Plants were flowering and producing seed during the 2001 reading, but no seedlings or young were encountered in the density strips. It appears that some layering is occurring in these large spread out shrubs which average about six feet in crown diameter. Bitterbrush occurs in low numbers and does not produce much forage. Mountain big sagebrush also occurs in low numbers. It displays moderate use, and vigor is poor on 20% of the population. Decadence has remained stable at 53%, but 20% of the sagebrush population appear to be dying and there are currently no young plants to replace them. The density of dead plants is slightly more than living plants. It is obvious that the thick cover of annual grasses and forbs make seedling establishment very difficult. Trend for grasses is slightly down. Sum of nested frequency and cover for perennial grasses remained similar, but annual grass cover increased from 10% to 21%. Trend for forbs is down. Perennial forb nested frequency decreased to values similar to those in 1990. The forb composition is still dominated by annuals and weedy perennials, although dyer's woad nested frequency significantly declined. The Desirable Components Index rated this study as very poor due to low browse cover, high decadence, and an increase in annual grass cover.

winter range condition (DC Index) - very poor (18) Mid-level potential scale
browse - down (-2) grasses - slightly down (-1) forbs - down (-2)

2006 TREND ASSESSMENT
Trend for key browse, mountain big sagebrush and bitterbrush, is down. Mountain big sagebrush density continued to decrease from 300 plants/acre in 2001 to 160 plants/acre in 2006. Decadence increased from

53% to 63% and over half (63%) the population was classified as dying. Seedlings and young recruitment have been rare and are not replacing the dying plants. Bitterbrush is not abundant and have remained similar to the previous reading. Trend for grasses is slightly up. Bluebunch wheatgrass nested frequency has remained similar, but cover nearly doubled. Cheatgrass nested frequency also decreased significantly and cover dropped from 19% to 8%, but quadrat frequency is still high at 88%. Trend for forbs is up. The sum of nested frequency for forbs increased, mostly due to a large increase in gray lomatium. Dyer's woad is a very minor component and was not sampled in any quadrats, but was observed in 2006. The Desirable Components Index rated this study as very poor-poor due to decreasing browse cover, high decadence, but with a slight reduction in annual grass cover.

winter range condition (DC Index) - very poor-poor (35) Mid-level potential scale
browse - down (-2) grasses - slightly up (+1) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 12

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	-	-	-	-	3	-	-	.15
G	Agropyron spicatum	151	176	154	168	180	6.40	6.50	11.37
G	Bromus brizaeformis (a)	-	-	a11	b49	b77	.03	.35	.56
G	Bromus japonicus (a)	-	-	c280	b95	a45	5.56	1.16	.34
G	Bromus tectorum (a)	-	-	a213	b347	a268	4.00	19.09	7.70
G	Koeleria cristata	18	8	11	9	5	.21	.11	.03
G	Poa bulbosa	-	-	4	8	10	.01	.18	.07
G	Poa fendleriana	-	-	-	-	2	-	-	.03
G	Poa pratensis	a-	ab4	a-	a-	b11	-	-	.11
G	Poa secunda	a66	c162	c158	c164	b121	3.68	2.92	2.30
Total for Annual Grasses		0	0	504	491	390	9.60	20.61	8.61
Total for Perennial Grasses		235	350	327	349	332	10.30	9.72	14.08
Total for Grasses		235	350	831	840	722	19.91	30.33	22.69
F	Achillea millefolium	6	1	-	-	-	-	-	.00
F	Agoseris glauca	a-	a1	a3	a9	b32	.00	.16	.19
F	Allium acuminatum	c60	a3	ab28	b24	ab13	2.14	.09	.08
F	Alyssum alyssoides (a)	-	-	a227	b286	a212	.89	4.43	1.34
F	Astragalus sp.	-	-	-	-	1	-	-	.03
F	Astragalus utahensis	2	4	1	-	-	.03	-	-
F	Balsamorhiza sagittata	17	24	12	11	7	.43	1.60	1.19
F	Castilleja linariaefolia	-	-	-	1	-	-	.03	-
F	Camelina microcarpa (a)	-	-	-	1	6	-	.00	.01
F	Calochortus nuttallii	2	1	3	-	6	.00	-	.01
F	Cirsium undulatum	2	4	5	-	4	.19	.12	.24

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Collomia linearis (a)	$_{ab}$7	$_{a}$-	$_{a}$1	$_{ab}$6	$_{b}$12	.00	.01	.04
F	Comandra pallida	$_{b}$35	$_{a}$2	$_{ab}$17	$_{a}$10	$_{a}$3	.07	.09	.03
F	Collinsia parviflora (a)	-	-	$_{a}$7	$_{a}$5	$_{b}$28	.01	.01	.09
F	Crepis acuminata	$_{a}$5	$_{b}$28	$_{ab}$17	$_{a}$8	$_{ab}$12	.25	.19	.31
F	Delphinium nuttallianum	-	-	-	-	2	-	-	.00
F	Descurainia pinnata (a)	-	-	-	3	-	-	.00	-
F	Draba sp. (a)	-	-	-	3	2	-	.00	.01
F	Epilobium brachycarpum (a)	-	-	$_{b}$11	$_{a}$-	$_{c}$49	.02	-	.51
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{a}$5	$_{b}$46	-	.06	1.37
F	Eriogonum umbellatum	1	2	2	5	-	.15	.03	-
F	Galium aparine (a)	-	-	$_{a}$3	$_{a}$3	$_{b}$24	.01	.03	.04
F	Hackelia patens	-	-	-	2	3	-	.00	.04
F	Holosteum umbellatum (a)	-	-	$_{a}$10	$_{c}$161	$_{b}$55	.05	.81	.17
F	Isatis tinctoria	$_{a}$-	$_{b}$13	$_{b}$19	$_{a}$-	$_{a}$-	.07	-	.00
F	Lappula occidentalis (a)	-	-	-	-	9	-	-	.02
F	Lactuca serriola	$_{a}$-	$_{ab}$15	$_{a}$5	$_{c}$58	$_{b}$25	.06	.62	.19
F	Lithospermum arvense (a)	-	-	-	-	1	-	-	.01
F	Linum lewisii	2	1	3	-	-	.03	-	-
F	Lithospermum ruderale	2	-	-	5	5	.03	.06	.18
F	Lomatium grayi	13	27	4	5	59	.01	.01	2.56
F	Melilotus officinalis	-	5	1	-	3	.00	-	.00
F	Microsteris gracilis (a)	-	-	-	-	8	-	-	.02
F	Oenothera sp.	-	-	-	-	1	-	-	.00
F	Penstemon sp.	-	-	3	-	-	.03	-	-
F	Petradoria pumila	$_{bc}$34	$_{c}$34	$_{a}$9	$_{ab}$10	$_{a}$9	.71	.89	1.31
F	Ranunculus testiculatus (a)	-	-	$_{a}$13	$_{a}$31	$_{b}$76	.02	.07	.42
F	Senecio sp.	1	-	-	-	-	-	-	-
F	Tragopogon dubius	$_{a}$18	$_{a}$53	$_{c}$175	$_{b}$98	$_{b}$112	2.85	1.29	3.09
F	Veronica biloba (a)	-	-	$_{a}$46	$_{a}$54	$_{b}$97	.15	.67	.43
Total for Annual Forbs		7	0	318	558	625	1.17	6.14	4.50
Total for Perennial Forbs		200	218	307	246	297	7.10	5.22	9.50
Total for Forbs		207	218	625	804	922	8.28	11.36	14.01

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

BROWSE TRENDS --
Management unit 02 , Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	19	13	8	3.20	1.74	.74
B	Chrysothamnus nauseosus hololeucus	2	2	3	.76	1.96	.76
B	Chrysothamnus viscidiflorus viscidiflorus	5	4	3	.06	.23	.31
B	Eriogonum heracleoides	1	0	0	-	-	-
B	Gutierrezia sarothrae	25	26	16	.65	.66	.39
B	Purshia tridentata	9	5	5	1.99	1.41	2.67
B	Rosa woodsii	0	2	2	-	.15	.15
Total for Browse		61	52	37	6.67	6.17	5.03

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 12

Species	Percent Cover '06
Artemisia tridentata vaseyana	.83
Chrysothamnus nauseosus hololeucus	2.16
Chrysothamnus viscidiflorus viscidiflorus	.83
Gutierrezia sarothrae	.90
Purshia tridentata	5.56
Rosa woodsii	.41

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 12

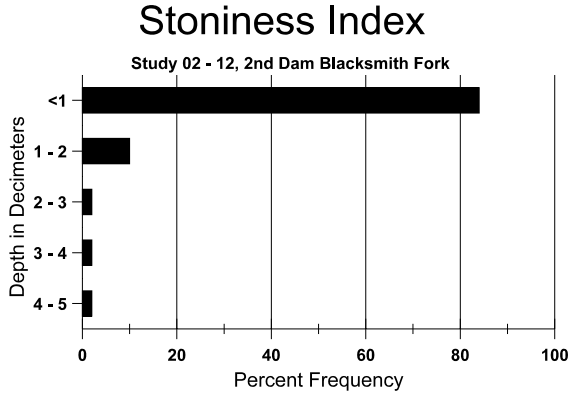
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.8	2.9
Purshia tridentata	3.9	3.8

BASIC COVER --
Management unit 02 , Study no: 12

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.25	9.75	33.04	52.43	34.54
Rock	43.00	39.00	31.60	29.89	36.88
Pavement	12.25	8.25	3.85	2.98	6.91
Litter	26.25	25.00	31.88	36.83	30.38
Cryptogams	4.25	1.75	4.36	3.26	1.75
Bare Ground	13.00	16.25	4.64	4.52	9.03

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 12, 2nd Dam Blacksmith Fork

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.2	58.8 (8.8)	7.4	36.6	35.1	28.4	3.4	10.0	176.0	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 12

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	4
Elk	6	1	5
Deer	8	4	11
Cattle	-	-	1

Days use per acre (ha)	
'01	'06
-	-
6 (15)	16 (40)
12 (30)	16 (40)
-	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	54/47
01	**0**	-	-	-	-	-	0	0	-	-	0	51/52
06	**0**	-	-	-	-	-	0	0	-	-	0	36/43
Artemisia tridentata vaseyana												
84	**933**	-	-	333	600	-	18	82	64	-	29	34/30
90	**633**	-	-	200	433	-	0	0	68	3	5	30/31
96	**380**	-	20	160	200	500	21	5	53	16	16	30/47
01	**300**	20	-	140	160	340	80	0	53	20	20	29/40
06	**160**	20	-	60	100	420	25	25	63	63	63	30/42
Chrysothamnus nauseosus hololeucus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	40	-	20	0	0	0	-	0	47/72
01	**40**	-	-	40	-	20	0	0	0	-	0	33/44
06	**60**	-	-	40	20	-	0	0	33	-	0	27/34
Chrysothamnus viscidiflorus viscidiflorus												
84	**132**	-	33	66	33	-	0	0	25	-	0	15/10
90	**100**	-	-	100	-	-	0	0	0	-	0	18/23
96	**140**	-	20	120	-	-	0	0	0	-	0	18/30
01	**100**	-	-	100	-	-	0	0	0	-	0	15/25
06	**80**	-	-	60	20	-	0	0	25	-	0	16/32
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	3/4
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**1260**	60	440	820	-	-	0	0	0	-	0	10/16
01	**1080**	-	-	1080	-	-	0	0	0	-	0	9/13
06	**500**	-	-	460	40	20	0	0	8	4	4	11/16
Purshia tridentata												
84	**199**	-	-	66	133	-	0	100	67	-	0	28/36
90	**199**	-	-	133	66	-	17	0	33	-	0	24/30
96	**180**	-	20	160	-	20	44	0	0	-	0	33/76
01	**100**	-	-	60	40	-	60	20	40	-	0	39/76
06	**100**	-	-	100	-	-	20	80	0	-	0	38/71
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	10/6
01	**40**	-	40	-	-	-	0	0	-	-	0	-/-
06	**180**	-	20	160	-	-	0	0	-	-	0	16/11
Sambucus racemosa												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	62/95

Trend Study 2-13-06

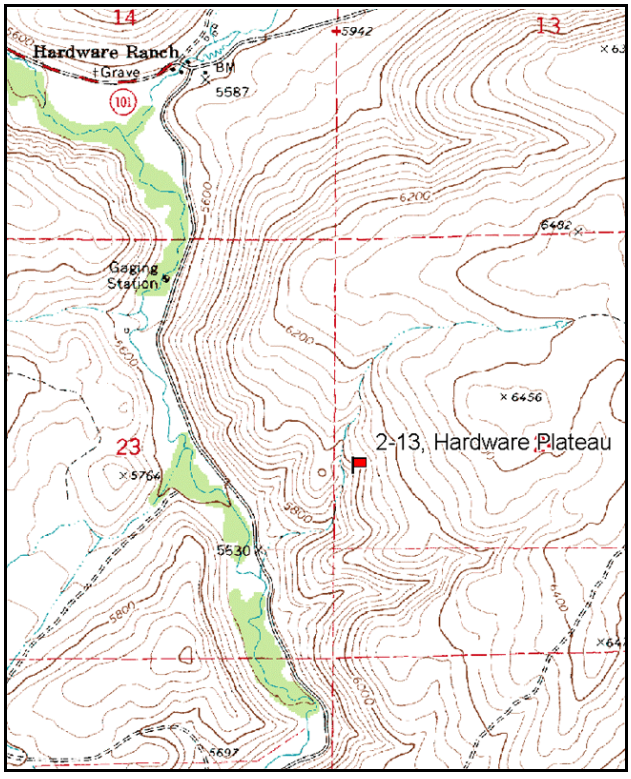
Study site name: Hardware Plateau . Vegetation type: Big Sagebrush .

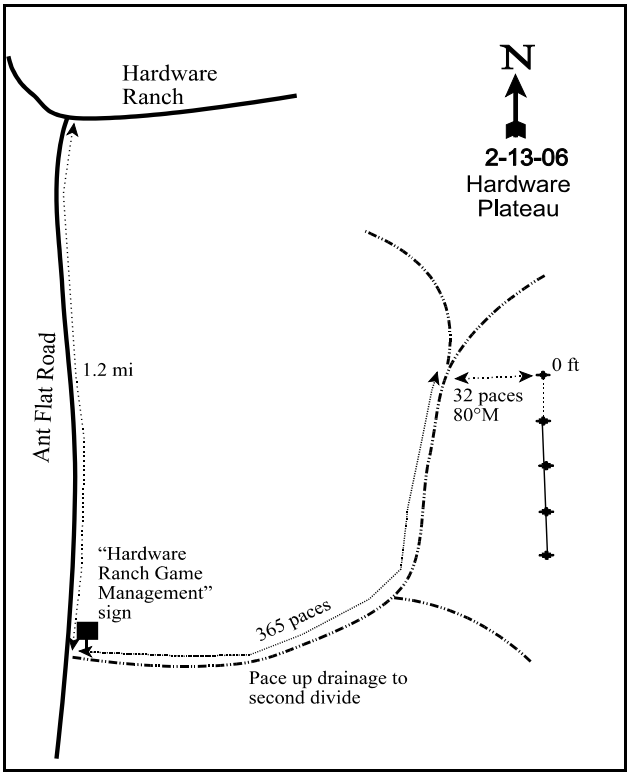
Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

From Hardware Ranch, proceed south on the Ant Flat road for 1.2 miles. This mileage should end at a sign that reads: "Welcome to Hardware Ranch Game Management Area." Stop here. Walk up the bottom of the wash (to the east of the sign) 365 paces, to the second very definite fork in the drainage. From the point where the wash divides take a bearing of 80 degrees magnetic and walk 32 paces to the 0-foot stake of the baseline, marked by browse tab #7984. The baseline runs at 163 degrees magnetic.





Map Name: Hardware Ranch Diagrammatic Sketch

Township 10N , Range 3E , Section 24 UTM NAD 27, UTM 12T 4603964 N, 453491 E

DISCUSSION

Hardware Plateau - Trend Study No. 2-13

Study Information

This study is located a short distance up one of the small draws at the western edge of the Hardware Plateau (elevation: 6,000 feet, slope: 50%, aspect: west), which is located on the DWR Hardware Ranch property. Slopes like this are very important to wintering deer and elk. The vegetation type is mountain big sagebrush/grass which also contains a scattered mixture of other shrub species, but the study area is dominated by perennial grasses. Due to the low density of preferred shrubs on many of the areas at Hardware Ranch WMA a cattle grazing treatment was implemented with the goal to increase browse for wintering deer. This treatment study began in 2005. The range monitoring crew has established paired grazed and ungrazed studies to monitor the effects of this treatment. This study serves as a grazed area with an ungrazed study located to the east, higher on the hill. Pellet group data show that cattle rarely utilize slopes this steep. In 2006, it was obvious that cattle utilized the less steep slopes above this trend study more than the 50% slope where the trend study is located.

Pellet groups were abundant and two carcasses from the 1983-84 winter were found during the study establishment in 1984. Chukars were noted in 1990. Use appeared lighter in 1996 with quadrat frequencies of deer and elk pellet groups at 18% and 7%, respectively. One deer was flushed from a drainage and 3 dead deer and 1 dead elk were found near the study in 1996. A pellet group transect read in 2001 estimated 39 deer and 13 elk days use/acre (96 ddu/ha and 32 edu/ha). Yellow bellied marmots were numerous around the larger rock outcrops. Pellet group data from 2006 was estimated at 28 deer, 9 elk, and 3 cow days use/acre (69 ddu/ha, 22 edu/ha, and 7 cdu/ha).

Soil

Soils in this area are classified in Yeates Hollow series (USDA-NRCS 2006). These are moderately shallow soils where bedrock is normally encountered at about 4 feet in depth. Derived from quartzite and sandstone, the Yeates Hollow soil has poor permeability and runoff is normally quite rapid. Roots penetrate to bedrock and soil reaction ranges from neutral to slightly acidic (Erickson and Mortensen, 1974). The soil has a loam texture and is very rocky on the surface and through the profile. Due to the rocky nature of the soil, effective rooting depth was estimated at about 10 inches with a soil penetrometer. Some inevitable soil erosion occurs due to the steep slope, but the ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was still moderate at 3.3:1 in 2006. There is little unprotected bare soil and even though there are some rills and active gullies, the erosion condition class was determined to be only slight in 2001 and 2006.

Browse

Although the study is classified as a mountain big sagebrush-grass type, increaser shrubs, including narrowleaf low rabbitbrush, mountain snowberry, woods rose, and Oregon grape are quite numerous. Mountain big sagebrush occurs in low densities. In 1984, sagebrush averaged 333 plants/acre and was fairly similar in 1996 at 280 plants/acre. This decreased to 120 plants/acre in both 2001 and 2006. Decadence has been high during most of the readings. In 1984 and 1990, over 70% of the population was classified as decadent. Percent decadence decreased in 1996 to 21%, increased to 50% by 2001, and decreased to 33% in 2006. Utilization was heavy in 1984 and 1990, but has been moderate since 1996. Dead plants, first counted in 1996, have numbered more than the live plants every year indicating a die-off had occurred. The number of dead sagebrush plants are a concern as they outnumber live ones by a ratio of nearly 2:1. Because of slope (50%), aspect (west), soils, drought, and competition, some thinning and die-off would be expected for mountain big sagebrush, but this is excessive. Annual leader growth averaged 4.9 inches in 2001 and 2.5 inches in 2006.

Serviceberry and bitterbrush offer additional preferred forage, but these shrubs occur in low numbers. Serviceberry averaged 440 plants/acre in 1996, 160 in 2001 and 200 plants/acre in 2006 with less than 1% cover each year. Bitterbrush has steadily declined in density from 333 plants/acre in 1984 to only 80

plants/acre since 1996. However, some of this change can be explained by the larger sample size used beginning in 1996, which gives a more accurate population estimate for species that characteristically have distributions that are clumped or discontinuous. Use of the bitterbrush and serviceberry has been heavy during all readings. Vigor has been normal on both species even though no bitterbrush seedlings or young plants have been encountered during any reading. Bitterbrush leader growth averaged 5.3 inches in 2001.

Herbaceous Understory

The study area has good perennial grass cover, however a few annuals, like cheatgrass, provide a high amount of fine fuel litter. Cheatgrass cover and nested frequency have steadily declined with each reading since 1996. In 1996, cheatgrass cover averaged 10% and had decreased to 1% in 2006. The most abundant perennial grasses include: bluebunch wheatgrass and Sandberg bluegrass. Kentucky bluegrass is an increaser under grazing and was significantly more abundant in 2006. Perennial grasses combined to produce nearly 26% cover in 2001 and 22% in 2006. Common perennial forbs include Louisiana sagebrush, arrowleaf balsamroot, western yarrow, tapertip hawksbeard, and silvery lupine. Forbs and grasses show little evidence of any grazing and are in good vigor.

1990 TREND ASSESSMENT

The overall poor vigor and heavy use of the browse is compounded by drought and competition with annual grasses and forbs. Together, this is causing low seed production. Even with good seed production, there are not many safe sites for seedling establishment. A majority of the sagebrush, bitterbrush, and serviceberry plants are decadent or already dead. The serviceberry classified as young are sprouts from old root crowns. The samples of these key species are small due to the sparsity of the browse population, but all the data indicate a decline in density. Trend for grasses is slightly up. Sum of nested frequency of perennial grasses increased, mostly due to an increase in bluebunch wheatgrass. Trend for forbs is stable. Very little change occurred in perennial forbs.

browse - down (-2) grasses - slightly up (+1) forbs - stable (0)

1996 TREND ASSESSMENT

The key browse species, mountain big sagebrush, appears to have a stable trend. Density is still low at only 280 plants/acre. However, young plants comprise 14% of the population, utilization is more moderate, vigor improved, and decadence has declined from 75% to 21%. Bitterbrush density was lower, which may be due the larger sample size. Bitterbrush only contributes less than 1% cover. Population density is down to 80 plants/acre, but utilization is not as heavy (from 100% down to 50% heavy use), and decadence has declined from 50% to 25%. Serviceberry also shows reduced heavy use, improved vigor, and less decadent plants. Preferred browse is lacking. Trend for grasses is down. Sum of nested frequency for perennial grasses is down 23%. Nested frequency for the key perennial grass, bluebunch wheatgrass, has declined significantly. Annuals grasses were included in the sample for the first time and cheatgrass is abundant. Trend for forbs is down. The sum of nested frequency of forbs has declined by 48%. Key forbs include western yarrow, arrowleaf balsamroot, sulfur eriogonum, and silvery lupine which have all declined significantly since 1990. The Desirable Components Index rated this study as very poor-poor due to low browse cover, good perennial grass cover, and high annual grass cover.

winter range condition (DC Index) - very poor-poor (35) Mid-level potential scale
browse - stable (0) grasses - down (-2) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for browse is down. Mountain big sagebrush density declined to only 120 plants/acre, half of these classified as decadent. Use is lighter than in 1996, vigor remains good, and there are a few young plants in the population. Bitterbrush shows heavier use than in 1996. Bitterbrush density is unchanged, vigor is normal, and percent decadence has remained stable. Trend for grasses is slightly up. Nested frequency of the

dominant grass, bluebunch wheatgrass, has remained stable although cover increased from 10% to 18%. Cheatgrass declined significantly in nested frequency and cover declined from 10% to 6%. Trend for forbs is slightly down. Sum of nested frequency of perennial forbs decreased by 9% and dyer's woad was sampled for the first time. Annual forbs nested frequency and cover more than doubled, especially storksbill. The Desirable Components Index rated this study as very poor-poor due to low browse cover, good perennial grass cover, and moderate annual grass cover.

winter range condition (DC Index) - very poor-poor (36) Mid-level potential scale
browse - down (-2) grasses - slightly up (+1) forbs - slightly down (-1)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, bitterbrush, and serviceberry, is stable. Both mountain big sagebrush and bitterbrush densities remained exactly the same as 2001. Serviceberry increased slightly, mostly from an increase in young plants. Decadence also decreased on both sagebrush and bitterbrush. There are still very few seedlings or young plants in the population to replace older plants. Trend for grasses is stable. The sum of nested frequency for perennial grasses did not change much. Sandberg bluegrass decreased significantly and Kentucky bluegrass increased significantly. Cheatgrass nested frequency and cover continues to decrease and only averaged 1% cover. Trend for forbs is stable. Perennial forb sum of nested frequency changed very little, although annual forb sum of nested frequency continued to rapidly increase. Dyer's woad has not increased much from 2001. The Desirable Components Index rated this study as poor due to decreasing browse cover, good perennial grass cover, and decreasing annual grass cover.

winter range condition (DC Index) - poor (38) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 13

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a267	c305	a232	ab244	bc258	9.70	17.86	18.21
G	Bromus japonicus (a)	-	-	10	14	2	.05	.10	.00
G	Bromus tectorum (a)	-	-	c296	b250	a174	9.67	5.96	1.04
G	Koeleria cristata	-	2	-	2	2	-	.03	.03
G	Poa fendleriana	-	-	4	-	-	.04	-	-
G	Poa pratensis	a-	a4	a3	a3	b62	.03	.03	1.49
G	Poa secunda	b244	b252	ab197	b249	a171	7.83	7.89	2.53
Total for Annual Grasses		0	0	306	264	176	9.72	6.06	1.05
Total for Perennial Grasses		511	563	436	498	493	17.61	25.82	22.27
Total for Grasses		511	563	742	762	669	27.33	31.88	23.32
F	Achillea millefolium	b175	b133	a69	a65	a48	.82	1.52	1.93
F	Agoseris glauca	-	1	-	6	6	-	.04	.05
F	Alyssum alyssoides (a)	-	-	b64	c95	a37	.42	.30	.10
F	Arabis sp.	-	6	8	2	-	.01	.00	-
F	Artemisia ludoviciana	15	20	21	23	21	2.30	1.77	1.02

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Balsamorhiza sagittata	$_{b}$60	$_{b}$61	$_{a}$26	$_{a}$19	$_{a}$13	.77	.60	.66
F	Calochortus nuttallii	-	3	-	-	-	-	-	-
F	Cirsium undulatum	10	19	5	13	12	.19	.71	.30
F	Collomia linearis (a)	-	-	$_{a}$-	$_{b}$15	$_{c}$74	-	.03	.22
F	Comandra pallida	-	-	-	1	-	-	.00	-
F	Collinsia parviflora (a)	-	-	50	66	47	.15	.16	.09
F	Crepis acuminata	$_{a}$-	$_{c}$153	$_{b}$28	$_{b}$18	$_{b}$34	.34	.45	1.17
F	Cymopterus sp.	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$21	$_{b}$32	.00	.40	.38
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$21	$_{c}$92	-	.03	.27
F	Epilobium brachycarpum (a)	-	-	$_{b}$83	$_{a}$11	$_{c}$123	.93	.03	.90
F	Erodium cicutarium (a)	-	-	$_{a}$52	$_{c}$132	$_{b}$103	.65	7.74	1.45
F	Eriogonum umbellatum	$_{b}$20	$_{b}$12	$_{ab}$7	$_{a}$-	$_{a}$-	.33	-	-
F	Galium aparine (a)	-	-	-	-	2	-	-	.00
F	Hackelia patens	$_{b}$27	$_{ab}$15	$_{b}$33	$_{a}$7	$_{ab}$24	.33	.07	.69
F	Holosteum umbellatum (a)	-	-	$_{a}$12	$_{b}$168	$_{c}$205	.03	.65	.49
F	Isatis tinctoria	-	-	-	1	3	-	.15	.15
F	Lappula occidentalis (a)	-	-	-	1	-	-	.03	-
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$16	$_{b}$19	$_{ab}$8	.03	.07	.02
F	Lomatium grayi	-	1	-	1	6	-	.03	.06
F	Lupinus argenteus	$_{c}$58	$_{b}$34	$_{a}$12	$_{a}$11	$_{a}$5	.34	.39	.30
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{a}$4	$_{b}$67	-	.01	.16
F	Penstemon humilis	13	12	4	4	4	.06	.24	.21
F	Phacelia sp.$_{a}$	$_{a}$-	$_{a}$-	$_{ab}$12	$_{b}$10	$_{a}$-	.48	.12	.00
F	Phlox longifolia	-	-	-	-	2	-	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{a}$23	$_{a}$13	$_{b}$118	.07	.05	.47
F	Senecio multilobatus	$_{b}$80	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$4	-	-	.03
F	Sisymbrium altissimum (a)	-	-	$_{b}$12	$_{a}$-	$_{a}$-	.09	-	-
F	Tragopogon dubius	2	-	2	3	3	.01	.06	.00
Total for Annual Forbs		0	0	296	526	868	2.36	9.05	4.17
Total for Perennial Forbs		460	470	245	224	225	6.05	6.67	7.02
Total for Forbs		460	470	541	750	1093	8.41	15.72	11.20

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

BROWSE TRENDS --
Management unit 02 , Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	9	7	8	.06	.03	.06
B	Artemisia tridentata vaseyana	14	6	6	1.30	.36	-
B	Chrysothamnus viscidiflorus viscidiflorus	17	16	18	1.79	1.27	.91
B	Eriogonum heracleoides	0	1	1	-	-	-
B	Mahonia repens	15	19	18	.07	.67	.49
B	Prunus virginiana	5	4	5	.03	.03	.03
B	Purshia tridentata	3	3	3	.38	1.00	.21
B	Rhus glabra cismontana	0	0	0	-	-	-
B	Rosa woodsii	12	16	14	.72	.51	.95
B	Sambucus cerulea	0	2	0	-	.03	-
B	Symphoricarpos oreophilus	6	4	8	1.31	1.62	1.25
Total for Browse		81	78	81	5.68	5.55	3.90

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 13

Species	Percent Cover '06
Amelanchier alnifolia	.98
Artemisia tridentata vaseyana	.18
Chrysothamnus viscidiflorus viscidiflorus	2.20
Mahonia repens	.90
Prunus virginiana	.43
Purshia tridentata	.90
Rosa woodsii	.70
Symphoricarpos oreophilus	2.36

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 13

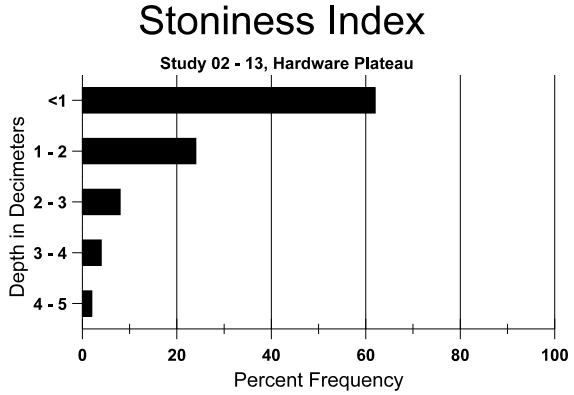
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	4.8
Artemisia tridentata vaseyana	4.9	2.5
Purshia tridentata	5.3	-

BASIC COVER --
Management unit 02 , Study no: 13

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.75	16.25	43.72	48.98	36.74
Rock	17.50	20.50	25.35	30.16	30.41
Pavement	2.25	.75	5.00	4.30	3.75
Litter	66.75	44.50	45.87	33.00	29.17
Cryptogams	6.50	1.25	1.18	1.94	.56
Bare Ground	5.25	16.75	7.04	4.88	16.10

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 13, Hardware Plateau

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.9	73.8 (10.1)	6.7	42.3	31.7	26.0	4.0	34.0	307.2	0.5



PELLET GROUP DATA --
Management unit 02 , Study no: 13

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	6	-
Elk	7	3	-
Deer	18	19	8
Cattle	-	-	-

Days use per acre (ha)	
'01	'06
-	-
13 (31)	9 (22)
39 (96)	28 (69)
-	3 (7)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**366**	166	300	33	33	-	82	18	9	-	0	27/22
90	**566**	-	433	-	133	-	29	53	23	-	6	-/-
96	**440**	-	240	200	-	40	36	36	0	-	0	17/21
01	**160**	-	20	140	-	-	38	25	0	-	0	20/21
06	**200**	-	100	100	-	-	0	90	0	-	0	21/21
Artemisia tridentata vaseyana												
84	**333**	-	-	100	233	-	30	50	70	-	0	14/9
90	**133**	-	-	33	100	-	0	75	75	-	25	13/13
96	**280**	-	40	180	60	480	71	14	21	7	7	24/34
01	**120**	-	20	40	60	260	67	0	50	-	0	32/37
06	**120**	-	20	60	40	260	33	17	33	-	0	29/37
Chrysothamnus viscidiflorus viscidiflorus												
84	**766**	-	100	633	33	-	4	0	4	-	4	16/18
90	**433**	-	33	400	-	-	8	0	0	-	0	17/21
96	**440**	-	-	440	-	-	9	0	0	-	0	15/24
01	**500**	-	20	480	-	-	0	0	0	-	0	12/22
06	**480**	-	60	400	20	-	0	4	4	-	0	16/26
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	4/7
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
84	**66**	-	33	33	-	-	0	0	-	-	0	7/11
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**980**	-	160	820	-	-	0	0	0	-	0	4/5
01	**3120**	-	60	3020	40	-	0	0	1	-	0	4/5
06	**3380**	-	-	3380	-	-	0	0	0	-	0	2/6
Prunus virginiana												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**100**	-	40	60	-	-	20	40	-	-	0	19/18
01	**100**	-	40	60	-	-	80	0	-	-	0	16/35
06	**260**	-	240	20	-	-	38	62	-	-	0	14/19
Purshia tridentata												
84	**333**	-	-	133	200	-	0	100	60	-	0	18/20
90	**132**	-	-	66	66	-	0	100	50	-	0	15/18
96	**80**	-	-	60	20	20	0	50	25	-	0	19/36
01	**80**	-	-	60	20	80	25	75	25	-	0	20/44
06	**80**	-	-	80	-	-	0	100	0	-	0	23/59
Rhus glabra cismontana												
84	**66**	-	-	66	-	-	50	0	-	-	0	43/41
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**1520**	20	340	1180	-	40	11	62	-	-	0	12/11
01	**1220**	-	440	780	-	-	8	0	-	-	0	13/12
06	**1900**	-	280	1620	-	20	26	0	-	-	0	12/11
Sambucus cerulea												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**33**	-	-	33	-	-	0	100	-	-	0	31/20
96	**0**	-	-	-	-	-	0	0	-	-	0	84/135
01	**60**	-	-	60	-	-	0	0	-	-	0	47/69
06	**0**	-	-	-	-	-	0	0	-	-	0	73/91

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**460**	-	160	300	-	-	78	0	-	-	0	20/27
01	**100**	-	-	100	-	-	0	0	-	-	0	26/50
06	**180**	-	20	160	-	-	44	0	-	-	0	28/46

Trend Study 2-15-06

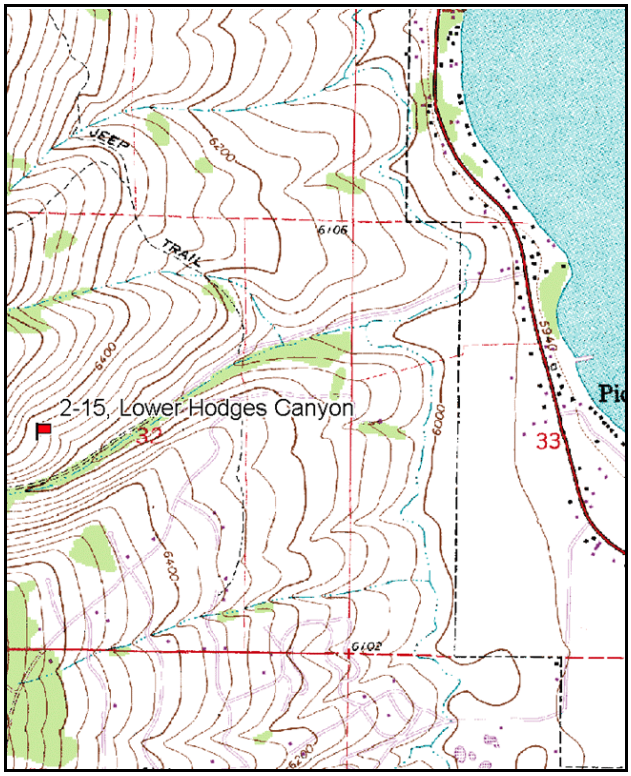
Study site name: Lower Hodges Canyon . Vegetation type: Mountain Brush .

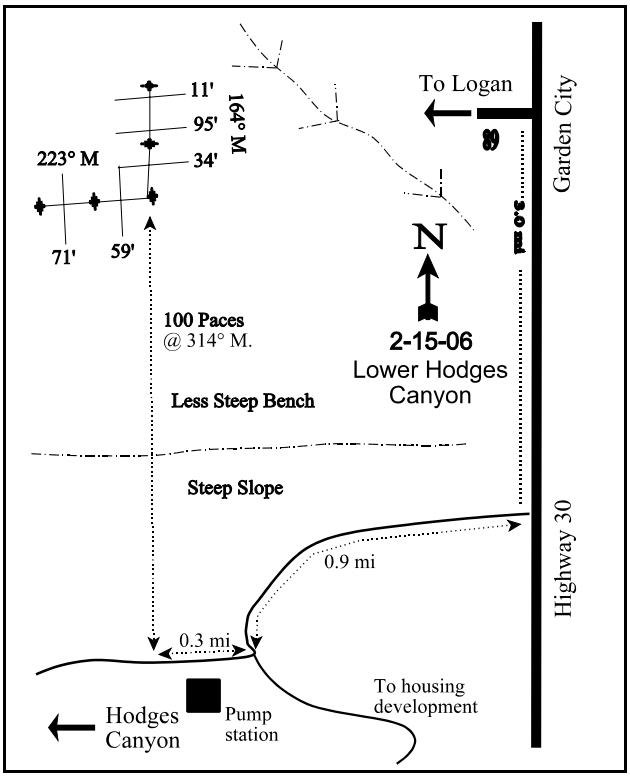
Compass bearing: frequency baseline 164 degrees magnetic.

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

LOCATION DESCRIPTION

From the Garden City junction of U-89 and U-30 proceed south for 3.0 miles and turn right. Travel west for 0.9 miles to a point where the main road curves sharply to the left. Continue straight up Hodges Canyon from this point for 0.3 miles to a small concrete pump station on the left. At the pump station take a bearing of 314 degrees magnetic and walk up the steep slope for approximately 100 paces to the 200-foot stake of the baseline. Walk two hundred feet beyond at 344 degrees magnetic to the 0-foot stake of the baseline, marked by browse-tag #7980. The bearing of the baseline is 164 degrees magnetic. The baseline doglegs at the 200-foot baseline stake and runs 223 degrees magnetic.





Map Name: Garden City Diagrammatic Sketch

Township 14N , Range 5E , Section 32 UTM NAD 27, UTM 12T 4639974 N, 465649 E

DISCUSSION

Lower Hodges Canyon - Trend Study No. 2-15

Study Information

This study is located on private land in Hodges Canyon, just west of Bear Lake in Rich county (elevation: 6,350 feet, slope: 30-35%, aspect: south). The vegetation community is a mountain big sagebrush-grass type, which also contains a number of other shrubs. Pellet group quadrat frequencies in 1996 estimated 19% deer and 3% elk. A pellet group transect read in 2001 estimated 91 deer and 6 elk days use/acre (225 ddu/ha and 15 edu/ha). Pellet group data from 2006 was estimated at 63 deer, 15 elk, and 2 moose days use/acre (155 ddu/ha, 38 edu/ha, and 5 mdu/ha).

Soil

The Rich county soil survey classifies the soil within the Yeates Hollow series. All of the soils in this mapping unit are deep, well-drained, and derived from sedimentary rock. Although not highly permeable to water, the Yeates Hollow soil has good water holding qualities and only a moderate erosion hazard (Campbell and Lacey 1982). Soils are rocky throughout the profile. Due to the rocky nature of the soil, effective rooting depth was estimated at only about 12 inches in 1996. However, deeper rooted shrubs are numerous, indicating no rooting depth restrictions. The soil reaction is slightly acidic (pH of 6.5). Texture is a sandy clay loam. The soil surface is adequately protected from erosion due to abundant and well dispersed vegetation and litter cover. The erosion condition class was determined to be stable in 2001 and 2006.

Browse

The key browse species include mountain big sagebrush and antelope bitterbrush with a small population of serviceberry. Mountain big sagebrush maintained a stable density of about 1,200 plants/acre between 1984 and 1996. The sagebrush density began declining in 2001 and has continued to decrease to only 520 plants/acre in 2006. The percentage of the population classified as dying has steadily increased since 1990 at 7% to 42% in 2006. The population has had a high decadence rate since the establishment of the study in 1984. Decadence has ranged from a low of 47% in 1990 to a high of 68% in 1984. Cover also decreased from 8.5% in 2001 to only 2% in 2006. Utilization was moderate to heavy in 1984 and has been light to moderate since 1990. Reproduction is minimal and no seedlings have been encountered during any reading. A few young plants were sampled in 1990, 1996, and 2006, but sagebrush is not producing enough plants to replace those that are dying. Annual leader growth roughly averaged 1.3 inches in 2001 and 2006.

Bitterbrush has averaged 11% cover since 1996 and density has averaged about 1,400 plants/acre since 1990. The population is moderately to heavily utilized, but has maintained good vigor and low decadence. The age class distribution is mostly mature, but reproduction appears adequate to maintain the population. Leader growth was quite low in 2001, averaging only 1.5 inches, but was higher at 4.2 inches in 2006.

Shrubs of secondary importance include serviceberry and snowberry. Serviceberry has averaged just over 1% cover since 1996 and density has slightly declined from 1990 to 2006 (533 plants/acre in 1990 to 380 plants/acre in 2006). The average mature shrub measures 2.5 feet high with a crown diameter of nearly 4 feet. Utilization has been moderate since 1996. There are no decadent plants but two-thirds of the population displayed poor vigor in 1996 due to a rust infestation. Snowberry has averaged over 10% cover since 2001 with a density of 1,200 plants/acre. Utilization has been mostly light.

Herbaceous Understory

A diverse mixture of grass species provides the bulk of the understory production and cover. Six perennial grasses have been found on the study, but only bluebunch wheatgrass and Sandberg bluegrass are abundant. Annual grasses were reported to occur infrequently in 1984. By 1996, cheatgrass was abundant and provided 16% cover. Nested frequency of cheatgrass declined significantly in 2001 and 2006, reducing cover from 6% to 3%, respectively. Cheatgrass is still widely distributed across the site as quadrat frequency was still at 63%

in 2006. Perennial forb cover has risen from 3% in 1996 to over 9% in 2006. Common perennial species include: tapertip hawksbeard, low penstemon, and yellow salsify. Tapertip hawksbeard had nearly 5% cover in 2006.

1990 TREND ASSESSMENT

Mountain big sagebrush density has decreased slightly from 1,266 plants/acre in 1984 to 1,132 plants/acre in 1990. The population still displays poor vigor on about one-third of the plants sampled. Decadence has declined from 68% to 47%, but this is still relatively high for sagebrush. Utilization is lighter on sagebrush but heavier on bitterbrush. Bitterbrush density increased from 333 plants/acre in 1984 to 1,133 in 1990. Serviceberry was not sampled in 1984, but the population was estimated at 533 plants/acre in 1990. Browse trend is slightly up. Trend for grasses is up. Perennial grass sum of nested frequency increased by 71%. Both bluebunch wheatgrass and Sandberg bluegrass increased significantly in nested frequency. Trend for forbs is up. Perennial forb sum of nested frequency nearly tripled. Species that significantly increased include: penstemon, longleaf pholx, tapertip hawksbeard, and bastard toadflax.

browse - slightly up (+1) grasses - up (+2) forbs - up (+2)

1996 TREND ASSESSMENT

The browse trend appears slightly down for sagebrush but stable for bitterbrush. The sagebrush population is mostly decadent with one-third of the population in poor vigor. Reproduction is limited. Utilization has not been extremely heavy so the high proportion of decadent sagebrush is likely a result of drought. The bitterbrush population is becoming increasingly mature. Utilization is moderate and vigor good. Overall, the browse trend is considered stable. Trend for grasses is slightly down. Bluebunch wheatgrass and Sandberg bluegrass nested frequencies remained similar to 1990, but there was a significant decrease in Kentucky bluegrass. Trend for forbs is down. Perennial forb sum of nested frequency decreased by 44%. Species that significantly decreased include: penstemon, longleaf phlox, and tapertip hawksbeard. The Desirable Components Index rated this study as fair-good due to excellent browse and perennial grass cover, but high annual grass cover prevented it from being better.

winter range condition (DC Index) - fair-good (68) Mid-level potential scale
browse - stable (0) grasses - slightly down (-1) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush and bitterbrush, is slightly down. The sagebrush population appears to be in a state of decline. Population density has declined 28%. Use is mostly light but decadence has increased from 53% in 1996 to 60% in 2001. In addition, 33% of population was classified as dying. Reproduction is poor with no seedlings or young encountered. This trend appears to be driven more by climate and interspecific competition than heavy use by wildlife. Use was moderate to heavy in 1984, but has been light to moderate since. Bitterbrush displays a slightly down trend. Density decreased slightly, but percent cover has remained at 11%. Utilization has been moderate to heavy since 1990, but vigor has remained normal and percent decadence is low. Recruitment, in the form of young plants, has been more than adequate to maintain the population. Trend for grasses is up due to a substantial increase in the sum of nested frequency of perennial grasses combined with a significant decline in cheatgrass. The dominant perennial grasses are bluebunch wheatgrass and Sandberg bluegrass. Trend for forbs is up. Sum of nested frequency of perennial forbs increased by 44%, although they are still a minor component of the herbaceous understory. Tapertip hawksbeard and longleaf pholx were the two main species that increased significantly. The Desirable Components Index rated this study as good due to excellent browse and perennial grass cover with decreasing annual grass cover.

winter range condition (DC Index) - good (75) Mid-level potential scale
browse - slightly down (-1) grasses - up (+2) forbs - up (+2)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is slightly down. Bitterbrush density has remained similar to the previous reading, but mountain big sagebrush has declined each reading since 1996. Sagebrush density has dropped from 840 plants/acre in 2001 to 520 in 2006 and cover decreased from 9% to 2%. Over half the population is decadent and 42% are classified as dying. Without young recruitment, the sagebrush population may disappear from this area. Trend for grasses is stable. Perennial grass sum of nested frequency has changed very little. Cheatgrass nested frequency significantly declined again and cover averaged 3% in 2006, but cheatgrass is widely distributed across the area. Trend for forbs is up. Sum of nested frequency for perennial forbs increased by 20%. Species that significantly increased include: longleaf phlox and false dandelion. Annual forbs have been increasing with each reading since 1996, when they were first included in the sample. The Desirable Components Index rated this study as good-excellent due to abundant perennial grass and forb cover with decreasing annual grass cover. The sagebrush cover is decreasing and the bitterbrush population is increasing with moderate young recruitment.

winter range condition (DC Index) - good-excellent (78) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 15

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a139	b196	b209	b210	b226	12.21	11.26	16.93
G	Bromus japonicus (a)	-	-	-	-	4	-	-	.00
G	Bromus tectorum (a)	-	-	c330	b207	a159	16.36	5.45	3.32
G	Koeleria cristata	ab16	a11	ab21	ab19	b37	.63	.43	1.10
G	Poa fendleriana	b19	ab11	a4	ab6	ab8	.06	.18	.27
G	Poa pratensis	bc64	c89	a6	a14	ab41	.12	.48	.64
G	Poa secunda	a10	b119	b118	d201	c163	3.69	6.65	5.01
G	Sitanion hystrix	-	-	-	2	-	-	.03	-
Total for Annual Grasses		0	0	330	207	163	16.36	5.45	3.33
Total for Perennial Grasses		248	426	358	452	475	16.72	19.04	23.96
Total for Grasses		248	426	688	659	638	33.09	24.49	27.30
F	Achillea millefolium	7	4	6	7	1	.19	.07	.03
F	Agoseris glauca	a-	a8	a4	a20	b46	.01	.44	.29
F	Alyssum alyssoides (a)	-	-	148	169	132	1.20	.87	.48
F	Arabis sp.	a-	b11	a-	a-	ab2	-	-	.00
F	Artemisia ludoviciana	-	-	2	-	-	.15	-	-
F	Astragalus beckwithii	a-	a-	a3	ab5	b11	.03	.03	.18
F	Astragalus convallarius	b18	ab6	b8	a-	b13	.02	-	.36
F	Balsamorhiza sagittata	ab6	ab4	b8	a-	a-	.59	.30	.45
F	Camelina microcarpa (a)	-	-	3	3	5	.00	.00	.01
F	Calochortus nuttallii	-	3	3	2	4	.00	.00	.01

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Chaenactis douglasii	-	1	-	-	-	-	-	-
F	Cirsium undulatum	4	11	4	9	2	.06	.25	.33
F	Collomia linearis (a)	-	-	$_{a}$1	$_{a}$-	$_{b}$33	.00	-	.09
F	Comandra pallida	$_{a}$22	$_{b}$40	$_{ab}$27	$_{ab}$24	$_{a}$10	.22	.28	.08
F	Collinsia parviflora (a)	-	-	$_{a}$18	$_{b}$62	$_{b}$61	.06	.13	.39
F	Cordylanthus ramosus (a)	-	-	2	-	3	.03	-	.03
F	Crepis acuminata	$_{a}$10	$_{c}$90	$_{b}$49	$_{c}$99	$_{c}$124	.72	2.98	4.95
F	Cymopterus sp.	-	-	-	4	9	-	.00	.01
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$1	$_{b}$14	-	.01	.08
F	Draba sp. (a)	-	-	-	2	2	-	.00	.00
F	Epilobium brachycarpum (a)	-	-	$_{b}$14	$_{a}$-	$_{b}$9	.04	-	.02
F	Erigeron sp.	-	-	6	10	8	.18	.18	.53
F	Eriogonum umbellatum	6	3	-	1	1	-	.03	.03
F	Hackelia patens	-	-	9	4	1	.09	.04	.01
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{a}$1	$_{b}$63	-	.00	.38
F	Lactuca serriola	-	-	2	4	1	.01	.03	.03
F	Linum lewisii	-	2	3	-	3	.03	-	.03
F	Lomatium sp.	-	-	-	3	4	-	.03	.06
F	Lupinus argenteus	3	-	-	-	-	-	-	.00
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$27	$_{b}$20	-	.05	.07
F	Penstemon humilis	$_{a}$33	$_{b}$70	$_{a}$21	$_{a}$17	$_{a}$13	.41	.25	.75
F	Phlox longifolia	$_{a}$3	$_{c}$122	$_{a}$22	$_{b}$64	$_{c}$114	.08	.52	1.02
F	Senecio integerrimus	-	-	-	1	-	-	.03	-
F	Sisymbrium altissimum (a)	-	-	-	-	-	-	-	.03
F	Tragopogon dubius	$_{ab}$28	$_{a}$14	$_{b}$43	$_{b}$43	$_{a}$12	.49	.49	.26
F	Unknown forb-perennial	3	2	-	-	-	-	-	-
Total for Annual Forbs		0	0	186	265	342	1.33	1.07	1.61
Total for Perennial Forbs		143	391	220	317	379	3.34	5.99	9.45
Total for Forbs		143	391	406	582	721	4.68	7.07	11.06

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

BROWSE TRENDS --
Management unit 02 , Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	16	15	16	1.43	1.27	1.16
B	Artemisia tridentata vaseyana	44	36	23	7.25	8.51	2.26
B	Chrysothamnus viscidiflorus viscidiflorus	13	13	16	.65	1.37	1.17
B	Eriogonum heracleoides	6	7	3	1.41	.33	.15
B	Eriogonum microthecum	21	21	22	.78	1.57	1.75
B	Pediocactus simpsonii	0	1	0	-	-	-
B	Purshia tridentata	55	55	55	11.32	11.55	11.10
B	Symphoricarpos oreophilus	49	48	44	6.24	10.67	10.26
B	Tetradymia canescens	2	3	3	.03	.03	.15
Total for Browse		206	199	182	29.13	35.32	28.03

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 15

Species	Percent Cover '06
Amelanchier alnifolia	2.95
Artemisia tridentata vaseyana	2.01
Chrysothamnus viscidiflorus viscidiflorus	1.70
Eriogonum heracleoides	.15
Eriogonum microthecum	3.90
Purshia tridentata	17.25
Symphoricarpos oreophilus	16.36
Tetradymia canescens	.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 15

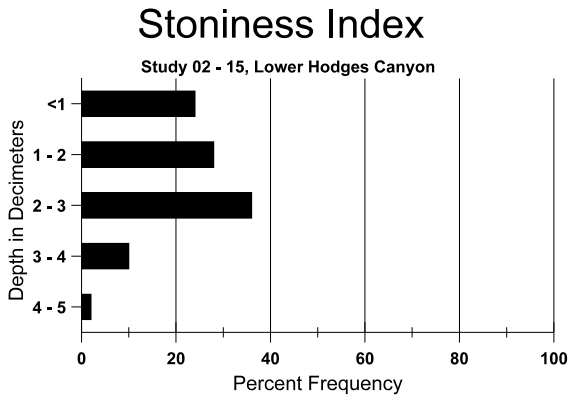
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	3.4	4.22
Artemisia tridentata vaseyana	1.3	1.2
Purshia tridentata	1.5	4.0

BASIC COVER --
Management unit 02 , Study no: 15

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.00	12.25	66.81	60.50	63.74
Rock	2.25	3.75	1.15	1.22	1.01
Pavement	1.25	1.75	.69	1.45	.44
Litter	86.75	72.75	77.68	58.52	53.47
Cryptogams	.25	.50	.49	1.03	2.24
Bare Ground	8.50	9.00	1.20	2.56	2.19

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 15, Lower Hodges Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.7	53.8 (12.0)	6.5	49.3	25.7	25.0	2.7	23.1	198.4	0.4



PELLET GROUP DATA --
Management unit 02 , Study no: 15

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	2	-
Elk	3	9	4
Deer	19	34	24
Moose	-	-	-

Days use per acre (ha)	
'01	'06
-	-
6 (15)	15 (38)
91 (225)	63 (155
-	2 (5)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**533**	-	333	200	-	-	13	0	-	-	0	37/33
96	**460**	20	200	260	-	40	57	13	-	-	74	26/46
01	**340**	-	80	260	-	20	59	6	-	-	0	30/43
06	**380**	-	120	260	-	20	32	5	-	-	0	32/47
Artemisia tridentata vaseyana												
84	**1266**	-	-	400	866	-	63	32	68	-	32	34/46
90	**1132**	-	133	466	533	-	29	0	47	7	29	36/53
96	**1160**	-	40	500	620	940	36	10	53	22	33	30/39
01	**840**	-	-	340	500	780	19	7	60	33	33	30/45
06	**520**	-	40	180	300	820	31	0	58	42	50	34/51
Chrysothamnus viscidiflorus viscidiflorus												
84	**133**	-	-	133	-	-	0	0	0	-	0	19/30
90	**133**	-	-	133	-	-	0	0	0	-	0	28/33
96	**340**	-	-	320	20	-	0	0	6	-	0	20/32
01	**280**	-	-	220	60	-	0	0	21	7	7	18/31
06	**400**	-	20	320	60	60	0	0	15	5	10	19/33
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**220**	-	-	220	-	-	0	0	-	-	0	9/15
01	**200**	-	-	200	-	-	20	0	-	-	0	7/16
06	**100**	-	20	80	-	-	0	0	-	-	0	9/13
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**680**	-	-	680	-	-	0	0	0	-	0	14/22
01	**560**	-	-	560	-	-	0	0	0	-	0	13/19
06	**600**	-	20	540	40	-	0	0	7	-	0	15/22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	100	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
84	**333**	-	133	200	-	-	0	0	0	-	0	15/27
90	**1133**	-	133	600	400	-	41	18	35	-	6	18/32
96	**1580**	20	80	1460	40	100	52	11	3	1	1	22/41
01	**1320**	-	60	1140	120	40	50	36	9	-	2	22/52
06	**1420**	-	200	1160	60	100	38	17	4	1	1	23/52
Symphoricarpos oreophilus												
84	**1133**	-	533	600	-	-	0	0	0	-	0	29/44
90	**4999**	-	600	4133	266	-	20	0	5	-	5	25/35
96	**1660**	140	180	1480	-	60	5	0	0	-	8	24/41
01	**1260**	-	-	1060	200	-	0	0	16	2	19	26/46
06	**1220**	-	180	780	260	20	0	0	21	8	41	28/48
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	-	60	-	-	0	0	0	-	0	19/30
01	**60**	-	-	40	20	-	0	0	33	-	0	16/22
06	**80**	-	20	60	-	-	0	0	0	-	0	18/20

Trend Study 2-16-06

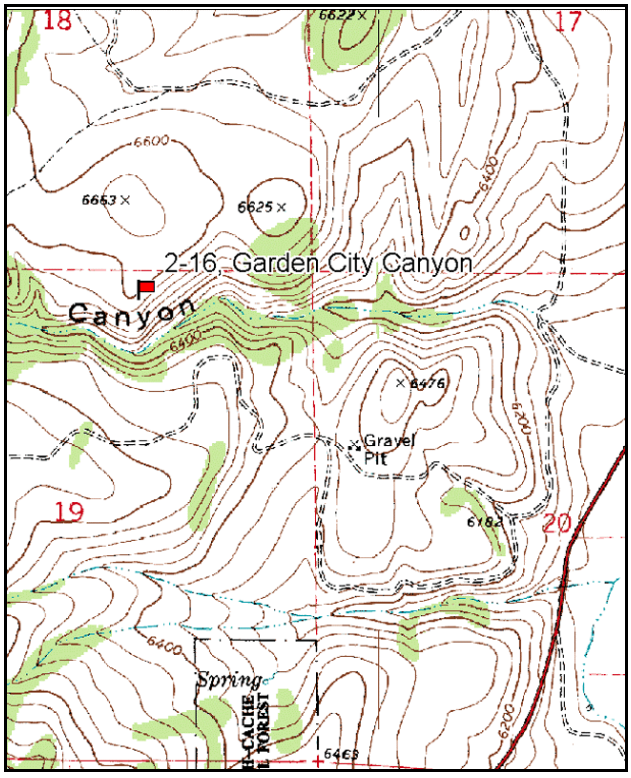
Study site name: Garden City Canyon . Vegetation type: Curlleaf Mahogany .

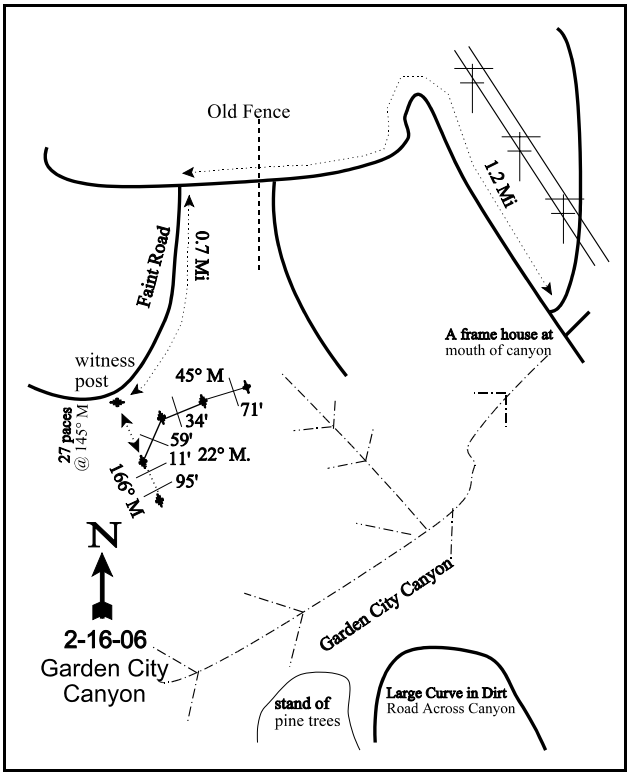
Compass bearing: frequency baseline 166 degrees magnetic.

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

LOCATION DESCRIPTION

From Garden City, proceed west on US-89. Turn right at 525 W. Proceed 0.25 miles and turn right. Stay left and continue for 1.2 miles to a fence with a gate (fence may be gone in 5 years). Follow a faint road 0.7 miles, staying right at the fork to the witness post at the left. From here walk down the road to a witness post on the edge of the canyon. From the witness post walk 27 paces at 145 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7936. Azimuth of the baseline is 166 degrees magnetic. Line 2 runs 22 degrees magnetic. Lines 3 and 4 run 45 degrees magnetic.





Map Name: Garden City

Diagrammatic Sketch

Township 14N , Range 5E , Section 19

UTM NAD 27, UTM 12T 4644019 N, 464684 E

DISCUSSION

Garden City Canyon - Trend Study No. 2-16

Study Information

This study samples winter range on the north rim of Garden City Canyon in Rich County (elevation: 6,580 feet, slope: 50%, aspect: southeast). The vegetation type is characterized by curlleaf mountain mahogany with an associated mixture of mountain brush. The knolls and hillsides of the area are dominated by curlleaf mountain mahogany and the adjacent level areas are dominated by vigorous stands of mountain big sagebrush and antelope bitterbrush. The area is heavily used by deer and elk and they seem to prefer the more exposed and less densely vegetated knolls and hillsides. Pellet group transect data from 2001 estimated 55 deer and 16 elk days use/acre (136 ddu/ha and 40 edu/ha). All of the elk and about 60% of the deer pellet groups were from winter use, while about 40% of the deer pellet groups were from late spring and early summer. Pellet group data from 2006 was estimated at 23 deer, 67 elk, and 2 moose days use/acre (56 ddu/ha, 165 edu/ha, and 4 mdu/ha).

Soil

Soil is classified in the Foxol series and occurs on moderately steep slopes. Foxol soil is shallow, moderately permeable, and excessively drained. Soil parent material is quartzite and depth to bedrock is normally about 15 inches (Campbell and Lacey 1982). Soil has a clay loam texture with an effective rooting depth estimated at only 9 inches in 1996. The soil reaction is moderately acidic (pH of 5.8). The surface is exceptionally rocky with many large boulders and exposed bedrock. In spite of these characteristics, there is relatively little erosion. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was good at 6:1 in 2006, leaving little unprotected soil. The soil erosion condition class was determined to be stable in 2001 and slight in 2006.

Browse

The browse composition includes 12 species of shrubs with 5 species that are highly preferred by wildlife. The most conspicuous shrub, although not the most numerous, is curlleaf mountain mahogany. Many of the mahogany are tree-like in stature and unavailable to further browsing. The majority of the mature plants are over 8 feet in height. Shrub density strips indicate a slight decrease in the population from 280 plants/acre in 1996 to 140 plants/acre in 2006. Overhead canopy cover of mahogany has averaged 16-17% in both 2001 and 2006. Most of the tall mahogany have been highlined and utilization of available plants is moderate to heavy. Decadence was moderate at 36% in 2001, but vigor and decadence were normal for most individuals in 2006.

Other important browse include a combination of low sagebrush, mountain big sagebrush, bitterbrush, and serviceberry. Low sagebrush is much more abundant and widespread than the other shrubs. It has averaged 6-8% cover from 1996 to 2006 and density was estimated at 2,600 plants/acre in 1996 and slightly declined to 2,100 plants/acre in 2001 and 2006. Utilization was heavy in 1984, but light to moderate use has occurred since. In 1996, 11% of the population was classified as decadent and this increased to about 20% in 2001 and 2006. Plants classified as dying increased from 2% of the population in 1996 to 12% in 2006.

Bitterbrush is not abundant, with density estimated at just over 100 plants/acre. Plants have displayed heavy use. In 2001, decadence was low, but it increased to 67% in 2006. Serviceberry has also been moderately to heavily browsed since the study was established in 1984. Density has been low at around 200 plants/acre since 1996. Mature plants are stunted and have measured only about 2 feet in height. Decadence has improved from 67% in 1990 to 14% in 2006. Vigor was normal on all plants sampled.

Herbaceous Understory

The herbaceous understory consists primarily of perennial grasses. Most important were bluebunch wheatgrass followed by Sandberg bluegrass. In 1984, Kentucky bluegrass was fairly common, but has not been sampled since. Also, cheatgrass was observed in isolated patches in 1984, but was not included in the

sample. Annual grasses were first included in the sample in 1996 at which point cheatgrass and Japanese brome cover was extremely high at 20%. It was reported in 1996 that about half of the brome grasses were infected with smut. In 2001, cheatgrass nested frequency decreased significantly and cover only averaged 2%, which remained the same in 2006.

Bluebunch wheatgrass and Sandberg bluegrass both have averaged about 7-8% cover in 2001 and 2006. Other perennial grasses that have been sampled, but are not abundant include: Prairie Junegrass, mutton bluegrass, squirreltail, Letterman needlegrass, oniongrass, and Kentucky bluegrass.

Forbs are a minor component. Composition includes relatively few species that are palatable. All perennial forbs combined have produced less than 2% cover. It is possible that the shallow and excessively drained soil is not conducive to a productive forb component.

1990 TREND ASSESSMENT

Within the diverse browse community, only curlleaf mountain mahogany is heavily to severely hedged. This is not unusual as it is the most preferred browse. The bulk of the mahogany forage production is unavailable to most big game animals due to highlining. Mahogany density has increased slightly because of the young age class. The increased decadence should not be of concern because it is a long-lived species. It is not unusual to find individuals more than 300 years of age in most areas of Utah. Data for sagebrush shows a stable population of low sagebrush. Trend for grasses is up. Perennial grass sum of nested frequency increased by 26%, mainly due to an increase in Sandberg bluegrass. Trend for forbs is stable. Very little change in perennial forb production.

browse - stable (0) grasses - up (+2) forbs - stable (0)

1996 TREND ASSESSMENT

Trend for the key browse species, curlleaf mountain mahogany, appears stable. The increased sample size used this year may be responsible for differences in density data between 1990 and 1996. Mahogany are very unevenly distributed. Utilization was more moderate on available plants and decadence was slightly lower. Understory browse, serviceberry and low sagebrush, display stable trends with lighter use and improved decadence rates. Bitterbrush is heavily utilized but maintains good vigor and low decadence. Overall, the browse trend appears stable. Trend for grasses was stable. There was very little change in perennial grass sum of nested frequency. Annual grasses were included in the study for the first time and cheatgrass cover was extremely high at 19%. Since annuals were not included in the previous readings, we do not know if change has occurred. However, the 1984 report states that cheatgrass occurred only in isolated patches. Trend for forbs is stable. Forbs continue to play a very minor role in this community. The Desirable Components Index rated this study as poor due to high annual grass cover.

winter range condition (DC Index) - poor (40) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2001 TREND ASSESSMENT

Overall, browse trend is slightly down. Curlleaf mountain mahogany utilization was heavy on available portions, vigor was poor on 18% of the plants sampled, and decadence has increased from 21% in 1996 to 36% in 2001. Low sagebrush density decreased slightly from 2,600 plants/acre in 1996 to 2,160 in 2001 and decadence increased from 11% to 20%. The secondary browse species, serviceberry and bitterbrush, appear to have stable populations. Trend for grasses is up. Bluebunch wheatgrass has not changed, but Sandberg bluegrass nested frequency increased significantly. Cheatgrass nested frequency decreased significantly and cover dropped from 19% to under 2%. Trend for forbs is stable. Perennial forbs are still uncommon and produce little forage. The Desirable Components Index rated this study as fair due to moderate browse, grass, and forb cover with low annual grass cover.

winter range condition (DC Index) - fair (62) Mid-level potential scale
browse - slightly down (-1) grasses - up (+2) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse species is stable. Low sagebrush, bitterbrush, and serviceberry populations have remained similar to values in 2001. Curlleaf mahogany decreased slightly in density from 220 plants/acre in 2001 to 140 in 2006. Decadence was fairly high in 2001 at 36%, but decreased to 0% in 2006. Trend for grasses is stable. Perennial grasses remained similar to 2001. Cheatgrass has also remained low at 3% cover. Trend for forbs is stable. Perennial forbs are still uncommon and produce little forage. The Desirable Components Index rated this study as fair due to moderate browse, grass, and forb cover with low annual grass cover.

winter range condition (DC Index) - fair (53) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 16

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	157	167	165	176	157	7.06	8.40	6.54
G	Bromus japonicus (a)	-	-	b55	a24	ab43	1.23	.10	.13
G	Bromus tectorum (a)	-	-	b341	a142	a157	18.94	2.33	2.54
G	Koeleria cristata	7	-	-	3	3	-	.03	.06
G	Melica bulbosa	-	-	-	-	11	-	-	.07
G	Poa fendleriana	3	-	-	-	-	-	-	.03
G	Poa pratensis	b25	a-	a-	a-	a-	-	-	-
G	Poa secunda	a44	b131	b137	c226	c217	3.46	7.52	8.17
G	Sitanion hystrix	-	-	1	-	-	.03	-	-
G	Stipa lettermani	-	-	-	1	-	-	.03	-
Total for Annual Grasses		0	0	396	166	200	20.17	2.44	2.67
Total for Perennial Grasses		236	298	303	406	388	10.55	15.98	14.88
Total for Grasses		236	298	699	572	588	30.72	18.43	17.55
F	Agoseris glauca	4	1	4	13	12	.00	.07	.08
F	Alyssum alyssoides (a)	-	-	b122	b150	a69	.56	.67	.14
F	Arabis sp.	-	3	4	4	4	.04	.01	.01
F	Artemisia ludoviciana	1	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	-	-	-	-	-	-	.03	.00
F	Camelina microcarpa (a)	-	-	a3	ab6	b14	.00	.07	.03
F	Calochortus nuttallii	-	6	-	-	-	-	-	-
F	Cirsium undulatum	ab7	ab7	b11	ab5	a-	.28	.36	-
F	Collomia linearis (a)	-	-	-	3	2	-	.03	.01
F	Comandra pallida	19	24	24	24	18	.15	.33	.31

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Collinsia parviflora (a)	-	-	$_{a}$4	$_{c}$135	$_{b}$101	.01	.42	.41
F	Crepis acuminata	$_{a}$-	$_{a}$1	$_{ab}$7	$_{b}$18	$_{b}$19	.24	.72	.58
F	Descurainia pinnata (a)	-	-	-	3	-	-	.01	-
F	Draba verna (a)	-	-	$_{a}$-	$_{b}$15	$_{c}$36	-	.07	.07
F	Epilobium brachycarpum (a)	-	-	$_{a}$48	$_{a}$29	$_{b}$69	.28	.14	.37
F	Erodium cicutarium (a)	-	-	-	8	3	-	.09	.15
F	Erigeron divergens	-	1	-	-	-	-	-	-
F	Erigeron pumilus	-	-	-	-	3	-	-	.00
F	Eriogonum umbellatum	-	-	-	-	3	-	.00	.03
F	Gayophytum ramosissimum(a)	-	-	$_{a}$1	$_{a}$-	$_{b}$46	.00	-	.23
F	Holosteum umbellatum (a)	-	-	-	1	6	-	.00	.02
F	Lappula occidentalis (a)	-	-	$_{a}$2	$_{a}$1	$_{b}$16	.00	.00	.03
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$64	$_{b}$67	-	.22	.18
F	Pellaea breweri	5	-	-	-	-	-	-	-
F	Penstemon sp.	-	1	-	-	-	-	-	-
F	Petradoria pumila	-	-	1	-	-	.03	.03	-
F	Phlox longifolia	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$1	$_{b}$16	-	.00	.03
F	Polygonum douglasii (a)	-	-	3	2	-	.00	.01	-
F	Sisymbrium altissimum (a)	-	-	3	-	-	.03	.03	-
F	Tragopogon dubius	$_{b}$15	$_{a}$4	$_{a}$6	$_{ab}$8	$_{a}$3	.01	.06	.01
F	Wyethia amplexicaulis	1	3	3	-	-	.03	-	-
Total for Annual Forbs		0	0	186	417	429	0.89	1.80	1.66
Total for Perennial Forbs		52	53	60	73	78	0.78	1.65	1.07
Total for Forbs		52	53	246	490	507	1.68	3.46	2.73

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

BROWSE TRENDS --
Management unit 02 , Study no: 16

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	11	8	6	.41	.30	.30
B	Artemisia arbuscula	56	54	51	7.85	8.18	6.48
B	Artemisia tridentata vaseyana	0	4	3	-	1.16	1.16
B	Cercocarpus ledifolius	14	10	7	3.65	1.72	1.67
B	Eriogonum heracleoides	2	2	2	-	-	-
B	Eriogonum microthecum	1	0	1	-	.15	.38
B	Juniperus scopulorum	0	0	0	.88	1.02	1.41
B	Mahonia repens	7	10	9	.03	.48	.07
B	Opuntia sp.	3	3	3	.18	.38	.63
B	Pachistima myrsinites	3	4	2	.18	.18	-
B	Purshia tridentata	6	6	6	.71	1.64	.81
B	Symphoricarpos oreophilus	16	16	14	1.72	3.23	1.98
Total for Browse		119	117	104	15.64	18.46	14.91

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 16

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	.45
Artemisia arbuscula	-	8.81
Artemisia tridentata vaseyana	-	.51
Cercocarpus ledifolius	15.60	17.06
Eriogonum heracleoides	-	.08
Eriogonum microthecum	-	.11
Juniperus scopulorum	.60	2.28
Mahonia repens	-	.28
Opuntia sp.	-	.36
Purshia tridentata	-	1.56
Symphoricarpos oreophilus	-	3.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 16

Species	Average leader growth (in)	
	'01	'06
Cercocarpus ledifolius	3.3	3.0
Purshia tridentata	-	2.8

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 16

Species	Trees per Acre	
	'01	'06
Cercocarpus ledifolius	-	70

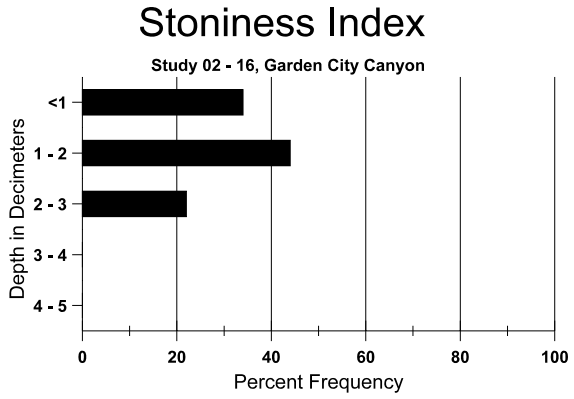
Average diameter (in)	
'01	'06
-	6.3

BASIC COVER --
Management unit 02 , Study no: 16

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	10.25	50.30	37.32	33.77
Rock	33.75	28.00	20.68	22.32	27.85
Pavement	.50	.25	.58	3.29	1.12
Litter	58.75	55.00	56.87	44.82	54.39
Cryptogams	1.75	1.75	.48	.56	.31
Bare Ground	3.00	4.75	2.30	8.35	6.93

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 16, Garden City Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.0	65.5 (9.0)	5.8	32.6	39.1	28.4	4.7	31.5	259.2	0.4



PELLET GROUP DATA --
Management unit 02 , Study no: 16

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	6	8	3
Elk	25	10	29
Deer	19	36	36

Days use per acre (ha)	
'01	'06
-	-
16 (40)	67 (165)
55 (136)	23 (56)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**666**	-	233	333	100	-	30	35	15	-	0	31/33
90	**499**	33	100	66	333	-	33	40	67	12	20	35/25
96	**220**	-	40	120	60	40	64	0	27	18	36	27/26
01	**200**	-	100	80	20	20	60	20	10	-	0	26/28
06	**140**	-	-	120	20	-	14	57	14	-	0	25/29
Artemisia arbuscula												
84	**1733**	66	100	1033	600	-	58	40	35	-	19	13/26
90	**1632**	-	166	1000	466	-	16	2	29	1	12	17/16
96	**2600**	-	140	2180	280	580	18	2	11	2	2	13/26
01	**2160**	-	40	1680	440	240	8	0	20	5	5	13/29
06	**2140**	-	-	1740	400	200	0	3	19	12	12	10/24
Artemisia tridentata vaseyana												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**100**	-	-	80	20	20	0	0	20	-	0	20/29
06	**60**	-	-	20	40	20	0	0	67	67	67	32/57
Cercocarpus ledifolius												
84	**433**	133	33	400	-	-	0	23	0	-	0	68/74
90	**565**	33	166	233	166	-	12	29	29	-	0	183/83
96	**280**	-	20	200	60	100	7	14	21	-	0	-/-
01	**220**	-	20	120	80	120	9	27	36	18	18	46/46
06	**140**	180	-	140	-	40	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	18/52

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	0	0	-	-	0	16/9
06	**60**	-	-	60	-	-	0	0	-	-	0	5/11
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	10/26
01	**0**	-	-	-	-	-	0	0	-	-	0	12/22
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Juniperus scopulorum												
84	**66**	-	33	33	-	-	50	0	-	-	0	67/83
90	**66**	-	33	33	-	-	0	0	-	-	0	118/98
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
84	**2466**	-	766	1700	-	-	0	0	-	-	0	8/6
90	**4266**	200	500	3766	-	-	3	0	-	-	0	7/4
96	**800**	-	-	800	-	-	0	0	-	-	0	4/6
01	**2140**	-	-	2140	-	-	0	0	-	-	0	3/4
06	**2260**	-	-	2260	-	-	0	0	-	-	0	5/5
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**100**	-	-	100	-	-	0	0	0	-	0	6/29
01	**160**	-	20	140	-	-	0	0	0	-	0	5/15
06	**120**	-	-	100	20	20	0	0	17	-	0	5/20
Pachistima myrsinites												
84	**33**	-	-	33	-	-	0	0	-	-	0	6/7
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**180**	-	60	120	-	-	0	0	-	-	0	7/12
01	**140**	-	60	80	-	-	0	0	-	-	0	5/7
06	**40**	-	-	40	-	-	0	0	-	-	0	9/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**132**	-	66	33	33	-	0	25	25	-	0	24/33
96	**140**	-	-	120	20	20	43	57	14	-	0	16/36
01	**120**	-	-	120	-	-	50	17	0	-	0	18/40
06	**120**	-	-	40	80	120	33	50	67	50	50	14/39
Symphoricarpos oreophilus												
84	**99**	-	33	66	-	-	0	0	0	-	0	18/26
90	**199**	-	33	166	-	-	0	0	0	-	0	15/28
96	**460**	-	100	320	40	-	4	0	9	-	4	19/37
01	**400**	-	-	380	20	-	0	0	5	-	5	27/52
06	**600**	-	40	520	40	40	0	0	7	7	13	21/34

Trend Study 2-17-06

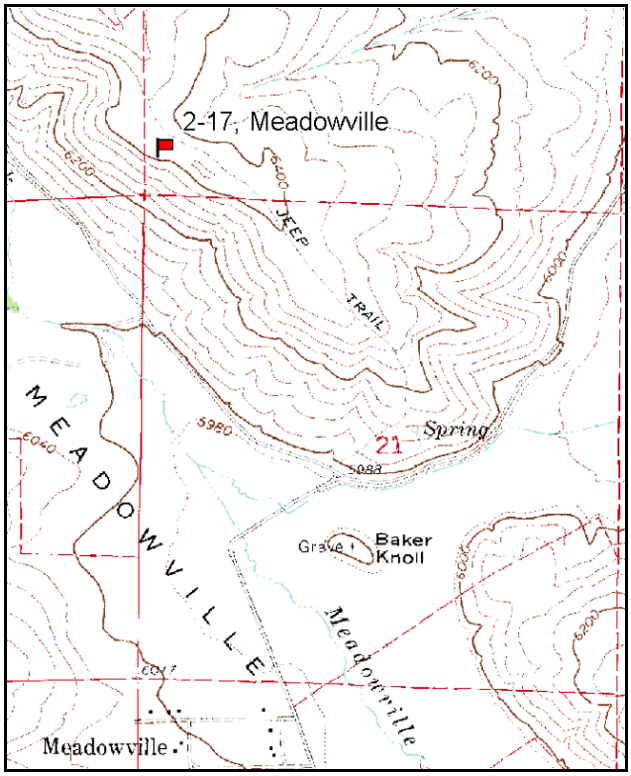
Study site name: Meadowville . Vegetation type: Big Sagebrush .

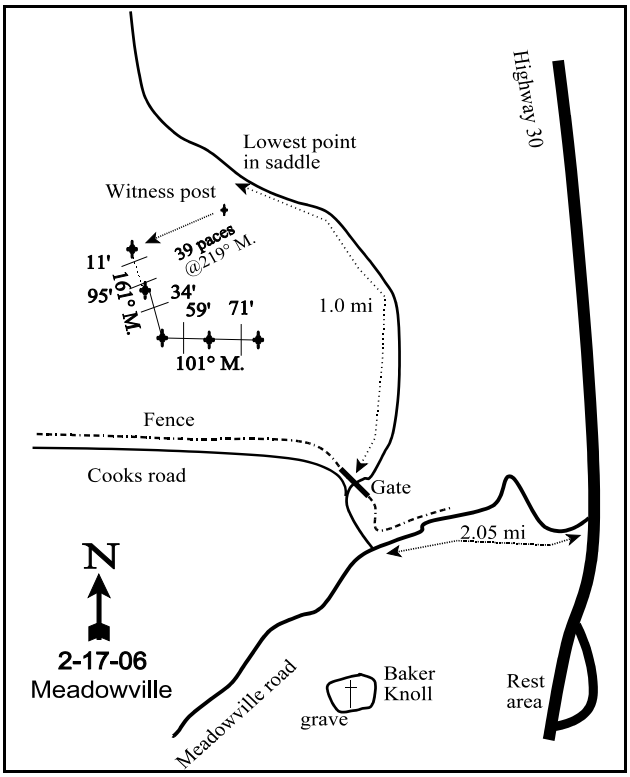
Compass bearing: frequency baseline 161 degrees magnetic.

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

LOCATION DESCRIPTION

At the intersection of Highway 30 and Meadowville Road, turn west on Meadowville Road and proceed 2.05 miles. Turn right (north) onto Cook's Road and turn immediately right through a large gate. Proceed 1.1 miles, passing a spring on the right and following the ridgetop, to the witness post in the low spot of a small saddle. Walk 39 paces at 219 degrees magnetic from the witness post to the 0-foot baseline stake. The 0-foot stake of the baseline is marked by browse tag # 7939. The 0-foot stake is also approximately 75 yards from a fence to the west. The baseline runs 161 degrees magnetic. Line three and four dogleg and run parallel to the fence at a bearing of 101 degrees magnetic.





Map Name: Meadowville

Diagrammatic Sketch

Township 13N , Range 5E , Section 16

UTM NAD 27, UTM 12T 4634407 N, 466814 E

DISCUSSION

Meadowville - Trend Study No. 2-17

Study Information

This study is located on private land, which is part of the Hideaway Ranch and overlooks the north end of the Meadowville Valley (elevation: 6,400 feet, slope: 35%, aspect: southwest). The vegetation type is mountain big sagebrush/grass. The area is considered critical deer winter range. Two winter killed deer carcasses and five antlers sheds were found in 1984. Pellet groups were reported to be abundant in 1984 and 1990. Pellet group transect data taken in 2001 estimated 56 deer, 3 elk, and 4 cow days use/acre (139 ddu/ha, 7 edu/ha, and 9 cdu/ha). Pellet group data from 2006 were estimated at 24 deer, 19 elk, and 6 cow days use/acre (60 ddu/ha, 46 edu/ha, and 14 cdu/ha). A deer carcass was found just east of the study transect in 2006.

Soil

Soil is classified in the Solak series, a shallow sandstone-limestone-quartzite conglomerate, where bedrock is normally found 10 to 20 inches below the surface. Solak soil is moderately permeable to water, but runoff is rapid and the erosion hazard is high. The principal limiting factors are low available water capacity and a limited root zone (Campbell and Lacey 1982). The soil has a clay loam texture with a neutral soil reaction (pH of 7.1). Effective rooting depth was estimated at nearly 16 inches. Rock and pavement are fairly common on the surface and within the profile. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 3.4:1 in 2006. There is some soil movement and pedestalling is apparent, but the erosion condition class was determined to be stable in 2001 and slight in 2006.

Browse

Mountain big sagebrush and antelope bitterbrush are the key browse species. The sagebrush population has consistently declined with each reading since 1984. In 1984, density was estimated at 1,466 plants/acre and has decreased to 400 plants/acre in 2006. Cover has also decreased from 4% in 1996 to less than 1% in 2006. Decadence has been high at every reading until 2006. The entire population was classified as decadent in 1984 and remained over 45% until 2006, when it decreased to 10%. Recruitment from young plants was minimal from 1990-2001 and none were observed in 2006. This sagebrush population will continue to decline with high decadence and no young recruitment. Utilization was heavy in 1984 and has been mostly light with some moderate use since 1990. Annual leader growth averaged only 1.2 inches in 2001 and 2.3 inches in 2006.

Additional forage is available from a few scattered antelope bitterbrush and serciveberry plants. Density of bitterbrush doubled in 2006 from 200 plants/acre in 1996 and 2001 to 400 plants/acre. Cover has averaged between 1-2% since 1996. Bitterbrush plants display moderate to heavy use but with normal vigor. Annual leader growth averaged only 4.6 inches in 2001 and 6.1 inches in 2006.

The dominant shrub is the increaser, stickyleaf low rabbitbrush. Cover has been estimated at 3-5% since 1996. Density was estimated at about 1,900 plants/acre in 1996 and 2001, but had decreased to 1,720 plants/acre in 2006. Broom snakeweed was also abundant, but has declined from a high of 11,932 plants/acre in 1990 to 480 plants/acre in 2006.

Herbaceous Understory

The most abundant perennial grasses are bluebunch wheatgrass, Indian ricegrass, and Sandberg bluegrass. All of these showed evidence of light to moderate utilization by cattle in 1984. Cheatgrass was very dominant in 1996 with 20% cover, but has declined to 7-8% in 2001 and 2006, which is still higher than would be desired. It is very widely distributed across the site with 96% quadrat frequency in 2006 and can be detrimental to sagebrush recruitment. Forb growth is sparse and generally low in stature. The most numerous perennial forbs are Utah milkvetch, arrowleaf balsamroot, thistle, wayside gromwell, and yellow salsify.

1990 TREND ASSESSMENT

As in 1984, there is still a large and increasing population of undesirable increasers and a high percentage of decadent plants in the sagebrush population. All the sagebrush were classified as decadent in 1984, but now decadence is 69% and 10% of the population consists of young plants. Sagebrush canopy cover is estimated at 6%. The sagebrush population density has declined by 34%. Bitterbrush has conversely increased in density by 62%. Sagebrush is the key species and therefore the browse trend is slightly down. Trend for grasses is up. Perennial grass sum of nested frequency increased by 33%, mostly due a significant increase in Sandberg bluegrass. Trend for forbs is stable. Perennial forb sum of nested frequency remained similar to 1984.

browse - slightly down (-1) grasses - up (+2) forbs -stable (0)

1996 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush and bitterbrush, is stable. Density decreased from 966 plants/acre in 1990 to 860 in 1996. Some of the differences in density estimates can be attributed to the larger sample taken in 1996, which gives better estimates for populations that are discontinuous and/or clumped. Utilization is heavier than in 1990, with 28% of the plants sampled displaying heavy use. Reproduction is limited and the proportion of shrubs displaying poor vigor has increased from 28% to 58%. Decadence is still high at 60%. Bitterbrush density decreased from 432 plants/acre in 1990 to 200 in 1996 and is moderately to heavily utilized. Undesirable increasers, stickyleaf low rabbitbrush and broom snakeweed, are numerous. Trend for grasses is stable. Perennial grass sum of nested frequency remained similar despite a significant decline in Sandberg bluegrass. Cheatgrass was included in the sample for the first time and cover was high at 20%, which causes a fire hazard. Trend for forbs is up. Sum of nested frequency increased by 38%, mostly due to a significant increase in yellow salsify. Forbs still remain a minor component of the herbaceous understory. The Desirable Components Index rated this study as very poor due to low browse and forb cover, but good perennial grass cover. Cheatgrass cover was very high, which also lowered the rating.

winter range condition (DC Index) - very poor (33) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - up (+2)

2001 TREND ASSESSMENT

Trend for browse is down due to a continual decline in sagebrush. The current population of just 520 plants/acre is moderately utilized and nearly half are classified as decadent (46%). In addition, 38% of the population was classified as dying. Young recruitment is poor and there are not enough young plants to maintain the population. Density of the increaser, stickyleaf low rabbitbrush is stable at about 1,900 plants/acre and the density of broom snakeweed has declined. The small population of bitterbrush is stable with good vigor and no decadent plants. Utilization of bitterbrush was moderate to heavy but plants are healthy and vigorous. Unfortunately, bitterbrush is not abundant. Trend for grasses is slightly up. Perennial grass sum of nested frequency increased by 16% due a significant increase in Sandberg bluegrass. Cheatgrass nested frequency decreased significantly and cover decreased from 20% to 7%, but quadrat frequency was still very high at 91%. Trend for forbs is stable. Very little change in sum of nested frequency and forbs still remain a minor component of the herbaceous understory. The Desirable Components Index rated this study as poor due to decreasing browse cover, even though cheatgrass cover decreased. Perennial grass cover remained high.

winter range condition (DC Index) - poor (38) Mid-level potential scale
browse - down (-2) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, mountiain big sagebrush and bitterbrush, is slightly down. Density of mountain big sagebrush declined from 520 plants/acre in 2001 to 400 plants/acre in 2006. Decadence decreased from 46% in 2001 to 10% in 2006, but several of the decadent plants died. Sagebrush cover decreased from 3% to less than

1%. Utilization is light to moderate. Bitterbrush density doubled from 200 plants/acre in 2001 to 400 plants/acre in 2006. Utilization is moderate and vigor is good. Trend for grasses is stable. Sum of nested of perennial grasses remained similar to 2001, even though bluebunch wheatgrass increased significantly. Cover increased from 7% to 12%. Cheatgrass remained similar to 2001 at 8% cover. Trend for forbs is stable. The sum of nested frequency changed little and forbs still remain a minor component of the herbaceous understory. The Desirable Components Index rated this study as very poor-poor due to decreasing browse cover and moderate cheatgrass cover. Perennial grass cover remained high.

winter range condition (DC Index) - very poor-poor (36) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 17

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	5	-	-	-	-	-	-	-
G	Agropyron spicatum	a95	ab120	b146	b156	c187	6.50	7.13	11.75
G	Bromus tectorum (a)	-	-	b367	a294	a307	19.65	6.85	8.19
G	Oryzopsis hymenoides	61	61	73	71	46	3.82	5.69	1.89
G	Poa bulbosa	-	-	-	-	4	-	-	.01
G	Poa pratensis	ab3	a-	ab3	a1	b15	.03	.03	.97
G	Poa secunda	a83	b152	a89	b138	b127	1.50	1.41	1.83
G	Sitanion hystrix	5	3	4	-	2	.03	-	.03
Total for Annual Grasses		0	0	367	294	307	19.65	6.85	8.19
Total for Perennial Grasses		252	336	315	366	381	11.90	14.27	16.50
Total for Grasses		252	336	682	660	688	31.56	21.13	24.69
F	Achillea millefolium	-	-	5	6	7	.04	.06	.06
F	Agoseris glauca	a-	a4	a-	a-	b21	-	-	.10
F	Alyssum alyssoides (a)	-	-	b292	b293	a187	2.44	2.25	.61
F	Astragalus sp.	-	-	-	-	4	-	-	.06
F	Astragalus utahensis	c56	bc51	bc34	ab17	a13	.48	.17	.14
F	Balsamorhiza sagittata	a2	ab6	a4	ab13	b15	.39	.30	.83
F	Castilleja chromosa	8	1	4	-	3	.01	-	.00
F	Camelina microcarpa (a)	-	-	2	2	4	.01	.00	.01
F	Chaenactis douglasii	1	8	5	-	4	.04	-	.01
F	Cirsium sp.	-	-	-	-	1	-	-	.03
F	Cirsium undulatum	ab22	b19	b25	ab19	a5	.39	.55	.04
F	Collomia linearis (a)	-	-	-	10	-	-	.02	-
F	Comandra pallida	a1	a-	a-	b10	a2	-	.10	.01
F	Collinsia parviflora (a)	-	-	a3	ab9	b16	.00	.04	.08
F	Crepis acuminata	-	-	-	7	9	-	.21	.30

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Descurainia pinnata (a)	-	-	15	14	5	.03	.03	.01
F	Draba sp. (a)	-	-	-	1	3	-	.00	.01
F	Holosteum umbellatum (a)	-	-	-	-	3	-	-	.00
F	Lactuca serriola	-	-	-	2	3	-	.00	.03
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{b}$10	$_{ab}$5	$_{a}$2	.02	.06	.00
F	Lithospermum ruderale	11	16	22	22	20	1.00	1.33	1.13
F	Microsteris gracilis (a)	-	-	-	3	7	-	.03	.01
F	Navarretia intertexta (a)	-	-	3	-	-	.00	-	-
F	Oenothera sp.	-	-	-	-	-	-	.00	-
F	Phlox hoodii	8	4	16	18	9	.16	.28	.27
F	Phlox longifolia	$_{a}$-	$_{a}$3	$_{ab}$11	$_{c}$36	$_{bc}$23	.02	.35	.32
F	Polygonum douglasii (a)	-	-	3	3	-	.00	.00	-
F	Sisymbrium altissimum (a)	-	-	$_{a}$3	$_{a}$-	$_{b}$12	.03	-	.51
F	Tragopogon dubius	$_{ab}$26	$_{a}$19	$_{b}$49	$_{ab}$43	$_{b}$48	.54	.38	.44
F	Unknown forb-perennial	-	3	-	-	-	-	-	-
F	Zigadenus paniculatus	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$12	-	-	.05
Total for Annual Forbs		0	0	321	335	237	2.53	2.39	1.25
Total for Perennial Forbs		135	134	185	198	201	3.09	3.82	3.88
Total for Forbs		135	134	506	533	438	5.63	6.22	5.14

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

BROWSE TRENDS --
Management unit 02 , Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	0	1	2	-	-	-
B	Artemisia tridentata vaseyana	35	18	14	4.47	2.40	.66
B	Chrysothamnus viscidiflorus viscidiflorus	44	43	43	3.99	2.88	4.51
B	Eriogonum microthecum	3	1	4	.15	-	.00
B	Gutierrezia sarothrae	24	20	12	.32	.36	.21
B	Opuntia sp.	7	10	11	.27	.46	.91
B	Purshia tridentata	9	9	10	1.14	1.93	2.22
B	Tetradymia canescens	21	18	20	.60	.97	1.67
Total for Browse		143	120	116	10.96	9.04	10.21

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 17

Species	Percent Cover '06
Artemisia tridentata vaseyana	.81
Chrysothamnus viscidiflorus viscidiflorus	8.21
Gutierrezia sarothrae	.31
Opuntia sp.	.18
Purshia tridentata	3.23
Tetradymia canescens	1.00

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 17

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.2	2.8
Purshia tridentata	4.6	6.1

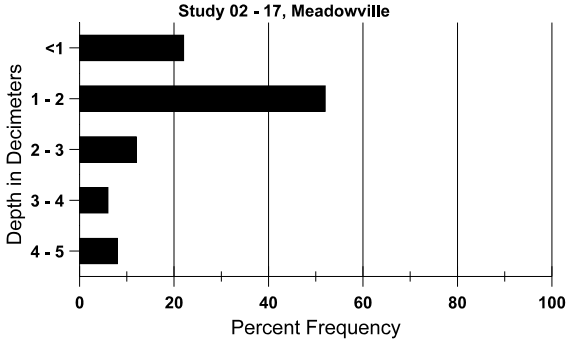
BASIC COVER --
Management unit 02 , Study no: 17

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.50	11.50	53.66	41.42	40.98
Rock	10.00	9.00	10.95	8.15	8.44
Pavement	13.75	16.25	3.86	17.51	11.26
Litter	66.25	45.00	52.17	38.69	43.56
Cryptogams	.25	1.75	.09	.18	.19
Bare Ground	7.25	16.50	4.17	10.99	12.70

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 17, Meadowville

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.7	59.8 (14.8)	7.03	46.16	20.0	33.84	2.2	14.18	192.0	0.72

Stoniness Index



PELLET GROUP DATA --
Management unit 02 , Study no: 17

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	3	2	6
Elk	7	4	8
Deer	15	25	16
Cattle	2	1	3

Days use per acre (ha)	
'01	'06
-	-
3 (7)	19 (46)
56 (139)	24 (60)
4 (9)	6 (14)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**33**	-	-	-	33	-	0	100	100	-	0	-/-
96	**0**	40	-	-	-	-	0	0	0	-	0	-/-
01	**20**	-	-	20	-	-	0	0	0	-	0	17/19
06	**40**	-	20	20	-	-	50	0	0	-	0	28/38
Artemisia tridentata vaseyana												
84	**1466**	-	-	-	1466	-	9	91	100	1	48	-/-
90	**966**	100	100	200	666	-	24	7	69	14	28	24/22
96	**860**	60	80	260	520	1160	28	28	60	40	58	25/33
01	**520**	-	20	260	240	820	38	4	46	38	42	21/34
06	**400**	-	-	360	40	840	25	0	10	5	5	15/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
84	**233**	-	33	200	-	-	0	0	0	-	0	9/11
90	**133**	-	-	133	-	-	0	0	0	-	0	10/10
96	**1900**	40	40	1800	60	-	0	0	3	-	0	13/24
01	**1960**	20	40	1560	360	20	0	0	18	2	2	11/20
06	**1720**	-	60	1540	120	-	3	1	7	2	3	13/24
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**100**	-	20	80	-	-	0	0	-	-	0	12/11
01	**20**	-	-	20	-	-	0	0	-	-	0	14/17
06	**120**	-	-	120	-	-	0	0	-	-	0	15/24
Gutierrezia sarothrae												
84	**7599**	-	3700	3733	166	-	0	0	2	-	0	7/11
90	**11932**	1400	9266	2400	266	-	2	0	2	.16	.27	9/11
96	**1400**	120	160	1200	40	-	0	0	3	1	1	7/10
01	**820**	40	20	800	-	-	0	0	0	-	0	5/8
06	**480**	-	20	440	20	-	0	0	4	-	0	6/11
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**180**	20	80	100	-	-	0	0	-	-	0	5/12
01	**300**	-	20	280	-	-	0	0	-	-	0	5/11
06	**320**	-	60	260	-	-	0	0	-	-	0	5/14
Purshia tridentata												
84	**166**	-	100	66	-	-	40	20	0	-	20	11/49
90	**432**	-	166	200	66	-	23	62	15	-	0	13/21
96	**200**	-	60	120	20	-	30	40	10	10	10	14/44
01	**200**	-	-	200	-	20	50	50	0	-	0	21/48
06	**400**	-	40	360	-	-	30	0	0	-	0	25/54
Tetradymia canescens												
84	**133**	-	-	100	33	-	0	0	25	-	0	7/12
90	**99**	-	-	66	33	-	0	0	33	-	0	8/15
96	**600**	-	100	440	60	-	10	10	10	3	3	11/17
01	**820**	40	60	660	100	-	2	0	12	2	2	9/14
06	**860**	-	80	760	20	20	16	0	2	-	0	10/19

Trend Study 2-19-06

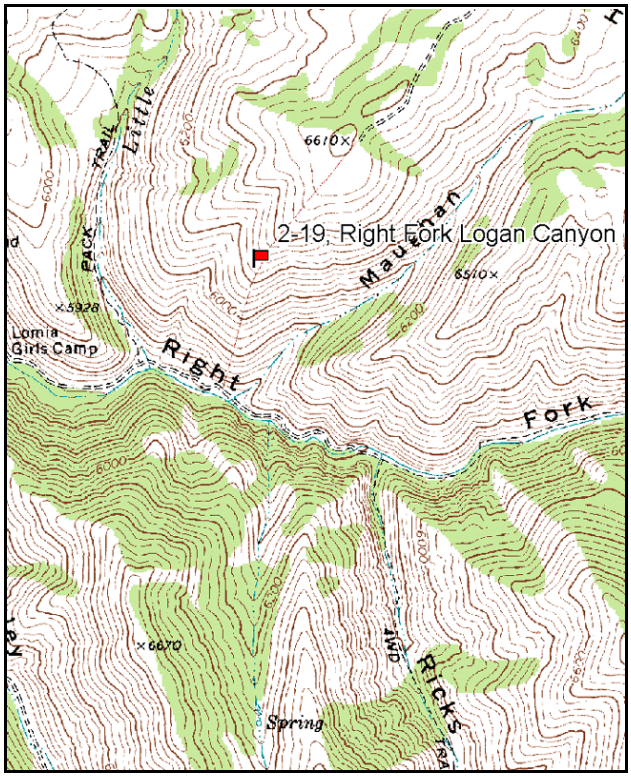
Study site name: Right Fork Logan Canyon . Vegetation type: Bitterbrush .

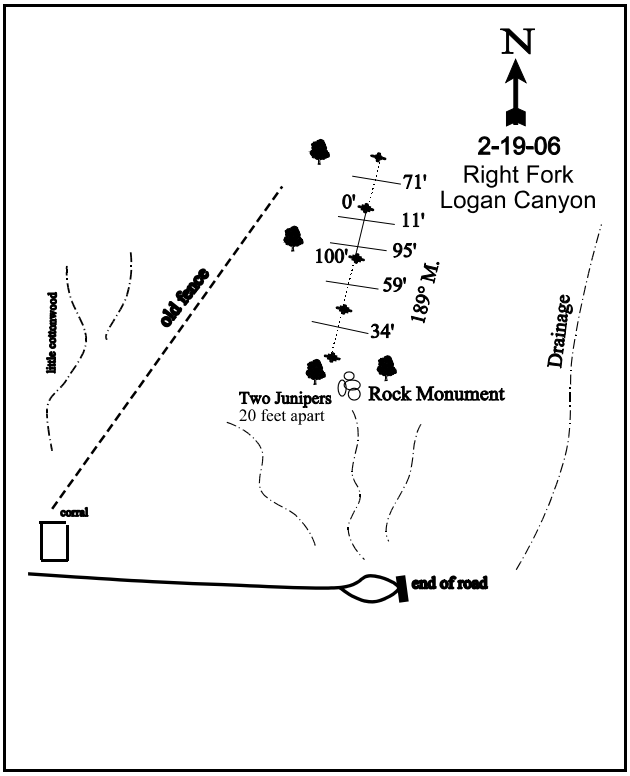
Compass bearing: frequency baseline 189 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 8 ft, belt 3 on 1 ft, belt 5 on 8 ft.

LOCATION DESCRIPTION

Drive up the Right Fork of Logan Canyon. Bear left at the girls camp. Go 0.6 miles to the end of the road just past the corral. Hike up the ridge to the north, going about 3/4 mile towards the ridgeline. Look for a rock monument between two junipers that are 20 feet apart. The hike from the bottom to the study is about 600 feet in elevation gain. The baseline runs 189 degrees magnetic. Lines 2 and 3 continue south from the 100 foot baseline. Line 4 runs off the 0-foot baseline stake at 9 degrees magnetic.





Map Name: Temple Peak

Diagrammatic Sketch

Township 12N , Range 3E , Seciton 16

UTM NAD 27, UTM 12T 4625144 N, 449598 E

DISCUSSION

Right Fork Logan Canyon - Trend study No. 2-19

Study Information

This study was established in 1990 and samples important elk and deer winter range that extends from Cowley to Willow Canyon (elevation: 6,200 feet, slope: 35-40%, aspect: south). The land is administered by the U.S. Forest Service. Judging by pellet group data this area serves as important elk winter range. Elk pellet groups were common in 1996 with a quadrat frequency of 47%, while deer sign was moderately abundant with a quadrat frequency of 22%. For part of the summer, cattle graze the Little Cottonwood drainage, but mainly stay off of the upper steep slopes. In 1996 and 2001, cows were seen near the top of the hill where the slope is more gentle. Pellet group transect data taken in 2001, estimated 17 deer, 83 elk, and 2 cow days use/acre (41 ddu/ha, 205 edu/ha, and 4 cdu/ha). Most of the elk use appeared to be from late winter. Pellet group data from 2006 was estimated at 6 deer, 158 elk, and 3 cow days use/acre (15ddu/ha, 390 edu/ha, and 7 cdu/ha).

Soil

The soil is moderately shallow and very rocky with a slightly alkaline soil reactivity (pH of 7.6). Texture is a clay loam. Effective rooting depth was estimated at about 8 inches with a layer of rock encountered at that depth. The presence of deeper rooted shrubs suggests that this layer of rock has cracks and long fissures, allowing deeper rooted plants to become established. Rock and pavement comprise about one-third of the ground cover. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 3.6:1 in 2006, leaving 13-14% bare ground cover. There is evidence of some soil movement as most shrubs are pedestalled, but the erosion condition class was determined to be slight in 2001 and stable in 2006. Erosion is inevitable due to the steep slopes.

Browse

Browse forage is limited with all species combined producing less than 8% cover in 2001 and 2006. The key browse species is bitterbrush. Density steadily increased from 232 plants/acre in 1990 to 380 in 2001, but decreased in 2006 to 220 plants/acre. Cover was averaged at 2% in 1996 and 2001, but increased in 2006 to 4%. All of the bitterbrush sampled in 1990 displayed heavy use. Utilization was moderate to heavy in 1996 and 2001, then increased to heavy in 2006. Decadence was extremely high in 1990 at 72% of the population, but has declined to 19% in 1996, 11% in 2001, and 9% in 2006. Young recruitment has been minimal during all readings and seedlings have never been observed. Annual leader growth in 2001 averaged 3.0 inches and only 1.5 inches in 2006.

A few serviceberry and mountain big sagebrush offer additional preferred forage, but they occur in small numbers. Serviceberry has displayed moderate to heavy use since 1990, while mountain big sagebrush use has been light to moderate. Snowberry is abundant, but mostly unutilized. The differences in snowberry density from 1990 to 1996 was likely the result of the larger sample used in 1996. This is suspected because there were no dead plants found in the population resultant of a large decline. Several of the junipers scattered across the slope have been highlined.

Herbaceous Understory

The area supports a vigorous stand of bluebunch wheatgrass, but bulbous bluegrass is the most abundant species. It made up 69% of the grass cover and 41% of the total herbaceous cover in 2006 and has averaged 17% cover since 1996. Annual grasses such as cheatgrass and rattlesnake brome are also present, but not abundant. Forbs are diverse and moderately productive with on average about 10% cover of perennials since 1996. Perennial forbs are primarily early season species, yet are numerous enough to provide some spring forage. By far the most abundant perennial forb is gray lomatium, which made up 71% of the forb cover in 1996, 61% in 2001, and 84% in 2006. Arrowleaf balsam root, tapertip hawksbeard, and yellow salsify are also moderately abundant.

1996 TREND ASSESSMENT

Trend for the key browse is slightly up. The bitterbrush population received heavy use in 1990, but heavy use has declined from 100% to 44%, vigor has improved, and decadence has declined from 72% to 19%. The differences in density may be due in most part to the larger sample used in 1996. Mountain big sagebrush did not appear in the smaller sample, but was observed in the larger sample. Trend for grasses is stable. Bluebunch wheatgrass nested frequency increased significantly even though bulbous bluegrass is still dominant and increased significantly in nested frequency. Sandberg bluegrass decreased significantly, but a misidentification may have occurred between the two bluegrasses. Trend for forbs is slightly down. Tapertip hawksbeard nested frequency decreased significantly, while yellow salsify increased significantly. Overall, perennial forb sum of nested frequency decreased by 14%. The Desirable Components Index rated this study as very poor-poor due to low browse cover, but perennial grass cover was good. This area is used predominately by elk, which prefer more grasses than shrubs.

winter range condition (DC Index) - very poor-poor (35) Mid-level potential scale
browse - slightly up (+1) grasses - stable (0) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, antelope bitterbrush, displays a stable population density. It is moderate to heavily utilized yet has good vigor and low decadence (11%). There is no recruitment in the form of seedlings and young even though annual leader growth of mature bitterbrush averaged 3 inches in 2001. Secondary browse species, serviceberry and mountain big sagebrush, appear to have stable populations with moderate use, improved vigor, and declining decadence. Trend for grasses is stable. Sum of nested frequency of perennial grasses and forbs have remained similar to 1996. Bulbous bluegrass still dominates the herbaceous understory by providing 65% of the grass cover and 43% of the total herbaceous cover. It has remained stable in frequency since 1996. Cheatgrass nested frequency decreased significantly, but cover remained near 1%. Bluebunch wheatgrass, the second most abundant perennial grass, also remained stable. Trend for forbs is stable. Very little changed in the sum of nested frequency for perennial forbs. The Desirable Components Index rated this study as very poor-poor due to low browse cover, but perennial grass cover was good. This area is used predominately by elk, which prefer more grasses than shrubs.

winter range condition (DC Index) - very poor-poor (34) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, bitterbrush and mountain big sagebrush, is down. Density of both bitterbrush and sagebrush decreased. Bitterbrush decreased from 380 plants/acre in 2001 to 220 plants/acre in 2006. Young recruitment for both species is very minimal and is not replacing dying plants. Percent decadence in both species is within acceptable limits. Bitterbrush had heavy use in 2006 compared to moderate to heavy use during the previous two readings. Trend for grasses is stable. Bluebunch wheatgrass has remained similar to previous readings, while bulbous bluegrass nested frequency decreased. Trend for forbs is slightly down. Yellow salsify nested frequency decreased significantly, which is a palatable forb for deer and elk. The Desirable Components Index rated this study as very poor-poor due to low browse cover, but perennial grass cover was good. This area is used predominately by elk, which prefer more grasses than shrubs.

winter range condition (DC Index) - very poor-poor (32) Mid-level potential scale
browse - down (-2) grasses - stable (0) forbs - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 19

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a161	b229	b180	b173	10.63	6.05	6.98
G	Bromus brizaeformis (a)	-	a14	ab27	b36	.23	.53	.11
G	Bromus tectorum (a)	-	b148	a83	a90	1.09	.92	.58
G	Poa bulbosa	a208	c342	c340	b283	17.93	14.90	18.02
G	Poa pratensis	2	-	3	6	-	.15	.09
G	Poa secunda	b144	a10	a36	a27	.07	.26	.18
Total for Annual Grasses		0	162	110	126	1.33	1.45	0.69
Total for Perennial Grasses		515	581	559	489	28.64	21.38	25.28
Total for Grasses		515	743	669	615	29.97	22.83	25.97
F	Agoseris glauca	-	-	1	5	-	.00	.01
F	Alyssum alyssoides (a)	-	b179	c253	a35	.48	2.07	.08
F	Allium sp.	5	-	-	3	-	-	.00
F	Aster chilensis	-	3	-	4	.15	-	.01
F	Astragalus utahensis	8	2	3	6	.06	.06	.06
F	Balsamorhiza sagittata	a-	ab1	a-	b6	.71	.42	.39
F	Chaenactis douglasii	-	-	-	-	.00	-	-
F	Cirsium undulatum	-	1	1	2	.00	.00	.03
F	Collomia linearis (a)	-	3	-	-	.00	-	-
F	Comandra pallida	2	5	8	7	.07	.19	.09
F	Collinsia parviflora (a)	-	6	-	-	.03	-	-
F	Crepis acuminata	b89	a29	a45	a34	.62	.76	.68
F	Cymopterus sp.	234	205	209	203	7.01	7.31	8.52
F	Descurainia pinnata (a)	-	2	-	-	.00	-	-
F	Epilobium brachycarpum (a)	-	7	-	-	.01	-	-
F	Erodium cicutarium (a)	-	3	-	-	.00	-	-
F	Hackelia patens	2	-	2	-	-	.03	-
F	Isatis tinctoria	-	-	-	-	-	-	.00
F	Lactuca serriola	ab15	a4	b15	a4	.01	.13	.02
F	Machaeranthera canescens	-	2	3	-	.03	.03	-
F	Microsteris gracilis (a)	-	-	-	1	-	-	.00
F	Penstemon humilis	9	17	7	7	.12	.07	.09
F	Phacelia sp.	-	2	-	-	.03	-	-
F	Phlox longifolia	-	-	1	-	-	.00	-
F	Sisymbrium altissimum (a)	16	-	15	3	-	.14	.01
F	Tragopogon dubius	a7	b48	b41	a12	.42	.63	.08

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	Veronica biloba (a)	-	3	-	3	.00	-	.00
Total for Annual Forbs		16	203	268	42	0.55	2.22	0.10
Total for Perennial Forbs		371	319	336	293	9.26	9.68	10.01
Total for Forbs		387	522	604	335	9.81	11.90	10.11

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

BROWSE TRENDS --
Management unit 02 , Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	3	2	2	.18	.03	-
B	Artemisia tridentata vaseyana	6	6	3	.03	.66	.18
B	Chrysothamnus viscidiflorus viscidiflorus	15	17	11	.48	1.38	.24
B	Mahonia repens	4	5	7	.21	.16	.09
B	Purshia tridentata	12	15	9	2.35	2.59	4.30
B	Sambucus cerulea	2	1	1	.38	.63	.63
B	Symphoricarpos oreophilus	8	6	6	2.04	2.04	1.95
Total for Browse		50	52	39	5.68	7.52	7.39

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 19

Species	Percent Cover '06
Amelanchier alnifolia	.36
Artemisia tridentata vaseyana	.81
Chrysothamnus viscidiflorus viscidiflorus	.06
Mahonia repens	.03
Purshia tridentata	7.51
Sambucus cerulea	.35
Symphoricarpos oreophilus	2.91

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 19

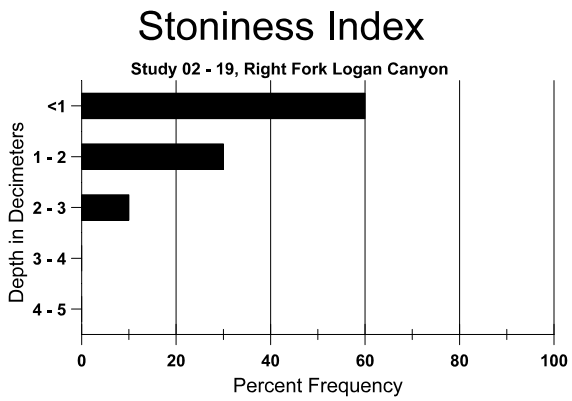
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	-	2.1
Purshia tridentata	3.0	1.5

BASIC COVER --
Management unit 02 , Study no: 19

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	10.00	42.68	46.01	42.00
Rock	31.50	23.11	21.66	19.88
Pavement	12.50	3.64	5.80	4.00
Litter	26.25	30.87	20.84	17.52
Cryptogams	1.00	1.75	3.45	3.77
Bare Ground	18.75	13.05	14.32	12.17

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 19, Right Fork Logan Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.4	63.4 (10.3)	7.6	27.6	34.4	38.0	4.2	13.8	115.2	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 19

Type	Quadrat Frequency		
	'96	'01	'06
Elk	47	53	55
Deer	22	22	18
Cattle	1	-	1

Days use per acre (ha)	
'01	'06
83 (205)	158 (390)
17 (41)	6 (15)
2 (4)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
90	**66**	33	66	-	-	-	50	50	0	-	0	-/-
96	**60**	-	-	40	20	-	67	33	33	-	100	25/28
01	**40**	-	-	40	-	-	100	0	0	-	0	29/33
06	**60**	-	20	40	-	-	0	67	0	-	0	30/33
Artemisia tridentata vaseyana												
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**160**	-	40	100	20	120	25	0	13	-	13	28/45
01	**140**	-	-	140	-	40	29	14	0	-	0	27/34
06	**60**	-	-	60	-	40	0	0	0	-	0	26/43
Chrysothamnus viscidiflorus viscidiflorus												
90	**599**	-	66	533	-	-	28	22	0	-	0	13/15
96	**340**	-	40	300	-	-	0	0	0	-	0	15/26
01	**400**	-	40	320	40	-	5	0	10	-	0	15/26
06	**220**	-	-	220	-	-	0	0	0	-	0	13/22
Mahonia repens												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**520**	-	40	480	-	-	0	0	-	-	0	3/4
01	**760**	-	60	700	-	-	0	0	-	-	0	3/6
06	**940**	-	-	940	-	-	0	0	-	-	0	2/4
Purshia tridentata												
90	**232**	-	-	66	166	-	0	100	72	-	14	29/56
96	**320**	-	20	240	60	160	56	44	19	-	0	40/74
01	**380**	-	-	340	40	80	37	42	11	-	0	43/72
06	**220**	-	-	200	20	-	18	82	9	9	9	41/67
Sambucus cerulea												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	29/44
01	**40**	-	-	40	-	-	0	0	-	-	0	37/77
06	**20**	-	-	20	-	-	100	0	-	-	0	47/69
Symphoricarpos oreophilus												
90	**1533**	-	233	1200	100	-	11	2	7	-	7	26/21
96	**200**	-	20	180	-	-	0	0	0	-	10	27/50
01	**120**	-	-	120	-	-	0	0	0	-	0	33/50
06	**180**	-	-	160	20	-	0	0	11	-	33	28/48

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	13/27

Trend Study 2-21-06

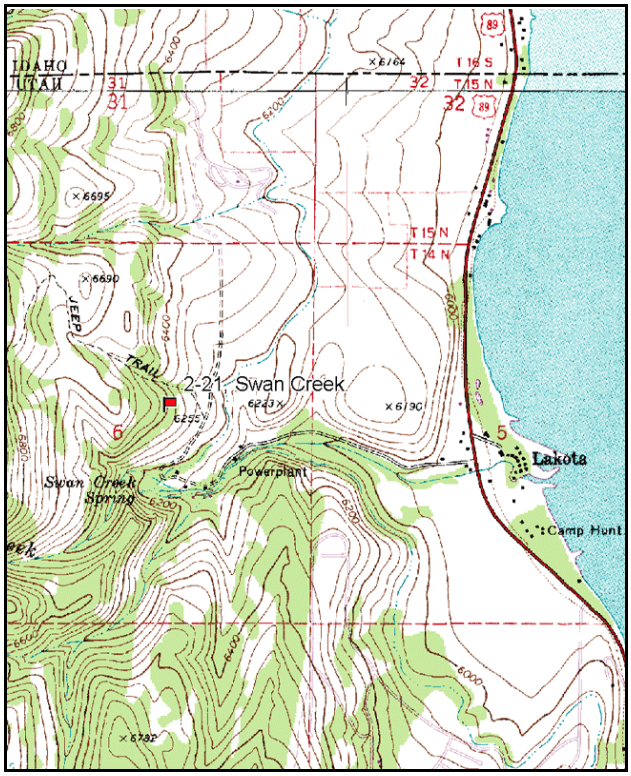
Study site name: Swan Creek . Vegetation type: Curlleaf Mahogany.

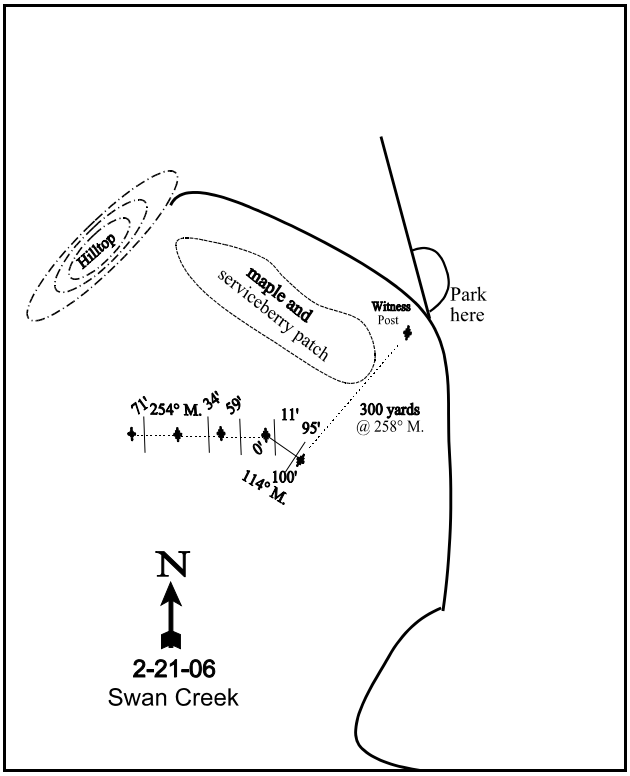
Compass bearing: frequency baseline 114 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Belt rebar: belt 1 on 5 ft, belt 2 on 5 ft, belt 4 no rebar.

LOCATION DESCRIPTION

Drive approximately 3.0 miles north of Garden City on US 89. Turn left on 2150 North in Lakota (1 mile south of Idaho border). Go approximately 1 mile on the narrow road up Swan Creek, staying right at one major fork. Just past the creek from the spring, before the pump house, turn right and go 0.2 miles up a jeep road to another fork. Park here, then walk up across the slope 300 yards at 258 degrees magnetic to the 100-foot baseline stake. The 0-foot baseline stake is 100 feet to the northwest. The rest of the baseline run 254 degrees magnetic off the 0-foot baseline stake. The study site is in the mahogany grove. The 0-foot baseline stake is marked by browse tag #97.





Map Name: Garden City Diagrammatic Sketch

Township 14N , Range 5E , Section 6 UTM NAD 27, UTM 12T 464700 N, 464700 E

DISCUSSION

Swan Creek - Trend Study No. 2-21

Study Information

This study was established on DWR property in the Swan Creek drainage (elevation: 6,400 feet, slope: 30%, aspect: southeast). The property contains areas that receive significant use by wintering elk, deer, and moose. The study is located on a hillside dominated by curlleaf mountain mahogany with an associated understory of bitterbrush, serviceberry, mountain snowberry, and mountain big sagebrush. The DWR owns only a portion of the section; the remainder is privately owned and used for cabins, recreation, and limited agriculture. Deer and elk pellet groups were fairly abundant with quadrat frequencies of 32% and 27% in 1996, respectively. A pellet group transect read in 2001 estimated 47 deer and 36 elk days use/acre (116 ddu/ha and 89 edu/ha). Most of the pellet groups were from winter use, but about one-third appeared to be from spring. Pellet group data from 2006 was estimated at 56 deer, 80 elk, and 1 moose days use/acre (137 ddu/ha, 198 edu/ha, and 2 mdu/ha).

Soil

Soil is classified in the Agassiz series, which was formed in shallow material over weathered limestone. Precipitation is somewhat excessively drained with medium to rapid runoff and moderate permeability (USDA-NRCS 2006). The soil has a loam texture with a soil reaction that is slightly alkaline (pH of 7.5). Effective rooting depth only measured 10 inches in 1996. However, deeper rooted shrubs like curlleaf mountain mahogany are growing. This would suggest that the rooting depth is not restricted in some places. The soil is rocky on the surface and throughout the profile with bedrock layers exposed on the slope. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was good at 5:1 in 2006, leaving little exposed bare soil. The erosion condition class was determined as stable in 2001 and slight in 2006.

Browse

The dominant browse species is curlleaf mountain mahogany. Curlleaf mahogany provided 22% overhead canopy cover in 2001 and 18% in 2006. Point-center quarter data from 1996 estimated 148 mahogany/acre with an average diameter of just over 4.5 inches. In 2006, mahogany was estimated at 126 trees/acre with an average diameter of 10 inches. Most of the mahogany sampled during all years were large mature plants which were mostly unavailable to browsing. Use of the available portions has been moderate to heavy and 37% of the population in 2006 were classified as decadent and dying.

Important understory shrubs include serviceberry, mountain big sagebrush, and bitterbrush. Serviceberry is moderately abundant and has steadily increased from 865 plants/acre in 1990 to 1,220 plants/acre in 2006. They have consistently displayed moderate to heavy use since 1990, but vigor has been good at each reading. Poor vigor was noted on 10% of the plants sampled in 1996 due to an infestation of rust. Recruitment from young plants has been excellent averaging 30% of the population. Mountain big sagebrush and bitterbrush occur in small numbers and sagebrush appears to be declining, while bitterbrush has maintained a stable population.

Herbaceous Understory

Bluebunch wheatgrass and Sandberg bluegrass are prominent in the understory and have increased from 8% cover in 1996 to 14% cover in 2006. Annual brome grasses (Japanese and cheatgrass brome) averaged 14% cover in 1996, but declined to less than 2% cover in 2001 and 2006. Bulbous bluegrass is not that abundant, but has been steadily increasing since 1996. Forbs are moderately diverse, but only a few species are abundant. The most common perennial forbs include arrowleaf balsamroot, rock goldenrod, and tapertip hawksbeard, which have provided over 75% of the forb cover.

1996 TREND ASSESSMENT

The browse trend appears stable for the key species, curlleaf mountain mahogany. Serviceberry, an important

understory shrub, also had a stable trend. Trend for grasses is stable. Sum on nested frequency for perennial grasses has remained similar to the 1990 reading. Annual grasses were included in the sample for the first time and they are abundant with 14% cover. Trend for forbs is down. The sum of nested frequency of perennial forbs decreased by 52%. Several species decreased significantly, include: longleaf phlox, tapertip hawksbeard, bastard toadflax, and sego lily. The Desirable Components Index rated this study as very poor due to low browse cover, but with fair perennial grass and forb cover. High annual grass cover was a negative factor on the score.

winter range condition (DC Index) - very poor (25) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species, curlleaf mountain mahogany, is stable. Population density has remained similar, utilization is moderate to heavy, and vigor is normal. Serviceberry, a key understory species, displayed a slightly improved trend due to an increase in density, improved vigor, and a decline in percent decadence. In addition, young plants are more numerous and accounted for 38% of the population. Mountain big sagebrush and bitterbrush occur in limited numbers yet appear to have stable populations. Overall, the browse trend is slightly up due to the improvement in serviceberry, which provides a large proportion of the available browse forage. Trend for grasses is up. Sum of nested frequency of perennial grasses increased slightly. In addition, sum of nested frequency of Japanese brome and cheatgrass declined significantly. Annual grass cover also declined from 14% in 1996 to only 1%. Trend for forbs is stable. Perennial forbs sum of nested frequency did not change much, but annual forbs increased in nested frequency. Annual forb cover has remained low at 1%. The Desirable Components Index rated this study as poor due to low browse cover. Perennial grass and forb cover were fair. Annual grass cover decreased, which improved the score from 1996.

winter range condition (DC Index) - poor (38) Mid-level potential scale
browse - stable (0) grasses - up (+2) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse is slightly up. Curlleaf mahogany has maintained a fairly stable population. Most plants remain large and unavailable to browsing. Serviceberry is the most abundant available shrub and density has increased from 1,060 plants/acre in 2001 to 1,220 plants/acre in 2006. Young recruitment has remained excellent at 31% of the population. Mountain big sagebrush continues to decline, but it is not an abundant species. Bitterbrush has maintained a stable population. Trend for grasses is slightly down. Sum of nested frequency for perennial grasses has not changed much from 2001. However, Japanese brome and cheatgrass nested frequency both increased significantly, but combined cover averaged only 2%. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 23%, but cover remained at 9%. The Desirable Components Index rated this study as poor due to low browse cover, but with fair perennial grass and forb cover. Annual grass cover remained similar to 2001.

winter range condition (DC Index) - poor (42) Mid-level potential scale
browse - slightly up (+1) grasses - slightly down (-1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 21

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{b}$286	$_{a}$222	$_{ab}$241	$_{a}$220	6.91	9.72	10.45
G	Bromus japonicus (a)	-	$_{c}$162	$_{a}$44	$_{b}$89	5.26	.26	.57
G	Bromus tectorum (a)	-	$_{b}$168	$_{a}$75	$_{b}$136	8.59	1.02	1.62
G	Koeleria cristata	-	-	-	2	-	-	.15
G	Oryzopsis hymenoides	-	4	1	2	.03	.06	.07
G	Poa bulbosa	$_{a}$-	$_{a}$3	$_{ab}$20	$_{b}$39	.09	.69	1.32
G	Poa pratensis	-	1	1	7	.03	.01	.30
G	Poa secunda	$_{a}$55	$_{b}$105	$_{b}$122	$_{b}$125	1.46	1.46	3.18
Total for Annual Grasses		0	330	119	225	13.85	1.29	2.19
Total for Perennial Grasses		341	335	385	395	8.53	11.94	15.48
Total for Grasses		341	665	504	620	22.39	13.24	17.68
F	Achillea millefolium	6	7	1	9	.16	.03	.07
F	Agoseris glauca	25	26	23	25	.12	.06	.18
F	Alyssum alyssoides (a)	-	$_{b}$183	$_{b}$198	$_{a}$131	.99	.76	.43
F	Arabis sp.	$_{b}$10	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Balsamorhiza sagittata	$_{b}$76	$_{ab}$52	$_{a}$40	$_{a}$31	3.67	4.35	2.85
F	Castilleja linariaefolia	4	-	2	-	-	.03	-
F	Camelina microcarpa (a)	-	$_{a}$12	$_{b}$43	$_{a}$10	.06	.12	.05
F	Calochortus nuttallii	$_{b}$19	$_{a}$-	$_{a}$3	$_{a}$-	-	.00	-
F	Cirsium undulatum	7	4	2	6	.19	.15	.21
F	Collomia linearis (a)	-	-	7	-	-	.01	-
F	Comandra pallida	$_{b}$26	$_{a}$4	$_{a}$2	$_{a}$3	.01	.03	.06
F	Collinsia parviflora (a)	-	$_{a}$9	$_{b}$99	$_{b}$85	.01	.19	.20
F	Crepis acuminata	$_{c}$106	$_{a}$16	$_{ab}$33	$_{b}$55	.19	.54	1.54
F	Delphinium nuttallianum	-	-	2	-	-	.01	-
F	Descurainia pinnata (a)	-	$_{a}$-	$_{b}$13	$_{a}$3	-	.03	.00
F	Draba sp. (a)	-	-	3	-	-	.03	-
F	Epilobium brachycarpum (a)	-	2	-	-	.01	-	-
F	Eriogonum umbellatum	5	-	-	-	-	-	.00
F	Gayophytum ramosissimum(a)	-	-	3	5	-	.01	.03
F	Hackelia patens	7	16	18	11	.19	.19	.14
F	Lappula occidentalis (a)	-	$_{a}$-	$_{b}$25	$_{b}$23	-	.19	.05
F	Lactuca serriola	3	-	3	-	-	.03	-
F	Lomatium sp.	5	-	1	-	-	.00	-
F	Machaeranthera canescens	-	-	-	2	-	.03	.01

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	Microsteris gracilis (a)	-	$_{a}$-	$_{b}$41	$_{b}$59	-	.08	.16
F	Penstemon humilis	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$28	-	.04	.24
F	Penstemon sp.	$_{b}$25	$_{ab}$13	$_{ab}$9	$_{a}$8	.13	.10	.30
F	Petradoria pumila	58	58	50	46	3.01	3.36	2.84
F	Phlox longifolia	$_{c}$28	$_{a}$-	$_{ab}$7	$_{b}$17	-	.02	.08
F	Polygonum douglasii (a)	-	-	-	1	-	-	.00
F	Tragopogon dubius	$_{a}$7	$_{ab}$9	$_{ab}$19	$_{b}$25	.02	.18	.14
F	Veronica biloba (a)	-	10	5	9	.07	.01	.01
F	Zigadenus paniculatus	9	-	5	8	-	.04	.08
Total for Annual Forbs		0	216	437	326	1.15	1.44	0.97
Total for Perennial Forbs		426	205	222	274	7.72	9.22	8.78
Total for Forbs		426	421	659	600	8.87	10.67	9.76

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

BROWSE TRENDS --
Management unit 02 , Study no: 21

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	26	23	27	2.77	2.39	2.18
B	Artemisia tridentata vaseyana	7	5	3	.30	.00	.03
B	Cercocarpus ledifolius	11	11	7	2.38	1.84	1.32
B	Cercocarpus montanus	1	1	0	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	9	12	12	.86	1.38	1.06
B	Eriogonum microthecum	23	23	15	.87	.66	.73
B	Gutierrezia sarothrae	32	44	33	.69	1.74	1.36
B	Mahonia repens	29	35	34	.40	.93	.70
B	Purshia tridentata	4	6	5	.06	.03	.30
B	Symphoricarpos oreophilus	22	19	23	.93	1.10	.86
Total for Browse		164	179	159	9.30	10.11	8.57

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 21

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	2.84
Artemisia tridentata vaseyana	-	.61
Cercocarpus ledifolius	22.00	18.29
Chrysothamnus viscidiflorus viscidiflorus	-	1.11
Eriogonum microthecum	-	.58
Gutierrezia sarothrae	-	2.00
Mahonia repens	-	.66
Purshia tridentata	-	.40
Symphoricarpos oreophilus	-	.43

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 21

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.9	3.1
Cercocarpus ledifolius	4.1	3.0
Purshia tridentata	-	3.1

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 21

Species	Trees per Acre	
	'01	'06
Cercocarpus ledifolius	-	126

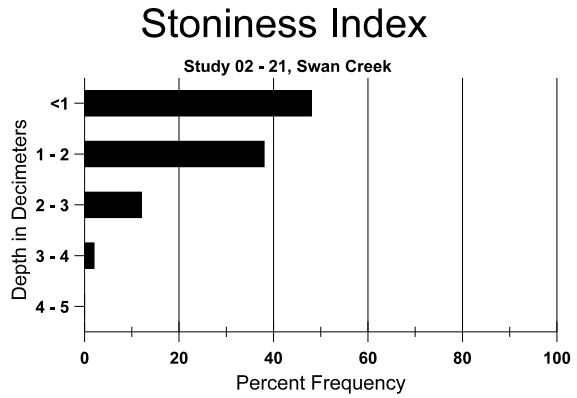
Average diameter (in)	
'01	'06
-	10.1

BASIC COVER --
Management unit 02 , Study no: 21

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	7.50	39.27	33.79	34.61
Rock	21.25	21.62	23.00	28.97
Pavement	3.00	1.18	2.80	2.49
Litter	53.25	48.38	45.56	42.52
Cryptogams	0	.50	.99	.85
Bare Ground	15.00	5.15	9.51	8.11

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 21, Swan Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.3	58.0 (11.9)	7.5	34.6	38.1	27.4	6.6	9.6	230.4	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 21

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Rabbit	2	1	1	-	-
Moose	-	-	1	-	1 (2)
Elk	27	13	34	36 (89)	80 (198)
Deer	32	29	38	47 (116)	56 (137)
Cattle	-	-	1	-	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
90	**865**	66	466	333	66	-	58	12	8	-	4	28/17
96	**840**	-	200	500	140	20	55	17	17	7	10	18/31
01	**1060**	20	400	660	-	-	49	19	0	-	0	18/28
06	**1220**	60	380	780	60	20	33	39	5	2	7	17/29

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
90	**99**	33	-	33	66	-	33	33	67	-	0	26/17
96	**180**	-	40	60	80	280	44	0	44	-	11	10/22
01	**100**	-	-	60	40	160	0	0	40	-	0	16/32
06	**60**	-	-	60	-	80	0	0	0	-	0	12/24
Cercocarpus ledifolius												
90	**166**	33	33	133	-	-	0	20	0	-	0	157/152
96	**280**	-	40	240	-	20	29	36	0	-	0	11/24
01	**220**	-	100	100	20	-	18	27	9	-	0	20/22
06	**380**	80	60	180	140	60	0	11	37	37	37	-/-
Cercocarpus montanus												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	100	-	-	0	36/54
01	**20**	-	-	20	-	-	100	0	-	-	0	32/59
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
90	**66**	-	-	33	33	-	0	50	50	-	0	10/10
96	**300**	-	20	280	-	-	7	0	0	-	0	14/24
01	**500**	-	-	500	-	-	0	0	0	-	0	12/25
06	**440**	-	20	420	-	-	0	0	0	-	36	10/16
Eriogonum microthecum												
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**540**	-	-	460	80	-	7	0	15	4	4	14/19
01	**760**	-	-	760	-	40	0	0	0	-	0	12/16
06	**480**	-	-	480	-	-	0	0	0	-	0	11/17
Gutierrezia sarothrae												
90	**2199**	66	333	1800	66	-	0	0	3	-	2	11/16
96	**1100**	-	100	1000	-	20	0	0	0	-	0	8/10
01	**1600**	20	40	1540	20	20	0	0	1	1	1	10/15
06	**1080**	80	20	960	100	-	0	0	9	4	4	8/14
Mahonia repens												
90	**2900**	-	900	2000	-	-	2	0	-	-	0	4/4
96	**2380**	-	1020	1360	-	-	0	0	-	-	0	5/6
01	**4360**	-	200	4160	-	-	0	0	-	-	0	3/5
06	**5020**	-	-	5020	-	-	0	0	-	-	0	4/4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
90	**133**	-	33	100	-	-	25	0	-	-	0	11/12
96	**80**	-	-	80	-	-	100	0	-	-	0	7/20
01	**120**	-	20	100	-	-	33	33	-	-	0	19/41
06	**100**	-	-	100	-	-	0	80	-	-	0	9/22
Symphoricarpos oreophilus												
90	**932**	66	166	666	100	-	7	0	11	-	14	19/17
96	**600**	-	180	400	20	-	0	0	3	-	0	14/23
01	**600**	-	20	540	40	-	3	0	7	3	3	14/23
06	**620**	-	-	480	140	-	0	0	23	13	42	15/24

Trend Study 2-23-06

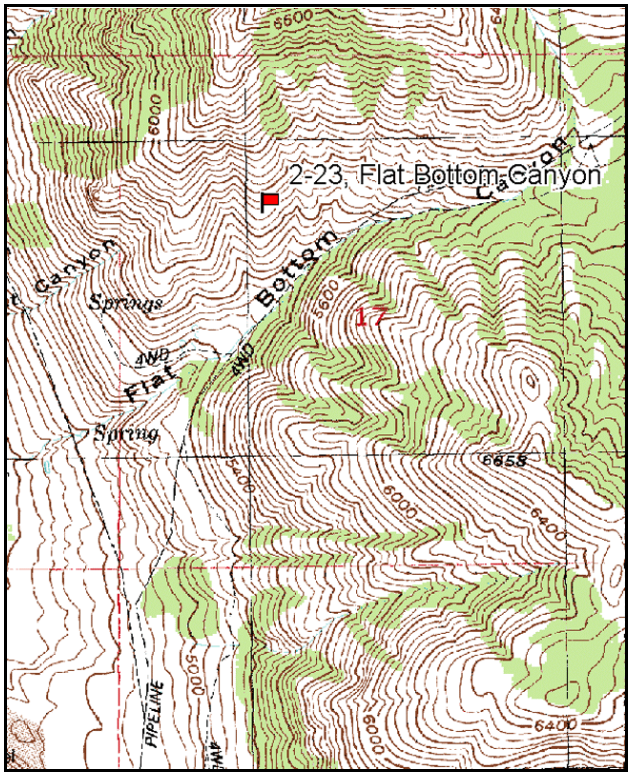
Study site name: Flat Bottom Canyon . Vegetation type: Big Sagebrush .

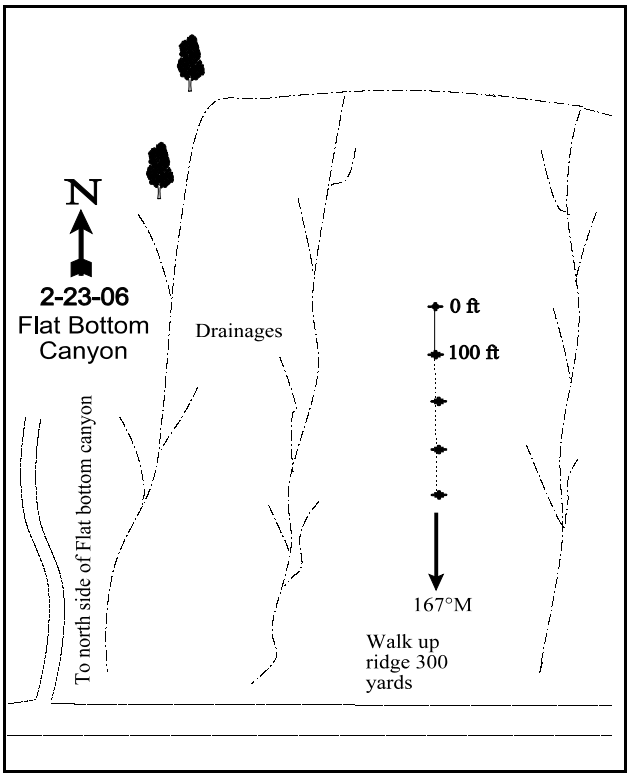
Compass bearing: frequency baseline 167 degrees magnetic.

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

LOCATION DESCRIPTION

Ask for permission and directions to the mouth of the canyon at the Bingham sand and gravel pit. Four-wheel drive is needed. From mouth of canyon proceed to the ridge on north side of canyon where the site is located. Walk up the ridge about 300 yards to the 400-foot stake. The 0-foot baseline stake is further up the ridge. The 0-foot stake is marked with browse tag #7919. This site can be reached by following aqueduct road in Box Elder Canyon and around the bench to Flat Bottom Canyon.





Map Name: Mount Pisgah

Diagrammatic Sketch

Township 9N , Range 1W , Section 17

UTM NAD 27, UTM 12T 4596766 N, 418054 E

DISCUSSION

Flat Bottom Canyon - Trend Study No. 2-23

Study Information

This study is located in Flat Bottom Canyon, which is just east of the Brigham City gravel pit (elevation: 5,600 feet, slope: 50%, aspect: south). Utilized by deer in winter, the study area produces relatively little browse forage. A very shallow soil almost certainly limits plant growth and plant densities on the steep south slopes of the canyon. A pellet group transect read in 2001 estimated 25 deer use days/acre (63 ddu/ha). Most of the pellet groups appeared to be from late spring use. There were more pellet groups near the bottom of the slope where the density of sagebrush was higher. Pellet group data from 2006 was estimated at 15 deer days use/acre (36 ddu/ha).

Soil

Soil is classified in the Foxol series, which have shallow, well drained soils with moderate permeability. The soils formed in residuum from quartzite (USDA-NRCS 2006). The soil is very rocky with a loam texture and a soil reaction that is moderately acidic (pH of 5.9). Effective rooting depth was estimated at only 7 inches in 1996. The potential for severe soil erosion and gully formation on the steep face is inevitable, but is not serious due to the abundance of rock and herbaceous cover. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 3.5:1 in 2006. The erosion condition class was classified as stable in 2001 and slight in 2006.

Browse

This study is dominated by annual grasses and weedy forbs. Browse is a minor component and consists of a low-growing population of mountain big sagebrush. Density has steadily decreased since 1984 at 2,232 plants/acre (half were young plants) to 20 plants/acre in 2006. Utilization was moderate to heavy in 1984 and has displayed moderate use since. Mature plants are short and may be stunted due to the poor site conditions combined with continual use by deer and dry growing conditions. The upper south slopes of the canyon are all depleted of sagebrush. More sagebrush is found near the bottom of the canyon where the soil is deeper.

The only abundant browse species has been broom snakeweed. Snakeweed density steadily increased from 1,065 plants/acre in 1984 to 4,760 by 2001. The population disappeared in 2006 when no plants were sampled.

Herbaceous Understory

Annual grasses and weedy forbs are very abundant, especially lower on the slope. Cheatgrass, rattlesnake brome, and rattail fescue dominated the herbaceous understory in 1996 and 2001 by producing 19% and 13% cover, respectively. In 2006, annual grass cover decreased by 35% and nested frequency decreased 47%. Rattail fescue was very common in 2001, but was not sampled in 2006. Bluebunch wheatgrass, red three-awn, and Sandberg bluegrass are moderately abundant. Bulbous bluegrass was a minor component until 2006, when cover increased from less than 1% in 2001 to 8% in 2006 and quadrat frequency increased from 21% in 2001 to 74% in 2006. Forbs are dominated by pale alyssum, ragweed, and storksbill. Dyer's woad, a noxious weed in the state of Utah, has been on the study since 1984. It decreased significantly from 1996 to 2006 and was only sampled in a single quadrat in 2006.

1990 TREND ASSESSMENT

The many heavily hedged sagebrush encountered in 1984 are now mostly dead. Mature and decadent plants decreased from 1,166 plants/acre in 1984 to 466 plants/acre in 1990. The small remaining sagebrush are vigorous, showing light to moderate use. The low amount of forage produced combined with heavy ant and aphid infestation and aggressive invaders, there appears little chance for reversal of the downward trends. Trend for grasses is up. Perennial grass sum of nested frequency increased by 28%, mostly due to a significant increase in Sandberg bluegrass and purple three-awn. Trend for forbs is stable. Nested frequency for ragweed and Louisiana wormwood both significantly decreased. Both species are native, but ragweed is generally

unpalatable and weedy. Spring parsley was not observed in 1984, but was fairly common in 1990.

browse - down (-2) grasses - up (+2) forbs - stable (0)

1996 TREND ASSESSMENT

The browse trend is down due to a 65% decline in the density of mountain big sagebrush. Currently, there are only 200 sagebrush plants/acre. Mature plants numbered only 60 plants/acre. Drought combined with the low water holding capacity of the rocky soil, high surface temperatures, and competition with winter annuals are eliminating sagebrush from the area. Trend for grasses is down. Perennial grass sum of nested frequency decreased by 44%, mainly due to a significant decrease in Sandberg bluegrass. Annual grasses were included in the sample for the first time and cheatgrass was extremely abundant at 17% cover. Trend for forbs is slightly down. Ragweed was the only species that significantly increased and it is considered weedy and generally unpalatable. The Desirable Components Index rated this study as very poor due to low browse cover, but with fair perennial grass and forb cover. Annual grass cover was very high at 19%.

winter range condition (DC Index) - very poor (9) Mid-level potential scale
browse - down (-2) grasses - down (-2) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is stable. Density of mountain big sagebrush has remained similar at 160 plants/acre, but the population is very small. Utilization is moderate and vigor is normal. Density of rubber rabbitbrush has increased, but the population is small and are mostly unutilized. Density of broom snakeweed increased from 3,240 plants/acre in 1996 to 4,760 plants/acre in 2001, which can be an indicator of disturbance. Trend for grasses is slightly up. Sandberg bluegrass and red three-awn both significantly increased. Bulbous bluegrass significantly increased, but is not abundant. Cheatgrass significantly declined from 17% to 7% cover, while rattail fescue increased from less than 1% to 6% cover. Trend for forbs is slightly down. Ragweed nested frequency significantly declined. Unfortunately, annual forb nested frequency also increased substantially with pale alyssum, storksbill, and *Holosteum umbellatum*. The composition of the herbaceous understory is still poor and will most likely not improve. The Desirable Components Index rated this study as very poor due to low browse cover, but with fair perennial grass and forb cover. Annual grass cover is common, but decreased since 1996.

winter range condition (DC Index) - very poor (18) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - slightly down (-1)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, is down. Mountain big sagebrush is nearly absent from the study area at only 20 plants/acre. Young recruitment has not been observed in since 1996. Broom snakeweed was very common in 2001 at 4,760 plants/acre, but not a single plant was sampled in 2006. Trend for grasses is stable. Perennial grass sum of nested frequency without bulbous bluegrass has remained similar to 2001. Bulbous bluegrass has significantly increased with each reading and cover increased from less than 1% in 2001 to 8% in 2006. Cheatgrass cover and nested frequency have remained similar to the 2001 reading. Rattail fescue decreased from 6% cover in 2001 to 0% in 2006. Trend for forbs is stable. Annual forbs changed very little and once again ragweed nested frequency significantly increased. Yellow salsify decreased significantly and was not sampled at all in 2006. Dyer's woad was only sampled in a single quadrat in 2006. The Desirable Components Index rated this study as very poor due to low browse cover, but with fair perennial grass and forb cover. Annual grass cover is common and has remained similar to 2001.

winter range condition (DC Index) - very poor (28) Mid-level potential scale
browse - down (-2) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 23

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{c}$184	$_{bc}$182	$_{ab}$126	$_{a}$117	$_{a}$125	4.07	4.67	7.17
G	Aristida purpurea	$_{a}$9	$_{b}$38	$_{b}$48	$_{c}$86	$_{c}$85	1.17	2.61	3.64
G	Bromus brizaeformis (a)	-	-	$_{c}$152	$_{b}$70	$_{a}$17	1.00	.20	.04
G	Bromus japonicus (a)	-	-	-	4	-	-	.01	-
G	Bromus tectorum (a)	-	-	$_{b}$387	$_{a}$330	$_{a}$342	16.60	7.41	8.67
G	Festuca myuros (a)	-	-	$_{b}$87	$_{c}$278	$_{a}$-	.91	5.73	-
G	Poa bulbosa	-	-	$_{a}$10	$_{b}$46	$_{c}$213	.02	.75	7.60
G	Poa secunda	$_{b}$162	$_{c}$234	$_{a}$70	$_{b}$184	$_{b}$147	1.00	4.06	1.51
Total for Annual Grasses		0	0	626	682	359	18.51	13.36	8.71
Total for Perennial Grasses		355	454	254	433	570	6.28	12.11	19.94
Total for Grasses		355	454	880	1115	929	24.79	25.48	28.66
F	Achillea millefolium	-	-	2	11	2	.03	.19	.03
F	Agoseris glauca	-	6	10	-	1	.05	-	.00
F	Alyssum alyssoides (a)	-	-	$_{a}$127	$_{c}$296	$_{b}$200	.38	1.07	.52
F	Allium sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$8	-	.00	.01
F	Ambrosia psilostachya	$_{b}$83	$_{a}$13	$_{c}$152	$_{b}$75	$_{c}$123	4.23	1.82	4.83
F	Artemisia ludoviciana	$_{b}$39	$_{a}$10	$_{a}$9	$_{a}$5	$_{a}$10	.22	.06	.07
F	Astragalus convallarius	-	-	-	2	-	-	.00	-
F	Astragalus utahensis	$_{a}$2	$_{a}$1	$_{b}$21	$_{ab}$12	$_{a}$1	.49	.07	.03
F	Balsamorhiza hookeri	-	4	-	-	-	-	-	-
F	Cymopterus sp.	$_{a}$-	$_{c}$33	$_{bc}$24	$_{bc}$21	$_{b}$14	.08	.14	.06
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$37	$_{c}$165	-	.20	.35
F	Epilobium brachycarpum (a)	-	-	6	-	2	.02	-	.00
F	Erodium cicutarium (a)	-	-	$_{a}$140	$_{b}$217	$_{a}$151	1.21	4.96	2.81
F	Erigeron sp.	-	-	2	-	-	.15	-	-
F	Eriogonum umbellatum	-	-	4	2	5	.09	.03	.21
F	Hackelia patens	-	-	-	3	-	-	.00	-
F	Helianthus annuus (a)	-	2	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$21	$_{b}$212	$_{b}$261	.04	.86	.89
F	Isatis tinctoria	$_{ab}$13	$_{ab}$16	$_{b}$25	$_{ab}$14	$_{a}$1	.13	.20	.00
F	Lactuca serriola	-	-	3	-	-	.00	-	-
F	Tragopogon dubius	$_{b}$30	$_{b}$18	$_{b}$33	$_{b}$25	$_{a}$-	.36	.26	-
F	Unknown forb-perennial	1	-	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	-	-	3	-	-	.00
Total for Annual Forbs		0	2	294	762	782	1.66	7.10	4.59

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
Total for Perennial Forbs		168	101	285	170	165	5.86	2.81	5.26
Total for Forbs		168	103	579	932	947	7.53	9.91	9.85

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

BROWSE TRENDS --
Management unit 02 , Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	7	5	1	.18	.03	.03
B	Chrysothamnus nauseosus hololeucus	3	5	0	.53	1.39	-
B	Gutierrezia sarothrae	54	69	0	1.46	4.40	-
B	Opuntia sp.	1	6	2	-	.01	-
Total for Browse		65	85	3	2.17	5.83	0.03

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 23

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	.36

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 21

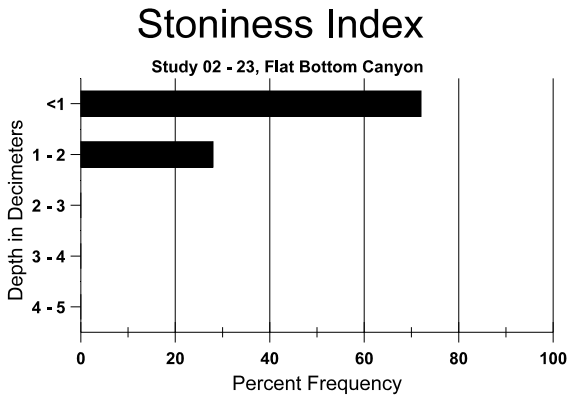
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.6	-

BASIC COVER --
Management unit 02 , Study no: 23

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	9.50	42.44	47.72	43.59
Rock	16.50	18.00	18.50	17.84	22.36
Pavement	18.25	33.25	10.93	19.59	21.03
Litter	40.00	22.50	41.72	19.67	11.59
Cryptogams	6.00	4.25	1.90	2.01	4.81
Bare Ground	17.00	12.50	1.45	6.20	8.23

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 23, Flat Bottom Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
7.1	69.2 (9.0)	5.9	48.2	29.4	22.4	1.8	10.7	140.8	0.3



PELLET GROUP DATA --
Management unit 02 , Study no: 23

Type	Quadrat Frequency		
	'96	'01	'06
Deer	7	5	8

Days use per acre (ha)	
'01	'06
25 (63)	15 (36)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	43/56
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
84	**2232**	33	1066	700	466	-	24	33	21	-	4	6/6
90	**566**	-	100	333	133	-	29	12	23	-	0	8/10
96	**200**	-	140	60	-	40	0	0	0	-	0	13/22
01	**160**	-	-	140	20	40	63	0	13	-	0	13/27
06	**20**	-	-	20	-	40	100	0	0	-	0	14/22
Chrysothamnus nauseosus hololeucus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	40	20	-	-	0	0	0	-	0	32/54
01	**120**	-	20	80	20	-	0	0	17	-	0	31/51
06	**0**	-	-	-	-	-	0	0	0	-	0	24/31
Gutierrezia sarothrae												
84	**1065**	166	66	866	133	-	0	0	12	-	0	9/12
90	**2432**	233	633	1766	33	-	1	0	1	-	1	7/8
96	**3240**	80	960	2020	260	-	0	0	8	-	0	9/13
01	**4760**	-	40	4420	300	80	0	0	6	5	5	8/16
06	**0**	-	-	-	-	-	0	0	0	-	0	10/15
Opuntia sp.												
84	**66**	-	-	66	-	-	0	0	0	-	0	7/11
90	**99**	66	66	-	33	-	0	0	33	-	0	-/-
96	**20**	-	-	20	-	-	0	0	0	-	0	3/10
01	**160**	-	40	100	20	-	0	0	13	-	0	2/8
06	**40**	-	-	40	-	-	0	0	0	-	0	4/10

Trend Study 2-25-06

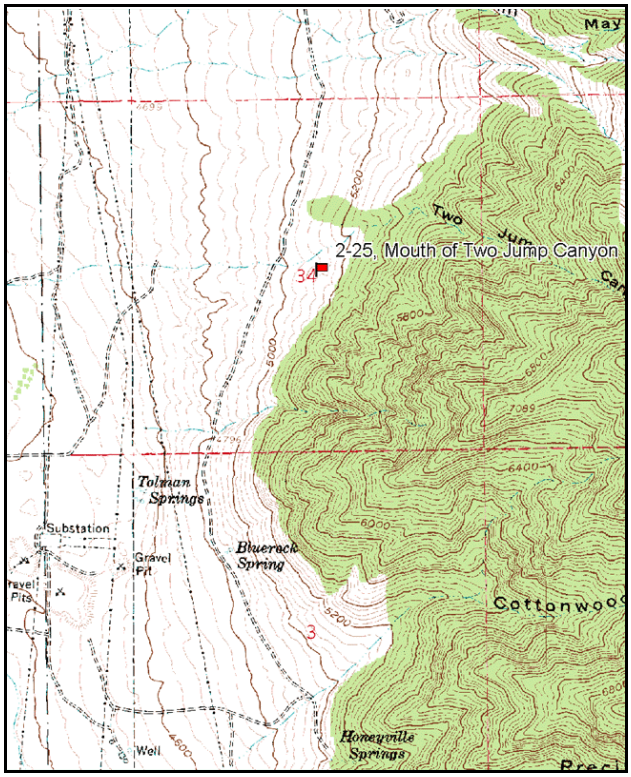
Study site name: Mouth of Two Jump Canyon . Vegetation type: Big Sagebrush .

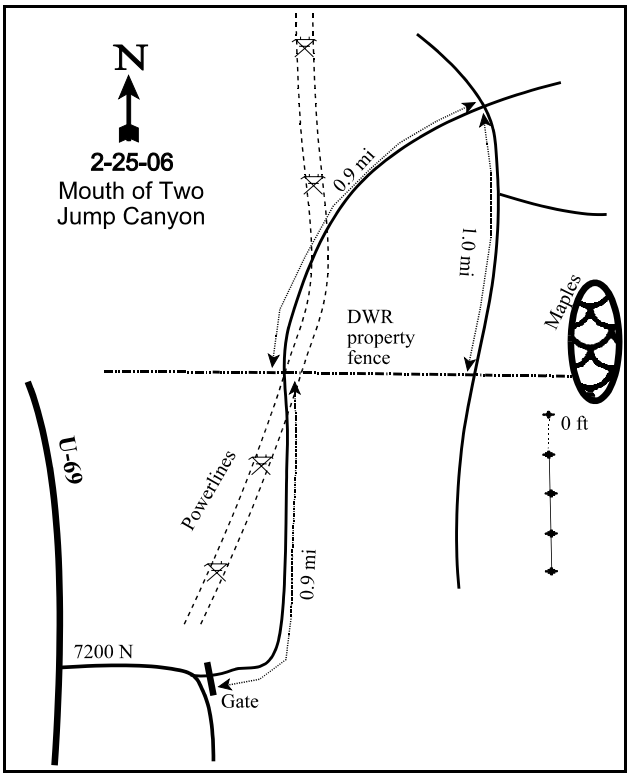
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of 7200 North and U-69 in Honeyville, proceed east and north for 0.55 miles to a gate. Proceed 0.9 miles to the north to a fence. Continue another 0.9 miles and turn right (south) and travel 1.0 mile to a fence running east and west. Walk east along the fence (approximately 200 yards) past one maple stand, and stopping at the second which the fence passes through. From where the fence enters the maples walk 16 paces at 244 degrees magnetic to the 0-foot stake of the baseline marked with browse tag #7923.





Map Name: Honeyville

Diagrammatic Sketch

Township 11N , Range 2W , Section 34

UTM NAD 27, UTM 12T 4611016 N, 412202 E

DISCUSSION

Mouth of Two Jump Canyon - Trend Study No. 2-25

Study Information

This study is located east of Honeyville, just south of Two Jump Canyon (elevation: 5,100 feet, slope: 25-30%, aspect: west). It samples one of the better mountain big sagebrush types in the unit. The area received heavy winter use by deer in 1984 and 1990. Use was lighter in 1996 with pellet group quadrat frequency low at only 7% for deer. A pellet group transect read in 2001 estimated 45 deer and 3 cow days use/acre (111 ddu/ha and 7 cdu/ha). Pellet group data from 2006 was estimated at 29 deer days use/acre (71 ddu/ha).

Soil

Soil is classified in the Sterling series, which is well drained and formed in alluvium, colluvium, and lacustrine deposits derived mainly from limestone and other sedimentary rocks. Sterling soils are on alluvial fans, fan remnants, stream terraces, lake terraces, and hills (USDA-NRCS 2006). Effective rooting depth was estimated at nearly 15 inches. The soil is extremely rocky throughout the profile with a strong calcareous layer at a depth of 6 to 8 inches. Soil texture is a loam with a soil reaction that is moderately alkaline (pH of 7.9). The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was good at 7.7:1 in 2006, which effectively limits erosion. The erosion condition class was determined to be stable in 2001 and 2006.

Browse

Mountain big sagebrush is the key browse species and density was estimated at 2,065 plants/acre in 1984. The density decreased to 1,465 plants/acre in 1990 with 73% of those plants classified as decadent. From 1996 to 2001, the population declined from 1,860 plants/acre in 1996 to 1,460 plants/acre in 2001. Density has remained similar in 2006 with some fluctuation in young recruitment. Seedlings were abundant in 2006 and young recruitment was estimated at 6%, which was a decrease from 23% in 1996 and 15% in 2001. Decadence was high in 1996 and 2001 at 41% and 52%, but decreased to 24% in 2006. Utilization was heavy in 1984 and moderate to heavy in 1990. Since then, use has been light to moderate.

The most numerous shrub is broom snakeweed, which had an estimated density of 5,580 plants/acre in 1996. During the 2001 reading, density of broom snakeweed increased by 25% to 7,460 plants/acre. By 2006, the population decreased to 3,120 plants/acre. A few other shrub species occur rarely in clumps or patches. They include blueberry elder, Rocky Mountain maple, Rocky Mountain smooth sumac, and a few Utah junipers.

Herbaceous Understory

Rattlesnake brome, Japanese brome, and cheatgrass (annual grasses) dominate the herbaceous understory. Combined, they produced nearly 30% cover in 1996, but declined to 17% in 2001 and 10% in 2006. Perennial grasses are represented by moderate amounts of Sandberg bluegrass and bluebunch wheatgrass, which significantly increased in 2006. Bulbous bluegrass is a mat-forming grass and has increased from less than 1% cover in 1996 and 2001 to 7% in 2006. The bulbous bluegrass may be out competing cheatgrass. Forbs are diverse and contain some desirable species which include: arrowleaf balsamroot, paintbrush, Utah sweetvetch, gray lomatium, and sulfur eriogonum.

1990 TREND ASSESSMENT

This study samples an area of suitable winter range, with an adequate amount of browse forage production. The mountain big sagebrush plants are generally moderately hedged and have fair vigor. Seventy-three percent of the population was classified as decadent, and sagebrush decreased in density. Snakeweed is abundant in the understory and its density increased three-fold. The browse trend is considered down. Trend for grasses is up. Perennial grass sum of nested frequency increased almost three-fold, mainly due to a significant increase in Sandberg bluegrass. Trend for forbs is up. Perennial forb sum of nested frequency doubled mainly due to an increase in gray lomatium and arrowleaf balsamroot. Composition was also greater in 1990 with 19 species compared to only 10 in 1984.

browse - down (-2) grasses - up (+2) forbs - up (+2)

1996 TREND ASSESSMENT

Trend for the key browse, mountain big sagebrush, is slightly up. Utilization is lighter, vigor is improved, decadence decreased from 73% to 41%, and recruitment has improved. Sagebrush density was higher, but this may be due to the increased sample size utilized since 1992. The high proportion of dead plants coupled with the decline in decadence suggests that the sagebrush population is in a process of changing from an old, mature population to a younger more vigorous one. If reproduction remains good in the future and utilization remains light to moderate, the sagebrush stand will be able to maintain itself. One negative aspect of the browse trend is the abundance and dynamic reproductive potential of broom snakeweed. Trend for grasses is stable. All species remained similar to previous reading. Annual grasses were included in the sample for the first time and they are abundant averaging 27% cover. Trend for forbs is stable. Perennial frobs remained similar to previous readings, except for gray lomatium, which significantly declined. The Desirable Components Index rated this study as poor due to moderate browse cover and fair perennial grass and forb cover. Annual grass cover is high and negatively affects the score.

winter range condition (DC Index) - poor (39) Mid-level potential scale
browse - slightly up (+1) grasses - stable (0) forbs - stable (0)

2001 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush, is down and appears to be suffering the effects of drought. Density has declined slightly while utilization is mostly light. Decadence has increased from 41% to 52%. Twenty-one percent of the population sampled were classified as dying. Reproduction is still good with 15% of the population consisting of young plants. Seedlings are also moderately abundant. Drought conditions also appear to be effecting the broom snakeweed population. Its density has increased 25% since 1996 to 7,460 plants/acre, but 16% of the plants sampled are chlorotic or have partial crown death. The population is now mostly mature. Trend for grasses is up. Perennial grass sum of nested frequency increased by 50%, mostly due to an increase in Sandberg bluegrass. Annuals grasses also decreased. Cheatgrass, rattlesnake brome, and rattail fescue nested frequencies all decreased significantly and annual grass cover decreased from 27% to 17%. Cheatgrass quadrat frequency is still high at 95% and is still a fire hazard. Trend for forbs is up. Perennial forb sum of nested frequency increased by 65%, mainly due to an increased yellow salsify and wild onion. Annual forb nested frequency also increased nearly three-fold, but cover is less than 2%. The Desirable Components Index rated this study as very poor due to a decrease in browse cover with high decadence, but still has fair perennial grass and forb cover. Annual grass cover decreased, but is still high and is negatively affecting the score.

winter range condition (DC Index) - very poor (33) Mid-level potential scale
browse - down (-2) grasses - up (+2) forbs - up (+2)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, is stable. Density of mature and decadent plants remained the same at 1,240 plants/acre. The young population was not as abundant in 2006 compared to 2001, but seedling production was very good. Decadence decreased from a high of 52% in 2001 to 24% in 2006, which is the lowest it has ever been during all 5 sample years. Broom snakeweed density also decreased from 7,460 plants/acre in 2001 to 3,120 plants/acre in 2006. Trend for grasses is slightly up. Bluebunch wheatgrass nested frequency increased significantly and cover increased from 2% in 2001 to 6% in 2006. Sandberg bluegrass nested frequency decreased significantly, while bulbous bluegrass increased significantly. Cover of bulbous bluegrass increased from less than 1% to 7%. Cheatgrass nested frequency decreased significantly again and cover declined from 15% to 7%, but cheatgrass is still widely distributed across the site. Trend for forbs is stable. Perennial forb sum of nested frequency remained similar to values in 2001. The Desirable Components Index rated this study as poor due to moderate browse cover with fair perennial grass and forb cover. Annual

grass cover decreased, but is still moderate and is negatively affecting the score.

winter range condition (DC Index) - poor (40) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 25

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a43	a65	a39	a43	b98	3.73	2.10	6.35
G	Bromus brizaeformis (a)	-	-	c267	a174	b219	4.28	1.18	2.80
G	Bromus japonicus (a)	-	-	67	72	49	1.12	.83	.71
G	Bromus tectorum (a)	-	-	c373	b334	a263	20.85	15.16	6.76
G	Festuca myuros (a)	-	-	c47	a-	b8	1.13	-	.07
G	Koeleria cristata	-	-	5	6	-	.09	.15	-
G	Poa bulbosa	a-	a-	ab6	b26	c161	.04	.24	6.85
G	Poa fendleriana	-	-	-	-	3	-	-	.03
G	Poa secunda	a24	b100	b136	c208	b105	4.36	6.32	2.19
Total for Annual Grasses		0	0	754	580	539	27.40	17.17	10.36
Total for Perennial Grasses		67	165	186	283	367	8.22	8.83	15.43
Total for Grasses		67	165	940	863	906	35.63	26.00	25.80
F	Achillea millefolium	12	16	11	8	11	.33	.06	.24
F	Agoseris glauca	-	-	-	-	3	-	-	.00
F	Alyssum alyssoides (a)	-	-	a152	b260	a171	1.00	1.56	.32
F	Allium sp.	a-	a2	a7	b73	a12	.07	.20	.06
F	Ambrosia psilostachya	27	39	31	33	56	.62	.38	1.66
F	Apocynum androsaemifolium pumilum	a-	b10	a-	b15	b14	-	.18	.43
F	Arabis sp.	-	1	1	-	-	.00	-	-
F	Arenaria fendleri	-	-	-	2	-	-	.03	-
F	Artemisia ludoviciana	22	24	16	29	28	.52	.38	1.39
F	Astragalus sp.	1	-	5	3	-	.04	.03	-
F	Astragalus utahensis	-	-	5	6	6	.18	.45	.30
F	Balsamorhiza sagittata	a33	b73	b64	b67	ab57	5.22	4.31	6.48
F	Castilleja linariaefolia	-	-	3	-	-	.03	-	-
F	Calochortus nuttallii	-	-	-	5	3	-	.01	.00
F	Cirsium undulatum	a-	ab1	ab1	ab4	b11	.04	.06	.54
F	Comandra pallida	a-	a2	a6	a6	b29	.09	.04	.37
F	Cryptantha sp.	a-	ab5	ab3	ab3	b8	.03	.00	.29
F	Cymopterus sp.	-	-	-	-	5	-	-	.30

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$48	$_{b}$32	-	.14	.05
F	Epilobium brachycarpum (a)	-	-	1	3	13	.00	.00	.05
F	Erodium cicutarium (a)	-	-	2	-	-	.06	-	-
F	Eriogonum umbellatum	$_{a}$5	$_{a}$6	$_{ab}$16	$_{b}$25	$_{ab}$16	.40	.15	.54
F	Gilia sp. (a)	-	-	-	4	-	-	.00	-
F	Hackelia patens	$_{a}$-	$_{b}$18	$_{ab}$11	$_{a}$3	$_{a}$2	.25	.00	.01
F	Hedysarum boreale	$_{a}$-	$_{b}$12	$_{a}$-	$_{ab}$1	$_{ab}$8	.06	.15	.48
F	Holosteum umbellatum (a)	-	-	$_{a}$17	$_{c}$113	$_{b}$65	.03	.22	.16
F	Lactuca serriola	-	-	1	-	4	.00	-	.01
F	Lithospermum ruderale	$_{ab}$4	$_{ab}$4	$_{b}$19	$_{ab}$22	$_{a}$4	.64	.70	.36
F	Lomatium grayi	$_{a}$-	$_{c}$64	$_{ab}$8	$_{b}$21	$_{c}$49	.07	.58	.73
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$12	-	.00	.37
F	Machaeranthera grindelioides	-	-	-	2	-	-	.00	-
F	Melilotus officinalis	-	-	-	-	5	-	-	.03
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$12	$_{b}$18	-	.04	.04
F	Penstemon sp.	$_{b}$7	$_{ab}$1	$_{a}$-	$_{ab}$3	$_{a}$-	.00	.00	-
F	Petradoria pumila	-	-	-	-	2	-	-	.00
F	Phacelia sp.	$_{c}$32	$_{b}$3	$_{b}$7	$_{a}$-	$_{a}$-	.12	-	-
F	Phlox longifolia	-	6	2	4	4	.03	.06	.04
F	Polygonum douglasii (a)	-	-	2	-	3	.00	-	.00
F	Ranunculus testiculatus (a)	-	-	-	2	-	-	.00	-
F	Tragopogon dubius	$_{a}$1	$_{a}$7	$_{a}$7	$_{b}$34	$_{b}$51	.10	.49	.62
F	Veronica biloba (a)	-	-	-	-	8	-	-	.01
F	Zigadenus paniculatus	-	-	-	-	1	-	-	.00
Total for Annual Forbs		0	0	174	442	310	1.10	1.99	0.65
Total for Perennial Forbs		144	294	224	371	401	8.90	8.33	15.32
Total for Forbs		144	294	398	813	711	10.01	10.32	15.97

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

BROWSE TRENDS --
Management unit 02 , Study no: 25

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	63	55	49	12.42	7.53	6.60
B	Eriogonum microthecum	1	0	0	-	-	-
B	Gutierrezia sarothrae	75	83	57	3.33	4.02	1.79
B	Purshia tridentata	0	0	3	-	-	.78
B	Rhus glabra cismontana	0	0	0	1.37	-	-
Total for Browse		139	138	109	17.13	11.56	9.18

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 25

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	10.26
Gutierrezia sarothrae	2.65

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 25

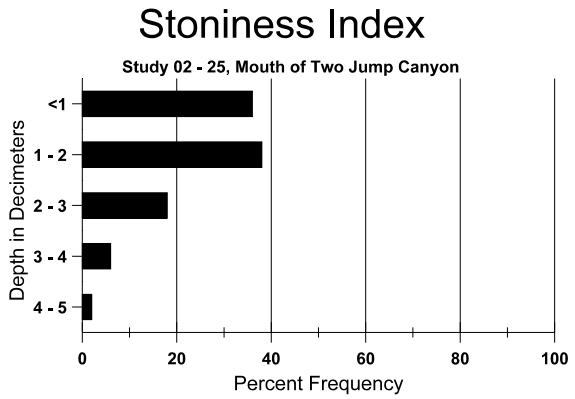
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.3	1.8

BASIC COVER --
Management unit 02 , Study no: 25

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.50	7.00	56.31	56.03	50.77
Rock	18.00	16.75	14.04	12.02	12.39
Pavement	21.25	13.75	3.66	3.74	4.63
Litter	57.50	55.75	65.69	49.71	43.88
Cryptogams	.50	.25	.70	.48	.93
Bare Ground	1.25	6.50	.44	.28	4.53

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 25, Mouth of Two Jump Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.8	73.4 (14.7)	7.9	43.4	33.4	23.3	3.5	13.3	70.4	0.6



PELLET GROUP DATA --
Management unit 02 , Study no: 25

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	6	18
Elk	-	-	4
Deer	7	14	12
Cattle	2	-	1

Days use per acre (ha)	
'01	'06
-	-
1 (3)	-
45 (111)	29 (71)
3 (7)	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 25

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**2065**	266	66	1466	533	-	23	77	26	.96	6	42/43
90	**1465**	66	66	333	1066	-	41	23	73	10	45	27/33
96	**1860**	200	340	760	760	960	32	2	41	13	15	27/41
01	**1460**	100	220	480	760	940	12	0	52	21	21	26/35
06	**1320**	840	80	920	320	1040	5	0	24	9	17	28/41

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	18/22
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	9/20
Gutierrezia sarothrae												
84	**3066**	-	-	3066	-	-	0	0	0	-	0	13/10
90	**9665**	66	5333	3866	466	-	0	0	5	.62	2	11/12
96	**5580**	3820	1380	4200	-	-	0	0	0	-	0	11/14
01	**7460**	20	40	6580	840	160	0	0	11	1	16	11/13
06	**3120**	100	240	2600	280	40	10	6	9	3	3	9/12
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**80**	-	-	80	-	-	100	0	-	-	0	32/72
Rhus glabra cismontana												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	420	-	-	-	-	0	0	-	-	0	70/107
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 2-27-06

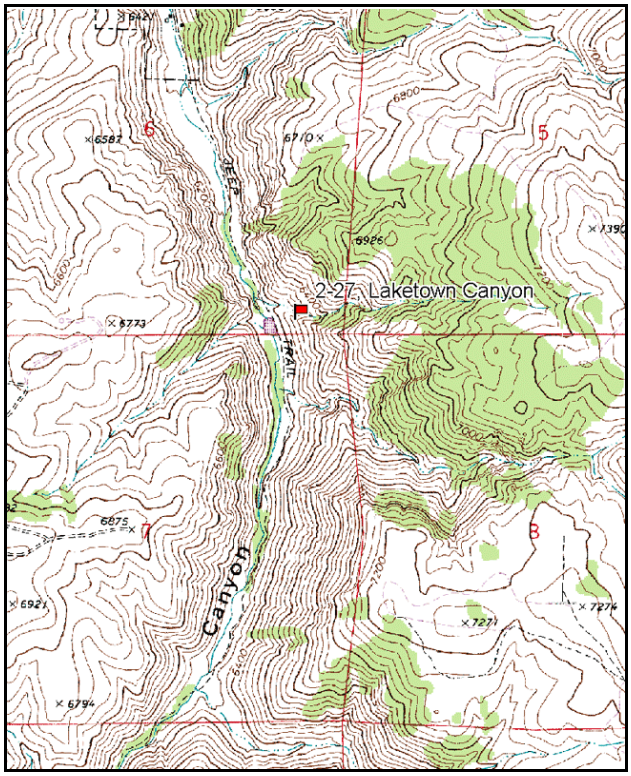
Study site name: Laketown Canyon . Vegetation type: Mountain Mahogany .

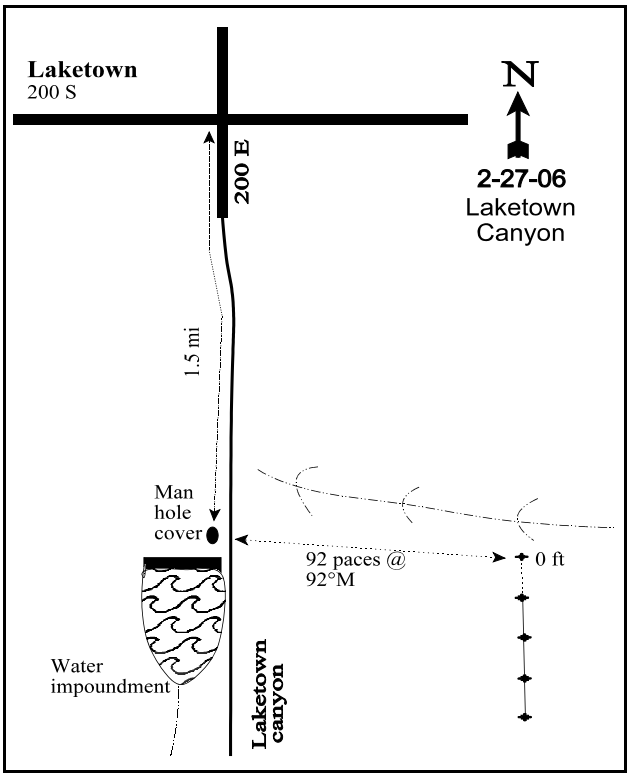
Compass bearing: frequency baseline 162 degrees magnetic.

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

LOCATION DESCRIPTION

From 200 East 200 South in Laketown, proceed south into Laketown Canyon 1.5 miles stopping at a stockpond dam. Walk to the manhole cover on the northeast corner of the dam. Take an azimuth of 92 degrees magnetic and walk 92 paces up the ridge to the 0-foot baseline stake. The 0-foot stake is marked with browse tag #7937.





Map Name: Laketown

Diagrammatic Sketch

Township 12N , Range 6E , Section 7

UTM NAD 27, UTM 12T 4627657 N, 474653 E

DISCUSSION

Laketown Canyon - Trend Study No. 2-27

Study Information

This study is located south of Bear Lake in Laketown Canyon on land administered by the BLM. It samples a mountain mahogany deer winter range (elevation: 6,300 feet, slope: 50-55%, aspect: west). Although elk are known to inhabit this general area, elk pellet groups have not been sampled at the study. In 1984, deer and domestic sheep pellet groups, tracks, and other signs were very common. Deer pellet groups were not very abundant in 1996 with a quadrat frequency of only 9%. A pellet group transect read in 2001 estimated 42 deer days use/acre (103 ddu/ha). A few moose pellet groups were seen near the study, but were not encountered within the pellet group transect. Cattle sign occurs at the bottom of the slope around a nearby stock pond, but not on the steep slopes. Pellet group data from 2006 was estimated at 5 deer, 2 moose, and 5 cow days use/acre (12 ddu/ha, 5 mdu/ha, and 13 cdu/ha).

Soil

Soil is classified within the Lundy series. Soils are excessively drained and moderately permeable to water. Formed residually or colluvially from limestone and shale, these soils normally possess only a 16 inch profile before fractured limestone bedrock is encountered. Strongly calcareous and moderately alkaline (pH of 7.6), the Lundy soil usually drys completely in mid-summer. Erosion is moderate to high (Campbell and Lacey 1982; USDA-NRCS 2006). Soil has a loam texture with an effective rooting depth estimated at just under 12 inches. Some bare ground is exposed mainly along trails that follow the contour. There is some erosion occurring due to the steep slope, but it does not appear to be excessive. Soil movement consists primarily of pedestalled soil on the uphill side of shrubs. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 3.4:1 in 2006. The erosion condition class was determined to be slight in 2001 and 2006.

Browse

Browse composition includes several co-dominant shrubs of which the most important are black sagebrush, true mountain mahogany, and mountain big sagebrush. Black sagebrush is the most abundant preferred species with a density of 1,460 plants/acre in 1996. Density has slowly declined since 1996 to 1,160 plants/acre in 2001 and 880 plants/acre in 2006. Utilization is mostly light and decadence was high in 1984 and 1990 at 67% and 94%, respectively. In 1996, 34% of the population was classified as decadent, which then declined to 19% in 2001, but was back up to 36% in 2006. Mountain big sagebrush occurs in scattered clumps where the soil is significantly deeper. These shrubs were moderately hedged with 80% showing poor vigor in 1996. Decadence was high in 1984, 1990, and 1996, ranging from 70% to 100%. Decadence declined in 2001 and 2006 from 20% to 0%, but the population has decreased as well, from 100 plants/acre in 2001 to 60 plants/acre in 2006. No reproduction was noted in readings before 2001 and dead plants outnumbered living ones.

True mountain mahogany numbered only 180 plants/acre in 2006, which is down from 240 plants/acre in 2001. The average mature shrub has measured 3-4 feet in height, but some plants are tall enough to be partly unavailable. Utilization was extremely heavy in 1984, when 92% of the population was heavily hedged. Since then, utilization has been mostly moderate. Annual leader growth averaged only 2.2 inches in 2001 and 3.6 inches in 2006.

Less desirable shrubs include: green rubber rabbitbrush, stickyleaf low rabbitbrush, broom snakeweed, gray horsebrush, snowberry, and Utah juniper. Point-center quarter data from 1996 estimated 40 juniper trees/acre with an average diameter of 6 inches. Broom snakeweed was the most abundant shrub in 2006 with a density of 1,520 plants/acre.

Herbaceous Understory

Herbaceous understory plants are composed of cheatgrass intermixed with Sandberg bluegrass, bluebunch

wheatgrass, and Indian ricegrass. Cheatgrass averaged 9% cover in 1996 and 5-6% in 2001 and 2006. Bluebunch wheatgrass has been increasing in abundance since 1984 and has averaged about 7% since 1996. Forbs occur infrequently and only produce about 2% total cover.

1990 TREND ASSESSMENT

The key browse species, black sagebrush and mountain big sagebrush, display downward trends because of lack of reproduction and severely hedged growth forms. The density of both populations decreased by 60% or greater in 1990. The number of true mountain mahogany remains low. The mahogany population declined 31%, while 44% of the population was classified as decadent. Broom snakeweed remains the most common species, although it did decrease by 58%. Trend for grasses is up, due to a 62% increase in the sum of nested frequency for perennial grasses. Sandberg bluegrass increased significantly in nested frequency. Trend for forbs is slightly down. Forbs are rare, but yellow salsify and lobeleaf groundsel both decreased significantly.

browse - down (-2) grasses - up (+2) forbs - slightly down (-1)

1996 TREND ASSESSMENT

Trend for browse is stable for true mountain mahogany and black sagebrush, but declining for mountain big sagebrush. Mountain big sagebrush has no reproduction and only moderate use, yet shows poor vigor and high decadence. Without some recruitment, mountain big sagebrush will eventually die out. However, it is only a minor component in the browse composition as it only makes up 2% of the browse cover. Black sagebrush is lightly utilized with similar vigor as noted in 1990, yet decadence has declined from 94% to 34%. The density change between 1990 and 1996 may be partly due to the larger sample used in 1996, which effectively tripled the sample size. There are high numbers of dead plants for both sagebrush species. Trend for grasses is slightly up due to a significant increase in bluebunch wheatgrass. Annual grasses were included in the sample for the first time and they are abundant with 9% cover. Trend for forbs is up even though they are not very abundant. Perennial forbs sum of nested frequency tripled due to a significant increases in cryptantha, low pentstemon, and lobeleaf groundsel. The Desirable Components Index rated this study as poor due to low browse cover, but with good perennial grass cover. Annual grass cover is moderate and is negatively affecting the score.

winter range condition (DC Index) - poor (41) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - up (+2)

2001 TREND ASSESSMENT

Trend for the key browse species, black sagebrush and true mountain mahogany, appear to be stable. Density of mountain mahogany remained similar to 1996 estimates, but black sagebrush declined from 1,460 plants/acre in 1996 to 1,160 plants/acre in 2001. Utilization is somewhat heavier on black sagebrush, but lighter on mahogany. Average vigor has improved on black sagebrush, while decadence has declined from 34% to 19%. Vigor of true mountain mahogany remains normal and there are no decadent plants. Mountain big sagebrush offers some additional preferred winter forage, however, it occurs in low densities (100 plants/acre), which has declined 50% since 1996. The drop in density comes entirely from the decadent age class. The remaining population is lightly browsed, shows improved vigor, and a decrease in decadence from 70% in 1996 to 20% in 2001. The shallow soil depth is a marginal site for mountain big sagebrush, especially during a drought year. Trend for grasses is stable. Sandberg bluegrass declined significantly. Cheatgrass also declined significantly and percent cover decreased from 9% to 5%. Trend for forbs is slightly down due to a significant decrease in lobeleaf groundsel. Forbs are still very minimal. The Desirable Components Index rated this study as very poor due to low browse cover, but has good perennial grass cover. Annual grass cover is moderate and is negatively affecting the score.

winter range condition (DC Index) - very poor (34) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - slightly down (-1)

2006 TREND ASSESSMENT

Trend for key browse, black sagebrush and mountain mahogany, is down. Black sagebrush density decreased by 24%, from 1,160 plants/acre in 2001 to 880 plants/acre in 2006. The percentage of decadent sagebrush plants in the population increased from 19% to 36%. The very small mountain big sagebrush population continues to decline as well. Mountain mahogany density declined from 240 plants/acre in 2001 to 180 plants/acre in 2006. Utilization also increased, with 44% displaying heavy use. Trend for grasses is stable. Perennial grass sum of nested frequency and cover remained similar to 2001. Cheatgrass nested frequency increased significantly back to values similar to those from the 1996 reading, although cover remained at 5%. Trend for forbs is stable. Forbs are limited and have changed very little. The Desirable Components Index rated this study as very poor due to low browse cover, but perennial grass cover was good. Annual grass cover is moderate and negatively affected the score.

winter range condition (DC Index) - very poor (37) Mid-level potential scale
browse - down (-2) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 27

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{a}$30	$_{a}$37	$_{b}$80	$_{bc}$111	$_{c}$122	6.01	7.86	6.53
G	Bromus brizaeformis (a)	-	-	$_{a}$9	$_{b}$32	$_{b}$36	.04	.67	.20
G	Bromus japonicus (a)	-	-	$_{a}$3	$_{a}$4	$_{b}$31	.00	.00	.06
G	Bromus tectorum (a)	-	-	$_{c}$315	$_{a}$163	$_{b}$245	8.50	5.09	4.66
G	Carex sp.	-	-	-	4	-	-	.03	-
G	Koeleria cristata	-	-	2	4	1	.06	.03	.15
G	Oryzopsis hymenoides	37	40	40	56	28	2.66	3.91	2.05
G	Poa secunda	$_{a}$136	$_{c}$270	$_{c}$276	$_{b}$182	$_{c}$243	6.79	1.93	5.61
G	Stipa comata	$_{a}$13	$_{a}$3	$_{ab}$21	$_{b}$30	$_{ab}$15	.85	1.02	.42
Total for Annual Grasses		0	0	327	199	312	8.54	5.77	4.92
Total for Perennial Grasses		216	350	419	387	409	16.38	14.81	14.77
Total for Grasses		216	350	746	586	721	24.93	20.58	19.70
F	Agoseris glauca	-	-	-	-	2	-	-	.01
F	Alyssum alyssoides (a)	-	-	$_{a}$28	$_{a}$49	$_{b}$88	.10	.11	.19
F	Arabis sp.	$_{ab}$4	$_{a}$-	$_{ab}$4	$_{ab}$6	$_{b}$11	.01	.01	.02
F	Artemisia ludoviciana	-	-	-	-	4	-	-	.00
F	Astragalus convallarius	-	-	3	-	-	.01	-	.06
F	Balsamorhiza sagittata	-	-	-	-	-	-	-	.03
F	Camelina microcarpa (a)	-	-	1	4	2	.00	.07	.00
F	Calochortus nuttallii	-	-	-	1	-	-	.00	-
F	Chaenactis douglasii	3	3	4	-	1	.01	-	.00
F	Cirsium undulatum	$_{b}$19	$_{ab}$5	$_{a}$4	$_{a}$-	$_{a}$2	.06	-	.03
F	Crepis acuminata	-	-	-	6	2	-	.06	.18

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Cryptantha sp.	$_{a}$4	$_{ab}$15	$_{c}$44	$_{bc}$49	$_{bc}$41	.93	1.55	.50
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{b}$8	$_{b}$13	-	.02	.02
F	Draba sp. (a)	-	-	-	3	5	-	.01	.01
F	Epilobium brachycarpum (a)	-	-	$_{ab}$8	$_{a}$-	$_{b}$11	.02	-	.17
F	Eriogonum umbellatum	-	-	-	2	-	-	.00	-
F	Hackelia patens	$_{a}$-	$_{b}$17	$_{b}$12	$_{b}$10	$_{b}$11	.14	.02	.43
F	Holosteum umbellatum (a)	-	-	-	-	1	-	-	.00
F	Lappula occidentalis (a)	-	-	-	9	3	-	.04	.00
F	Machaeranthera grindelioides	-	-	3	3	-	.03	.03	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{a}$1	$_{b}$21	-	.00	.05
F	Penstemon humilis	$_{a}$-	$_{a}$-	$_{b}$15	$_{ab}$8	$_{a}$6	.27	.01	.27
F	Phlox hoodii	-	-	4	7	9	.04	.06	.19
F	Ranunculus testiculatus (a)	-	-	-	-	3	-	-	.00
F	Senecio multilobatus	$_{b}$12	$_{a}$-	$_{bc}$28	$_{a}$-	$_{ab}$4	.18	-	.06
F	Tragopogon dubius	$_{b}$14	$_{a}$-	$_{ab}$1	$_{a}$-	$_{ab}$4	.00	-	.07
F	Verbascum thapsus	$_{ab}$8	$_{a}$-	$_{b}$10	$_{ab}$1	$_{ab}$3	.10	.03	.15
Total for Annual Forbs		0	0	37	74	147	0.12	0.26	0.48
Total for Perennial Forbs		64	40	132	93	100	1.81	1.80	2.03
Total for Forbs		64	40	169	167	247	1.94	2.06	2.51

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

BROWSE TRENDS --
Management unit 02 , Study no: 27

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	30	28	21	3.37	2.23	1.68
B	Artemisia tridentata vaseyana	9	5	3	.18	-	.63
B	Cercocarpus montanus	8	8	9	1.20	1.36	2.07
B	Chrysothamnus nauseosus consimilis	19	14	19	3.09	3.56	3.62
B	Chrysothamnus viscidiflorus viscidiflorus	12	12	10	.72	.49	.73
B	Eriogonum microthecum	0	1	2	.00	-	.03
B	Gutierrezia sarothrae	57	53	45	1.58	2.03	1.24
B	Juniperus osteosperma	1	1	1	.00	-	-
B	Symphoricarpos oreophilus	2	2	2	-	.06	.53
B	Tetradymia canescens	10	8	9	.39	.48	1.37
Total for Browse		148	132	121	10.56	10.23	11.92

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 27

Species	Percent Cover '06
Artemisia nova	3.79
Artemisia tridentata vaseyana	.38
Cercocarpus montanus	3.68
Chrysothamnus nauseosus consimilis	3.93
Chrysothamnus viscidiflorus viscidiflorus	.85
Gutierrezia sarothrae	1.23
Juniperus osteosperma	.20
Symphoricarpos oreophilus	1.41
Tetradymia canescens	.26

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 27

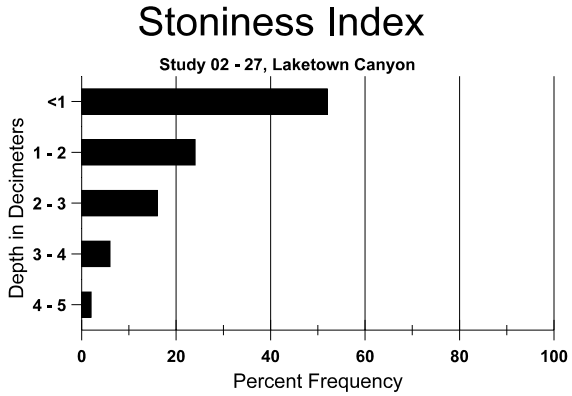
Species	Average leader growth (in)	
	'01	'06
Cercocarpus montanus	2.2	3.6

BASIC COVER --
Management unit 02 , Study no: 27

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.75	9.50	37.45	34.99	39.90
Rock	33.25	30.75	26.56	24.75	25.67
Pavement	7.00	11.25	6.03	8.76	8.51
Litter	38.00	25.25	30.82	32.23	24.31
Cryptogams	13.75	10.75	2.84	2.50	2.57
Bare Ground	5.25	12.50	7.39	14.36	14.98

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 27, Laketown Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.8	58.0 (11.9)	7.6	39.2	37.4	23.4	2.4	5.6	153.6	0.8



PELLET GROUP DATA --
Management unit 02 , Study no: 27

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	6	-	4
Moose	-	-	2
Elk	1	-	-
Deer	9	5	4
Cattle	-	-	2

Days use per acre (ha)	
'01	'06
-	-
-	2 (4)
-	-
42 (103)	5 (12)
-	5 (13)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 27

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**1299**	233	100	333	866	-	5	95	67	-	0	7/8
90	**599**	33	-	33	566	-	44	0	94	10	17	10/16
96	**1460**	20	40	920	500	360	3	0	34	14	16	15/28
01	**1160**	20	60	880	220	320	16	2	19	5	5	11/19
06	**880**	60	20	540	320	200	30	0	36	9	14	15/29
Artemisia tridentata vaseyana												
84	**299**	-	-	33	266	-	22	78	89	13	33	16/18
90	**33**	-	-	-	33	-	0	0	100	-	0	-/-
96	**200**	-	-	60	140	480	50	20	70	10	80	18/31
01	**100**	-	20	60	20	300	0	0	20	20	20	31/37
06	**60**	20	-	60	-	120	0	0	0	-	33	27/39
Cercocarpus ledifolius												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	40/43
06	**0**	-	-	-	-	-	0	0	-	-	0	40/56
Cercocarpus montanus												
84	**433**	333	100	333	-	-	8	92	0	-	0	48/59
90	**299**	-	-	166	133	-	71	0	44	-	0	40/45
96	**200**	-	40	160	-	40	80	20	0	-	0	38/56
01	**240**	-	-	240	-	-	67	0	0	-	0	51/72
06	**180**	20	-	180	-	20	22	44	0	-	0	45/68
Chrysothamnus nauseosus consimilis												
84	**332**	-	66	-	266	-	70	0	80	-	0	-/-
90	**399**	-	-	333	66	-	0	0	17	-	0	32/26
96	**620**	-	20	500	100	-	0	0	16	-	23	26/41
01	**420**	-	-	260	160	-	0	0	38	-	0	30/48
06	**520**	-	40	220	260	40	23	0	50	19	19	25/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	31/34
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
84	**500**	-	200	300	-	-	0	0	0	-	0	13/27
90	**200**	-	-	200	-	-	0	0	0	-	0	10/14
96	**400**	-	20	320	60	20	0	0	15	-	15	14/22
01	**340**	-	-	200	140	20	6	0	41	-	0	15/20
06	**220**	-	20	140	60	20	9	0	27	18	36	13/24
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**20**	-	-	-	20	-	0	0	100	-	0	-/-
06	**40**	-	-	40	-	-	50	50	0	-	0	13/24
Gutierrezia sarothrae												
84	**4766**	-	2100	2666	-	-	0	0	0	-	0	8/9
90	**1999**	733	1166	500	333	-	0	0	17	2	4	13/12
96	**3420**	100	680	2740	-	-	0	0	0	-	0	10/11
01	**3180**	-	20	3140	20	-	0	0	1	-	0	8/12
06	**1520**	20	140	1120	260	580	1	0	17	7	7	8/12
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	20	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	20	0	0	-	-	0	-/-
Leptodactylon pungens												
84	**66**	-	-	66	-	-	0	0	-	-	0	4/4
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ribes sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	30/35
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**80**	-	40	40	-	-	50	0	0	-	100	17/28
01	**40**	-	-	20	20	20	0	0	50	-	0	11/13
06	**140**	-	20	100	20	-	0	0	14	-	0	35/50
Tetradymia canescens												
84	**66**	-	33	33	-	-	0	0	0	-	0	9/10
90	**100**	-	-	100	-	-	0	0	0	-	0	7/7
96	**280**	-	20	220	40	-	0	0	14	-	50	11/20
01	**300**	20	-	100	200	-	0	0	67	-	0	10/17
06	**300**	-	60	160	80	20	33	7	27	7	7	10/17

Trend Study 2-28-06

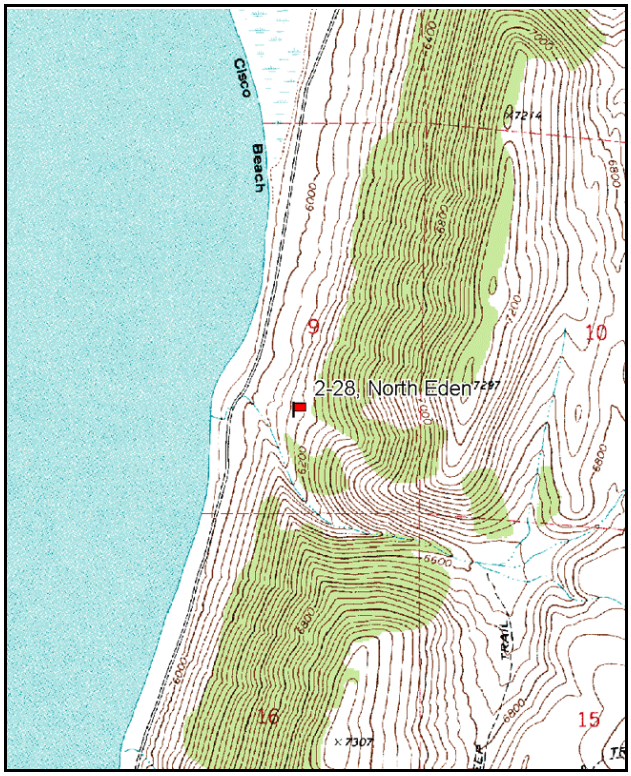
Study site name: North Eden . Vegetation type: Big Sagebrush .

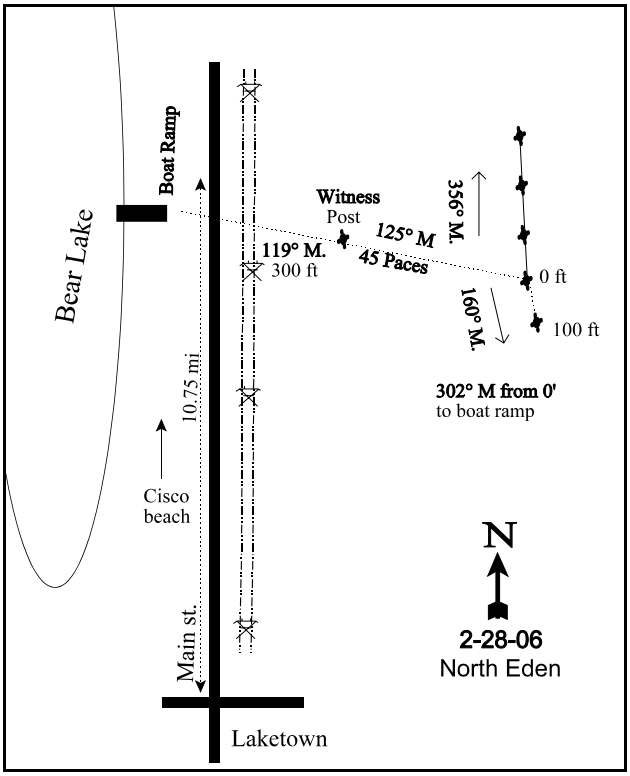
Compass bearing: frequency baseline 160 degrees magnetic.

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

LOCATION DESCRIPTION

From Bear Lake road and Main Street in Laketown, proceed north on Main Street 10.75 miles along the east shore. Turn right onto a dirt road proceeding to a power line. From the power line, walk up the slope on a bearing of 119 degrees magnetic for 300 feet to a witness post. From the witness post, walk 45 paces at 119 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7979. The first 100 feet of the baseline runs 160 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake and runs in a direction of 356 degrees magnetic.





Map Name: Bear Lake South

Diagrammatic Sketch

Township 14N , Range 6E , Section 9

UTM NAD 27, UTM 12T 4645840 N, 477747 E

DISCUSSION

North Eden - Trend Study No. 2-28

Study Information

This study is located on the east side of Bear Lake between North and South Eden Canyons (elevation: 6,140 feet, slope: 20-25%, aspect: west). This study is located on the border of private land and land administered by the State Institutional Trust Land Administration. The vegetation type is a mixture of Wyoming big sagebrush and black sagebrush interrupted by scattered Utah juniper. Utilization by deer, cattle, and possibly sheep has been moderate to heavy. Quadrat frequency for deer pellet groups was moderately high at 39% in 1996, 36% in 2001 and 60% in 2006. A pellet group transect read in 2001 estimated 108 deer and 3 cow days use/acre (266 ddu/ha and 7 cdu/ha). Pellet group data from 2006 was estimated at 169 deer days use/acre (417 ddu/ha). Rabbit pellet groups were abundant in both 2001 and 2006.

Soil

The soil is classified within the Dagan series, a moderately deep, well drained soil derived from quartzite-sandstone conglomerate. This is a moderately calcareous soil with low water holding capability. Potential rooting depth is not significantly impaired even though there is sometimes a slight calcium carbonate accumulation at about 28 inches in depth. All the Dagan soils are subject to rapid runoff and have high erosion hazards (Campbell and Lacey 1982; USDA-NRCS 2006). Soil texture is a clay loam with a neutral pH. The effective rooting depth was estimated at nearly 12 inches. There is little rock on the surface and within the profile, but no evidence of a hardpan. There is some erosion occurring in the form of pedestalling, flow patterns, rills, and soil movement, but is localized and not severe. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground remained good at 5.3:1 in 2006. The erosion condition class was determined to be slight in 2001 and 2006.

Browse

The key browse species are Wyoming big sagebrush and black sagebrush. Wyoming big sagebrush density has declined every reading since 1984. Density was estimated at 5,332 plants/acre in 1984 and decreased to 3,465 plants/acre in 1990. In 1996, density was estimated at 2,800 plants/acre and in 2006 estimated 2,280 plants/acre. Decadence has remained consistently high, ranging from 46% in 1996 to 62% in 2006. In 2006, 33% of the population was classified at dying. Young recruitment was good in 2006 (19% of the population) and should help to replace those plants that have died or will die. Wyoming big sagebrush was heavy utilized in 1984, but has been light to moderate since 1990.

Density of black sagebrush declined from 2,065 to 440 plants/acre between 1990 and 1996. Due to the low number of dead plants and low decadence rate in 1996, this change in density is mostly the result of the larger sample used in 1996. This new estimate would be more representative of the whole area. Black sagebrush has continued to decrease from 440 plants/acre in 1996 to 280 plants/acre in 2006. Use on black sagebrush was heavy in 1984 and moderate in 1996, but all other years have been light.

Other shrub species include stickyleaf low rabbitbrush, white rubber rabbitbrush, prickly pear, and Utah juniper. None occur very frequently or sustain much browsing use. They will likely remain secondary in importance. Point-center quarter data from 2001 estimated 72 juniper trees/acre with an average diameter of just over 3 inches. In 2006, density decreased to 40 juniper trees/acre, but the diameter was larger at 8.3 inches.

Herbaceous Understory

Herbaceous cover consists mainly of perennial grasses, which have increased in cover from 17% in 1996 to 35% in 2006. Cheatgrass is also abundant and has averaged 2-4% cover since 1996. The dominant perennial grasses are bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail. Bluebunch wheatgrass nested frequency significantly increased in 2006 and cover increased from 10% to 18%.Forbs are uncommon

and produce only 2% cover, except in 2001 when annual forb cover spiked to 8%. That increase was created by a single species, bush birdbeak.

1990 TREND ASSESSMENT
Trend for browse is down. Wyoming big sagebrush and black sagebrush have both declined and many dead and decadent sagebrush are evident. The Wyoming big sagebrush population is 60% decadent, while the black sagebrush population improved from 70% to 32% decadence. As opposed to the heavily hedged growth forms recorded in 1984, the sagebrush appear to be only moderately hedged. Trend for grasses is up. Perennial grass sum of nested frequency increased by 30%, due to a significant increase in bluebunch wheatgrass and Sandberg bluegrass. This increase in cover occurred even though the grasses were heavily grazed. Trend for forbs is up. Two perennial forbs significantly increased in nested frequency, which were longleaf phlox and tapertip hawksbeard.

browse - down (-2) grasses - up (+2) forbs - up (+2)

1996 TREND ASSESSMENT
The larger sample used in 1996 estimated cover of black sagebrush at only about 2%, while Wyoming big sagebrush at cover was 14%. This new, larger sample estimated only 440 black sagebrush plants/acre instead of 2,065 estimated in 1990. The differences in density may be due to the larger sample better estimates shrub populations which sometimes have aggregated and/or discontinuous distributions. Black sagebrush displays a stable trend with light to moderate use, generally good vigor, and a low decadence rate. Wyoming big sagebrush use is more moderate, yet vigor is still poor on 26% of the population. Decadence has declined, but it is still high at 46%. Young recruitment is down. The overall browse trend is stable. Trend for grasses is slightly down. The sum of nested frequency for perennial grasses declined by 10%, mainly due to a significant decrease in bluebunch wheatgrass. Annual grasses were included in the sample for the first time and cheatgrass averaged 4% cover. Trend for forbs is down. The perennial forb sum of nested frequency decreased by 64%, mainly due a significant decrease in longleaf phlox and hoods phlox. The Desirable Components Index rated this study as good due to good browse cover and excellent perennial grass cover. Annual grass cover is low, but negatively affects the score.

winter range condition (DC Index) - good (56) Low Potential scale
browse - stable (0) grasses - slightly down (-1) forbs - down (-2)

2001 TREND ASSESSMENT
Trend for browse is down slightly for both black sagebrush and Wyoming big sagebrush. Both sagebrush have declined in density, increased in decadence, and display poor reproduction. Wyoming big sagebrush accounts for 53% of the browse cover. It shows similar moderate to heavy use that was reported in 1996. Decadence has increased from 46% to 56% and 16% of population were classified as dying. Reproduction is poor and not nearly enough to maintain the population. Trend for grasses is stable. Sum of nested frequency for perennial grasses and forbs has not changed substanitially. Sandberg bluegrass has declined significantly in nested frequency, but cover has remained at 7%, similar to 1996 estimates. Cheatgrass nested frequency has remained similar to 1996 estimates. Trend for forbs is stable. Forbs are still lacking. The Desirable Components Index rated this study as good due to good browse cover and excellent perennial grass cover. Annual grass cover is low, but negatively affects the score.

winter range condition (DC Index) - good (52) Low Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT
Trend for key browse, black and Wyoming sagebrush, is slightly down. The density of mature and decadent Wyoming big sagebrush decreased by 26%, from 2,500 plants/acre in 2001 to 1,840 plants/acre in 2006.

Decadence increased to 62% of the population and 33% were classified as dying. Young recruitment increased to 19% of the population, which will help replace dying plants. Black sagebrush density remained similar to 2001 estimates, although plants classified as dying increased from 17% to 29% and young recruitment remains minimal. Trend for grasses is up. Perennial grass sum of nested frequency increased by 28%, mainly due to a significant increase in bluebunch wheatgrass. Bluebunch wheatgrass cover increased from 10% in 2001 to 18% in 2006. Cheatgrass continues to remain around 2-4% cover. Trend for forbs is slightly up. Forbs provided 2% cover, but false dandelion was sampled for the first time and yellow salsify has not been sampled since 1984. The Desirable Components Index rated this study as good due to good browse cover and excellent perennial grass cover, but with sagebrush decadence was high. Annual grass cover is low, but still negatively affects the score.

winter range condition (DC Index) - good (51) Low Potential scale
browse - down (-2) grasses - up (+2) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 28

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a161	b210	a137	a155	b222	7.19	10.05	17.88
G	Bromus tectorum (a)	-	-	152	173	168	4.32	2.15	3.40
G	Oryzopsis hymenoides	3	-	-	14	7	.03	.86	.77
G	Poa secunda	a210	c303	c284	b239	ab280	8.09	7.41	14.00
G	Sitanion hystrix	bc26	a5	c47	ab20	bc39	1.29	.75	1.85
Total for Annual Grasses		0	0	152	173	168	4.32	2.15	3.40
Total for Perennial Grasses		400	518	468	428	548	16.61	19.08	34.50
Total for Grasses		400	518	620	601	716	20.94	21.24	37.91
F	Agoseris glauca	a-	a-	a-	a-	b10	-	-	.05
F	Arabis sp.	-	-	-	1	3	-	.00	.00
F	Astragalus convallarius	b9	a-	a-	b9	b11	-	.02	.11
F	Astragalus sp.	2	-	-	-	3	-	-	.00
F	Balsamorhiza sagittata	-	-	1	4	5	.30	.21	.24
F	Calochortus nuttallii	-	3	-	-	2	-	-	.00
F	Chaenactis douglasii	-	-	3	-	-	.00	-	-
F	Collomia linearis (a)	-	-	-	-	8	-	-	.02
F	Collinsia parviflora (a)	-	-	7	5	3	.18	.01	.00
F	Cordylanthus ramosus (a)	-	-	ab30	b55	a16	.48	7.51	.09
F	Crepis acuminata	a9	bc33	ab16	abc25	c35	.14	.56	1.00
F	Cryptantha sp.	1	2	-	-	7	-	-	.02
F	Descurainia pinnata (a)	-	-	-	3	6	-	.00	.04
F	Draba sp. (a)	-	-	-	-	3	-	-	.00
F	Erigeron sp.	a-	a5	a6	ab11	b21	.09	.48	.52

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Hackelia patens	-	-	-	1	-	-	.00	-
F	Holosteum umbellatum (a)	-	-	$_{a}$1	$_{a}$-	$_{b}$12	.00	-	.03
F	Penstemon sp.	-	-	-	5	-	-	.01	.03
F	Phlox hoodii	$_{a}$6	$_{b}$26	$_{a}$-	$_{a}$6	$_{ab}$12	-	.03	.08
F	Phlox longifolia	$_{a}$-	$_{c}$149	$_{b}$53	$_{a}$1	$_{a}$6	.19	.00	.04
F	Sphaeralcea grossulariifolia	-	-	3	-	-	.15	-	-
F	Tragopogon dubius	$_{b}$10	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$1	-	-	.03
F	Unknown forb-perennial	$_{a}$-	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
Total for Annual Forbs		0	0	38	63	48	0.67	7.53	0.20
Total for Perennial Forbs		37	230	82	63	116	0.88	1.34	2.17
Total for Forbs		37	230	120	126	164	1.55	8.88	2.37

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

BROWSE TRENDS --
Management unit 02 , Study no: 28

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	10	8	7	1.60	1.92	1.06
B	Artemisia tridentata wyomingensis	80	72	70	14.01	11.19	7.11
B	Atriplex canescens	0	0	0	-	.38	-
B	Chrysothamnus nauseosus	0	0	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	13	17	13	1.30	2.28	.86
B	Eriogonum microthecum	2	0	2	-	-	-
B	Gutierrezia sarothrae	0	1	0	-	-	-
B	Juniperus osteosperma	3	3	5	3.94	5.14	5.63
B	Opuntia polyacantha	3	3	3	.03	-	.18
Total for Browse		111	104	101	20.89	20.92	14.85

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 28

Species	Percent Cover	
	'01	'06
Artemisia nova	-	1.41
Artemisia tridentata wyomingensis	-	9.60
Chrysothamnus viscidiflorus viscidiflorus	-	.96
Juniperus osteosperma	9.00	8.88

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 28

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.0	1.5

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 28

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	72	40

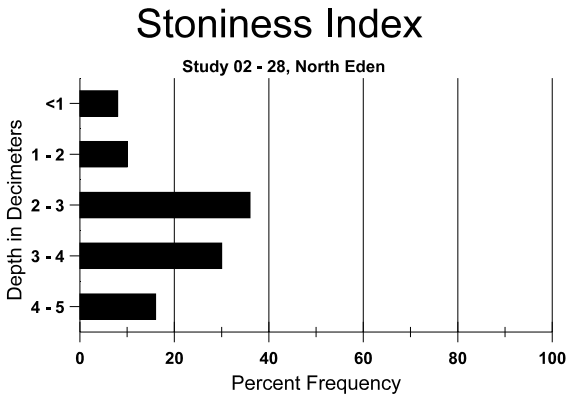
Average diameter (in)	
'01	'06
3.1	8.3

BASIC COVER --
Management unit 02 , Study no: 28

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	10.00	43.52	45.41	57.80
Rock	1.00	1.00	.74	.28	1.01
Pavement	0	0	.75	1.60	1.26
Litter	54.25	43.25	44.15	61.11	39.27
Cryptogams	20.50	16.00	11.19	6.84	12.67
Bare Ground	22.00	29.75	12.75	12.17	11.55

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 28, North Eden

Effective rooting depth (in)	Temp °F (depth)	PH				%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.8	62.6 (12.7)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



PELLET GROUP DATA --
Management unit 02 , Study no: 28

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	25	41	46
Elk	-	-	1
Deer	39	36	60
Cattle	7	1	-

Days use per acre (ha)	
'01	'06
-	-
-	-
108 (266)	169 (417)
3 (7)	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**3332**	-	66	933	2333	-	40	60	70	-	12	13/14
90	**2065**	66	333	1066	666	-	0	0	32	-	3	15/19
96	**440**	-	20	360	60	40	82	0	14	-	9	13/21
01	**240**	-	20	160	60	100	17	0	25	17	17	15/29
06	**280**	-	20	180	80	80	0	0	29	29	29	19/31
Artemisia tridentata wyomingensis												
84	**5332**	533	266	2266	2800	-	30	65	53	-	10	24/25
90	**3465**	66	333	1066	2066	-	23	17	60	3	33	22/20
96	**2800**	-	80	1420	1300	1900	40	10	46	13	26	29/38
01	**2560**	40	60	1060	1440	1640	43	12	56	16	16	27/39
06	**2280**	80	440	420	1420	1380	23	5	62	33	40	26/38

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	28/31
Chrysothamnus viscidiflorus viscidiflorus												
84	**199**	-	-	66	133	-	0	0	67	-	67	21/11
90	**199**	-	-	66	133	-	33	33	67	-	33	6/7
96	**400**	-	20	340	40	20	20	0	10	-	45	15/23
01	**360**	-	-	220	140	-	0	0	39	11	11	15/26
06	**360**	20	40	160	160	-	22	0	44	6	17	14/24
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	40	-	-	0	0	0	-	0	8/9
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**40**	-	-	20	20	-	0	0	50	50	50	9/11
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	6/4
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
84	**133**	66	-	133	-	-	0	0	-	-	0	69/49
90	**132**	-	66	66	-	-	0	0	-	-	0	93/63
96	**60**	-	20	40	-	-	0	0	-	-	0	-/-
01	**60**	-	20	40	-	-	0	0	-	-	0	-/-
06	**100**	20	40	60	-	-	0	0	-	-	0	-/-
Opuntia polyacantha												
84	**200**	-	-	200	-	-	0	0	-	-	0	6/7
90	**400**	66	-	400	-	-	0	0	-	-	0	4/7
96	**80**	-	-	80	-	-	0	0	-	-	0	6/20
01	**60**	-	-	60	-	-	0	0	-	-	0	6/15
06	**100**	-	20	80	-	-	0	0	-	-	0	6/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	26/57

Trend Study 2-29-06

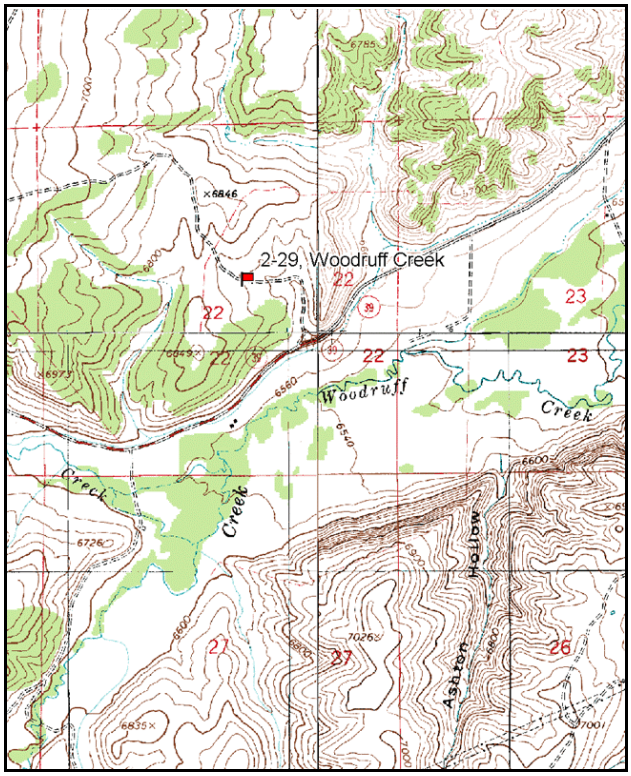
Study site name: Woodruff Creek . Vegetation type: Big Sagebrush .

Compass bearing: frequency baseline 162 degrees magnetic.

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

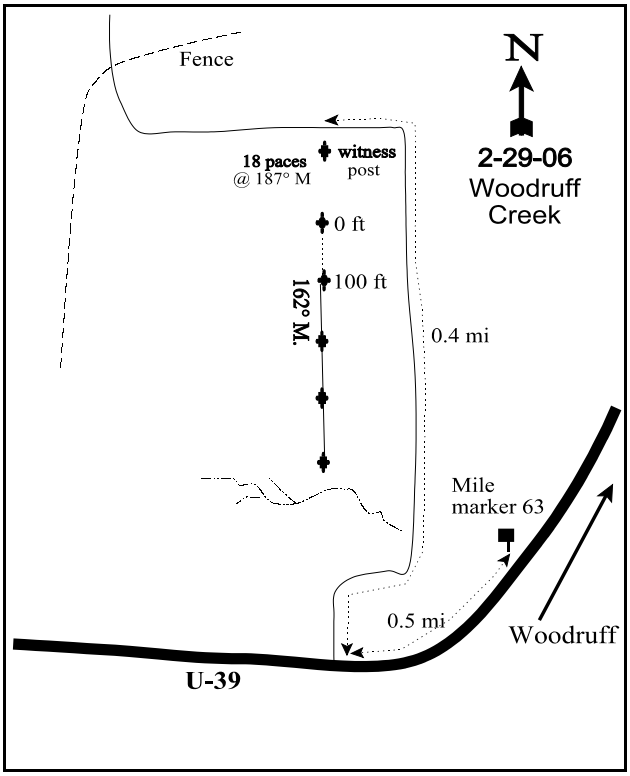
LOCATION DESCRIPTION

From the junction of U-39 and U-16 in Woodruff, proceed west on U-39 for 5.05 miles, and turn right onto a dirt road. This road should be 0.05 miles past marker 63. Proceed north on this road stopping after 0.4 miles at a witness post on the left (south). From the witness post, walk 18 paces at 187 degrees magnetic to the 0-foot stake of the baseline marked by browse tag #7989.



Map Name: Birch Creek Reservoirs

Township 9N , Range 6E , Section 22



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4594285 N, 478796 E

DISCUSSION

Woodruff Creek - Trend Study No. 2-29

Study Information

This study is located north of Woodruff Creek on critical winter range in a Wyoming big sagebrush and scattered juniper woodland (elevation: 6,740 feet, slope: 7-10%, aspect: east). The surrounding habitat was chained and seeded, but the study area was left unchained. The design of the chaining resulted in an extremely large open area, which has little edge and browse cover. Wildlife use may have intensified on the study plot (unchained), because of the lack of browse species in the chained area. Cattle use appeared most abundant in the chained area. A pellet group transect read in 2001 estimated 103 deer and 2 cow days use/acre (255 ddu/ha and 5 cdu/ha). Pellet group data from 2006 was estimated at 88 deer and 4 cow days use/acre (218 ddu/ha and 11 cdu/ha). Three deer carcasses were found near the study in 2006.

Soil

Soil is classified in the Cutoff series, a moderately deep, well drained, and moderately permeable soil that formed in residuum and colluvium derived from sandstone and conglomerate (USDA-NRCS 2006). Effective rooting depth was moderately shallow at 12 inches. Soil texture is a clay loam with some gravel in the profile and pavement concentrated on the surface. Rock and pavement combined for an estimated 11% cover in 1996 and 2001 and 15% in 2006. Soil has a neutral soil reaction (7.3 pH). Chemical analysis of the soil indicates a low level of phosphorus (6.2 ppm), which could be a limiting factor as values less than 6 ppm may limit plant growth and development (Tiedemann and Lopez 2004). The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground remained moderate at 2.7:1 in 2006, leaving large unprotected interspaces. Soil pedestalling is evident and sheet erosion is occurring, yet no large gullies have formed due to the gentle terrain. The erosion condition class was determined to be slight in 2001 and moderate in 2006.

Browse

Available browse forage comes primarily from Wyoming big sagebrush, which has averaged 5% cover since 1996. Density in 1984 and 1990 both were estimated at 6,465 plants/acre. During the 1996 reading, the baseline was lengthened to increase the sample size. The longer baseline extended into a more dense stand of juniper trees than the original 100 foot baseline, therefore density estimates for 1996 were lower. Density averaged about 2,300 plants/acre in 1996 and 2001, but decreased in 2006 to 1,800 plants/acre. Even with the change in sample size, the population may have declined from 1990 to 1996, due to the large number of dead plants (1,260 plants/acre) sampled in 1996. Utilization was heavy in 1984 and 1990, but decreased to moderate use in 1996 and 2001. In 2006, utilization was mostly light. Sagebrush classified as decadent has been high since 1984 and has ranged between 41% in 1996 to a high of 66% in 2006. Also in 2006, over half (63%) the population was classified as dying (>50% crown death). Young recruitment has been low at 4-7% and does not appear to be adequate to maintain the population. Juniper encroachment may also be limiting available resources for sagebrush.

Juniper average canopy cover was 14% in 1996, 10% in 2001, and 16% in 2006. Point-center quarter data in 1990 was estimated at 182 junipers/acre with a diameter 5.5 inches. Junipers have continually increased from 218 trees/acre with a mean a diameter of 7.1 inches in 2001 to 226 trees/acre in 2006 with a mean diameter of 6.4 inches. Other browse species include serviceberry, stickyleaf low rabbitbrush, snowberry, and gray horsebrush. All occur in small numbers except rabbitbrush, which accounts for about one-third of the browse cover and has a density of nearly 5,000 plants/acre.

Herbaceous Understory

The herbaceous understory is diverse but not particularly abundant. Seven perennial grasses combined have produced about 10-12% cover since 1996. The most common species are thickspike wheatgrass, mutton bluegrass, and Sandberg bluegrass. Cheatgrass is present, but has produced less than 1% cover since 1996. Forbs are fairly diverse depending on precipitation and have averaged 3-5% cover since 1996.

1990 TREND ASSESSMENT
The Wyoming big sagebrush stand on the Woodruff Creek study has remained stable in density since 1984. However, the relatively small shrubs display heavy hedging and poor vigor. There is a high percentage (57%) of decadent plants. However, this has not changed since 1984. The density of juniper has not increased since 1984. The point-centered quarter method estimate is 182 juniper/acre, mostly young trees. Trend for grasses is up. Perennial grass sum of nested frequency increased by 42%, mostly due to a significant increase in mutton bluegrass. Trend for forbs is down. Perennial forb sum of nested frequency decreased by 37%, mostly due to a significant decreases in wild onion, 2 species of milkvetch, Douglas chaenactis, and lobeleaf groundsel.

browse - stable (0) grasses - up (+2) forbs - down (-2)

1996 TREND ASSESSMENT
Trend for the key browse species, Wyoming big sagebrush is down and appears to be in a state of decline. Density has dropped 55% since 1990. Some of the change is due to the much larger sample used in 1996, but dead plants, first sampled in 1996, number 1,260 plants/acre. Due to the lack of adequate reproduction, the population has declined since 1990. Utilization has been heavy in the past, although current use is mostly light to moderate. Vigor is poor on 25% of the shrubs with 41% of the population classified as decadent. Sagebrush plants that were classified as dying increased from 8% to 20%. This downward trend will continue as juniper cover increases. Trend for grasses is down. Perennial grass sum of nested frequency decreased by 28% due to a significant decease in thickspike wheatgrass and Sandberg bluegrass. Trend for forbs is slightly up. A few of the species, lobeleaf groundsel and timber poison milkvetch, that decreased in 1990, increased back to levels similar to 1984. The Desirable Components Index rated this study as fair due to moderate browse cover and good perennial grass cover. High decadence negatively effects the score.

winter range condition (DC Index) - fair (42) Low Potential scale
browse - down (-2) grasses - down (-2) forbs - slightly up (+1)

2001 TREND ASSESSMENT
Trend for Wyoming big sagebrush is stable yet in poor condition. Utilization is mostly moderate with improved vigor. However, percent decadence is still high at 57%. Average vigor of the decadent age class has improved as only 9% of the population was classified as dying. Annual leader growth is minimal, averaging only 1 inch in 2001. Trend for grasses is stable. Very little change in grasses from 1996. Trend for forbs is also stable and has not changed much from 1996. The Desirable Components Index rated this study as fair due to moderate browse cover and good perennial grass cover. High decadence negatively effects the score.

winter range condition (DC Index) - fair (40) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT
Trend for key browse, Wyoming big sagebrush, is down. Cover remained near 5%, but density of mature and decadent plants decreased from 2,360 plants/acre in 2001 to 1,740 plants/acre in 2006. Sagebrush classified as decadent has always been high, but 66% were decadent in 2006 and 63% of population was classified as dying. Without a substantial increase in young recruitment and a decrease in juniper density, the sagebrush will mostly likely continue to decrease. Trend for grasses is stable. Very little change in cover or nested frequency of perennial grasses occurred and cheatgrass continued to remained a minimal component of the herbaceous understory. Trend for forbs is stable. Very few changes in sum of nested frequency of perennial forbs occurred, only minor changes in a couple of species. The Desirable Components Index rated this study as fair-good due to moderate browse cover, high decadence, and good perennial grass cover.

winter range condition (DC Index) - fair-good (45) Low Potential scale
browse - down (-2) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 29

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{a}$1	$_{ab}$12	$_{b}$22	.03	.51	1.08
G	Agropyron dasystachyum	$_{c}$195	$_{c}$201	$_{b}$101	$_{b}$142	$_{b}$124	.54	1.97	2.47
G	Agropyron spicatum	$_{a}$1	$_{ab}$7	$_{b}$24	$_{ab}$8	$_{ab}$11	.36	.41	.45
G	Bromus tectorum (a)	-	-	11	6	3	.16	.01	.01
G	Oryzopsis hymenoides	$_{a}$1	$_{ab}$20	$_{ab}$11	$_{b}$24	$_{ab}$14	.61	1.22	.74
G	Poa fendleriana	$_{a}$46	$_{d}$141	$_{cd}$133	$_{bc}$102	$_{ab}$86	5.24	4.10	3.74
G	Poa pratensis	$_{a}$-	$_{a}$-	$_{a}$1	$_{a}$-	$_{b}$23	.03	-	.63
G	Poa secunda	$_{bc}$123	$_{c}$161	$_{ab}$102	$_{abc}$111	$_{a}$77	2.53	2.26	2.50
G	Sitanion hystrix	$_{ab}$22	$_{ab}$22	$_{b}$27	$_{a}$9	$_{ab}$17	.57	.24	.30
G	Stipa comata	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$10	-	-	.12
Total for Annual Grasses		0	0	11	6	3	0.16	0.01	0.01
Total for Perennial Grasses		388	552	400	408	384	9.94	10.73	12.07
Total for Grasses		388	552	411	414	387	10.10	10.75	12.09
F	Achillea millefolium	-	-	1	-	3	.00	-	.03
F	Allium acuminatum	$_{b}$14	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$7	-	-	.04
F	Alyssum alyssoides (a)	-	-	-	1	-	-	.00	-
F	Antennaria rosea	7	10	3	2	10	.00	.03	.07
F	Arabis holboellii	2	-	4	-	11	.01	-	.04
F	Astragalus beckwithii	$_{ab}$13	$_{a}$-	$_{a}$-	$_{a}$3	$_{b}$29	-	.03	.52
F	Astragalus convallarius	$_{b}$13	$_{a}$-	$_{b}$12	$_{c}$34	$_{b}$14	.05	.33	.06
F	Asclepias speciosa	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$-	$_{a}$-	.36	-	-
F	Astragalus utahensis	$_{b}$18	$_{a}$6	$_{a}$2	$_{ab}$12	$_{a}$1	.00	.12	.03
F	Calochortus nuttallii	1	-	-	-	-	-	-	-
F	Chaenactis douglasii	$_{b}$34	$_{a}$2	$_{a}$6	$_{a}$7	$_{a}$5	.01	.02	.10
F	Comandra pallida	35	21	23	24	25	.13	.17	.33
F	Cordylanthus ramosus (a)	-	-	12	20	21	.07	.09	.25
F	Crepis acuminata	3	-	4	3	-	.00	.03	-
F	Cryptantha sp.	26	22	26	32	27	.46	1.08	.50
F	Cymopterus sp.	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$-	$_{a}$-	.02	-	-
F	Descurainia pinnata (a)	-	-	3	-	-	.00	-	-
F	Draba sp. (a)	-	-	-	-	2	-	-	.00
F	Erigeron pumilus	$_{b}$11	$_{a}$-	$_{a}$-	$_{a}$2	$_{a}$3	-	.00	.03
F	Eriogonum racemosum	-	-	-	-	1	-	-	.03
F	Eriogonum umbellatum	$_{ab}$4	$_{a}$-	$_{ab}$5	$_{a}$-	$_{b}$11	.04	-	.10
F	Halogeton glomeratus (a)	-	-	1	-	-	.00	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Ipomopsis aggregata	$_{a}$7	$_{a}$-	$_{a}$4	$_{a}$-	$_{b}$18	.01	-	.14
F	Lappula occidentalis (a)	-	-	-	-	2	-	-	.00
F	Lithospermum ruderale	3	-	-	4	-	-	.15	.03
F	Microsteris gracilis (a)	-	-	-	4	-	-	.01	-
F	Penstemon humilis	$_{b}$86	$_{b}$85	$_{a}$46	$_{a}$53	$_{a}$43	.58	.40	.31
F	Phlox hoodii	88	103	80	80	72	1.41	.74	2.25
F	Phlox longifolia	62	48	33	58	51	.08	.15	.24
F	Ranunculus testiculatus (a)	-	-	1	-	3	.00	-	.00
F	Senecio multilobatus	$_{b}$61	$_{a}$10	$_{b}$75	$_{a}$20	$_{a}$13	.89	.07	.11
Total for Annual Forbs		0	0	17	25	28	0.08	0.11	0.26
Total for Perennial Forbs		488	307	346	334	344	4.11	3.37	5.00
Total for Forbs		488	307	363	359	372	4.19	3.48	5.26

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

BROWSE TRENDS --
Management unit 02 , Study no: 29

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	60	60	57	5.53	5.25	4.52
B	Chrysothamnus viscidiflorus viscidiflorus	77	74	80	4.97	4.13	7.97
B	Juniperus osteosperma	8	8	11	4.42	4.32	3.76
B	Symphoricarpos oreophilus	3	1	1	.15	.30	.06
B	Tetradymia canescens	19	18	18	1.01	.85	1.47
Total for Browse		167	161	167	16.11	14.86	17.79

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 29

Species	Percent Cover	
	'01	'06
Artemisia tridentata wyomingensis	-	4.09
Chrysothamnus viscidiflorus viscidiflorus	-	6.61
Juniperus osteosperma	9.80	15.96
Tetradymia canescens	-	.60

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 29

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.0	0.7

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 29

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	218	226

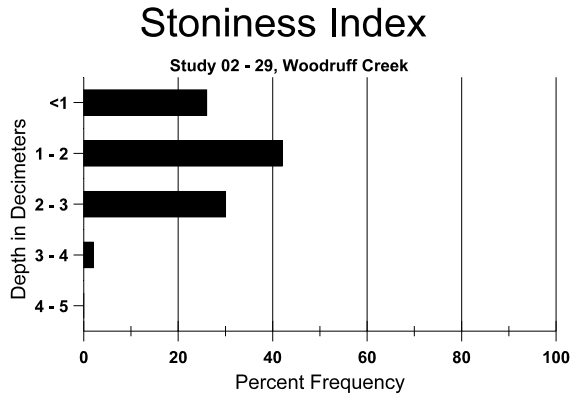
Average diameter (in)	
'01	'06
7.1	6.4

BASIC COVER --
Management unit 02 , Study no: 29

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	4.75	7.50	30.55	31.23	36.56
Rock	1.75	2.50	1.46	.78	.95
Pavement	10.50	21.75	9.37	9.81	13.93
Litter	47.25	33.50	38.38	42.15	28.74
Cryptogams	3.00	13.75	2.05	3.30	3.23
Bare Ground	32.75	21.00	27.75	31.45	26.09

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 29, Woodruff Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.2	55.8 (13.7)	7.3	34.6	32.1	33.4	2.5	6.2	25.6	0.6



PELLET GROUP DATA --
Management unit 02 , Study no: 29

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	21	15	28
Elk	6	2	6
Deer	38	42	32
Cattle	-	-	2

Days use per acre (ha)	
'01	'06
-	-
-	-
103 (255)	88 (218)
2 (5)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 29

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	16/24
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	20/27
Artemisia tridentata wyomingensis												
84	**6465**	-	333	2466	3666	-	11	78	57	.92	6	13/16
90	**6465**	-	266	2533	3666	-	51	41	57	8	28	19/21
96	**2260**	60	-	1340	920	1260	41	11	41	20	25	16/27
01	**2540**	100	180	920	1440	1320	57	2	57	9	9	16/25
06	**1860**	80	120	520	1220	1520	16	1	66	63	68	14/26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
84	**2999**	-	133	2400	466	-	0	0	16	-	2	7/10
90	**3599**	-	1000	1933	666	-	43	2	19	-	0	7/12
96	**4900**	-	160	4660	80	20	0	0	2	.81	.81	9/15
01	**4720**	-	80	4200	440	-	.42	0	9	3	3	9/13
06	**5240**	40	400	4480	360	-	.38	0	7	5	5	9/15
Juniperus osteosperma												
84	**266**	66	133	133	-	-	0	25	-	-	0	57/22
90	**332**	-	266	66	-	-	40	20	-	-	0	89/51
96	**160**	-	-	160	-	20	25	0	-	-	0	-/-
01	**160**	-	60	100	-	-	0	0	-	-	0	-/-
06	**220**	20	60	160	-	-	0	0	-	-	0	51/51
Pinus edulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	40	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	-	80	-	-	0	0	-	-	25	11/21
01	**20**	-	-	20	-	-	0	0	-	-	0	10/29
06	**20**	-	-	20	-	-	0	0	-	-	0	14/30
Tetradymia canescens												
84	**133**	-	-	133	-	-	50	50	0	-	0	9/16
90	**200**	-	-	-	200	-	67	33	100	-	0	-/-
96	**440**	-	-	400	40	20	9	0	9	5	5	12/20
01	**400**	-	-	320	80	20	0	0	20	-	0	12/21
06	**440**	40	60	300	80	-	9	0	18	18	23	11/18

Trend Study 2-30-06

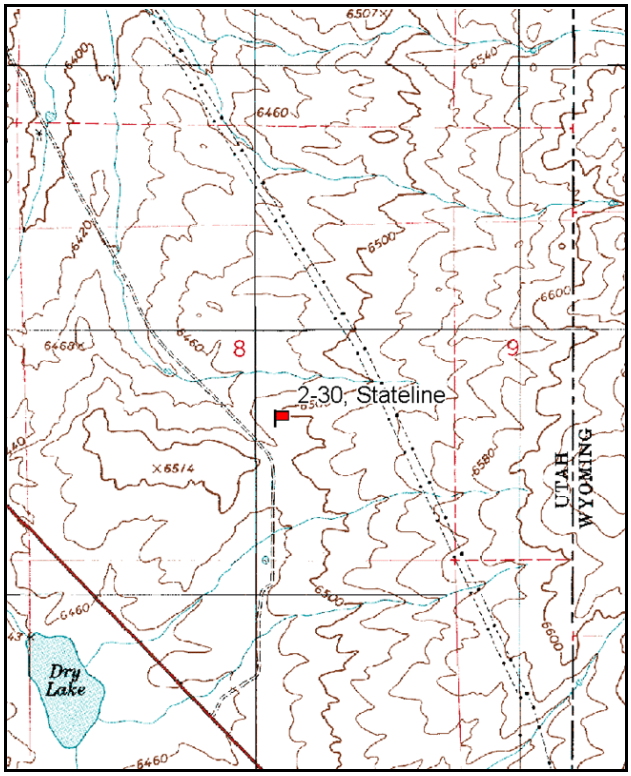
Study site name: State Line . Vegetation type: Big Sagebrush .

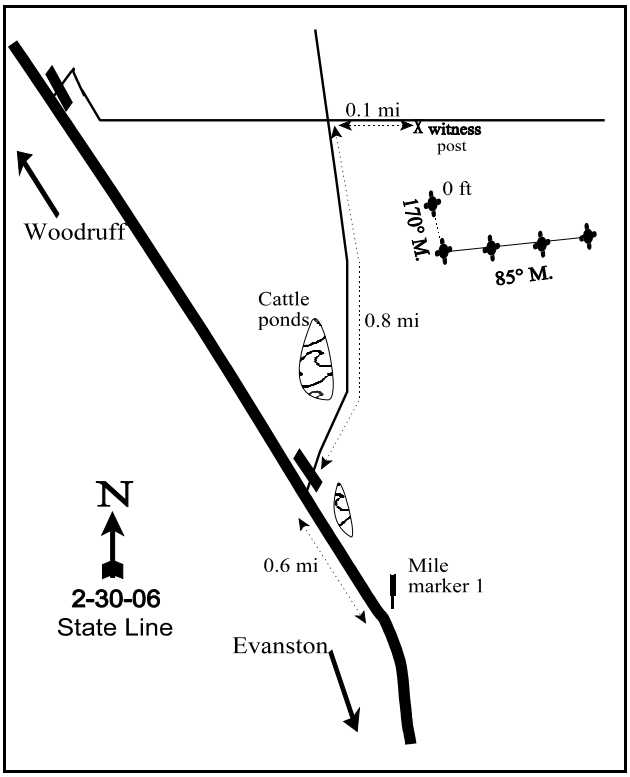
Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From the Utah/Wyoming border, proceed north on Highway 16 for 0.6 miles past mile marker 1. Turn right proceeding through gate, and travel 0.8 miles north to an intersection in a wash. Turn right, and drive 0.1 miles east to a witness post. Walk ten paces at a bearing of 170 degrees magnetic. From 0' to 100' 170 degrees magnetic from 100' to 400' 85 degrees magnetic. The 0-foot stake is wired with a browse tag # 7991





Map Name: Neponset Reservoir NE Diagrammatic Sketch

Township 8N , Range 8E , Section 8 UTM NAD 27, UTM 12T 4587628 N, 495083 E

DISCUSSION

State Line - Trend Study No. 2-30

Study Information

This study is located near the Utah-Wyoming border southeast of Woodruff on land administered by the BLM (elevation: 6,500 feet, slope: 3%, aspect: nearly level). This area is dominated by Wyoming big sagebrush and has very few species in the herbaceous understory. The area is used by deer and pronghorn. Quadrat frequency of deer pellet groups was moderately high at 26% in 1996, declined to 13% in 2001, and slightly increased to 20% in 2006. A pellet group transect read in 2001 estimated 31 deer/pronghorn, 7 elk, and 12 cow days use/acre (76 ddu/ha, 17 edu/ha, and 29 cdu/ha). Deer and pronghorn pellet groups were combined due to their similarity in appearance. Pellet group data from 2006 was estimated at 25 deer/pronghorn, 5 elk, and 14 cow days use/acre (63 ddu/ha, 12 edu/ha, and 34 cdu/ha). Cattle were in the area during the spring and early summer of 2001 and 2006. Sage grouse also use the area, and some sage grouse droppings were encountered in 2001.

Soil

Soil is classified in the Neponset series, a moderately deep, well drained soil residually formed from sandstone and siltstone. Total soil depth ranges from 20 to 40 inches and is calcareous throughout. Neponset soil is moderately permeable to water and has low available water capacity. It is moderately susceptible to water erosion and highly susceptible to wind erosion and dune formation (Campbell and Lacey 1982; USDA-NRCS 2006). The soil has a clay loam texture and a soil reaction that is slightly alkaline (7.8 pH). Effective rooting depth is slightly more than 10 inches. The surface is nearly free of rock cover with a calcareous layer at about 10 inches below the surface. Moderately high amounts of bare ground are exposed, but terrain is nearly level so water erosion is not excessive. Soil pedestalling is evident around plants and the soil is held in place by the abundance of cryptogamic crusts under sagebrush crowns. The presence of flow patterns, rills, and soil movement indicate continual erosion is occurring. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground remained fair at 2.9:1 in 2006. The erosion condition class was determined to be slight in 2001 and 2006.

Browse

The landscape is dominated by Wyoming big sagebrush, which has averaged between 22-25% cover since 1996. Density declined from 8,066 plants/acre in 1990 to 6,500 in 1996. The decline in density is largely the result of changes in the number of young plants and the larger sample size collected in 1996. The density has changed very little since 1996. Due to drought, seedlings and young were scarce in 1996 and 2001, but seedlings were very abundant in 2006 with above average precipitation, especially in the spring (Monsen and Meyer 1990; Utah Climate Summaries 2006). Annual leader growth was relatively poor in 2001 at 1.0 inch and only 0.5 inches in 2006. Utilization of sagebrush has been consistently moderate to heavy since 1990, except in 2006 when it was only considered light. Vigor has remained normal on most plants and decadence steadily declined from 39% in 1990 to 21% in 2001, but increased to 30% in 2006.

Other fairly common browse species include Gardner saltbush and stickyleaf low rabbitbrush. Gardner saltbush is a very small, low-growing saltbush that is strongly rhizomatous and sprouts profusely. It is an important browse, especially on disturbed sites where it seems to perform exceptionally well (Carlson et al. 1984). The density plot data from 1984 and 1990 almost certainly present a biased picture of this species importance with 3,866 and 5,532 plants/acre estimated respectively. The larger sample used beginning in 1996 gives a better picture of the species true density, which was estimated at 1,840 plants/acre in 1996 and 1,100 plants/acre in 2001 and 2006. Stickyleaf low rabbitbrush has a mostly mature population of around 2,000 plants/acre.

Herbaceous Understory

Herbaceous composition produces little forage and lacks diversity. Grass production is poor and many acres

are required to support a single AUM. Total grass cover has only averaged between 5-6% since 1996. The only common grass is Sandberg bluegrass, which accounts for at least 75% of the grass cover during all readings. Not a single annual grass has been found on this study since 1984. Forbs are even less productive and few species have any significant value. The only fairly common species include hoods phlox and stemless goldenweed.

1990 TREND ASSESSMENT
Wyoming big sagebrush displays a stable trend. It is moderately to heavily hedged with fair vigor and a well-balanced age class structure. Decadence is moderately high at 38%. Trend for grasses is slightly down. Perennial grass sum of nested frequency decreased by 14% due mainly to a significant decrease in western wheatgrass and needle-and-thread. Trend for forbs is stable. Forbs are minimal and have not changed from 1984.

browse - stable (0) grasses - slightly down (-1) forbs - stable (0)

1996 TREND ASSESSMENT
Trend for Wyoming big sagebrush is stable although it could decline in the near future without an improvement in reproduction. The number of seedlings and young plants have declined since 1990, but the number of mature and decadent sagebrush have remained similar. Total density has declined from 8,066 plants/acre in 1990 to 6,500 plants/acre in 1996. Some of the difference in density is due to the larger sample used in 1996. Dead sagebrush, first included in 1996, number 800 plants/acre. Considering the large population, this would not suggest a major die-off. It is indicative that the larger sample used in 1996 gives a more accurate estimate of the actual Wyoming big sagebrush density. There is less heavy use of the sagebrush, vigor has improved, and percent decadence has declined slightly (38% to 32%). However, 8% population was classified at dying (>50% crown death). If reproduction does not improve, the population will likely decline slightly. Trend for grasses is slightly down. Perennial grass sum of nested frequency decreased by 13%. Trend for forbs is slightly down. Perennial forb sum of nested frequency decreased by 16% due mainly to a decrease in stemless goldenweed. The Desirable Components Index rated this study as good due to excellent browse cover, moderate decadence, and low perennial grass cover.

winter range condition (DC Index) - good (52) Low Potential scale
browse - stable (0) grasses - slightly down (-1) forbs - slightly down (-1)

2001 TREND ASSESSMENT
Trend for Wyoming big sagebrush is stable. Density has remained similar to 1996. Utilization is moderate, vigor is normal on most plants, and percent decadence has declined to 21%. Seed production is good this year, while annual leader growth appeared to be poor averaging only 1 inch. Reproduction is poor with few seedlings and young plants encountered. The population will eventually decline if reproduction does not improve. Trend for grasses is slightly up. The sum of the nested frequency of perennial grasses increased 12%. Trend for forbs is down. Perennial forb sum of nested frequency declined by 27% and has continually declined since 1984. Hoods phlox was the main species that decreased significantly. The Desirable Components Index rated this study as good due to excellent browse cover, moderate decadence, and low perennial grass cover.

winter range condition (DC Index) - good (57) Low Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - down (-2)

2006 TREND ASSESSMENT
Trend for key browse, Wyoming big sagebrush, is stable. Density has not changed from previous years, but the number of decadent plants increased to 30% and 15% of the population was classified as dying. Seedlings were very abundant and may contribute to the population if they survive. Trend for grasses is stable. Very little change in sum of nested frequency for perennial grasses. Trend for forbs is up. Perennial forb cover still

remains minimal, but sum of nested frequency increased by 37%, mainly due to significant increase in longleaf phlox. The Desirable Components Index rated this study as good due to excellent browse cover, moderate decadence, and low perennial grass cover.

winter range condition (DC Index) - good (53) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 30

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	$_{c}$140	$_{ab}$94	$_{a}$51	$_{ab}$96	$_{bc}$108	.36	.87	1.23
G	Oryzopsis hymenoides	5	9	8	10	12	.19	.51	.08
G	Poa secunda	235	248	232	245	212	4.11	4.94	3.68
G	Sitanion hystrix	$_{a}$-	$_{ab}$9	$_{b}$23	$_{a}$-	$_{b}$17	.07	-	.07
G	Stipa comata	$_{b}$39	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		419	360	314	351	349	4.73	6.32	5.07
Total for Grasses		419	360	314	351	349	4.73	6.32	5.07
F	Alyssum alyssoides (a)	-	-	$_{a}$2	$_{c}$211	$_{b}$147	.00	.69	.57
F	Antennaria rosea	6	9	2	1	3	.15	.00	.00
F	Arabis sp.	$_{b}$19	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$1	-	.00	.00
F	Astragalus convallarius	$_{b}$20	$_{a}$6	$_{a}$2	$_{ab}$9	$_{a}$-	.00	.07	-
F	Astragalus utahensis	-	2	1	1	-	.00	.00	-
F	Cymopterus sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$3	$_{b}$15	-	.00	.05
F	Draba sp. (a)	-	-	3	3	-	.00	.03	-
F	Eriogonum caespitosum	-	2	-	-	-	-	-	-
F	Eriogonum cernuum (a)	-	-	-	1	-	-	.00	-
F	Erigeron pumilus	3	5	-	-	-	-	-	-
F	Haplopappus acaulis	$_{b}$69	$_{b}$64	$_{a}$30	$_{a}$15	$_{a}$16	.74	.54	.42
F	Phlox hoodii	$_{ab}$125	$_{ab}$128	$_{b}$133	$_{a}$89	$_{ab}$102	2.08	1.88	1.34
F	Phlox longifolia	$_{a}$3	$_{ab}$25	$_{b}$39	$_{ab}$29	$_{c}$70	.11	.12	.32
F	Ranunculus testiculatus (a)	-	-	-	-	4	-	-	.00
F	Trifolium sp.	7	4	-	2	1	-	.00	.00
F	Unknown forb-perennial	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	5	215	151	0.00	0.73	0.57
Total for Perennial Forbs		253	245	207	152	208	3.09	2.64	2.16
Total for Forbs		253	245	212	367	359	3.10	3.37	2.74

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

BROWSE TRENDS --
Management unit 02 , Study no: 30

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	98	96	94	23.38	25.17	21.96
B	Atriplex gardneri falcata	14	15	14	.56	.27	.28
B	Chrysothamnus depressus	0	0	0	-	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	56	51	47	1.41	1.91	1.71
B	Leptodactylon pungens	0	3	4	-	.53	.30
B	Opuntia sp.	9	12	17	.21	.21	.16
B	Tetradymia canescens	6	4	5	.01	.00	.01
Total for Browse		183	181	181	25.57	28.10	24.44

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 30

Species	Percent Cover '06
Artemisia tridentata wyomingensis	24.26
Atriplex gardneri falcata	.21
Chrysothamnus viscidiflorus viscidiflorus	1.58
Leptodactylon pungens	.25
Opuntia sp.	.28
Tetradymia canescens	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 30

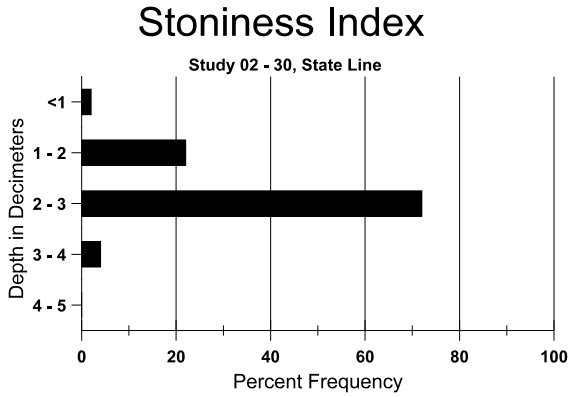
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.0	0.5

BASIC COVER --
Management unit 02 , Study no: 30

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	6.25	12.00	31.88	39.17	31.01
Rock	.75	.25	.33	.11	.41
Pavement	7.00	7.00	1.16	1.01	.74
Litter	42.75	24.00	26.83	28.42	31.02
Cryptogams	5.50	14.00	8.70	12.45	11.36
Bare Ground	37.75	42.75	39.54	42.63	43.56

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 30, State Line

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.4	54.8 (9.3)	7.8	41.9	28.1	30.0	2.0	8.4	99.2	0.8



PELLET GROUP DATA --
Management unit 02 , Study no: 30

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	4	1	27
Grouse	-	5	-
Elk	-	-	4
Deer	26	13	20
Cattle	-	1	2
Antelope	1	1	1

Days use per acre (ha)	
'01	'06
-	-
-	-
7 (17)	5 (12)
31 (76)	25 (63)
12 (29)	14 (34)
-	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
84	**7532**	1533	1133	3466	2933	-	45	27	39	-	3	14/19
90	**8066**	66	1400	3600	3066	-	42	37	38	2	19	15/16
96	**6500**	40	100	4320	2080	800	46	11	32	8	8	15/31
01	**6700**	40	20	5260	1420	700	58	15	21	8	8	18/30
06	**6600**	17180	240	4360	2000	920	14	0	30	15	19	16/28
Atriplex gardneri falcata												
84	**3866**	5400	2200	1666	-	-	38	0	0	-	0	7/11
90	**5532**	3600	4466	1066	-	-	5	5	0	-	0	5/7
96	**1840**	-	-	1800	40	-	0	0	2	-	0	3/7
01	**1060**	-	60	1000	-	-	23	38	0	-	0	4/7
06	**1100**	40	320	740	40	-	2	0	4	-	2	4/7
Ceratoides lanata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	5/11
Chrysothamnus viscidiflorus viscidiflorus												
84	**1732**	66	66	1600	66	-	0	0	4	-	4	11/14
90	**2065**	-	133	1066	866	-	39	3	42	-	6	6/10
96	**2020**	-	-	1660	360	20	0	0	18	10	10	8/13
01	**2000**	-	20	1840	140	40	0	0	7	4	4	8/12
06	**1880**	200	60	1200	620	60	11	0	33	10	24	7/12
Eriogonum microthecum												
84	**66**	-	-	66	-	-	0	0	-	-	0	1/2
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**220**	-	20	200	-	-	0	0	-	-	0	4/9
06	**180**	-	-	180	-	-	0	0	-	-	0	5/12
Opuntia sp.												
84	**600**	-	-	600	-	-	0	0	0	-	0	5/13
90	**932**	133	533	133	266	-	0	0	29	2	14	4/6
96	**500**	-	100	340	60	20	0	0	12	4	4	3/11
01	**440**	20	20	340	80	-	0	0	18	5	5	3/7
06	**540**	60	80	440	20	20	0	0	4	-	0	3/10
Tetradymia canescens												
84	**66**	-	-	66	-	-	100	0	0	-	0	4/5
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**360**	-	-	200	160	-	0	17	44	11	11	4/9
01	**80**	-	-	80	-	-	25	0	0	-	0	7/12
06	**120**	-	20	40	60	-	17	0	50	33	33	6/10

Trend Study 2-31-06

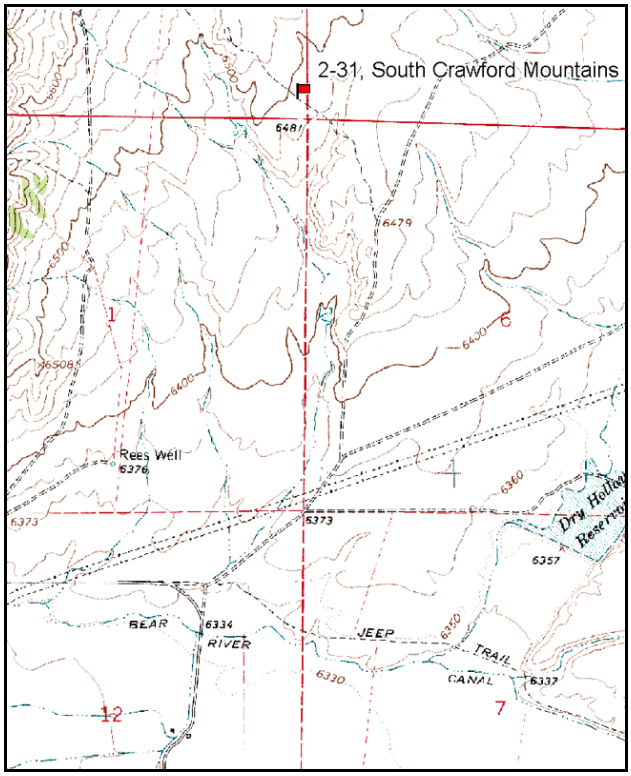
Study site name: South Crawford Mountains . Vegetation type: Big Sagebrush .

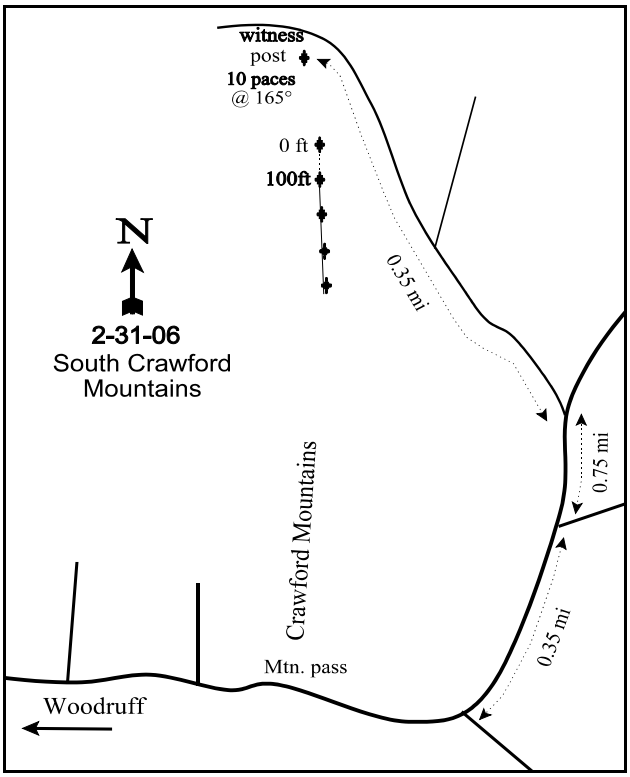
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed east 1.6 miles through the small pass to the east side of the mountains. Take the left fork and travel northeast for 0.35 miles. Turn left here and proceed northeast for 0.75 miles. At this point, turn left onto a lightly used jeep trail and travel northwest for an additional 0.35 miles to a witness post on the left hand side of the road. From the witness post walk 10 paces at 165 degrees magnetic to the 0-foot baseline stake of the baseline. The baseline is marked by browse tag #7940.





Map Name: Woodruff Narrows

Diagrammatic Sketch

Township 10N , Range 7E , Section 36

UTM NAD 27, UTM 12T 4600223 N, 492408 E

DISCUSSION

South Crawford Mountains - Trend Study No. 2-31

Study Information

This study is located on the southeastern foothills of the Crawford Mountains, just northeast of Woodruff on land administered by the BLM (elevation: 6,500 feet, slope: 3-5%, aspect: southeast). It samples a Wyoming big sagebrush type and is an important wintering area for deer and elk. It is also used intermittently year-round by pronghorn and sage grouse. Cattle graze the area in spring and summer, and were present during the 1996 reading. Quadrat frequency of deer pellet groups was moderately high at 31% in 1996. A pellet group transect read in 2001 estimated 23 deer/pronghorn, 1 elk, and 13 cow days use/acre (56 ddu/ha and 32 cdu/ha). Deer and pronghorn pellet groups were combined due to their similarity in appearance. Pellet group data from 2006 was estimated at 8 deer/pronghorn, 9 elk, and 10 cow days use/acre (20 ddu/ha, 22 edu/ha, and 25 cdu/ha). Three sage grouse pellet groups were also sampled in 2001 and 2006.

Soil

Soil is classified in the Woodpass series, a widely distributed series in this area. It is a deep, well-drained soil that forms in alluvial deposits derived from sandstone and limestone. Permeability is slow and available water capacity is high (Campbell and Lacey 1982; USDA-NRCS 2006). Soil texture is a sandy clay loam with a neutral pH (7.1) in the upper horizons. Effective rooting depth was estimated at just over 12 inches with a rocky calcium carbonate layer starting at about 12 inches. This layer appears to limit rooting depth at the end of the baseline where black sagebrush was encountered. Potassium is low at 51 ppm, which could be a limiting factor. Potassium values less than 60 ppm may limit plant development and growth (Tiedemann and Lopez 2004). Exposed bare ground cover is common, averaging 31% between in 1984 and 2006. Wind and water erosion are not severe due to the gentle terrain, but are apparent. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground remained fair at 2.9:1 in 2006. The erosion condition class was determined to be stable in 2001 with slight pedestalling of sagebrush, but was classified as slight in 2006 with signs of soil cracking from shrinking and swelling.

Browse

The dominant browse is a fairly dense stand of Wyoming big sagebrush that generally receives light to moderate use. Cover has averaged about 18% since 1996, while density has varied from 8,266 plants in 1984 to 6,260 plants/acre in 2006. Young recruitment has averaged 3-5% of the population since 1996 and seedlings were very abundant in 2006. Decadence was very high in 1990 with 72% of population displaying decadence, but since then has averaged about 24%. Annual leader growth was relatively poor in both 2001 and 2006, averaging 1.0 inch or less. Other shrubs of secondary importance that appear to have relativity stable populations include: black sagebrush, narrowleaf low rabbitbrush, slenderbush eriogonum, prickly phlox, pricklypear, and gray horsebrush,

Herbaceous Understory

Grasses and forbs are sparsely distributed and include a mix of species common in a Wyoming big sagebrush type. Four perennial grass species provide the bulk of the herbaceous forage, which is supplemented by low-growing, low-value forbs. Annual grasses and forbs are rare. Sandberg bluegrass is the most common perennial grass, which has averaged 5-6% cover since 1996. Although needle-and-thread increased significantly in 2006, it only averaged 3% cover. Forbs are fairly diverse for this type, yet only hoods phlox is abundant.

1990 TREND ASSESSMENT

Trend for key browse is slightly down. Wyoming big sagebrush density declined by 6% due to a decrease in young plants, but the combined density of mature and decadent plants actually increased by 11% since 1984. The large young population in 1984 appears to have contributed to the overall population. The percentage of decadent sagebrush increased from 21% in 1984 to 72% of the population with very few young plants

encountered. The sagebrush is moderately to heavily hedged and has poor vigor and low growth. Sagebrush canopy cover averages 16%. Trend for grasses is slightly down. Perennial grass sum of nested frequency decreased by 14% mainly due to a large decrease in bottlebrush squirreltail and bluebunch wheatgrass. Trend for forbs is down. Several perennial forbs nested frequency decreased significantly, these include: drummond rockcress, cryptantha, timber poison milkvetch, and a clover species.

browse - slightly down (-1) grasses - slightly down (-1) forbs - down (-2)

1996 TREND ASSESSMENT

Trend for Wyoming big sagebrush is stable. Total density declined 18% since 1990, but utilization is more moderate, vigor has improved, and decadence has declined from 72% to 30%. Some of the difference in density may be due to the larger sample used in 1996. Young plants are more abundant this year, although seedlings are limited. Trend for grasses is stable. There was very little change in perennial grasses. Trend for forbs is slightly down. Perennial forb sum of nested frequency continue to decline even though they are not very abundant. Hoods phlox, the most abundant forb, decreased significantly in nested frequency. The Desirable Components Index rated this study as good due to excellent browse cover, moderate decadence, and fair perennial grass cover.

winter range condition (DC Index) - good (57) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is up slightly. Density has increased by 13%, utilization is mostly light, average vigor has improved, and percent decadence has declined from 30% to 20%. No seedlings were sampled; however, young plants account for 3% of the population. Annual leader growth appears to be poor, averaging less than 1 inch. Narrowleaf low rabbitbrush appears to have a stable population of about 3,000 plants/acre. Trend for grasses is stable. Perennial grasses have not changed much since 1996 and still average 9% cover. Trend for forbs is stable. Perennial forbs remained similar to 1996 and are still not very abundant. The Desirable Components Index rated this study as good-excellent due to excellent browse cover, moderate decadence, and fair perennial grass cover.

winter range condition (DC Index) - good-excellent (67) Low Potential scale
browse - slightly up (+1) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, Wyoming big sagebrush, is down slightly. Density has decreased by 16%, from 7,420 plants/acre in 2001 to 6,260 in 2006. The percentage of plants classified as dying increased slightly to 15% and decadence continues to average about 20%. Trend for grasses is stable. Perennial grass sum of nested frequency has changed very little, although cover increased from 9% to 11%. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 16% and cover increased from 4% in 2001 to 7% in 2006. The Desirable Components Index rated this study as excellent due to high browse cover, moderate decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (72) Low Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 31

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	a-	a-	a-	a4	b16	-	.06	.03
G	Agropyron spicatum	c140	a53	ab81	b97	ab73	.84	1.12	1.32
G	Bromus tectorum (a)	-	-	1	-	1	.00	-	.00
G	Carex sp.	a-	a-	a-	b12	c30	-	.07	.18
G	Oryzopsis hymenoides	b60	ab45	a21	a30	a34	.21	.64	.68
G	Poa fendleriana	a-	a-	b30	a2	a3	.50	.00	.03
G	Poa secunda	a231	b275	ab246	b272	a226	5.18	6.03	6.13
G	Sitanion hystrix	c107	a3	b29	ab17	ab10	.22	.13	.07
G	Stipa comata	a16	c98	bc79	ab56	c116	1.06	.64	2.90
Total for Annual Grasses		0	0	1	0	1	0.00	0	0.00
Total for Perennial Grasses		554	474	486	490	508	8.03	8.72	11.35
Total for Grasses		554	474	487	490	509	8.03	8.72	11.36
F	Agoseris glauca	1	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a-	b15	c74	-	.04	.16
F	Antennaria rosea	a-	b12	ab3	a-	c20	.04	-	.52
F	Arabis drummondi	b31	a-	a6	a4	a4	.07	.01	.01
F	Astragalus convallarius	c60	a1	ab8	ab19	b28	.04	.12	.15
F	Astragalus sp.	a-	a-	a-	a-	b10	-	-	.05
F	Astragalus utahensis	10	8	13	10	9	.19	.09	.05
F	Cordylanthus ramosus (a)	-	-	a2	b29	a10	.01	.27	.15
F	Cryptantha sp.	c80	b40	ab24	a11	ab19	.19	.02	.28
F	Draba sp. (a)	-	-	-	2	3	-	.00	.00
F	Epilobium brachycarpum (a)	-	-	-	-	1	-	-	.00
F	Erigeron pumilus	8	-	6	2	3	.01	.00	.03
F	Eriogonum umbellatum	-	-	1	1	2	.00	.00	.15
F	Haplopappus acaulis	3	-	1	1	1	.03	.03	.03
F	Lappula occidentalis (a)	-	-	a-	b31	a4	-	.08	.01
F	Melilotus officinalis	-	-	-	-	2	-	-	.00
F	Microsteris gracilis (a)	-	-	-	-	1	-	-	.00
F	Phlox hoodii	b220	b200	a153	ab180	ab183	3.00	3.80	5.26
F	Phlox longifolia	-	-	8	2	3	.01	.01	.01
F	Tragopogon dubius	4	-	-	-	-	-	-	-
F	Trifolium sp.	b26	a2	a-	ab15	a-	-	.06	-
Total for Annual Forbs		0	0	2	77	93	0.00	0.39	0.33
Total for Perennial Forbs		443	263	223	245	284	3.61	4.17	6.57

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
Total for Forbs		443	263	225	322	377	3.62	4.57	6.91

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

BROWSE TRENDS --
Management unit 02 , Study no: 31

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	7	7	10	.19	1.24	1.50
B	Artemisia tridentata wyomingensis	98	98	98	16.34	20.70	18.17
B	Chrysothamnus viscidiflorus stenophyllus	70	62	76	1.77	1.83	2.78
B	Eriogonum microthecum	23	15	23	.29	.34	.24
B	Gutierrezia sarothrae	0	0	3	-	-	.03
B	Leptodactylon pungens	14	11	15	.24	.19	.31
B	Opuntia sp.	4	5	7	.03	-	.04
B	Tetradymia canescens	1	1	1	-	-	-
Total for Browse		217	199	233	18.87	24.31	23.08

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 31

Species	Percent Cover '06
Artemisia nova	1.79
Artemisia tridentata wyomingensis	24.85
Chrysothamnus viscidiflorus stenophyllus	2.59
Eriogonum microthecum	.16
Leptodactylon pungens	.30

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 31

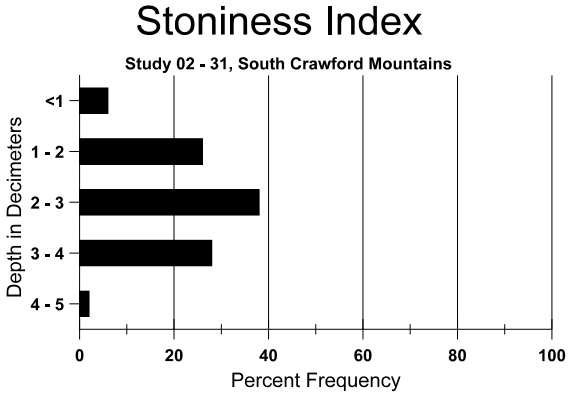
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	0.7	0.7

BASIC COVER --
Management unit 02 , Study no: 31

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	9.25	9.75	29.03	37.43	40.09
Rock	.25	.75	1.10	.13	.10
Pavement	8.00	3.00	7.37	2.61	5.19
Litter	52.25	26.00	30.34	34.68	30.29
Cryptogams	5.00	25.25	9.66	7.50	5.74
Bare Ground	25.25	35.25	32.97	37.84	39.94

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 31, South Crawford Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.5	57.8 (13.0)	7.1	55.3	17.4	27.4	1.9	160.3	51.2	0.6



PELLET GROUP DATA --
Management unit 02 , Study no: 31

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	3	7	16
Grouse	-	2	1
Elk	2	-	4
Deer	31	13	15
Cattle	1	1	7

Days use per acre (ha)	
'01	'06
-	-
26 groups/acre	26 groups/acre
1 (2)	9 (22)
23 (56)	8 (20)
13 (32)	10 (25)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**320**	-	20	280	20	40	6	0	6	6	6	9/14
01	**440**	-	20	400	20	-	86	0	5	-	0	12/16
06	**660**	340	-	600	60	-	0	0	9	9	9	10/16
Artemisia tridentata wyomingensis												
84	**8266**	2333	1333	5200	1733	-	68	26	21	.48	5	14/21
90	**7799**	66	133	2066	5600	-	50	40	72	5	50	12/19
96	**6420**	40	360	4160	1900	1300	63	4	30	11	11	15/27
01	**7420**	-	240	5700	1480	1140	23	3	20	7	7	16/25
06	**6260**	2160	280	4560	1420	860	18	3	23	15	19	16/26
Chrysothamnus viscidiflorus stenophyllus												
84	**6999**	-	800	6066	133	-	42	0	2	-	0	9/12
90	**6465**	-	666	2533	3266	-	36	14	51	4	21	6/6
96	**2880**	-	140	2400	340	20	3	7	12	6	9	9/11
01	**2940**	-	40	2600	300	40	5	2	10	4	4	8/10
06	**3840**	-	140	3560	140	20	.52	0	4	2	2	8/12
Eriogonum microthecum												
84	**333**	-	-	333	-	-	60	0	0	-	0	5/8
90	**733**	-	133	600	-	-	27	9	0	-	0	5/7
96	**700**	-	-	680	20	-	0	0	3	-	0	6/9
01	**540**	-	-	500	40	-	4	0	7	-	0	4/7
06	**680**	-	40	540	100	20	12	3	15	3	3	5/8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**80**	20	-	80	-	-	0	0	-	-	0	6/13
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**133**	-	-	-	133	-	0	0	100	30	100	-/-
96	**400**	-	-	380	20	-	0	0	5	-	0	6/12
01	**440**	-	-	400	40	-	0	0	9	-	0	4/9
06	**420**	-	40	360	20	-	0	0	5	5	10	5/11
Opuntia sp.												
84	**266**	-	-	266	-	-	0	0	0	-	0	4/5
90	**532**	-	466	66	-	-	0	0	0	-	0	3/6
96	**80**	-	-	60	20	-	0	0	25	-	0	4/12
01	**100**	-	-	100	-	-	0	0	0	-	0	3/10
06	**160**	-	20	120	20	20	0	0	13	13	13	4/9
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	4/9
01	**20**	-	-	20	-	-	0	0	-	-	0	3/13
06	**20**	-	-	20	-	-	0	0	-	-	0	4/7

Trend Study 2-32-06

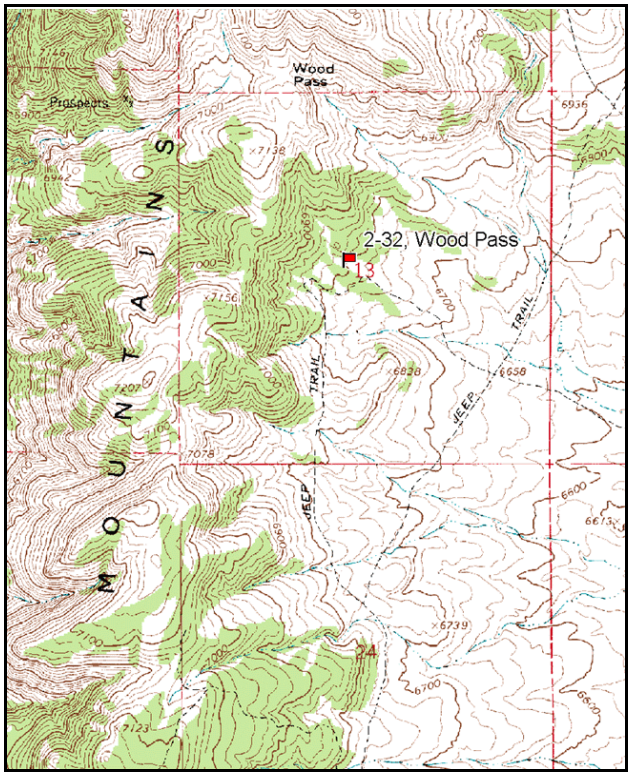
Study site name: Wood Pass . Vegetation type: Juniper .

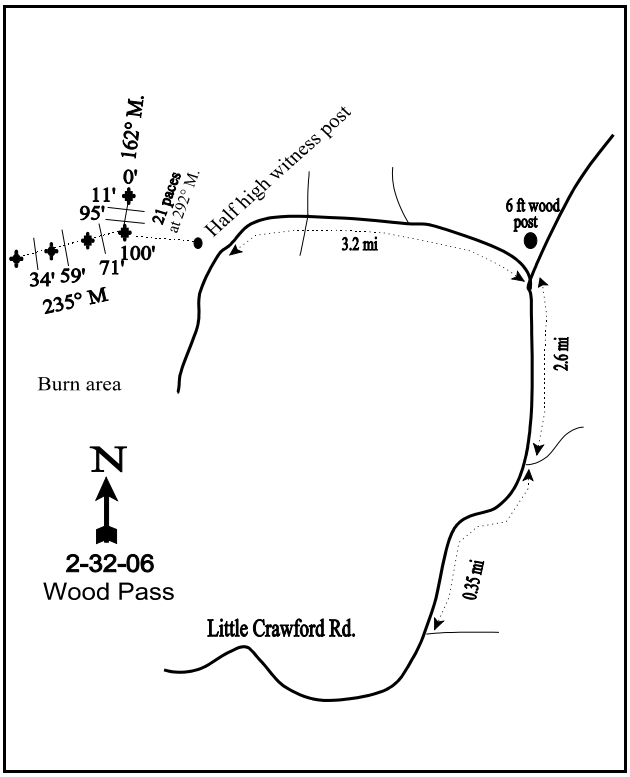
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed northeast for 1.35 miles to a fork. Turn left and travel 0.35 mile to another fork. Turn left and proceed 2.6 miles to a third fork marked by a six-foot tall wooden post. Turn left and proceed 3.2 miles staying on the main road, to a witness post just off the right side of road. From the witness post walk 21 paces at 292 degrees magnetic to the 100-foot baseline stake. Walk 100 feet at 342 degrees magnetic from the 100-foot stake to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7942. The baseline doglegs at 100 feet and runs 235 degrees magnetic.





Map Name: Woodruff Narrows

Diagrammatic Sketch

Township 10N , Range 7E , Section 13

UTM NAD 27, UTM 12T 4605849 N, 491564 E

DISCUSSION

Wood Pass - Trend Study No. 2-32

Study Information

This study is located on the east side of the Crawford Mountains approximately a half mile south of Wood Pass on land administered by the BLM (elevation: 6,800 feet, slope: 3-5%, aspect: southeast). The vegetation type is an open juniper woodland with an abundant association of low-growing black sagebrush and Wyoming big sagebrush. Animal use includes cattle in spring and summer, and deer and elk in winter. Pronghorn and sage grouse use the area continuously. Depending on the winter, snow depth could limit mid-winter utilization of the sagebrush. A pellet group transect read in 2001 estimated 19 deer/pronghorn and 9 cow days use/acre (46 ddu/ha and 23 cdu/ha). Deer and pronghorn pellet groups were combined due to their similarity in appearance. Pellet group data from 2006 was estimated at 21 deer/pronghorn, 33 elk, and 17 cow days use/acre (51 ddu/ha, 81 edu/ha, and 43 cdu/ha).

Soil

The soil is classified in the Solak series, a shallow, excessively drained soil that formed in residuum and colluvium weathered from conglomerate composed of sandstone, quartzite, and limestone. Total soil depth does not usually exceed 20 inches. Permeability to water is moderate, but available water capacity is low and erosion hazard is high. This soil, although occupied by Utah juniper, has a very low site productivity index or capability for producing juniper (Campbell and Lacey 1982; USDA-NRCS 2006). Soils have a clay loam texture with a soil reaction that is slightly alkaline (pH of 7.4). Effective rooting depth is variable, ranging from 10 inches to nearly 14 inches along the baseline. Black sagebrush is found in the more shallow soil, while Wyoming big sagebrush occupies the deeper soil. The soil is rocky throughout the profile with a calcareous layer at about 10 to 12 inches. Phosphorus could be a limiting factor at only 4.5 ppm. Values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). Relative bare ground cover averaged 23% until 2001. In 2001, bare ground cover increased to 30% and then decreased to 24% in 2006. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 3.1:1 in 2006. There is some localized erosion and a small gully is starting just north of the 0' stake. The erosion condition class was determined as stable in 2001 and slight in 2006 due to the formation of an active gully and soil movement.

Browse

The important browse species include black sagebrush and Wyoming big sagebrush. Black sagebrush has averaged 7% cover since 1996 with about 3,700 plants/acre. Plants classified as decadent have ranged from 50-65% of the population between 1984 and 1990. In 1996, decadence dropped to 25% in 1996 and slightly increased to 37% in 2006. Along with the moderately high number of decadent plants, 27% of the population was classified as dying in 2006, which was up from 6% in 2001. Utilization was moderate in 1984 and 1990, but has been light since 1996. Young recruitment has been low at only 1-3% of population during each reading since 1996.

There is most likely some hybridization between the black sagebrush and the Wyoming big sagebrush. Wyoming big sagebrush averaged 6% cover in 1996 and 2001, but decreased slightly to 4% in 2006. Density remained stable at about 4,600 plants/acre between 1984 and 1990. The baseline was extended in 1996 to increase the sample size and get a more accurate measurement of density. Density in 1996 averaged about 2,440 plants/acre, but decreased to 2,000 plants/acre in 2001 and 2006. Plants classified as decadent were estimated at 30% in 1996, decreased in 2001 to 21%, but increased to 42% of population in 2006. Young recruitment has been good during each year read, but in 2006 only 8% of population were young and 33% were classified as dying. It appears that the population may decline unless some of the dying plants recover or young recruitment increases. Seedlings were very abundant in 2006, which may contribute to the young population if they survive. Utilization has been light to moderate, except in 1984 and 1990 when it was moderate.

Point-center quarter data in 1996 estimated 235 junipers/acre with an average diameter of just over 5 inches. The density has increased in 2006 to 309 junipers/acre with average diameter of 5 inches. Plants ranged from about 4-8 feet in height on average. Canopy cover in 2001 averaged 13% and increased to 18% in 2006. A few of the more mature trees are highlined.

Herbaceous Understory

The herbaceous understory is diverse but not abundant. Eight perennial grasses produced less than 6% total cover in 1996 and 8% in 2001 and 2006. Sandberg bluegrass is the most abundant species. Forbs are also diverse yet few occur more than occasionally. Hoods phlox is the only common species and it accounted for over half of the forb cover.

1990 TREND ASSESSMENT

Density data indicates a slight increase in juniper on this open site. The trees are highlined. Sagebrush is common on the density plots where a large number of young sagebrush were classified. The sagebrush currently display a moderately hedged growth form. Rabbits have heavily browsed the low rabbitbrush. Trend for grasses is slightly up. Sandberg bluegrass, the most abundant grasses, increased significantly in nested frequency. Trend for forbs is slightly down. Forbs are rare, but cryptantha, lobeleaf groundsel, and a clover species all decreased significantly in nested frequency.

browse - stable (0) grasses - slightly up (+1) forbs - slightly down (-1)

1996 TREND ASSESSMENT

The browse trend is slightly up for black sagebrush and Wyoming big sagebrush. Black sagebrush shows improved vigor and a decline in percent decadence from 65% to 25%. Wyoming big sagebrush is less heavily utilized, and displays improved vigor and a decline in percent decadence. Seedlings and young plants are sufficient to maintain the population. Total density has declined, but the number of mature plants is similar to 1990 estimates. Some of the change in density of black sagebrush and Wyoming big sagebrush are due to the larger sample used in 1996. Trend for grasses is up. Perennial grass sum of nested frequency increased by 27%, mainly due to a significant increase in western wheatgrass. Trend for forbs is stable. Not much change from 1990, except a significant decrease in low penstemon nested frequency. Forbs are few and not abundant. The Desirable Components Index rated this study as good due to good browse cover, moderate decadence, and fair perennial grass cover.

winter range condition (DC Index) - good (43) Low Potential scale
browse - slightly up (+1) grasses - up (+2) forbs - stable (0)

2001 TREND ASSESSMENT

Trend for black and Wyoming big sagebrush is slightly down. Black sagebrush has remained at a similar density compared to 1996. Utilization is mostly light, vigor normal, and decadence similar (25% to 31%). Recruitment is currently poor and the population could decline slightly if drought conditions continue. Wyoming big sagebrush density declined 18%, but displays mostly light use and good vigor. Decadence has also declined from 30% to 21%. Recruitment is good with 16% of the population consisting of young plants. Trend for grasses is stable. Perennial grass sum of nested frequency remained unchanged, while cover increased from 6% to 8%. Cheatgrass is present, but not abundant (less than 1% cover). Trend for forbs is up. Perennial forb sum of nested frequency increased by 50% mainly due to a significant increase in cryptantha, low penstemon, and a clover species. The Desirable Components Index rated this study as good due to good browse cover, moderate decadence, and fair perennial grass cover.

winter range condition (DC Index) - good (57) Low Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - up (+2)

2006 TREND ASSESSMENT

Trend for key browse, Wyoming big sagebrush and black sagebrush, is stable. Density of both species remained similar to 2001 estimates. Decadence of Wyoming big sagebrush increased from 21% in 2001 to 42% in 2006. Also 33% of the population was classified as dying. Young recruitment was moderate, but is not enough to replace the population if all 33% die. Black sagebrush also increased in the number of plants classified as dying and young recruitment is not quite as good. Both species may decrease with high densities of dying plants. Trend for grasses is slightly up. Perennial grass sum of nested frequency increased by 18% even though cover remained at 8%. Trend for forbs is stable. Perennial forbs sum of nested frequency remained similar to 2001. The Desirable Components Index rated this study as fair-good due to good browse cover, moderate decadence, decreased young recruitment, and fair perennial grass cover.

winter range condition (DC Index) - fair-good (47) Low Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 32

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	$_{b}$31	$_{a}$-	$_{b}$88	$_{b}$58	$_{c}$98	.97	.49	.89
G	Agropyron spicatum	$_{b}$47	$_{c}$79	$_{ab}$34	$_{bc}$64	$_{a}$8	.65	2.08	.10
G	Bromus tectorum (a)	-	-	$_{ab}$25	$_{b}$30	$_{a}$4	.10	.45	.01
G	Carex sp.	-	-	-	-	6	-	-	.06
G	Oryzopsis hymenoides	$_{a}$8	$_{ab}$17	$_{bc}$32	$_{ab}$19	$_{c}$47	.52	.63	.86
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{b}$13	$_{b}$10	$_{b}$21	.07	.10	.21
G	Poa secunda	$_{a}$145	$_{b}$206	$_{b}$191	$_{b}$198	$_{b}$233	3.28	3.77	4.71
G	Sitanion hystrix	$_{b}$36	$_{a}$9	$_{ab}$26	$_{ab}$16	$_{a}$9	.11	.57	.06
G	Stipa comata	$_{abc}$7	$_{ab}$5	$_{a}$17	$_{c}$25	$_{bc}$28	.21	.78	.53
G	Stipa lettermani	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$11	-	-	.15
Total for Annual Grasses		0	0	25	30	4	0.10	0.45	0.00
Total for Perennial Grasses		274	316	401	390	461	5.84	8.43	7.60
Total for Grasses		274	316	426	420	465	5.94	8.89	7.61
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$3	$_{b}$11	.00	.03	.05
F	Alyssum alyssoides (a)	-	-	-	6	5	-	.01	.01
F	Antennaria rosea	$_{a}$-	$_{ab}$4	$_{ab}$8	$_{b}$15	$_{b}$12	.31	.25	.36
F	Arabis sp.	$_{a}$-	$_{a}$-	$_{b}$10	$_{ab}$1	$_{a}$-	.02	.00	-
F	Arenaria sp.	1	-	-	-	-	-	-	-
F	Astragalus convallarius	$_{a}$8	$_{a}$-	$_{a}$10	$_{a}$7	$_{b}$22	.02	.10	.20
F	Astragalus utahensis	29	14	21	14	20	.12	.11	.13
F	Camelina microcarpa (a)	-	-	-	-	2	-	-	.00
F	Calochortus nuttallii	4	-	-	-	-	-	-	-
F	Chaenactis douglasii	7	-	-	-	-	-	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Cirsium undulatum	-	-	-	3	-	-	.00	-
F	Collomia linearis (a)	-	-	-	3	-	-	.03	-
F	Comandra pallida	6	5	-	-	3	-	-	.00
F	Collinsia parviflora (a)	-	-	-	-	11	-	-	.02
F	Cordylanthus ramosus (a)	-	-	$_{a}$15	$_{ab}$36	$_{b}$51	.10	.18	.88
F	Crepis acuminata	$_{b}$11	$_{ab}$2	$_{ab}$3	$_{a}$1	$_{ab}$5	.06	.00	.01
F	Cryptantha sp.	$_{b}$25	$_{a}$-	$_{ab}$8	$_{c}$47	$_{b}$11	.09	.58	.10
F	Cymopterus sp.	-	-	-	2	1	-	.03	.00
F	Cynoglossum officinale	-	-	-	3	-	-	.00	-
F	Descurainia pinnata (a)	-	-	$_{ab}$6	$_{b}$8	$_{a}$-	.01	.03	.00
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Erigeron pumilus	-	-	-	-	8	-	-	.02
F	Eriogonum umbellatum	-	-	-	-	1	-	-	.00
F	Haplopappus acaulis	-	4	-	-	-	-	-	-
F	Ipomopsis aggregata	5	-	-	-	-	-	-	-
F	Lappula occidentalis (a)	-	-	$_{a}$3	$_{b}$9	$_{ab}$3	.00	.02	.01
F	Microsteris gracilis (a)	-	-	-	2	-	-	.01	-
F	Penstemon humilis	$_{b}$49	$_{b}$36	$_{a}$3	$_{b}$24	$_{b}$25	.01	.22	.51
F	Phlox hoodii	115	133	104	111	100	2.30	2.45	2.47
F	Phlox longifolia	$_{ab}$11	$_{a}$6	$_{ab}$13	$_{a}$5	$_{b}$22	.03	.04	.13
F	Senecio multilobatus	$_{b}$21	$_{a}$-	$_{a}$3	$_{a}$4	$_{a}$5	.00	.03	.01
F	Trifolium sp.	$_{b}$45	$_{a}$6	$_{a}$3	$_{b}$43	$_{b}$66	.00	.27	.39
Total for Annual Forbs		0	0	24	65	72	0.12	0.29	0.93
Total for Perennial Forbs		337	210	189	283	312	3.00	4.16	4.43
Total for Forbs		337	210	213	348	384	3.12	4.45	5.36

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

BROWSE TRENDS --
Management unit 02 , Study no: 32

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia nova	55	52	54	6.93	7.48	7.47
B	Artemisia tridentata wyomingensis	50	41	40	6.50	6.23	4.05
B	Atriplex canescens	0	0	0	-	.00	-
B	Chrysothamnus nauseosus consimilis	0	2	0	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	13	11	10	.10	.53	.31
B	Eriogonum microthecum	1	2	2	.03	.15	.03
B	Juniperus osteosperma	23	20	20	7.63	11.09	12.79
B	Leptodactylon pungens	0	1	1	-	.03	.03
B	Opuntia sp.	1	0	0	-	-	-
B	Tetradymia canescens	0	1	1	-	-	.03
Total for Browse		143	130	128	21.20	25.53	24.72

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 32

Species	Percent Cover	
	'01	'06
Artemisia nova	-	8.93
Artemisia tridentata wyomingensis	-	5.11
Chrysothamnus viscidiflorus stenophyllus	-	.40
Juniperus osteosperma	12.60	18.11

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 32

Species	Average leader growth (in)	
	'01	'06
Artemisia nova	0.5	0.6
Artemisia tridentata wyomingensis	0.9	0.8

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 32

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	216	309

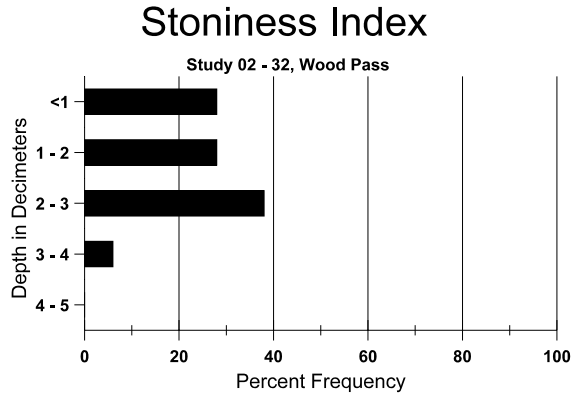
Average diameter (in)	
'01	'06
6.0	5.0

BASIC COVER --
Management unit 02 , Study no: 32

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.75	6.00	29.52	36.61	33.29
Rock	2.00	3.25	1.21	1.04	2.42
Pavement	14.75	18.00	4.10	3.92	11.23
Litter	55.50	41.00	39.92	40.78	40.39
Cryptogams	3.00	8.75	4.83	3.94	3.76
Bare Ground	23.00	23.00	21.77	37.10	28.82

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 32, Wood Pass

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.7	60.6 (12.7)	7.4	32.9	36.7	30.4	3.3	4.5	70.4	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 32

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	15	20	21
Elk	2	-	4
Deer	38	17	29
Cattle	1	4	6

Days use per acre (ha)	
'01	'06
-	-
-	33 (81)
19 (46)	21 (51)
9 (23)	17 (43)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 32

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
84	**1199**	-	133	466	600	-	78	0	50	-	0	9/16
90	**1533**	66	133	400	1000	-	39	0	65	5	26	10/13
96	**3800**	-	100	2760	940	460	20	2	25	2	2	11/21
01	**3760**	-	20	2560	1180	580	4	0	31	6	6	12/22
06	**3560**	2060	60	2200	1300	620	.56	.56	37	27	30	12/19
Artemisia tridentata wyomingensis												
84	**4666**	200	666	1400	2600	-	71	6	56	-	14	18/24
90	**4532**	-	1733	933	1866	-	53	15	41	1	15	18/20
96	**2440**	100	640	1080	720	600	28	2	30	-	0	17/31
01	**2000**	-	320	1260	420	620	12	0	21	7	7	16/28
06	**1940**	1360	160	960	820	380	27	8	42	33	69	15/23
Atriplex canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	6/10
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	24/28
01	**40**	-	-	40	-	-	0	0	-	-	0	31/45
06	**0**	-	-	-	-	-	0	0	-	-	0	29/40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus												
84	**466**	-	-	333	133	-	0	0	29	-	0	10/12
90	**1400**	-	400	1000	-	-	38	24	0	-	0	7/11
96	**500**	-	80	160	260	20	12	0	52	36	36	8/11
01	**380**	-	80	300	-	40	0	0	0	-	0	9/17
06	**360**	60	-	160	200	-	0	0	56	11	17	10/16
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	6/9
01	**60**	-	-	60	-	-	0	0	-	-	0	5/10
06	**40**	-	-	40	-	-	0	0	-	-	0	5/11
Juniperus osteosperma												
84	**266**	-	133	133	-	-	0	0	0	-	0	69/43
90	**399**	-	133	266	-	-	33	33	0	-	0	84/49
96	**500**	-	140	360	-	20	0	0	0	-	0	-/-
01	**460**	20	120	320	20	20	4	0	4	-	0	-/-
06	**460**	60	100	320	40	-	0	0	9	9	9	16/17
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**66**	266	-	66	-	-	0	0	-	-	0	2/3
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	6/11
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**66**	-	-	66	-	-	0	0	-	-	0	3/9
96	**60**	-	-	60	-	-	0	0	-	-	0	4/8
01	**0**	-	-	-	-	-	0	0	-	-	0	4/8
06	**0**	-	-	-	-	-	0	0	-	-	0	5/21
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	14/27
01	**0**	-	-	-	-	-	0	0	-	-	0	15/29
06	**0**	-	-	-	-	-	0	0	-	-	0	10/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**132**	-	66	-	66	-	50	50	50	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	6/8
01	**20**	-	-	20	-	-	0	0	0	-	0	11/19
06	**40**	-	-	40	-	-	0	0	0	-	0	11/21

Trend Study 2-33-06

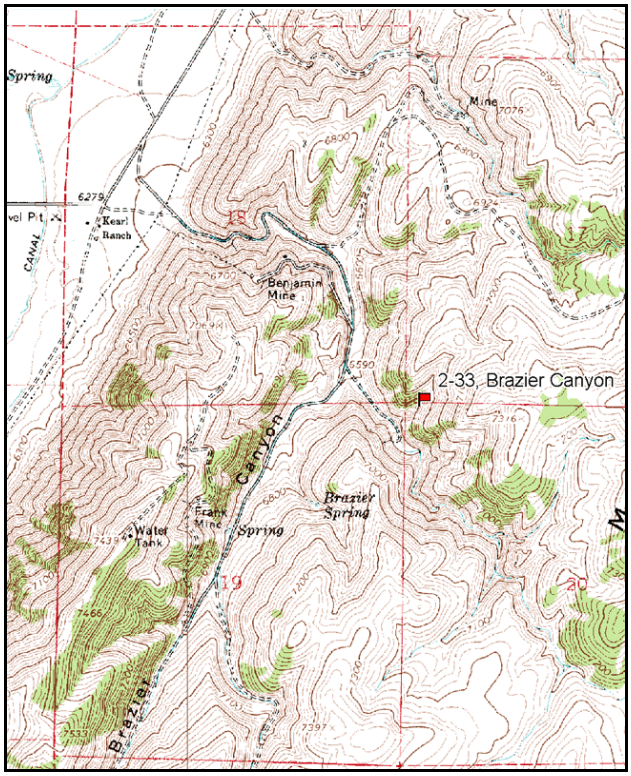
Study site name: Brazier Canyon . Vegetation type: Black Sagebrush .

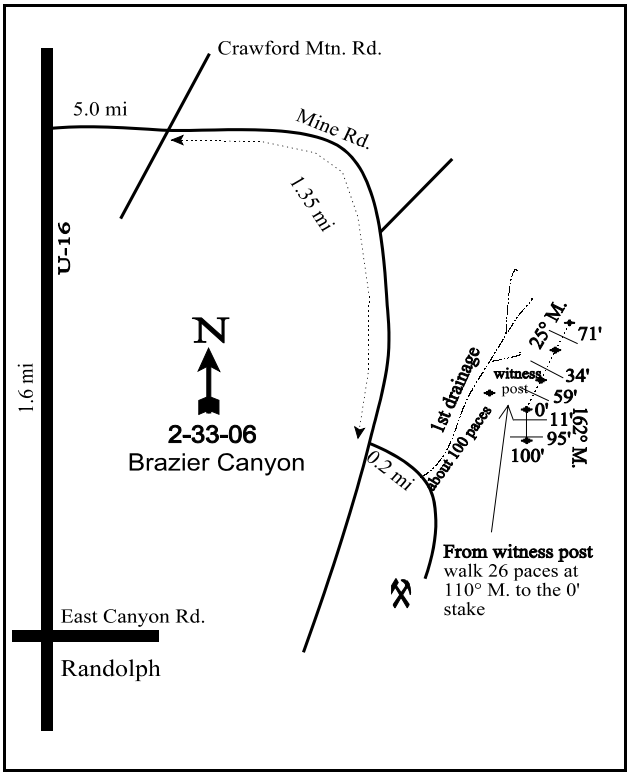
Compass bearing: frequency baseline 162 degrees magnetic.

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

LOCATION DESCRIPTION

From North Main and East Canyon Road (100 North) in Randolph proceed north on U-16 for 1.60 miles, and turn right (east) onto Crawford Mountian Road. continue east for 5.0 miles to a two way stop. Turn right (i.e. southeast) and proceed 1.35 miles on this road to where there is a small canyon on the left with a road going up it. Turn left (i.e. east) onto this road, and proceed 0.2 miles to the first ravine on the left (i.e., north) side of the road. Walk up ravine 100 paces to a witness post. From the witness post walk 26 paces at a bearing of 110 degrees magnetic to the 0-foot baseline stake. The 0-foot stake is marked by a browse tag, #7978. The rest of the baseline runs off the 0-foot baseline stake at a bearing of 25 degrees magnetic.





Map Name: Rex Peak

Diagrammatic Sketch

Township 11N , Range 8E , Section 20

UTM NAD 27, UTM 12T 4614824 N, 494144 E

DISCUSSION

Brazier Canyon - Trend Study No. 2-33

Study Information

This study is located on the northeastern side of the Crawford Mountain and is located in a tributary of Brazier Canyon on land administered by the BLM (elevation: 6,800 feet, slope: 40-50%, aspect: west). The vegetation type is a black sagebrush-perennial grass community with scattered juniper. This area is considered winter range for deer. Cattle graze the area in the spring, but typically do not use the steep slopes. Deer use was moderately high in 1996 with a quadrat frequency of pellet groups at 33%. In addition, two deer carcasses were found on the study in 1984 and two antler sheds in 1996. A pellet group transect from 2001 estimated 48 deer, 1 elk, and 1 cow days use/acre (117 ddu/ha, 3 edu/ha, and 2 cdu/ha). Pellet group data from 2006 was estimated at 80 deer, 8 elk, and 4 cow days use/acre (198 ddu/ha, 20 edu/ha, and 11 cdu/ha).

Soil

The soil is classified in the Rexmont series, which are shallow and excessively drained gravelly loams. They are primarily residual soils derived from limestone and thus are moderately to strongly alkaline and calcareous throughout the 20 inch soil profile. Permeability is moderate, available water capacity is poor, and both runoff and erosion hazard are high (Campbell and Lacey 1982; USDA-NRCS 2006). Soil reaction is slightly alkaline (pH of 7.7) and the effective rooting depth was estimated at almost 16 inches in 1996. Rock and pavement are common on the surface. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair at 2.7:1 in 2006. There is some localized soil movement, which is inevitable due to the steep slope. The study showed evidence of significant sheet erosion and somewhat less serious gully erosion in 1984. Soil pedestalling was evident, but abundant vegetation and litter cover adequately protect the soil from serious erosion. The erosion condition class was determined to be slight in 2001 and stable in 2006.

Browse

The key browse is black sagebrush, which forms a moderately dense and uniform stand. Utilization is generally light to moderate, except in 1990 when it was moderate. The larger sample taken in 1996 estimated 5,340 plants/acre of black sagebrush, which was much lower than the 1990 estimate of 11,666 plants/acre using the old method. Density slightly increased in 2001 and stayed the same in 2006. The lack of large numbers of dead plants in 1996, suggests that this new density estimate is more reflective of the actual population over the whole area. Decadence was high in 1990 at 46%, but decreased to 14% in 1996 and 2001. In 2006, decadence increased to 30% with 19% of population classified as dying. Young recruitment has averaged 3-7% of the population, which is not enough to replace those plants that are dying.

Wyoming big sagebrush is less abundant and is hybridizing with black sagebrush. Utilization on Wyoming big sagebrush is moderate. Density averaged 1,500 plants/acre in 1990 and 1996, but declined in 2001 to 1,060 plants/acre. By 2006, most of the Wyoming big sagebrush had died, leaving only 40 plants/acre. Due to the dry conditions during the summers of 1996 and 2000-2002, many of the Wyoming big sagebrush plants had dropped their leaves. This is likely a marginal site for Wyoming big sagebrush under drought conditions. Decadence increased from 30% in 1996 to 42% 2001 with 19% of the population classified as dying. Young recruitment averaged 9% from 1984 to 1996, then dropped to 2% in 2001 and was not enough to replace the plants that were dying.

Other preferred shrubs include winterfat and serviceberry, which occur in relatively small numbers. Point-quarter data from 2001 estimated 121 juniper trees/acre with an average diameter of 4 inches. In 2006, junipers were estimated at 127 trees/acre with a average diameter of 3 inches. Several are young plants about 1 to 4 feet tall.

Herbaceous Understory

Perennial grasses are the most abundant herbaceous component. Within that category, bluebunch wheatgrass

and Sandberg bluegrass are the most productive. They have produced over 90% of the grass cover and combined have averaged 15-18% cover since 1996. Forb composition is moderately diverse, but not very abundant, except hoods phlox. Total cover of perennial forbs has averaged between 5-6%, yet most are relatively unproductive and unpalatable.

1990 TREND ASSESSMENT

Allowing for difficulties in separating sagebrush species at Brazier Canyon, the total density of sagebrush declined slightly. A dense stand of sagebrush, dominated by black sagebrush, remains. While the black sagebrush decreased in density, improvements were seen in age class structure, vigor, and growth form. Sagebrush appear moderately hedged, although there is evidence of very heavy deer use. Several deer carcasses were found on the site. A density of 89 juniper/acre was calculated from the point-quarter method. Trend for grasses is stable. Perennial grass sum of nested frequency remained similar, but the frequency of bluebunch wheatgrass declined significantly. Trend for forbs is down. Forbs are diverse, but not abundant. Perennial forbs sum of nested frequency decreased by 31%, due to a significant decrease in longleaf phlox, cryptantha, low penstemon, and 2 milkvetch species.

browse - stable (0) grasses - stable (0) forbs - down (-2)

1996 TREND ASSESSMENT

The browse trend appears stable for black sagebrush. Population density declined 52% compared to 1990 data. However, the lack of large numbers of dead shrubs suggests that this new estimate using a much larger sample is a more accurate reflection of black sagebrush density. Utilization of black sagebrush is mostly light to moderate, vigor is good, and percent decadence has declined from 46% in 1990 to 14% in 1996. Black sagebrush makes up the majority of the browse cover (68%). Wyoming big sagebrush has a similar density compared to 1990. Utilization is less heavy, yet vigor is poor on 11% of the population, and decadence has increased from 22% in 1990 to 30% in 1996. There is one dead plant for every two living ones. Trend for Wyoming big sagebrush appears slightly down, but it only contributes 13% of the browse cover. The browse trend is considered stable overall. Trend for grasses is slightly up. Perennial grass sum of nested frequency increased by 17% due to an increase in bluebunch wheatgrass and mutton bluegrass. Cheatgrass was sampled, but is not abundant. Trend for forbs is stable. Forbs are not abundant and did not change much overall from 1990. The Desirable Components Index rated this study as excellent due to good browse cover, low decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (69) Low Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

2001 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, is stable. Utilization continues to be light to moderate, vigor normal on most plants, and percent decadence low at 13%. Young plants are abundant and adequate to maintain the stand. Wyoming big sagebrush is of secondary importance. It has declined slightly in density. It displays moderate to heavy use, poor vigor on 19% of the population, and high percent decadence at 42%. Recruitment is poor and there are not currently enough young plants to replace the plants classified as dying (200 plants/acre). This is probably a marginal site for Wyoming big sagebrush, especially during drought. The density of young juniper trees increased from 20 plants/acre in 1996 to 100 plants/acre in 2001. Over time, the increase in juniper cover could negatively effect the sagebrush understory. Trend for grasses is slightly up. Perennial grass sum of nested frequency did not change much, but bluebunch wheatgrass increased significantly, while Sandberg bluegrass decreased significantly. Trend for forbs is stable. Perennial forb sum of nested frequency increased by 13%, although forbs remain a minor component of the herbaceous understory. The Desirable Components Index rated this study as excellent due to good browse cover, low decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (75) Low Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse is slightly down. Black sagebrush density has remained similar to 2001 and young recruitment is still good at 5% of population. Decadence increased from 13% to 30%. The Wyoming big sagebrush is down and practically has been eliminated from the study area. Density decreased from 1,060 plants/acre in 2001 to 40 plants/acre in 2006. Cover has only averaged about 1%, but typically Wyoming big sagebrush has been much more utilized than black sagebrush. This area is probably marginal for Wyoming big sagebrush and appears it will no longer be a part of this community. Junipers continue to expand their population. Trend for grasses is stable. Perennial grass sum of nested frequency remained similar to 2001 and cheatgrass has continued to be a minor component. Trend for forbs is stable. Perennial forb nested frequency changed very little. The Desirable Components Index rated this study as good-excellent due to decreased browse cover, moderate decadence, and good perennial grass cover.

winter range condition (DC Index) - good-excellent (64) Low Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 33

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{c}$208	$_{a}$119	$_{ab}$166	$_{c}$212	$_{bc}$207	6.76	10.46	12.07
G	Bromus tectorum (a)	-	-	$_{a}$19	$_{ab}$43	$_{b}$54	.21	.66	.59
G	Koeleria cristata	$_{b}$23	$_{ab}$11	$_{a}$1	$_{a}$6	$_{a}$-	.00	.09	-
G	Poa fendleriana	$_{a}$8	$_{a}$-	$_{b}$27	$_{ab}$14	$_{a}$3	.28	.27	.03
G	Poa secunda	$_{a}$190	$_{c}$302	$_{c}$308	$_{b}$252	$_{b}$265	8.95	4.30	5.39
G	Sitanion hystrix	-	-	3	-	-	.15	-	-
G	Stipa comata	-	-	-	-	2	-	-	.03
Total for Annual Grasses		0	0	19	43	54	0.21	0.66	0.59
Total for Perennial Grasses		429	432	505	484	477	16.16	15.13	17.54
Total for Grasses		429	432	524	527	531	16.38	15.79	18.13
F	Agoseris glauca	-	-	-	-	4	-	-	.03
F	Alyssum alyssoides (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$14	-	-	.03
F	Antennaria rosea	10	6	5	5	-	.06	.06	-
F	Arenaria fendleri	46	44	35	21	29	1.61	.37	.61
F	Arabis holboellii	$_{a}$1	$_{a}$-	$_{b}$10	$_{ab}$6	$_{ab}$3	.03	.06	.01
F	Aster chilensis	-	-	-	-	1	-	-	.04
F	Astragalus convallarius	$_{c}$43	$_{a}$4	$_{bc}$25	$_{c}$43	$_{ab}$18	.51	.90	.37
F	Astragalus sp.	$_{c}$115	$_{a}$13	$_{a}$8	$_{a}$4	$_{b}$37	.09	.01	.48
F	Astragalus utahensis	1	3	-	2	4	-	.00	.03
F	Balsamorhiza sagittata	8	5	2	14	7	.15	.31	.24

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Castilleja linariaefolia	-	-	-	4	-	-	.06	-
F	Camelina microcarpa (a)	-	-	-	-	-	-	.00	-
F	Calochortus nuttallii	1	4	-	-	-	-	-	-
F	Chaenactis douglasii	3	-	-	-	-	-	-	-
F	Comandra pallida	-	-	-	8	8	-	.09	.04
F	Collinsia parviflora (a)	-	-	6	-	3	.01	-	.00
F	Cordylanthus ramosus (a)	-	-	7	1	1	.07	.00	.01
F	Crepis acuminata	28	23	24	43	29	.49	.57	.38
F	Cryptantha sp.	$_{b}$39	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$1	-	-	.00
F	Cymopterus sp.	-	-	-	8	3	-	.05	.03
F	Descurainia pinnata (a)	-	-	3	4	12	.03	.03	.02
F	Draba sp. (a)	-	-	-	-	3	-	-	.00
F	Erigeron divergens	$_{a}$-	$_{b}$34	$_{a}$4	$_{a}$6	$_{a}$2	.06	.06	.03
F	Haplopappus acaulis	$_{ab}$4	$_{a}$-	$_{b}$14	$_{ab}$2	$_{b}$11	.21	.03	.33
F	Hackelia patens	-	9	-	3	3	-	.03	.03
F	Holosteum umbellatum (a)	-	-	-	-	6	-	-	.01
F	Lupinus sp.	-	-	-	2	-	-	.00	-
F	Machaeranthera canescens	-	-	-	2	-	-	.00	-
F	Melilotus officinalis	-	-	-	-	1	-	-	.00
F	Penstemon humilis	$_{b}$10	$_{a}$2	$_{ab}$3	$_{a}$1	$_{a}$-	.01	.00	-
F	Phacelia sp.	6	-	-	-	-	-	-	-
F	Phlox hoodii	$_{a}$32	$_{a}$34	$_{b}$74	$_{b}$80	$_{b}$68	.93	2.57	2.37
F	Phlox longifolia	$_{a}$29	$_{b}$83	$_{ab}$60	$_{a}$38	$_{b}$85	.52	.21	.68
F	Physaria sp.	-	-	-	-	5	-	-	.01
F	Polygonum douglasii (a)	-	-	-	-	4	-	-	.01
F	Senecio multilobatus	3	-	-	1	-	-	.03	-
F	Solidago sp.	3	-	-	-	-	-	-	-
F	Trifolium sp.	$_{a}$-	$_{a}$-	$_{ab}$6	$_{b}$13	$_{ab}$5	.02	.08	.04
Total for Annual Forbs		0	0	16	5	43	0.11	0.04	0.10
Total for Perennial Forbs		382	264	270	306	324	4.73	5.54	5.78
Total for Forbs		382	264	286	311	367	4.85	5.59	5.88

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

BROWSE TRENDS --
Management unit 02 , Study no: 33

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	4	1	0	-	.00	-
B	Artemisia nova	82	80	87	10.04	13.06	9.27
B	Artemisia tridentata wyomingensis	42	30	2	1.89	.98	.15
B	Ceratoides lanata	15	15	13	.07	.30	.51
B	Chrysothamnus viscidiflorus viscidiflorus	29	34	33	1.03	3.69	2.57
B	Eriogonum microthecum	37	36	46	.87	1.05	1.46
B	Juniperus osteosperma	4	7	8	.56	1.23	2.14
B	Leptodactylon pungens	0	0	1	-	-	-
B	Opuntia sp.	2	2	2	-	-	-
B	Symphoricarpos oreophilus	5	4	6	.38	.21	.06
B	Tetradymia canescens	0	0	1	-	.03	-
Total for Browse		220	209	199	14.85	20.59	16.18

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 33

Species	Percent Cover	
	'01	'06
Artemisia nova	-	10.76
Artemisia tridentata wyomingensis	-	.21
Ceratoides lanata	-	.45
Chrysothamnus viscidiflorus viscidiflorus	-	3.48
Eriogonum microthecum	-	2.00
Juniperus osteosperma	1.00	6.34
Opuntia sp.	-	.05
Symphoricarpos oreophilus	-	.26

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 33

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	3.1
Artemisia nova	0.2	0.5

POINT-QUARTER TREE DATA --
Management unit 02 , Study no: 33

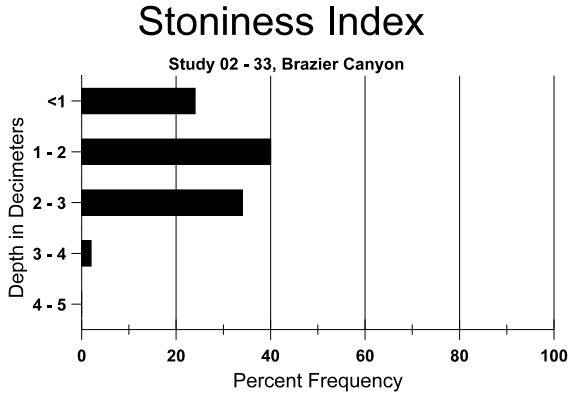
Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	121	127	3.7	2.8

BASIC COVER --
Management unit 02 , Study no: 33

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	14.75	35.12	42.21	39.31
Rock	15.50	6.00	13.34	5.89	13.22
Pavement	16.00	24.50	16.43	13.54	16.69
Litter	49.25	32.50	26.29	33.81	24.45
Cryptogams	6.75	4.75	5.01	2.72	2.19
Bare Ground	9.50	17.50	11.36	19.00	24.33

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 33, Brazier Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.5	53.2 (16.8)	7.7	36.7	39.0	24.3	4.0	14.4	105.6	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 33

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	7	5	9
Elk	-	2	7
Deer	33	25	27
Cattle	1	1	3

Days use per acre (ha)	
'01	'06
-	-
1 (3)	8 (20)
48 (117)	80 (198)
1 (2)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 33

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**66**	-	66	-	-	-	0	0	0	-	0	-/-
90	**133**	-	133	-	-	-	0	0	0	-	0	-/-
96	**80**	-	40	-	40	20	0	0	50	50	50	14/13
01	**20**	-	-	-	20	-	0	100	100	100	100	19/20
06	**0**	-	-	-	-	-	0	0	0	-	0	22/32
Artemisia nova												
84	**14132**	333	600	5466	8066	-	25	.47	57	-	2	7/13
90	**11666**	200	1000	5333	5333	-	63	2	46	.51	4	10/11
96	**5340**	180	160	4440	740	880	28	.37	14	2	2	12/21
01	**5760**	560	420	4620	720	900	17	1	13	6	6	12/20
06	**5680**	1080	260	3740	1680	1240	.70	0	30	19	20	13/21
Artemisia tridentata wyomingensis												
84	**865**	-	66	533	266	-	54	15	31	-	0	12/12
90	**1532**	66	133	1066	333	-	22	26	22	-	9	33/26
96	**1460**	-	100	920	440	620	52	5	30	8	11	14/24
01	**1060**	20	20	600	440	300	40	17	42	19	19	12/21
06	**40**	40	20	-	20	640	50	0	50	50	50	-/-
Ceratoides lanata												
84	**399**	-	66	333	-	-	67	0	0	-	0	6/7
90	**465**	-	266	133	66	-	29	14	14	-	0	6/5
96	**580**	-	40	540	-	-	38	10	0	-	0	8/10
01	**680**	-	-	680	-	-	6	0	0	-	0	8/15
06	**580**	-	-	580	-	-	0	21	0	-	0	10/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus consimilis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	28/65
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
84	**2399**	-	200	1266	933	-	0	0	39	-	0	15/12
90	**2732**	66	666	1600	466	-	0	2	17	-	0	13/11
96	**840**	-	20	700	120	-	2	0	14	-	0	13/19
01	**1020**	-	-	940	80	-	0	0	8	-	0	12/20
06	**1160**	-	40	1040	80	20	2	0	7	-	10	11/15
Eriogonum microthecum												
84	**1400**	400	400	1000	-	-	0	0	-	-	0	9/8
90	**1466**	66	800	666	-	-	5	0	-	-	0	5/7
96	**1300**	-	20	1280	-	-	0	0	-	-	0	7/9
01	**1380**	-	-	1380	-	-	0	1	-	-	0	6/8
06	**1740**	20	60	1680	-	-	1	0	-	-	0	8/12
Juniperus osteosperma												
84	**66**	-	66	-	-	-	0	0	-	-	0	-/-
90	**66**	66	66	-	-	-	0	0	-	-	0	-/-
96	**80**	20	20	60	-	20	0	0	-	-	0	-/-
01	**140**	-	100	40	-	-	0	0	-	-	0	-/-
06	**180**	100	80	100	-	-	0	0	-	-	0	49/59
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**20**	-	-	-	20	-	0	0	100	-	100	-/-
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	3/10
01	**40**	-	-	40	-	-	0	0	-	-	0	6/12
06	**80**	-	20	60	-	-	0	0	-	-	0	3/3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	20/41
Symphoricarpos oreophilus												
84	**599**	-	266	333	-	-	0	0	-	-	0	16/6
90	**1799**	-	66	1733	-	-	19	4	-	-	15	22/12
96	**140**	-	20	120	-	-	0	0	-	-	14	16/32
01	**120**	-	-	120	-	100	0	0	-	-	0	18/32
06	**200**	-	20	180	-	-	0	0	-	-	0	16/33
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	12/30
06	**20**	-	20	-	-	-	0	0	-	-	0	12/25

Trend Study 2-34-06

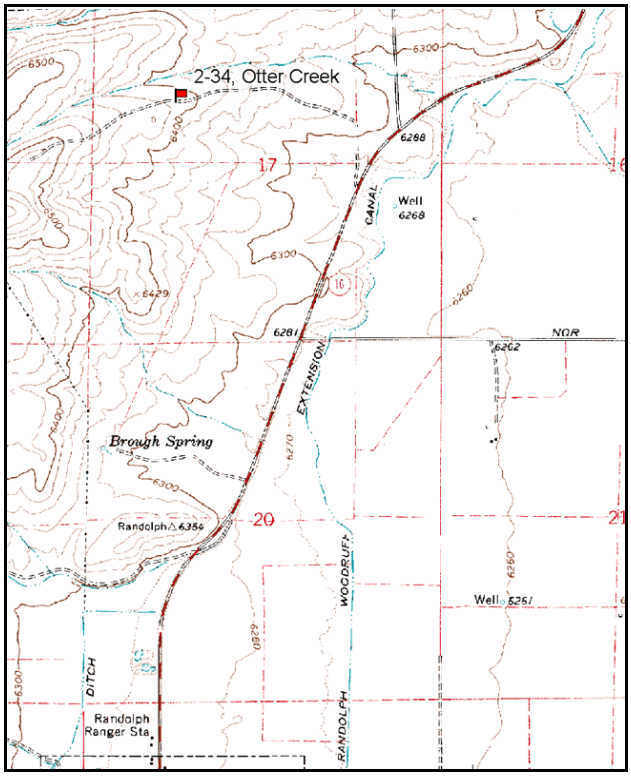
Study site name: Otter Creek . Vegetation type: Big Sagebrush .

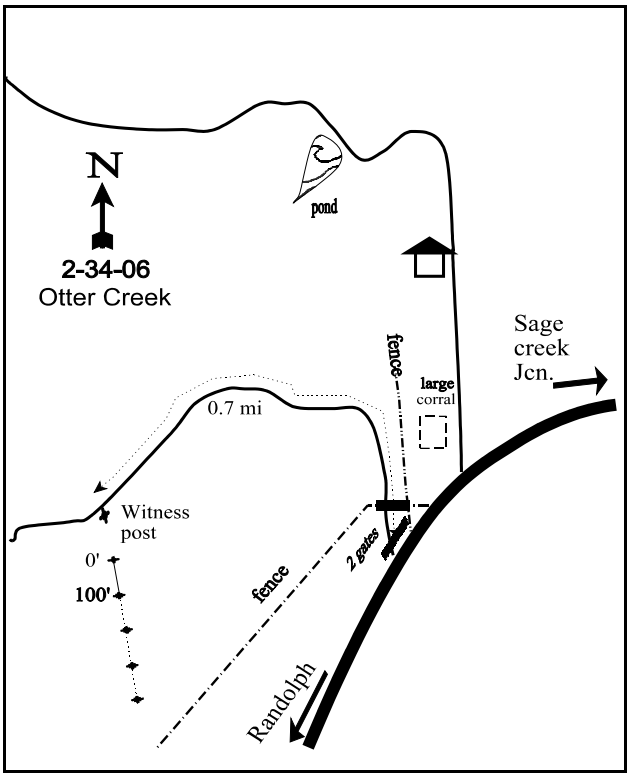
Compass bearing: frequency baseline 146 degrees magnetic.

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

LOCATION DESCRIPTION

Proceed north from Randolph on U-16. Travel 1/2 mile past Nor Gray Lane. Turn left here, and proceed 0.7 miles from the first gate to a witness post on the left hand side of the road. From the witness post walk 15 feet at 160 degrees magnetic to the 0-foot stake of the baseline marked with browse tag #7977.





Map Name: Randolph

Diagrammatic Sketch

Township 11N , Range 7E , Section 17

UTM NAD 27, UTM 12T 4616055 N, 484758 E

DISCUSSION

Otter Creek - Trend Study No. 2-34

Study Information

This study is located approximately 2 miles north of Randolph on the west side of SR 16 on land administered by the BLM (elevation: 6,400 feet, slope: 5%, aspect: east). The study area was treated with herbicides or some kind of mechanical means to control sagebrush prior to 1984. In addition, crested wheatgrass was drill seeded to increase forage production for livestock. By 2001, the area had returned to a climax Wyoming big sagebrush community and 41% of the sagebrush was decadent. In the spring of 2004, 355 acres were treated with a Lawson aerator; a greenstirping design was used, which left some untreated strips of sagebrush. The seed mix included thickspike wheatgrass, crested wheatgrass, slender wheatgrass, Lewis flax, and forage kochia. The pasture just south of the study area remains a thick sagebrush community. Many different animals use the area including cattle, sheep, deer, pronghorn, elk, and sage grouse. Pellet group transect data from 2001 estimated 42 deer/pronghorn and 11 cow days use/acre (103 days use/ha and 27 cdu/ha). Deer and antelope pellet groups were combined due to their similarity in appearance. Sage grouse pellet groups were seen on the study in 2001. Pellet group data from 2006 was estimated at 28 deer/pronghorn and 11 cow days use/acre (69 ddu/ha and 27 cdu/ha).

Soil

Soils are classified in the Pancheri series, which includes deep, well drained soils that formed in loess covered lava plains, which are fertile with agricultural potential. The principal problem is high susceptibility to wind and water erosion. A good plant cover is essential for preventing soil erosion (Campbell and Lacey 1982; USDA-NRCS 2006). The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground remained fair at 2.6:1 in 2006. Soils have a loam texture with a neutral pH of 6.9 and limited organic matter (1.4%). Effective rooting depth is estimated at almost 16 inches. There is little rock on the surface, but a calcareous layer becomes evident at about 10 inches. The study area is not badly eroded even though the amount of exposed bare ground is greater than on nearby undisturbed big sagebrush types. In 2001, an erosion condition class determined soils to be eroding slightly due mostly to pedestalling around sagebrush stems, but were classified as stable in 2006. Bare ground decreased from 40% relative cover in 2001 to 29% in 2006 and both litter and vegetation cover increased. The herbaceous cover provided by crested wheatgrass helps stabilize the soil.

Browse

Browse composition consists almost entirely of Wyoming big sagebrush, which has made up half of the total vegetation cover, except in 2006 (only made up 23%). Sagebrush are small in stature and in 1996 density was estimated at 9,620 plants/acre, which increased in 2001 to 10,440 plants/acre. Decadence was quite high in 2001 at 41% of the population. In 2006, 1,860 dead plants/acre were estimated. The aerator treatment in 2004 decreased the population to 6,760 plants/acre in 2006, but cover remained relativity high at 9% cover. A comparison aerator study on Deseret Land and Livestock decreased sagebrush cover from 25% to 2.5% (Summers 2005). The greenstrip method may have accounted for the high cover, because partial areas were left untreated. Recruitment from young plants has been moderate in all sampling years, but was the lowest in 2006 at 7% of the population. Utilization has typically been light to moderate with good vigor except in 1996, when most of the population experienced early leaf drop due to dry conditions. Annual leader growth was very minimal in 2001 and 2006, averaging about 1 inch.

Herbaceous Understory

The herbaceous understory consists exclusively of perennial grasses, with crested wheatgrass dominating the area. It averaged 11-12% cover in 1996 and 2001, then increased to 23% in 2006. Crested wheatgrass averaged 62% of the total vegetation cover in 2006. It was seeded before the study was established in 1984 and again in 2004 with the aerator treatment. Sandberg bluegrass is the only other common perennial grass found and cover has averaged 3-5%. Grasses showed a moderate level of grazing use in 1984, but in 2006

grazing was light. Forbs occur rarely and produced about 1% cover in 1996 and 2001. In 2006, cover increased to 4% due to an increase in Hood's phlox and the newly seeded Lewis flax.

1990 TREND ASSESSMENT

The seeded Wyoming big sagebrush shows an upward trend and is still recovering. Young plants still make up a significant portion of the population, although the percentage of decadent plants has increased. The overall density decreased from 9,566 plants/acre to 7,665 plants/acre, but over a 1,000 plants were added to the mature population. Canopy cover is estimated at 14%. Sagebrush has been moderately hedged and has normal vigor. Trend for grasses is stable. Crested wheatgrass nested frequency decreased significantly, while Sandberg bluegrass increased significantly. Trend for forbs is slightly up. Forbs are a minimal component of the herbaceous understory and most are low growing and unpalatable.

browse - up (+2) grasses - stable (0) forbs - slightly up (+1)

1996 TREND ASSESSMENT

Trend for Wyoming big sagebrush is stable. Utilization is light to moderate and percent decadence is low. Recruitment is good with abundant seedlings and young. The poor vigor found on the majority of the population appears to be a temporary condition brought on by prolonged drought conditions. Current cover for sagebrush is 16%. Trend for grasses is stable. Sum of nested frequency for perennial grasses has increased slightly, while frequency of forbs has declined slightly. Nested frequency for the native Sandberg bluegrass has increased significantly. Trend for forbs is stable. Forbs are a minimal component of the herbaceous understory and most are low growing and unpalatable. The Desirable Components Index rated this study as excellent due to good browse cover, low decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (76) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2001 TREND ASSESSMENT

Trend for browse is stable. Wyoming big sagebrush density remains stable, and recruitment from young plants is adequate to replace the decadent plants classified as dying in the population. Vigor is generally good, although percent decadence increased from 9% to 41%. Increased decadence is likely due to drought and should improve with normal precipitation in the future. Use remains light to moderate. Trend for grasses is stable. Crested wheatgrass, the dominant herbaceous species, remains at a stable frequency. Trend for forbs is stable. Sum of nested frequency of perennial forbs remained similar to 1996. The Desirable Components Index decreased to good due to decreased browse cover and moderate decadence, but perennial grass cover is still good.

winter range condition (DC Index) - good (54) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, Wyoming big sagebrush, is down. Mature and decadent plants combined decreased by 32%, from 9,180 plants/acre to 6,280 plants/acre. Drought conditions in 2001 and 2002 most likely stressed the sagebrush, but the aerator treatment caused the decrease in density. Decadence was quite high in 2001 at 41% of the population and in 2006 dead plants were estimated at 1,860 plants/acre. Young recruitment remains fair at 7%. Trend for grasses is stable. Perennial grass sum of nested frequency remained similar to 2001. Trend for forbs is up. Perennial forb sum of nested frequency increased by 82%, mainly due to a significant increase in Lewis flax. The Desirable Components Index rated this study as good-excellent due to moderate browse cover, moderate decadence, and increased perennial grass cover.

winter range condition (DC Index) - good-excellent (44) Low Potential scale
browse - down (-2) grasses - stable (0) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 34

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{b}$341	$_{a}$309	$_{ab}$310	$_{a}$300	$_{a}$317	11.62	10.64	23.34
G	Carex sp.	-	4	-	4	5	-	.01	.18
G	Oryzopsis hymenoides	-	-	-	3	-	-	.00	-
G	Poa secunda	$_{a}$147	$_{b}$208	$_{c}$265	$_{bc}$227	$_{b}$190	5.29	2.48	3.41
G	Stipa comata	-	3	2	3	-	.01	.03	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		488	524	577	537	512	16.93	13.17	26.93
Total for Grasses		488	524	577	537	512	16.93	13.17	26.93
F	Alyssum alyssoides (a)	-	-	-	20	52	-	.04	.09
F	Arabis sp.	-	-	-	1	1	-	.00	.00
F	Arenaria sp.	-	-	-	-	1	-	-	.03
F	Astragalus utahensis	$_{ab}$2	$_{b}$6	$_{ab}$5	$_{ab}$3	$_{a}$-	.03	.00	.00
F	Calochortus nuttallii	-	-	-	2	-	-	.00	-
F	Cordylanthus ramosus (a)	-	-	-	2	-	-	.01	-
F	Erigeron pumilus	-	-	-	1	1	-	.00	.00
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$79	-	-	.87
F	Lomatium sp.	-	1	-	9	-	-	.02	-
F	Phlox hoodii	$_{a}$38	$_{b}$81	$_{ab}$75	$_{ab}$58	$_{b}$85	1.16	.54	2.77
F	Phlox longifolia	$_{a}$-	$_{b}$50	$_{b}$31	$_{b}$25	$_{b}$50	.15	.10	.30
F	Tragopogon dubius	-	-	-	4	-	-	.03	-
F	Trifolium sp.	$_{c}$29	$_{a}$4	$_{a}$-	$_{bc}$18	$_{ab}$7	-	.05	.02
F	Unknown forb-perennial	1	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	-	4	3	-	.03	.07
Total for Annual Forbs		0	0	0	22	52	0	0.04	0.08
Total for Perennial Forbs		70	142	111	125	227	1.35	0.80	4.09
Total for Forbs		70	142	111	147	279	1.35	0.85	4.18

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

BROWSE TRENDS --
Management unit 02 , Study no: 34

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	98	94	89	16.12	11.36	9.11
B	Atriplex gardneri falcata	8	9	7	.06	.18	.03
B	Chrysothamnus viscidiflorus stenophyllus	10	5	10	.60	.03	.18
B	Eriogonum microthecum	1	1	0	.15	.03	-
B	Opuntia sp.	2	1	1	-	-	-
Total for Browse		119	110	107	16.93	11.60	9.32

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 34

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	7.81
Atriplex gardneri falcata	.16
Chrysothamnus viscidiflorus stenophyllus	.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 34

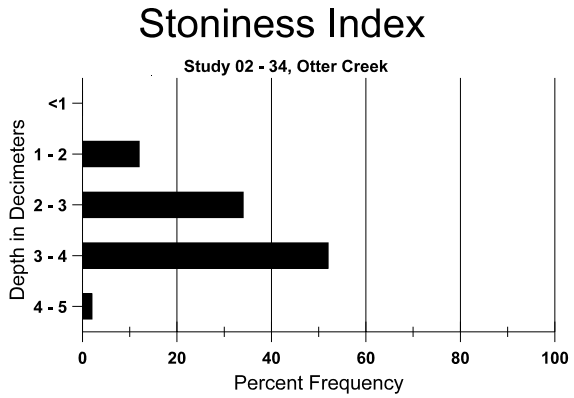
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	0.8	1.0

BASIC COVER --
Management unit 02 , Study no: 34

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	13.50	5.00	36.29	28.72	38.15
Rock	0	0	.03	.01	.04
Pavement	0	0	.22	.10	.04
Litter	40.25	40.50	29.26	35.75	43.18
Cryptogams	0	.50	3.84	4.25	1.48
Bare Ground	46.25	54.00	42.42	46.36	33.09

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 34, Otter Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.6	62.0 (13.6)	6.9	40.6	35.1	24.4	1.4	15.2	108.8	0.6



PELLET GROUP DATA --
Management unit 02 , Study no: 34

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	3	4	-
Rabbit	1	-	2
Elk	7	-	1
Deer	14	23	20
Cattle	5	6	3

Days use per acre (ha)	
'01	'06
3 (8)	-
-	-
-	-
42 (103)	28 (69)
11 (27)	11 (27)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 34

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
84	**9566**	700	5233	3433	900	-	51	8	9	-	0	17/28
90	**7665**	166	2133	2866	2666	-	42	0	35	6	10	15/14
96	**9620**	400	1500	7300	820	340	31	3	9	2	87	16/23
01	**10440**	-	1260	4920	4260	860	32	0	41	2	2	15/22
06	**6760**	340	480	4860	1420	1860	20	14	21	14	14	12/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex gardneri falcata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**33**	-	33	-	-	-	0	0	-	-	0	-/-
96	**180**	-	-	180	-	-	0	0	-	-	0	4/10
01	**240**	-	-	240	-	-	0	0	-	-	0	2/7
06	**160**	-	20	140	-	-	0	0	-	-	0	4/10
Chrysothamnus viscidiflorus stenophyllus												
84	**332**	-	166	166	-	-	10	0	0	-	0	11/25
90	**699**	-	-	33	666	-	0	0	95	52	86	8/15
96	**340**	-	-	320	20	-	0	0	6	-	88	9/15
01	**140**	-	-	80	60	-	0	0	43	-	0	7/14
06	**320**	-	-	280	40	-	0	0	13	6	19	10/17
Eriogonum microthecum												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**20**	-	-	20	-	-	0	0	0	-	0	6/11
01	**20**	-	-	-	20	-	0	0	100	-	0	6/9
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	33/44
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**33**	-	-	33	-	-	0	0	-	-	0	7/17
90	**33**	-	-	33	-	-	0	0	-	-	0	6/17
96	**60**	-	20	40	-	-	0	0	-	-	0	4/7
01	**20**	-	-	20	-	-	0	0	-	-	0	4/11
06	**20**	-	-	20	-	-	0	0	-	-	0	6/16

Trend Study 2-35-06

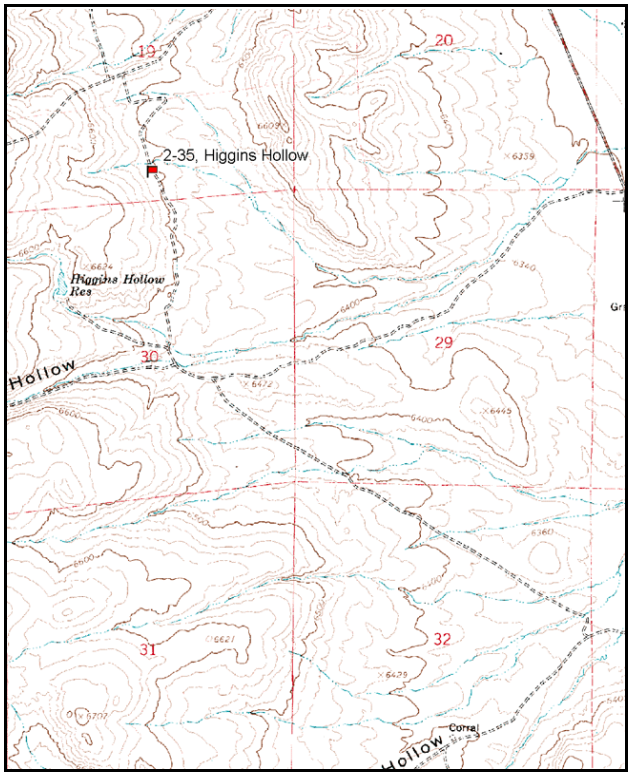
Study site name: Higgins Hollow . Vegetation type: Big Sagebrush .

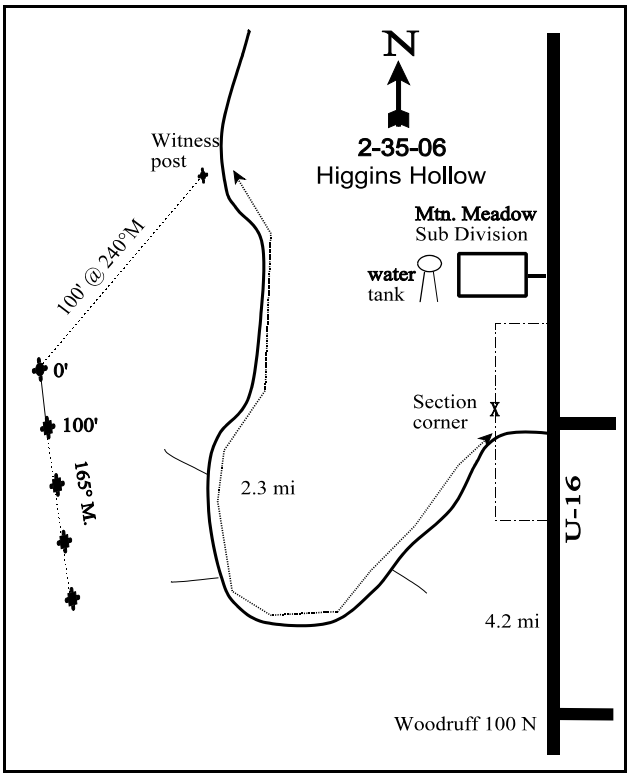
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 1st North in Woodruff proceed north on U-16 for 4.2 miles, and turn west to a dirt road. Proceed through pasture passing section marker at west gate. Travel a total of 2.3 miles (staying right) to a witness post on west side of road. From the witness post walk 100 feet at 240 degrees magnetic to the 0-foot stake of the baseline.





Map Name: Woodruff

Diagrammatic Sketch

Township 10N , Range 7E , Section 19

UTM NAD 27, UTM 12T 4603446 N, 483519 E

DISCUSSION

Higgins Hollow - Trend Study No. 2-35

Study Information

This study is located north of Woodruff on the west side of SR 16 on land administered by the BLM (elevation: 6,500 feet, slope: 15-20%, aspect: east). The area is similar physically and edaphically to the Otter Creek study (2-34). The principal difference between these two areas is management practices of the past. This study samples a relatively undisturbed Wyoming big sagebrush type. Thus, it provides a good comparison to the Otter Creek study (2-34), an area that was mechanically treated and seeded. Wildlife use of the Higgin's Hollow study area appears light to moderate. Pellet group transect data collected in 2001 estimated 7 deer/pronghorn and 12 cow days use/acre (17 days use/ha and 29 cdu/ha). Deer and pronghorn pellet groups were combined due to their similarity in appearance. Pellet group data from 2006 was estimated at 11 deer/pronghorn and 4 cow days use/acre (26 ddu/ha and 11 cdu/ha).

Soil

The soil is classified in the Pancheri series, which includes deep, well drained soils that formed in loess covered lava plains, which are fertile soils with agricultural potential (Campbell and Lacey 1982; USDA-NRCS 2006). Soil is mostly rock free and has a clay loam texture with a neutral soil reaction (pH of 7.1). There is a considerable amount of roots in the top 6 inches of the soil, due mostly to Sandberg bluegrass. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was good at 3.4:1 in 2006. Some erosion is apparent but not serious. An erosion condition class conducted in 2001 classified erosion as stable, but in 2006 it was classified as slight. Pedstelling is apparent around the shrubs and a few active gullies have formed on the steeper slopes.

Browse

The key browse species is Wyoming big sagebrush. It is by far the most abundant and palatable shrub on the study area. Wyoming big sagebrush density was relatively stable from 1984-1996 at around 6,800 plants/acre and 16-33% of the population was classified as young over this same period. The number of young plants in the population declined to only 1-2% of the population in 2001 and 2006. However, sagebrush density increased in 2001 as some of the young plants reached maturity. The population declined from 8,080 plants/acre in 2001 to 6,040 plants/acre in 2006. Some plants were dropping leaves in 2001 due to several consecutive years of relatively dry conditions. Precipitation in both 2001 and 2002 were 25% below normal and drought is most likely the cause of the die-off. Cover remained has remained high at 21-27% since 1996. Decadence has been high at over 35% in all sampling years, except in 1996, when decadence was estimated at 19%. In 2006, 25% of the population was classified as dying, which may further reduce the population, since young recruitment has been very low. Overall use has been at a moderate level, with heavier use occurring in 1984 and 1990. In 2001 and 2006, sagebrush leader growth averaged less than 1 inch.

Stickyleaf low rabbitbrush occurs in fairly high numbers, although it is much smaller and seldom utilized.

Herbaceous Understory

The herbaceous component is dominated by Sandberg bluegrass, a low-growing species. This species has averaged 14-16% cover since 1996 and provides more than 90% of the grass cover. Several other perennials are present but in limited numbers. These species include: western wheatgrass, bluebunch wheatgrass, mutton bluegrass, and bottlebrush squirreltail. Forbs occur only rarely and are primarily low growing species with little forage value. Hood's phlox and longleaf phlox are the most common species.

1990 TREND ASSESSMENT

The Higgins Hollow winter range continues to support a dense stand of Wyoming big sagebrush. At about 20% canopy cover, the sagebrush community appears about at its maxim. There is a high percentage of seedling and young plants. The sagebrush tends to be moderately hedged, as opposed to the more heavily

hedged classification of mature plants in 1984. Trend for grasses is slightly down. The frequency of bluebunch wheatgrass has declined dramatically, even if the increase in western wheatgrass is interpreted as a misidentification. Squirreltail nested frequency also decreased significantly. However, the most abundant grass, Sandberg bluegrass, increased significantly. Trend for forbs is slightly up due to a significant increase in longleaf phlox nested frequency. Forbs are rare and low growing.

browse - stable (0) grasses - slightly down (-1) forbs - slightly up (+1)

1996 TREND ASSESSMENT

The browse trend is stable. Sagebrush density remained similar to 1990 and both heavy use and percent decadence decreased (45% to 19%). Trend for grasses is down. Perennial grass sum of nested frequency decreased by 26%, mainly due to a significant decrease in bluebunch wheatgrass/western wheatgrass. Trend for forbs is slightly down due to a significant decrease in longleaf phlox. Forbs continue to be rare and low growing. The Desirable Components Index rated this study as excellent due to high browse cover, moderate decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (82) Low Potential scale
browse - stable (0) grasses - down (-2) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is slightly up. Wyoming big sagebrush density increased from 6,760 plants/acre in 1996 to 8,080 plants/acre in 2001. Young plants are few and percent decadence increased from 19% to 48%. Utilization is light to moderate, and vigor is normal on most plants. Trend for grasses is slightly up. Sum of nested frequency for perennial grasses increased by 17% due to a significant increase in western wheatgrass. Trend for forbs is stable. Forbs continue to be rare and low growing. The Desirable Components Index rated this study as good-excellent due to good browse cover, high decadence, and high perennial grass cover.

winter range condition (DC Index) - good-excellent (66) Low Potential scale
browse - slightly up (+1) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, Wyoming big sagebrush, is down. Density decreased by 25%, from 8,080 plants/acre in 2001 to 6,040 plants/acre in 2006. Sagebrush decadence decreased from 48% to 36% and 25% of the population was classified as dying. Young recruitment was minimal at only 1% of the population. Trend for grasses is slightly up. Perennial grass sum of nested frequency increased by 12% due to an increase in bluebunch wheatgrass. Trend for forbs is slightly up due to significant increase in low fleabane and milkvetch. The Desirable Components Index rated this study as excellent due to good browse cover, moderate decadence, and good perennial grass cover.

winter range condition (DC Index) - excellent (72) Low Potential scale
browse - down (-2) grasses - slightly up (+1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 35

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	a-	c105	b14	c84	c111	.07	.62	1.06
G	Agropyron spicatum	c217	a14	a9	a24	b53	.04	.29	1.72
G	Bromus tectorum (a)	-	-	2	-	-	.00	-	-
G	Carex sp.	b29	c55	a4	a2	ab10	.02	.03	.02
G	Oryzopsis hymenoides	-	-	1	-	2	.00	-	.00
G	Poa bulbosa	-	-	4	-	-	.15	-	-
G	Poa fendleriana	-	-	4	8	10	.04	.06	.44
G	Poa pratensis	a-	a-	a-	ab2	b10	-	.03	.12
G	Poa secunda	a263	bc304	d339	cd318	ab281	15.75	14.18	14.19
G	Sitanion hystrix	c91	b69	a30	a34	ab53	.25	.50	.79
G	Stipa comata	-	-	-	2	-	-	.03	-
Total for Annual Grasses		0	0	2	0	0	0.00	0	0
Total for Perennial Grasses		600	547	405	474	530	16.32	15.75	18.37
Total for Grasses		600	547	407	474	530	16.33	15.75	18.37
F	Agoseris glauca	4	-	-	4	3	-	.03	.03
F	Antennaria rosea	-	8	4	2	3	.06	.03	.06
F	Arabis sp.	a2	b13	ab3	ab6	a-	.00	.02	-
F	Astragalus convallarius	2	2	3	4	7	.03	.01	.04
F	Astragalus sp.	a-	a-	a-	a-	b20	-	-	.36
F	Calochortus nuttallii	3	4	-	3	1	-	.00	.00
F	Collinsia parviflora (a)	-	-	-	1	3	-	.00	.00
F	Cordylanthus ramosus (a)	-	-	a8	b23	b40	.04	.14	.20
F	Crepis acuminata	-	-	-	-	1	-	-	.03
F	Cryptantha sp.	13	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	5	10	5	.01	.02	.01
F	Erigeron divergens	14	14	19	18	12	.28	.14	.15
F	Erigeron pumilus	a12	a-	a3	a8	b42	.03	.02	.69
F	Haplopappus acaulis	-	-	-	-	-	-	-	.00
F	Lomatium triternatum	-	9	-	5	5	-	.18	.01
F	Microsteris gracilis (a)	-	-	a-	b16	a-	-	.03	-
F	Penstemon humilis	5	1	1	-	5	.00	-	.06
F	Phlox hoodii	a5	a7	b53	b60	b54	1.12	1.24	1.28
F	Phlox longifolia	a57	c160	b113	ab89	ab101	.55	.40	.57
F	Salsola iberica (a)	-	-	-	3	-	-	.00	-
F	Schoencrambe linifolia	-	-	-	1	5	-	.00	.01

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Trifolium sp.	$_{b}$25	$_{b}$12	$_{a}$-	$_{b}$24	$_{b}$15	-	.08	.04
F	Zigadenus paniculatus	$_{a}$-	$_{bc}$11	$_{ab}$2	$_{a}$1	$_{c}$11	.03	.03	.13
Total for Annual Forbs		0	0	13	53	48	0.06	0.21	0.21
Total for Perennial Forbs		142	241	201	225	285	2.11	2.21	3.51
Total for Forbs		142	241	214	278	333	2.17	2.43	3.74

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

BROWSE TRENDS --
Management unit 02 , Study no: 35

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	0	0	1	-	-	-
B	Artemisia tridentata wyomingensis	96	97	92	20.53	26.73	22.64
B	Chrysothamnus viscidiflorus stenophyllus	39	46	45	1.36	1.90	2.61
B	Eriogonum microthecum	8	4	6	.01	.00	.09
B	Opuntia sp.	3	6	5	.00	-	-
B	Tetradymia canescens	3	7	6	-	.06	.21
Total for Browse		149	160	155	21.92	28.70	25.56

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 35

Species	Percent Cover '06
Artemisia tridentata wyomingensis	30.46
Chrysothamnus viscidiflorus stenophyllus	3.38
Eriogonum microthecum	.10
Opuntia sp.	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 35

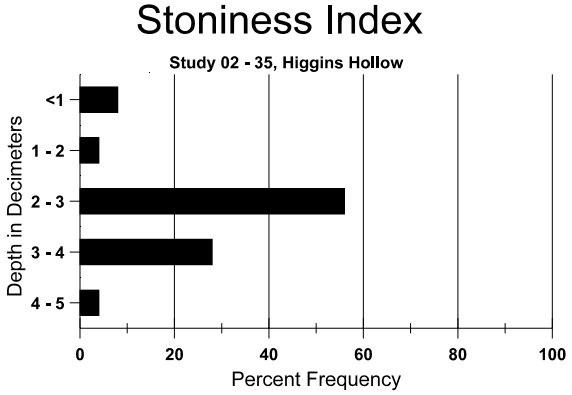
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	0.7	0.8

BASIC COVER --
Management unit 02 , Study no: 35

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	7.75	7.75	39.28	49.63	45.86
Rock	0	0	.10	.09	.11
Pavement	.75	.25	.36	.46	1.01
Litter	76.00	54.25	38.15	44.29	43.97
Cryptogams	2.75	14.25	10.31	13.38	6.60
Bare Ground	12.75	23.50	23.33	17.78	21.75

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 35, Higgins Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.9	59.0 (13.1)	7.1	42.9	31.1	26.0	1.9	11.8	137.6	0.6



PELLET GROUP DATA --
Management unit 02 , Study no: 35

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	12	14	23
Elk	-	-	1
Deer	13	11	9
Cattle	9	2	2

Days use per acre (ha)	
'01	'06
-	-
-	-
7 (17)	11 (26)
12 (29)	4 (11)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 35

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**160**	-	-	160	-	60	0	0	-	-	0	-/-
Artemisia tridentata wyomingensis												
84	**6866**	4266	1600	2333	2933	-	44	17	43	.58	3	17/21
90	**6798**	1400	2266	1466	3066	-	34	10	45	2	8	23/21
96	**6760**	80	1300	4180	1280	1500	43	4	19	2	2	24/33
01	**8080**	20	160	4080	3840	1260	23	1	48	1	1	23/30
06	**6040**	-	40	3800	2200	1620	14	2	36	25	26	23/32
Chrysothamnus viscidiflorus stenophyllus												
84	**5532**	-	866	3666	1000	-	0	0	18	-	0	9/13
90	**4999**	200	200	266	4533	-	4	0	91	.40	52	8/12
96	**1620**	-	-	1560	60	-	0	0	4	2	9	10/17
01	**2320**	-	-	2080	240	-	0	0	10	5	5	10/17
06	**2480**	20	-	2260	220	-	0	0	9	.80	12	10/17
Eriogonum microthecum												
84	**266**	-	-	266	-	-	0	0	0	-	0	4/4
90	**133**	-	133	-	-	-	0	0	0	-	0	-/-
96	**220**	-	20	180	20	-	0	0	9	9	9	7/8
01	**80**	-	-	80	-	-	0	0	0	-	0	6/9
06	**140**	-	-	140	-	-	0	0	0	-	0	6/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
84	**400**	-	-	400	-	-	0	0	0	-	0	5/7
90	**200**	66	-	200	-	-	0	0	0	-	0	5/1
96	**100**	-	-	100	-	-	0	0	0	-	0	4/11
01	**180**	-	-	160	20	-	0	0	11	-	0	3/8
06	**140**	-	-	140	-	-	0	0	0	-	0	5/13
Tetradymia canescens												
84	**332**	-	66	266	-	-	80	0	0	-	0	5/4
90	**266**	200	66	-	200	-	0	75	75	23	75	-/-
96	**60**	-	-	40	20	-	0	0	33	33	33	5/10
01	**180**	-	20	120	40	-	33	0	22	22	22	7/12
06	**140**	-	20	100	20	-	0	0	14	-	0	6/8

Trend Study 2-36-06

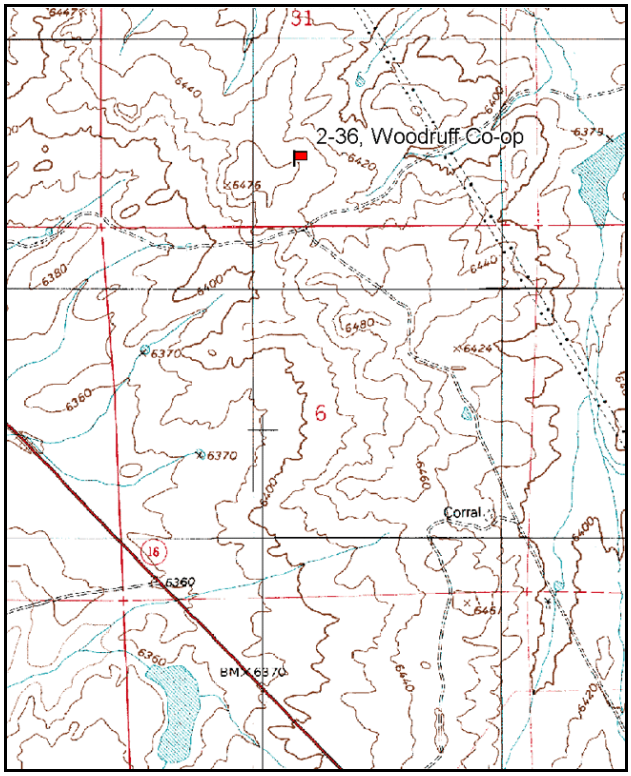
Study site name: Woodruff Co-op . Vegetation type: Big Sagebrush .

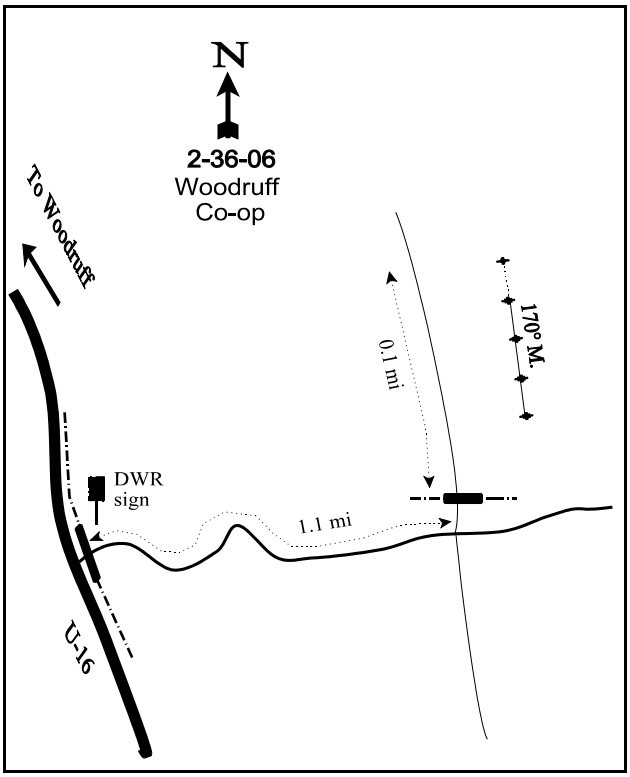
Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of U-39 and U-16 in Woodruff, travel south on U-16 5.7 miles to the Woodruff Co-op Livestock Management Area. Turn left (east) through the gate. Drive 1.1 miles to a fork. Turn left and go north through the gate. From the gate, go 0.1 miles. The study is on the east side of the road, approximately 60 paces to the 0-foot baseline stake. The study stakes are short fenceposts. No witness post. The 0-foot baseline stake is marked with browse tag #131. The baseline has a small dogleg from 300 - 400.





Map Name: Neponset Reservoir NE

Diagrammatic Sketch

Township 9N , Range 8E , Section 31

UTM NAD 27, UTM 12T 4590485 N, 493173 E

DISCUSSION

Woodruff Co-op - Trend Study No. 2-36

Study Information

This study was established in 1990 on DWR property to monitor sagebrush reestablishment in an area dominated by introduced perennial grasses (elevation: 6,550 feet, slope: 1-4%, aspect: southeast). In 2003, 173 acres were disked twice and drill seeded in the fall to establish more shrubs and to increase diversity of the community. The seed mix is listed below. Livestock were allowed back onto the allotment in 2005. The allotment continues to be used for spring cattle grazing. Pronghorn use the area year round and deer and elk in the winter. Signs of sage grouse are also common. Pellet group transect data collected in 2001 estimated 3 elk, 7 deer/pronghorn, and 41 cow days use/acre (7 edu/ha, 18 ddu/ha, 102 cdu/ha). Deer pellet groups appear to be from the previous fall and winter, while elk pellet groups appear more recent. Deer and pronghorn pellet groups were combined due to their similarity in appearance. Pellet group data from 2006 was estimated at 7 elk, 13 deer/pronghorn, and 17 cow days use/acre (17 edu/ha, 31 ddu/ha, and 43 cdu/ha). Only one sage grouse pellet group was encountered in 2006.

Soil

The soil is classified in the Woodpass series, which includes very deep, well drained soils that formed in alluvium derived mainly from sandstone and limestone (USDA-NRCS 2006). The effective rooting depth averaged 13 inches in 1996. Soil texture is a sandy clay loam with a neutral soil reaction (pH of 7.2). Pavement and rock cover are limited. The vegetation cover has been moderate due to the dense stand of crested wheatgrass, but there has also been a significant amount of bare soil in all sampling years. Bare ground cover has increased slightly, while the ratio of protective cover (vegetation, litter, and cryptograms) to bare ground decreased from 2.5 to 2.0. Cryptogams are abundant around the base of crested wheatgrass plants. An erosion condition class conducted in 2001 and 2006 both determined soils to be stable. Soil pedestalling provides evidence that some erosion has occurred in the past.

Browse

Wyoming big sagebrush and winterfat are the most important browse species on this study, although a small population of fourwing saltbush was observed for the first time in 2006. The fourwing saltbush had been seeded in the 2003 treatment. Sagebrush density was estimated at nearly 1,000 plants/acre in 1990. The decrease in density between 1990 and 1996 is due to the larger sample used beginning in 1996. The larger sample gives greater accuracy for species that are clumped and/or discontinuous in their distributions. Wyoming big sagebrush density has continually increased from 320 plants/acre in 1996 to 620 plants/acre in 2006, but still averages less than 1% cover. It appears the seeding treatment from 2003 has increased sagebrush density. The majority of sagebrush plants encountered before the treatment showed light to moderate hedging and were relatively small in stature. The use remained light-moderate in 2006 (after the treatment) and the average height and crown of plants were small (7 inches in height and 8 inches in width). Percent decadence had steadily decreased before the treatment and remained low in 2006. Vigor has been good throughout the population all years, including 2006. Annual leader growth does not seem to have been affected by the disking; it averaged about 1 inch in 2001 and 2006.

Winterfat was the most abundant shrub on the study in 2001, averaging 2,500 plants/acre, but was almost completely gone by 2006 at only 20 plants/acre. Winterfat cover was low like sagebrush, averaging less than 1%. Winterfat was greatly affected by the disk treatment. Other browse that are present include: low rabbitbrush, broom snakeweed, gray horsebrush, and pricklypear cactus.

Herbaceous Understory

The herbaceous understory is totally dominated by crested wheatgrass, which has accounted for over 80% of the total vegetation cover since 1996. It was sampled in almost every quadrat and averages around 23% cover. Crested wheatgrass had been moderately utilized in 2001 and 2006. Sandberg bluegrass, needle-and-thread,

and Indian ricegrass have also been sampled. Forbs are limited and provide very little cover or forage. Hoods phlox and longleaf phlox were the most abundant of the perennial forb species in 1996 and 2001, but were not sampled at all in 2006; they apparently did not survive the treatment. Alfalfa, which was seeded in the treatment at a relatively high rate, averaged 1.5% cover in 2006.

1996 TREND ASSESSMENT

Density of Wyoming big sagebrush is still relatively low and does not show signs of increasing. The new, larger sample used in 1996 estimated only 320 plants/acre. No seedlings or young were encountered. The lack of dead plants would suggest that the 1990 population density was overestimated with the smaller sample size. The only positive aspect of the browse trend is an improvement in decadence, which declined from 31% to 6%. Trend for browse is considered stable. Trend for grasses is stable. Sum of nested frequency for crested wheatgrass and all perennial grasses remained similar to 1990. Trend for forbs is down. Sum of nested frequency for perennial forbs declined; the nested frequencies of both phlox and the trifolium species decreased significantly. The Desirable Components Index rated this study as fair due to poor browse cover, but excellent perennial grass cover.

winter range condition (DC Index) - fair (34) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for browse is stable overall. Wyoming big sagebrush remains limited, but shows a slightly upward trend with an increase in young plants. Decadence decreased from 6% to 0%, and vigor is good on all plants. Winterfat is the most abundant species and has a stable trend. Density estimates are similar to 1996, where young plants outnumber the decadent and dead in the population. Trend for grasses is stable. Sum of nested frequency for crested wheatgrass and all perennial grasses remained similar to 1996. Trend for forbs is slightly up. Sum of nested frequency for perennial forbs increased; however, forbs are rare and produce only 1% total cover. The Desirable Components Index rated this study as fair due to poor browse cover and excellent perennial grass cover.

winter range condition (DC Index) - fair (34) Low Potential scale
browse - stable (0) grasses - stable (0) forbs - slightly up (+1)

2006 TREND ASSESSMENT

Trend for browse is slightly down. Winterfat was the most abundant species and decreased from 2,500 plants/acre to only 20 plants/acre in 2006. Decreases in winterfat are due to the disk treatment. Wyoming big sagebrush increased from 420 plants/acre in 2001 to 620 plants/acre in 2006. Both winterfat and sagebrush combined produce less than 1% cover. Fourwing saltbush was sampled for the first time and it averaged 460 plants/acre. It also produced less than 1% cover. Trend for grasses is down, due to a significant decrease in nested frequency of crested wheatgrass. Crested wheatgrass still remains abundant and averaged 22% cover. The nested frequency of perennial grasses decreased 21%. Trend for forbs is up. Sum of nested frequency for perennial forbs increased, mainly due to an increase in alfalfa and blue flax. The number of valuable forage forb species increased substantially. The Desirable Components Index rated this study as fair due to poor browse cover and excellent perennial grass cover.

winter range condition (DC Index) - fair (35) Low Potential scale
browse - slightly down (-1) grasses - down (-2) forbs - up (+2)

Woodruff Co-op WMA 2003 Seed Mix

Kind of Seed	Pounds in Mix	Bulk lbs/acre
Alfalfa, "Ranger"	250	1.4
Small Burnet, VNS	250	1.4
Cicer Milkvetch	150	0.9
Yellow Sweetclover	50	0.3
Sainfoin, "Remont"	100	0.6
Blue Flax, "Appar"	25	0.1
Russian WR, "Bozoisky"	175	1.0
Orchardgrass, "Paiute"	100	0.6
Great Basin Wildrye "Trailhead"	71	0.4
Great Basin Wildrye "Trailhead"	50	0.3
Indian Ricegrass, "Rimrock"	100	0.6
Bluebunch WG, "Goldar"	100	0.6
Thickspike WG, "Critana"	100	0.6
Sagebrush, Wyoming	35	0.2
Fourwing Saltbush	200	1.2
Bulk LBS. per acre: 10.15	1756	10.2

HERBACEOUS TRENDS --
Management unit 02 , Study no: 36

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{c}$348	$_{bc}$360	$_{b}$344	$_{a}$293	22.46	30.84	22.66
G	Agropyron spicatum	-	-	-	1	-	-	.15
G	Bromus tectorum (a)	-	-	-	5	-	-	.03
G	Dactylis glomerata	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	-	-	.19
G	Oryzopsis hymenoides	$_{a}$5	$_{a}$-	$_{a}$4	$_{b}$19	-	.03	.48
G	Poa secunda	$_{b}$89	$_{b}$90	$_{b}$99	$_{a}$36	1.38	1.44	.35
G	Stipa comata	$_{ab}$11	$_{a}$1	$_{b}$24	$_{ab}$6	.03	.45	.09
Total for Annual Grasses		0	0	0	5	0	0	0.03
Total for Perennial Grasses		453	451	471	370	23.88	32.77	23.92
Total for Grasses		453	451	471	375	23.88	32.77	23.96
F	Alyssum alyssoides (a)	-	$_{a}$41	$_{c}$159	$_{b}$123	.10	.40	.97
F	Antennaria sp.	-	2	-	-	.00	-	-
F	Astragalus convallarius	-	-	4	-	-	.06	-
F	Astragalus sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$9	-	-	.05
F	Astragalus utahensis	7	-	3	2	-	.03	.03
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$33	-	-	.22
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$112	-	-	1.50

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	Phlox hoodii	$_{c}$83	$_{b}$43	$_{b}$33	$_{a}$-	1.10	.41	-
F	Phlox longifolia	$_{c}$81	$_{b}$37	$_{c}$70	$_{a}$-	.08	.24	-
F	Sanguisorba minor	-	-	-	5	-	-	.01
F	Schoencrambe linifolia	-	3	-	-	.00	-	-
F	Tragopogon dubius	-	3	8	-	.00	.06	-
F	Trifolium sp.	$_{b}$11	$_{a}$-	$_{c}$26	$_{b}$8	-	.11	.02
Total for Annual Forbs		0	41	159	123	0.10	0.40	0.97
Total for Perennial Forbs		182	88	144	169	1.19	0.93	1.86
Total for Forbs		182	129	303	292	1.30	1.33	2.83

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

BROWSE TRENDS --
Management unit 02 , Study no: 36

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	14	16	22	.28	.96	.24
B	Atriplex canescens	0	0	19	-	-	.52
B	Atriplex gardneri falcata	0	0	0	-	-	-
B	Ceratoides lanata	40	42	1	.59	.53	-
B	Chrysothamnus nauseosus consimilis	0	1	0	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	33	34	2	.26	.75	.06
B	Gutierrezia sarothrae	5	7	0	.03	.33	-
B	Opuntia polyacantha	12	11	4	.18	.34	-
B	Tetradymia canescens	8	3	3	.06	-	.00
Total for Browse		112	114	51	1.41	2.92	0.82

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 36

Species	Percent Cover '06
Artemisia tridentata wyomingensis	.16
Atriplex canescens	.58

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 36

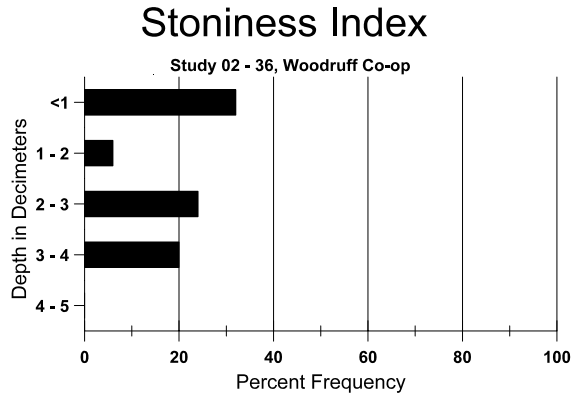
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.1	0.9
Atriplex canescens	-	2.2
Ceratoides lanata	5.0	-

BASIC COVER --
Management unit 02 , Study no: 36

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	16.75	28.00	39.97	27.23
Rock	1.75	2.09	1.01	2.54
Pavement	1.25	3.02	1.88	1.97
Litter	36.50	34.31	44.11	42.73
Cryptogams	.50	.28	2.07	0
Bare Ground	43.25	26.78	36.09	39.20

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 36, Woodruff Co-op

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.2	63.0 (14.1)	7.2	56.6	14.1	29.4	2.1	3.9	108.8	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 36

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	10	7	76
Elk	-	-	1
Deer	8	6	9
Cattle	15	19	4
Antelope	6	-	-

Days use per acre (ha)	
'01	'06
-	-
3 (7)	7 (17)
7 (18)	13 (31)
41 (102)	17 (43)
-	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 36

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
90	**966**	-	100	566	300	-	62	3	31	-	0	10/16
96	**320**	-	-	300	20	60	31	0	6	-	0	14/24
01	**420**	20	100	320	-	-	19	0	0	-	0	18/29
06	**620**	20	260	360	-	-	26	23	0	-	0	7/8
Atriplex canescens												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**460**	20	180	280	-	20	22	9	-	-	0	16/16
Atriplex gardneri falcata												
90	**33**	-	-	33	-	-	0	0	-	-	0	5/5
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Ceratoides lanata												
90	**333**	-	100	233	-	-	40	0	0	-	0	7/5
96	**2660**	-	280	2320	60	20	48	35	2	-	0	7/9
01	**2500**	-	240	2260	-	-	54	.80	0	-	0	8/9
06	**20**	-	-	20	-	-	100	0	0	-	0	4/7
Chrysothamnus nauseosus consimilis												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	100	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
90	**1499**	-	366	900	233	-	53	0	16	-	0	4/6
96	**880**	-	-	800	80	-	0	0	9	7	7	7/11
01	**1060**	-	-	1040	20	-	0	0	2	-	0	7/11
06	**40**	-	-	40	-	-	100	0	0	-	0	5/10
Gutierrezia sarothrae												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**120**	-	-	120	-	-	0	0	-	-	0	5/7
01	**220**	-	-	220	-	-	0	0	-	-	0	7/12
06	**0**	-	-	-	-	-	0	0	-	-	0	5/10
Opuntia polyacantha												
90	**266**	-	66	200	-	-	0	0	0	-	13	4/6
96	**280**	-	20	200	60	140	0	0	21	14	14	4/12
01	**420**	20	20	400	-	40	0	0	0	-	0	3/9
06	**80**	-	20	60	-	-	0	0	0	-	0	3/4
Tetradymia canescens												
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**200**	-	-	180	20	-	40	10	10	-	0	5/9
01	**60**	-	-	60	-	-	0	0	0	-	0	5/13
06	**80**	20	-	80	-	-	25	75	0	-	0	5/10

Trend Study 2-38-06

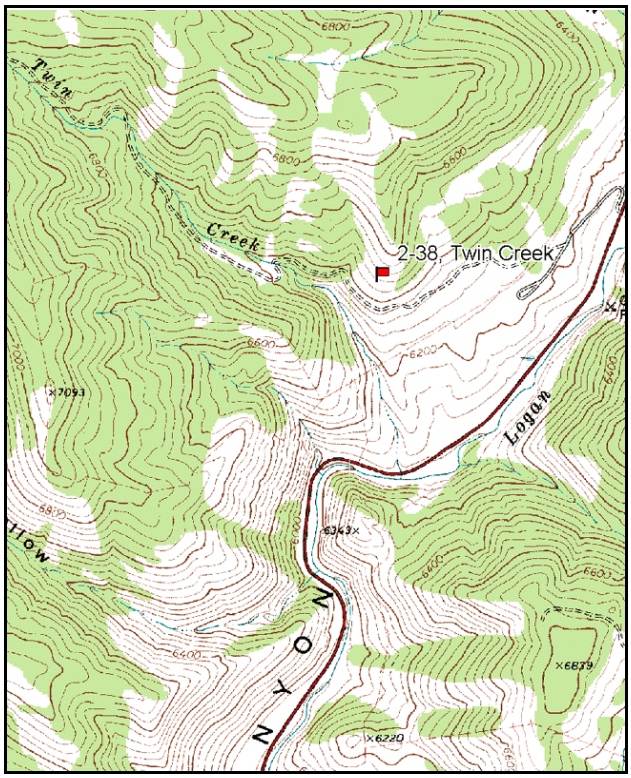
Study site name: Twin Creek . Vegetation type: Mountain Brush .

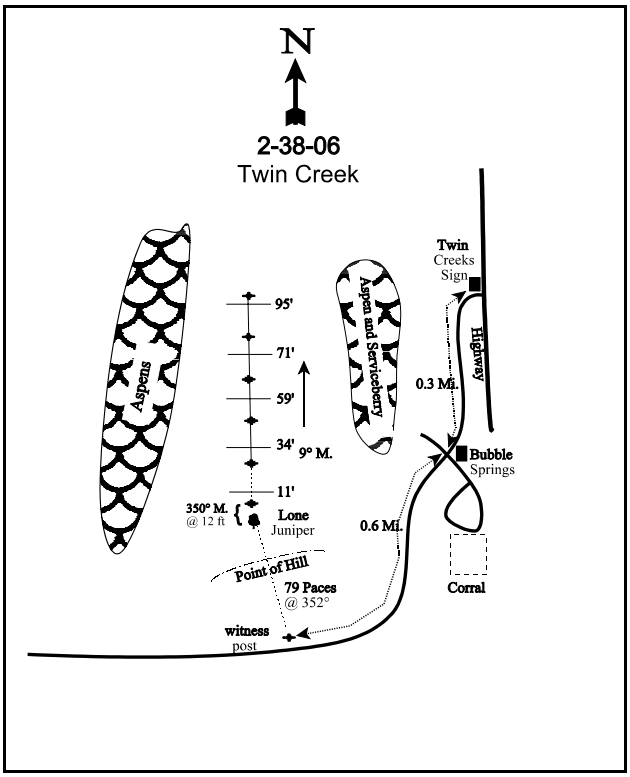
Compass bearing: frequency baseline 9 degrees magnetic.

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

LOCATION DESCRIPTION

Take the Twin Creek turnoff off of U.S. 89 and proceed 0.3 miles to the Bubble Springs turn. Go right for 0.6 miles to a witness post. From the witness post walk 74 paces at a bearing of 352 degrees magnetic to a lone juniper. From the juniper, the 0-foot baseline stake is 12 feet away at a bearing of 350 degrees magnetic. The baseline runs up the slope at 9 degrees magnetic.





Map Name: Temple Peak

Diagrammatic Sketch

Township 13N , Range 3E , Section 3

UTM NAD 27, UTM 12T 4634536 N, 451703 E

DISCUSSION

Twin Creek - Trend Study No. 2-38

Study Information

This study is located in Logan Canyon, just east of the Twin Creek corrals on land administered by the USFS (elevation: 6,500 feet, slope: 30-35%, aspect: south). The study was established to monitor elk concentrations during the winter months. Elk pellet groups were fairly abundant with quadrat frequencies of 28% in 1996, 18% in 2001. By 2006, elk pellet group frequency was only 2%. Sign of cattle, sheep, and deer have also been encountered. Moose sign was observed, but not within the sampled quadrats. Pellet group transect data collected in 2001 estimated 42 elk, 6 deer, and 3 cow days use/acre (103 edu/ha, 15 ddu/ha, 7 cdu/ha). Pellet group data from 2006 was estimated at 10 elk, 14 deer, and 13 cow days use/acre (25 edu/ha, 35 ddu/ha, and 32 cdu/ha).

Soil

The soil is moderately shallow and rocky with an effective rooting depth of 13 inches. Soil texture is a loam with a slightly acidic soil reaction (pH of 6.3). Organic matter is high at 6.5%. Bare ground was low in 1996 at 5%, but increased to 11% in 2001 and 19% in 2006. Much of the bare soil in 1996 and 2006 was caused by gopher activity. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground has decreased with each reading from 5.2 in 1996 to 3.1 in 2006. Vegetation and litter cover are still good and well dispersed, effectively limiting erosion. An erosion condition class determined soils to be stable in 2001 and 2006.

Browse

A variety of palatable and preferred shrubs provide forage for wildlife, which include: saskatoon serviceberry, mountain big sagebrush, chokecherry, and bitterbrush. Of these species, only mountain big sagebrush and bitterbrush are abundant. Mountain big sagebrush had an estimated density of 1,460 plants/acre in 1996, then slightly decreased to 1,260 plants/acre in 2001, mostly due to a decrease in young plants. Density remained similar in 2006 and cover has averaged about 11% since 2001. Utilization was moderate in 1996, but was only light in 2001 and 2006. Sagebrush annual leader growth has been good; it averaged 2 inches in 2001 and increased to 3 inches in 2006.

The highly preferred shrubs, bitterbrush and serviceberry, are found in small numbers and are heavily hedged. Bitterbrush density has averaged 180 plants/acre from 1996 to 2006. In 2001, decadence was moderate at 22%, but all plants recovered in 2006. Bitterbrush annual leader growth averaged just over 3 inches in 2001 and 4 inches in 2006. Serviceberry density was estimated at 20 plants/acre in 1996 and 2001, but was not sampled in 2006. These were heavily hedged with their leaves were covered with a rust fungus in 1996. Narrowleaf low rabbitbrush is the most abundant shrub. It had an estimated density of around 2,200 plants/acre in 1996 and 2001, but dropped slightly in 2006 to 1,700 plants/acre. The population is almost entirely mature and does not appear to be increasing. Snowberry is abundant with an average cover of 7% and density of 1,000 plants/acre.

Herbaceous Understory

The herbaceous understory is abundant and diverse. Grasses and forbs combined to produce half of the cover in 2001 and 2006. Grasses are represented by 10 perennial and 2 annual species. Bluebunch wheatgrass is the most abundant species and increased from 7% cover in 2001 to 17% in 2006. Kentucky bluegrass was abundant in 2001 averaging 7% cover, but only averaged about 2-3% cover in 1996 and 2006. Sandberg bluegrass, slender wheatgrass, bulbous bluegrass, oniongrass, mountain brome, and Great Basin wildrye are other perennial grasses that have been sampled. Cheatgrass and Japanese brome are rarely encountered and produce very little cover. Bulbous bluegrass is present and does not appear to be increasing. Forbs are diverse, but unfortunately weedy species dominate the composition. Perennials include: mulesears wyethia, pacific aster, and bastard toadflax. Arrowleaf balsamroot and yellow salsify are the most abundant desirable species.

2001 TREND ASSESSMENT

Trend for browse is stable. The most abundant species, mountain big sagebrush, had a stable density and low decadence rates. The main negative factor is the decrease of young plants in 2001, which is likely caused by a combination of extended drought and competition with the weedy herbaceous understory. The more preferred but less abundant species, serviceberry and bitterbrush, have low but stable densities with little to no reproduction at the present time. Trend for grasses is slightly up. Perennial grass sum of nested frequency increased by 15%, due to a significant increase in Kentucky bluegrass and oniongrass. Trend for forbs is stable. The forb composition remains dominated by weedy increasers. Although annual forbs decreased in sum of nested frequency, they are still abundant. The Desirable Components Index rated this study as good due to good browse cover and excellent perennial grass and forb cover.

1996 winter range condition (DC Index) - good (77) Mid-level potential scale
2001 winter range condition (DC Index) - good (75) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, is stable. Density and cover have remained similar to 2001 and decadence is low. Bitterbrush and serviceberry are not abundant, but both display heavy use. Snowberry is abundant and has remained stable. Trend for grasses is stable. The two species that had increased nested frequency values in 2001, Kentucky bluegrass and oniongrass, decreased significantly in 2006. Bluebunch wheatgrass nested frequency increased significantly and cover increased from 7% cover in 2001 to 17% in 2006. Trend for forbs is stable. The forb composition remains dominated by weedy increasers. Annual forbs decreased again in sum of nested frequency and averaged less than 1% cover. The Desirable Components Index rated this study as good due to good browse cover and excellent perennial grass and forb cover.

winter range condition (DC Index) - good (75) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 38

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{a}$265	$_{a}$264	$_{b}$339	12.38	7.47	17.09
G	Agropyron trachycaulum	$_{b}$70	$_{a}$19	$_{a}$9	1.93	.53	.21
G	Bromus carinatus	40	25	47	.79	.38	.89
G	Bromus japonicus (a)	-	-	10	-	-	.04
G	Bromus tectorum (a)	3	-	4	.06	-	.00
G	Carex sp.	-	-	-	-	.03	-
G	Elymus cinereus	$_{b}$23	$_{ab}$9	$_{a}$10	1.04	.54	1.21
G	Melica bulbosa	$_{a}$9	$_{b}$64	$_{a}$27	.06	.89	.16
G	Poa bulbosa	33	50	46	1.62	1.22	.73
G	Poa pratensis	$_{a}$162	$_{b}$222	$_{a}$137	3.42	6.82	1.96
G	Poa secunda	$_{a}$27	$_{b}$67	$_{ab}$36	.46	.80	.34
G	Stipa columbiana	9	13	-	.21	.21	-

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
Total for Annual Grasses		3	0	14	0.06	0	0.04
Total for Perennial Grasses		638	733	651	21.94	18.93	22.62
Total for Grasses		641	733	665	22.00	18.93	22.66
F	Achillea millefolium	16	10	27	.27	.10	.43
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$21	-	-	.11
F	Alyssum alyssoides (a)	$_{c}$173	$_{b}$117	$_{a}$35	.85	.28	.07
F	Arabis drummondi	3	-	3	.01	.00	.00
F	Astragalus beckwithii	-	-	7	-	-	.04
F	Aster sp.	$_{b}$9	$_{a}$-	$_{a}$-	.71	-	-
F	Astragalus sp.	-	-	2	-	-	.06
F	Balsamorhiza macrophylla	-	-	1	-	-	.38
F	Balsamorhiza sagittata	$_{a}$2	$_{ab}$6	$_{b}$13	.48	.86	1.12
F	Camelina microcarpa (a)	-	4	-	-	.01	-
F	Calochortus nuttallii	-	-	7	-	-	.01
F	Chenopodium album (a)	-	-	3	-	-	.00
F	Cirsium undulatum	3	-	4	.15	.00	.38
F	Collomia linearis (a)	$_{a}$46	$_{b}$94	$_{b}$86	.17	.25	.19
F	Comandra pallida	$_{b}$22	$_{b}$14	$_{a}$11	.48	.09	.15
F	Collinsia parviflora (a)	106	99	32	.30	.52	.07
F	Crepis acuminata	5	7	7	.03	.19	.10
F	Delphinium nuttallianum	10	3	-	.02	.01	-
F	Descurainia pinnata (a)	-	6	-	-	.01	-
F	Draba sp. (a)	3	-	-	.01	-	-
F	Epilobium brachycarpum (a)	$_{b}$99	$_{a}$53	$_{a}$62	.66	.12	.17
F	Galium aparine (a)	4	2	1	.03	.00	.03
F	Gayophytum ramosissimum(a)	-	-	1	-	-	.00
F	Hackelia patens	-	3	-	-	.00	-
F	Helianthella uniflora	5	9	21	.36	.27	1.57
F	Lappula occidentalis (a)	8	3	3	.07	.00	.01
F	Lactuca serriola	18	3	1	.08	.03	.00
F	Linum lewisii	-	-	1	-	-	.00
F	Lithospermum ruderale	14	19	10	.24	.83	.42
F	Lupinus argenteus	20	9	9	.38	.25	.20
F	Microsteris gracilis (a)	$_{b}$46	$_{b}$54	$_{a}$22	.21	.22	.04
F	Phlox longifolia	-	-	2	-	-	.00
F	Polygonum douglasii (a)	$_{b}$69	$_{a}$22	$_{b}$68	.22	.10	.16

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Senecio multilobatus	5	9	-	.03	.04	.00
F	Taraxacum officinale	4	-	-	.01	-	-
F	Thlaspi montanum	1	-	-	.00	-	.00
F	Tragopogon dubius	$_{b}$88	$_{b}$94	$_{a}$17	1.08	1.20	.13
F	Veronica biloba (a)	$_{b}$132	$_{a}$18	$_{a}$3	1.38	.04	.01
F	Verbascum blattaria	$_{b}$8	$_{a}$-	$_{b}$17	.07	-	.03
F	Wyethia amplexicaulis	$_{a}$31	$_{b}$58	$_{ab}$42	3.81	6.89	4.64
Total for Annual Forbs		686	472	316	3.92	1.57	0.79
Total for Perennial Forbs		264	244	223	8.26	10.81	9.84
Total for Forbs		950	716	539	12.19	12.38	10.63

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

BROWSE TRENDS --
Management unit 02 , Study no: 38

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	1	1	0	.38	.15	-
B	Artemisia tridentata vaseyana	52	50	48	6.65	11.47	10.26
B	Chrysothamnus viscidiflorus viscidiflorus	57	62	56	7.40	6.65	4.82
B	Eriogonum heracleoides	22	25	22	2.15	2.32	1.96
B	Prunus virginiana	5	6	6	.09	.33	.51
B	Purshia tridentata	8	9	8	2.02	2.21	2.13
B	Symphoricarpos oreophilus	30	38	32	5.64	7.69	6.46
Total for Browse		175	191	172	24.35	30.85	26.17

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 38

Species	Percent Cover '06
Artemisia tridentata vaseyana	18.50
Chrysothamnus viscidiflorus viscidiflorus	7.41
Eriogonum heracleoides	2.46
Prunus virginiana	.18
Purshia tridentata	1.85
Symphoricarpos oreophilus	9.31

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 38

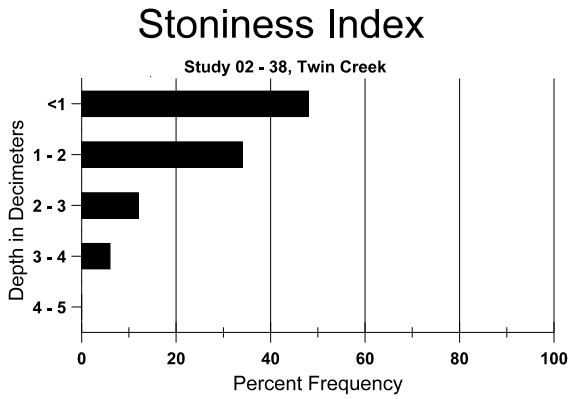
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	3.7	-
Artemisia tridentata vaseyana	2.0	2.9
Purshia tridentata	3.1	4.3

BASIC COVER --
Management unit 02 , Study no: 38

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	53.65	58.72	58.75
Rock	5.68	2.70	3.68
Pavement	2.76	5.84	5.72
Litter	55.04	42.15	33.81
Cryptogams	.58	.55	.01
Bare Ground	5.33	11.01	18.77

Herd Unit 02, Study no: 38, Twin Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.0	58.4 (15.9)	6.3	42.9	32.1	25.0	6.5	38.4	278.4	0.5



PELLET GROUP DATA --
Management unit 02 , Study no: 38

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	2	-	-
Elk	28	18	2
Deer	4	5	4
Cattle	2	-	7

Days use per acre (ha)	
'01	'06
-	-
42 (103)	10 (25)
6 (15)	14 (35)
3 (7)	13 (32)

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 38

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**20**	-	-	20	-	-	0	100	0	-	0	35/25
01	**20**	-	-	-	20	-	0	100	100	-	0	33/27
06	**0**	-	-	-	-	-	0	0	0	-	0	43/43
Artemisia tridentata vaseyana												
96	**1460**	280	260	1160	40	460	51	4	3	-	10	27/43
01	**1260**	20	40	1120	100	140	11	5	8	2	2	33/49
06	**1280**	600	100	1040	140	160	3	0	11	5	9	30/50
Chrysothamnus viscidiflorus viscidiflorus												
96	**2180**	-	60	2100	20	-	0	0	1	-	2	16/26
01	**2260**	20	160	1980	120	-	0	0	5	-	.88	15/26
06	**1740**	-	40	1680	20	-	0	0	1	-	1	14/25

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum heracleoides												
96	**860**	-	-	840	20	-	0	0	2	-	0	8/22
01	**1060**	-	-	1040	20	-	0	0	2	2	2	8/21
06	**840**	-	-	840	-	-	7	0	0	-	0	9/21
Prunus virginiana												
96	**140**	-	120	20	-	-	43	0	-	-	0	13/9
01	**260**	-	140	120	-	-	0	0	-	-	0	22/25
06	**400**	-	40	360	-	-	0	90	-	-	0	11/15
Purshia tridentata												
96	**180**	-	40	120	20	-	44	44	11	-	0	21/41
01	**180**	-	-	140	40	-	0	89	22	22	22	25/35
06	**180**	-	-	180	-	-	22	67	0	-	0	25/46
Symphoricarpos oreophilus												
96	**1220**	20	120	1020	80	20	10	18	7	3	13	29/46
01	**1060**	-	-	980	80	-	0	0	8	-	0	32/49
06	**1000**	-	80	920	-	-	0	0	0	-	0	30/46

Trend Study 2-39-06

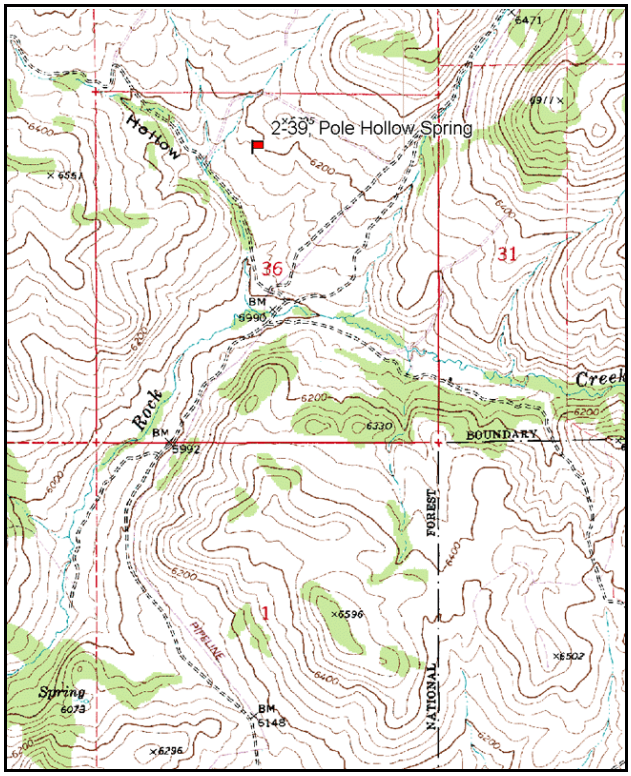
Study site name: Pole Hollow Spring . Vegetation type: Mountain Brush .

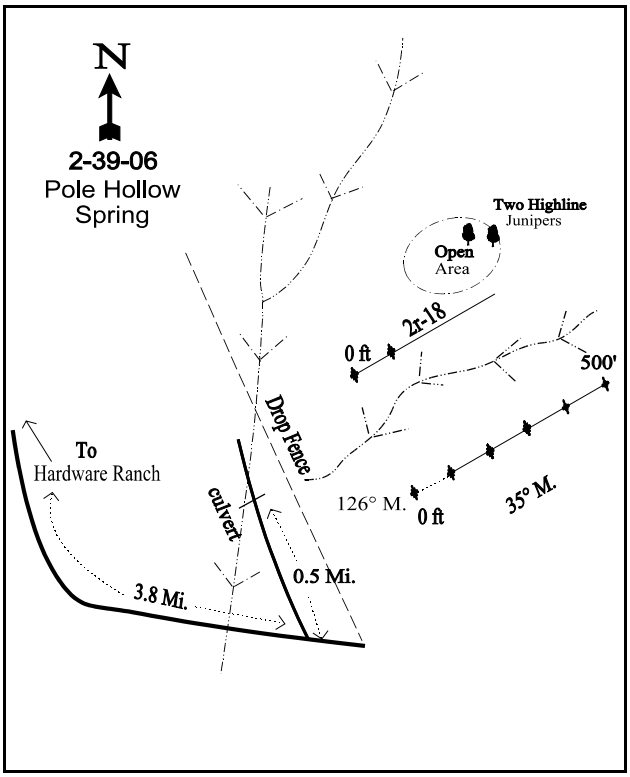
Compass bearing: frequency baseline 35 degrees magnetic.

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

LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow for 0.5 miles to a culvert. From the open area, walk160 paces at a bearing of approximately 135 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 35 degrees magnetic.





Map Name: Boulder Mountain

Diagrammatic Sketch

Township 11N , Range 3E , Section 36

UTM NAD 27, UTM 12T 4611017 N, 454192 E

DISCUSSION

Pole Hollow Spring - Trend Study No. 2-39

Study Information

This study is located 4 miles northeast of Hardware Ranch on land administered by the DWR (elevation: 6,200 feet, slope: 15%, aspect: southwest). The study monitors a mountain brush community and is best classified as summer/transitional range for wildlife. Elk and deer use was minimal in 1996 and 2001. Cattle use the area in summer. It was also in an area that might have been intesively grazed as part of the Hardware grazing study. A control study, temporarily surrounded by an electric fence, is located 300 feet to the northeast. Sheep may have also grazed here in past years. A pellet group transect read in 2001 estimated 13 deer and 2 cow days use/acre (32 ddu/ha and 4 cdu/ha). No elk pellets were sampled in 2001. Pellet group data from 2006 was estimated at 3 elk, 7 deer, 8 cow and 1 moose days use/acre (7edu/ha, 17ddu/ha, 20 cdu/ha, and 2 mdu/ha). A grouse pellet group was also sampled in the transect.

Soil

Soil is moderately deep with an estimated effective rooting depth of nearly 20 inches. It has a clay texture and organic matter is high at 5.1%. Some gravel occurs in the profile and on the soil surface. Average relative cover of bare soil has remained near 14% since 1996 and protective cover (vegetation, litter, and cryptograms) to bare ground is good at 3.7 or above. Vegetation and litter cover are abundant and well dispersed, resulting in only limited erosion. Terracing and bare trails were noted in 2001, along with soil movement in small areas. An erosion condition class determined soils to be slightly eroding in 2001, but stable in 2006.

Browse

The mixed mountain brush community has several important browse species. The key species are mountain big sagebrush and bitterbrush. Mountain big sagebrush density has estimated about 3,400-3,600 mature-decadent plants/acre since 1996. Cover has increased as the plants have grown larger; from 12% in 1996 to 20% in 2006. Young recruitment was good in 1996 and 2001, but decreased to 1% of the population in 2006. Utilization has been light to moderate with vigor being generally good. Decadence has generally been low, ranging from 7-16%. Annual leader growth was relatively low, averaging about 2 inches in 2001 and 2006.

The bitterbrush population has fluctuated slightly, but has averaged just under 600 plants/acre. Cover has averaged about 7-9% since 1996. Utilization was light to moderate in 1996 and 2001, but increased in 2006 to moderate to heavy. There were no decadent plants sampled in 1996, but 21% of the population was classified as decadent in 2001 and 11% were decadent in 2006. Recruitment was low, but with no dead plants in the population, the number of young are adequate to maintain the population. Bitterbrush annual leader growth averaged 3.5 inches in 2001 and 2006.

Serviceberry is not abundant. Density was 500 plants/acre in 1996 and declined to 180 plants/acre in 2001 and 140 in 2006. Cover has continually increased as the plants have increased in size. Utilization was light to moderate in 1996 and 2001, but increased to moderate to heavy in 2006. Snowberry is abundant and has averaged 12% cover since 1996. The snowberry population is mostly mature and showed very little utilization by wildlife.

Herbaceous Understory

The herbaceous understory is dominated by perennial grasses, but the nested frequency has steadily declined since 1996. Shrubs are very thick and are most likely out competing the grasses for resources. The most numerous species was Kentucky bluegrass, an increaser, which decreased significantly from 12% cover in 2001 to 3% in 2006. Bluebunch wheatgrass was the most abundant grass with 4% cover in 2006. Cheatgrass and Japanese brome combined, averaged 4% cover in 1996. Nested frequency of both species decreased significantly in 2001 and have remained under 1% cover since. Smooth brome, Prairie junegrass, mutton bluegrass, Sandberg bluegrass, squirreltail, and Letterman needlegrass are all present but in relatively low

numbers. When the study was established in 1996, field notes stated that areas dominated by bluebunch wheatgrass were less heavily grazed. Those places dominated by Kentucky bluegrass were more heavily used and contained a higher number of weedy forbs. It was also noted that nearby meadow areas contained large amounts of tarweed, mulesears, and curlycup gumweed. Forbs are fairly abundant and diverse, but most are weedy increaser species. Western yarrow, pacific aster, and silver lupine accounted for 77% of the forb cover in 1996 and 65% in 2001 and 2006. Other perennial forbs include yellow salsify and bastard toadflax.

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush and bitterbrush, show light to moderate use and normal vigor. Percent decadence increased for both species, but remains within normal limits for these species, especially during consecutive dry years. Trend for grasses is stable. Sum of nested frequency for perennial grasses decreased slightly, but annual grasses also decreased significantly and averaged less than 1% cover in 2001. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 21%, mostly due to a significant increase in wild onion and bastard toadflax. Species classified as weedy and/or increasers are still abundant. The Desirable Components Index rated this study as excellent due to high browse cover and excellent perennial grass and forb cover.

1996 winter range condition (DC Index) - good (86) Mid-level potential scale
2001 winter range condition (DC Index) - good (86) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - slightly up (+1)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is slightly down. The density of mature/decadent plants of both species did not change, but the density of young sagebrush decreased in 2006 to less than 1% of the population. The large loss of young could lead to less future recruitment. Decadence is low and vigor is good. Trend for grasses is down slightly. Perennial grass sum of nested frequency decreased by 13%, due mainly to a significant decrease in Kentucky bluegrass. Cover also decreased from 12% to 3%. Bluebunch wheatgrass nested frequency actually increased significantly, but cover only increased from 2% to 4%. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 19% and cover increased from 9% in 2001 to 12% in 2006. The Desirable Components Index rated this study as good due to high browse cover, although the perennial grass cover decrease lowered the score slightly.

winter range condition (DC Index) - good (72) Mid-level potential scale
browse - slightly down (-1) grasses - slightly down (-1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 39

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{b}$214	$_{a}$109	$_{b}$164	6.75	2.46	3.77
G	Agropyron trachycaulum	$_{a}$-	$_{a}$-	$_{b}$23	-	-	.21
G	Bromus inermis	$_{a}$3	$_{b}$16	$_{b}$15	.03	.48	.09
G	Bromus japonicus (a)	$_{c}$144	$_{b}$66	$_{a}$10	2.54	.29	.02
G	Bromus tectorum (a)	$_{b}$32	$_{a}$1	$_{a}$2	1.62	.03	.01
G	Elymus cinereus	-	1	-	-	.00	-
G	Koeleria cristata	29	32	27	.26	.49	.52

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Poa fendleriana	$_{a}$13	$_{b}$41	$_{b}$52	.12	1.08	.58
G	Poa pratensis	$_{b}$279	$_{b}$251	$_{a}$141	8.06	11.56	3.34
G	Poa secunda	8	21	11	.19	.51	.18
G	Sitanion hystrix	$_{ab}$14	$_{b}$14	$_{a}$2	.10	.48	.00
G	Stipa lettermani	42	50	28	.40	1.45	.75
Total for Annual Grasses		176	67	12	4.17	0.32	0.03
Total for Perennial Grasses		602	535	463	15.94	18.54	9.47
Total for Grasses		778	602	475	20.11	18.87	9.51
F	Achillea millefolium	98	77	95	1.71	.91	3.14
F	Agoseris glauca	5	-	2	.01	-	.00
F	Alyssum alyssoides (a)	-	-	1	-	-	.00
F	Allium sp.	$_{a}$-	$_{b}$47	$_{c}$90	-	.33	.41
F	Artemisia ludoviciana	6	7	3	.30	.30	.03
F	Astragalus beckwithii	-	-	4	-	-	.06
F	Aster chilensis	166	170	168	2.75	3.96	3.47
F	Astragalus cibarius	-	-	5	-	-	.18
F	Astragalus convallarius	$_{a}$9	$_{a}$16	$_{b}$47	.04	.16	.49
F	Balsamorhiza macrophylla	5	-	3	.03	.03	.03
F	Calochortus nuttallii	-	3	2	-	.03	.00
F	Cirsium undulatum	$_{b}$19	$_{ab}$14	$_{a}$3	.49	.21	.18
F	Collomia linearis (a)	-	$_{b}$48	$_{a}$12	-	.18	.02
F	Comandra pallida	$_{a}$4	$_{b}$54	$_{b}$44	.07	.90	.68
F	Collinsia parviflora (a)	$_{a}$3	$_{b}$27	$_{ab}$9	.01	.10	.02
F	Cordylanthus ramosus (a)	$_{a}$1	$_{a}$21	$_{b}$73	.03	.72	1.70
F	Crepis acuminata	-	-	2	-	-	.03
F	Cryptantha sp.	1	-	-	.00	-	-
F	Eriogonum umbellatum	7	-	6	.06	-	.15
F	Geranium richardsonii	-	-	-	.03	-	-
F	Geranium viscosissimum	$_{a}$-	$_{a}$2	$_{b}$13	-	.03	.19
F	Hackelia patens	-	2	2	-	.00	.03
F	Helianthella uniflora	2	-	7	.06	-	.01
F	Holosteum umbellatum (a)	-	-	5	-	-	.00
F	Ipomopsis aggregata	2	-	1	.03	-	.03
F	Lappula occidentalis (a)	3	-	-	.00	-	-
F	Lactuca serriola	-	-	5	-	-	.03
F	Lupinus argenteus	50	63	66	1.12	1.74	2.38

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Microsteris gracilis (a)	$_{a}$10	$_{ab}$23	$_{b}$40	.01	.05	.09
F	Penstemon humilis	4	4	6	.01	.00	.06
F	Phlox hoodii	-	-	2	-	-	.00
F	Phlox longifolia	5	-	-	.01	-	-
F	Potentilla diversifolia	1	-	4	.15	-	.15
F	Polygonum douglasii (a)	14	20	6	.02	.03	.03
F	Senecio multilobatus	3	4	-	.00	.06	-
F	Taraxacum officinale	3	7	6	.00	.01	.04
F	Tragopogon dubius	$_{ab}$19	$_{b}$28	$_{a}$8	.20	.41	.10
F	Veronica biloba (a)	12	13	15	.01	.04	.02
F	Viguiera multiflora	3	-	-	.04	-	-
F	Wyethia amplexicaulis	3	3	-	.00	.00	-
F	Zigadenus paniculatus	2	2	3	.00	.00	.06
Total for Annual Forbs		43	152	161	0.10	1.13	1.91
Total for Perennial Forbs		417	503	597	7.17	9.13	11.98
Total for Forbs		460	655	758	7.27	10.27	13.89

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

BROWSE TRENDS --
Management unit 02 , Study no: 39

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	12	7	6	.18	.97	1.08
B	Artemisia tridentata vaseyana	83	87	81	12.31	16.63	19.53
B	Chrysothamnus viscidiflorus viscidiflorus	72	54	65	2.93	2.71	3.27
B	Eriogonum heracleoides	2	1	0	-	-	-
B	Juniperus osteosperma	0	0	1	-	-	-
B	Mahonia repens	28	37	38	1.49	1.11	1.90
B	Purshia tridentata	23	30	25	7.86	9.56	7.24
B	Symphoricarpos oreophilus	53	58	58	11.23	11.42	12.08
Total for Browse		273	274	274	36.02	42.42	45.13

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 39

Species	Percent Cover '06
Amelanchier alnifolia	1.10
Artemisia tridentata vaseyana	26.31
Chrysothamnus viscidiflorus viscidiflorus	5.08
Mahonia repens	1.10
Purshia tridentata	9.68
Symphoricarpos oreophilus	17.29

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 39

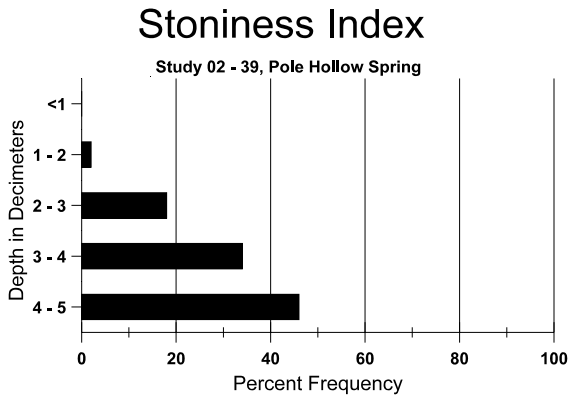
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	2.9
Artemisia tridentata vaseyana	1.6	1.9
Purshia tridentata	3.5	3.7

BASIC COVER --
Management unit 02 , Study no: 39

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	55.67	61.97	61.25
Rock	.50	.19	.09
Pavement	1.85	1.89	.37
Litter	56.73	41.05	47.43
Bare Ground	14.36	15.38	22.48

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 39, Pole Hollow Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
19.5	52.8 (18.1)	7.0	28.6	27.4	44.0	5.1	28.8	249.6	1.3



PELLET GROUP DATA --
Management unit 02 , Study no: 39

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Elk	6	-	-	-	3 (7)
Deer	2	-	2	13 (32)	7 (17)
Cattle	2	-	1	2 (4)	8 (20)
Moose	-	-	-	-	1 (2)
Sage Grouse	-	-	-	-	9 groups/acre

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 39

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**500**	-	40	460	-	-	24	4	-	-	4	33/33
01	**180**	20	60	120	-	-	22	0	-	-	0	44/44
06	**140**	-	-	140	-	-	71	29	-	-	0	36/39
Artemisia tridentata vaseyana												
96	**4020**	420	380	3340	300	700	27	4	7	.99	.99	25/34
01	**4040**	-	480	2920	640	140	20	2	16	.49	4	29/35
06	**3440**	180	40	2960	440	120	36	3	13	6	11	28/39
Chrysothamnus viscidiflorus viscidiflorus												
96	**3200**	-	120	2840	240	-	.62	0	8	3	4	18/21
01	**2280**	-	20	2260	-	-	0	0	0	-	0	14/16
06	**2400**	-	100	2120	180	-	.83	0	8	3	13	14/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum heracleoides												
96	**60**	-	-	60	-	-	0	0	-	-	0	7/19
01	**20**	-	-	20	-	-	100	0	-	-	0	6/9
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
96	**5640**	40	1160	4480	-	-	0	0	-	-	0	4/5
01	**6080**	-	20	6060	-	-	0	0	-	-	0	3/4
06	**6900**	40	20	6880	-	-	0	0	-	-	0	3/5
Purshia tridentata												
96	**500**	-	60	440	-	-	40	0	0	-	0	35/62
01	**660**	-	40	480	140	-	30	9	21	3	3	34/47
06	**560**	20	40	460	60	20	29	50	11	4	4	32/61
Quercus gambelii												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	36/43
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
96	**2140**	100	260	1820	60	-	.93	0	3	2	2	32/51
01	**1820**	-	60	1620	140	40	0	0	8	1	2	32/51
06	**2280**	-	120	2160	-	-	3	0	0	-	0	32/49

Trend Study 2-40-06

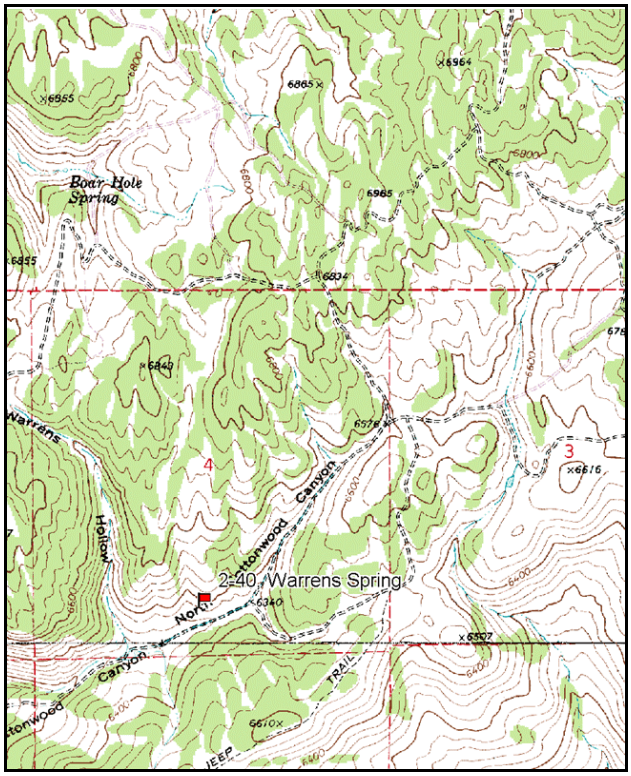
Study site name: Warrens Spring . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 10 degrees magnetic.

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

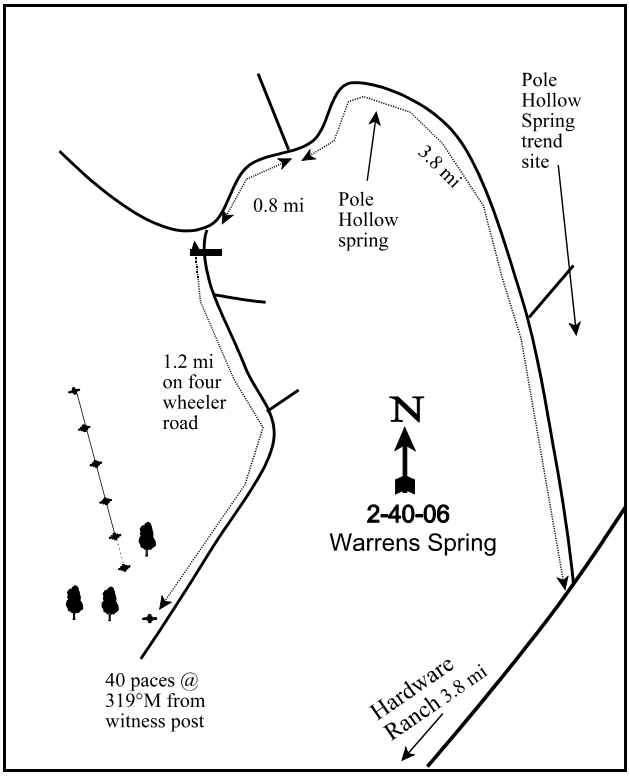
LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow 3.8 miles, passing the Pole Hollow trend site and Pole Hollow Spring. Continue on the main road 0.8 miles to a fork. Turn left and go over a cattleguard. Continue down the canyon 1.2 mile to a witness post on the right hand side of the road. From the witness post, walk 40 paces at 319 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 10 degrees magnetic.



Map Name: Boulder Mountain

Township 10N , Range 3E , Section 5



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4608266 N, 449379 E

DISCUSSION

Warren Spring - Trend Study No. 2-40

Study Information

This study is located in North Cottonwood Canyon, which is a side canyon of Blacksmith Fork Canyon (elevation: 6,350 feet, slope: 28-30%, aspect: south). The study monitors winter range in a mountain brush community and water is available at Warren Spring, which is about 1/3 of a mile to the southwest. The area is used by deer, elk, and cattle. Pellet group transect data collected in 2001 estimated 43 deer, 11 elk, and 9 cow days use/acre (107 ddu/ha, 28 edu/ha, and 23 cdu/ha). Numerous trails run through the area and off the hills down to the road in the bottom of the canyon and south to the spring. Livestock use on the actual study is fairly light, but use is heavy in the bottoms throughout the canyon. Pellet group data in 2006 was estimated at 52 deer, 1 elk, and 7 cow days use/acre (127 ddu/ha, 2 edu/ha, and 18 cdu/ha).

Soil

Soil is classified in the Goring series, which formed from sandstone and quartzite (USDA-NRCS 2006). The soil is moderately deep with an estimated effective rooting depth of 15 inches. Texture is a clay loam with a neutral pH of 6.8. Phosphorus is low at only 3.9 ppm and values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). Rock and pavement account for less than 10% of the ground cover. Some compaction occurs due to numerous livestock trails, as most of the bare ground is associated with these trails. Bare ground has increased slightly as litter cover decreased, but the ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair in 2006 at 2.6. Pedestalling provides the most evidence of past erosion. An erosion condition class completed in 2001 determined erosion to be slight, but was stable in 2006.

Browse

The key browse species in this mountain brush community are mountain big sagebrush and bitterbrush. Mountain big sagebrush density has averaged about 2,500 plants/acre since 1996. Sagebrush cover averaged about 14-15% in both 1996 and 2006, but spiked in 2001 to 20%. Utilization on sagebrush was mostly light with a few shrubs displaying moderate use. In 1996, many of the sagebrush were beginning to drop leaves due to the dry conditions. Vigor has been normal and percent decadence moderately low at 20% or less during all sampling years. Annual leader growth averaged 1.5 inches in 2001 and 1.9 inches in 2006.

Bitterbrush has maintained a mature population of 180 plants/acre since 1996. Utilization is moderate to heavy and decadence decreased from 22% in 1996 to only 11% in 2001 and 2006. Annual leader growth was relatively low at 2 inches in 2001 and 4 inches in 2006. In 1996, elderberry plants were observed to have no leaves left and bitterbrush near the bottom of the canyon were heavily utilized. Serviceberry is rare and moderately utilized. Other browse species include: chokecherry, Woods rose, and snowberry. Chokecherry is usually found growing under the canopy of sagebrush and juniper.

Herbaceous Understory

The herbaceous understory is not particularly abundant for a mountain brush community. The grass component is diverse, but bluebunch wheatgrass is the only common perennial species. Cheatgrass and Japanese brome were abundant in 1996, producing 6% cover, which was half of the total grass cover. Due to drought conditions in 2001, these species provided less than 1% cover and remained low in 2006. In 2001 and 2006, bluebunch wheatgrass and Great Basin wildrye both displayed moderate to heavy use. Forbs are very diverse and produce nearly as much cover as grasses. Composition is not good however. Annual forbs are abundant as are weedy perennials that include: thistle, common sunflower, and dyer's woad. Perennial herbaceous species have shown a slight increase in sum of nested frequency from 1996 to 2006. Annual forbs decreased in sum of nested frequency in 2001 due to the extremely dry conditions, but rebounded in 2006 with good precipitation.

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush, has a stable density, low decadence, normal vigor, and mostly light use. Young plants are currently adequate to maintain the population. Bitterbrush also have a stable population with moderate to heavy use. Trend for grasses is slightly up. Perennial grass sum of nested frequency remained similar to 1996. A positive factor is that annual grasses decreased from 6% cover to less than 1%. Trend for forbs is also stable. Perennial forbs remained similar, although annuals also decreased in sum of nested frequency. The composition of forbs remains less than ideal with a large number of weeds and increasers. Dyers woad is not abundant, but decreased significantly. The Desirable Components Index rated this study as fair due to good browse cover, but only moderate perennial grass cover.

1996 winter range condition (DC Index) - fair (57) Mid-level potential scale
2001 winter range condition (DC Index) - fair (61) Mid-level potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is stable. Sagebrush density has remained close to 2,500 mature plant/acre and the recruitment from young plants increased to 7% of the population. Bitterbrush population are low and have remained at 180 plants/acre. Trend for grasses is up, due to a significant increase in bluebunch wheatgrass nested frequency. Cheatgrass and Japanese brome both remained less than 1% cover. Trend for forbs is up. Arrowleaf balsmroot, hoary aster, and pacific aster all increased significantly in nested frequency. The composition is still less than ideal with weeds and increasers, although dyer's woad density was low enough that it was not sampled in 2006.. The Desirable Components Index rated this study as fair-good due to good browse cover, but only moderate perennial grass cover.

winter range condition (DC Index) - fair-good (64) Mid-level potential scale
browse - stable (0) grasses - up (+2) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 40

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{ab}$184	$_{a}$161	$_{b}$212	4.42	4.51	6.16
G	Agropyron trachycaulum	7	5	3	.18	.04	.02
G	Bromus carinatus	$_{a}$5	$_{b}$23	$_{b}$32	.06	.17	.16
G	Bromus japonicus (a)	$_{b}$142	$_{a}$69	$_{a}$97	2.75	.65	.45
G	Bromus tectorum (a)	$_{b}$156	$_{a}$42	$_{a}$59	3.21	.28	.49
G	Elymus cinereus	5	5	5	.38	.03	.41
G	Melica bulbosa	-	-	-	-	-	.00
G	Poa bulbosa	16	23	26	.34	.53	.66
G	Poa fendleriana	1	-	-	.00	-	-
G	Poa pratensis	12	14	21	.45	.19	.57
G	Poa secunda	4	14	22	.01	.09	.11
Total for Annual Grasses		298	111	156	5.96	0.93	0.94

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
Total for Perennial Grasses		234	245	321	5.85	5.58	8.10
Total for Grasses		532	356	477	11.82	6.52	9.05
F	Achillea millefolium	19	31	31	.16	.38	.36
F	Agoseris glauca	-	3	5	-	.01	.03
F	Alyssum alyssoides (a)	$_{c}$213	$_{b}$129	$_{a}$14	.96	.41	.04
F	Allium sp.	$_{a}$81	$_{ab}$113	$_{b}$129	.25	.35	.41
F	Arabis sp.	-	1	2	-	.00	.01
F	Artemisia dracunculus	6	-	-	.03	-	-
F	Aster chilensis	$_{a}$30	$_{a}$32	$_{b}$52	.66	.75	1.44
F	Astragalus sp.	14	4	-	.21	.06	-
F	Astragalus utahensis	1	1	4	.03	.00	.01
F	Balsamorhiza macrophylla	-	-	3	-	-	.18
F	Balsamorhiza sagittata	$_{a}$15	$_{a}$13	$_{b}$35	1.33	1.28	3.58
F	Castilleja linariaefolia	1	-	-	.00	-	-
F	Camelina microcarpa (a)	-	3	-	-	.01	-
F	Calochortus nuttallii	-	-	2	-	-	.00
F	Chaenactis douglasii	10	-	4	.04	-	.18
F	Cirsium undulatum	6	5	5	.27	.06	.33
F	Collomia linearis (a)	$_{a}$40	$_{b}$107	$_{b}$92	.12	.52	.25
F	Comandra pallida	5	2	-	.01	.01	-
F	Collinsia parviflora (a)	$_{a}$44	$_{a}$46	$_{b}$137	.41	.15	.22
F	Crepis acuminata	5	1	3	.04	.15	.15
F	Cryptantha sp.	-	5	13	-	.01	.07
F	Cymopterus sp.	2	3	4	.00	.06	.09
F	Descurainia pinnata (a)	-	2	-	-	.01	-
F	Epilobium brachycarpum (a)	$_{ab}$65	$_{a}$54	$_{b}$78	.61	.26	.20
F	Galium aparine (a)	5	-	3	.15	-	.00
F	Hackelia patens	-	4	-	-	.03	-
F	Helianthus annuus (a)	2	-	-	.63	-	-
F	Helianthella uniflora	-	2	10	.00	.21	.15
F	Holosteum umbellatum (a)	1	2	4	.00	.00	.00
F	Isatis tinctoria	$_{b}$36	$_{a}$8	$_{a}$-	.45	.06	-
F	Lactuca serriola	1	8	4	.03	.02	.01
F	Linum lewisii	15	22	28	.14	.14	.23
F	Lithospermum ruderale	-	5	10	.00	.01	.18
F	Lupinus argenteus	11	5	2	.85	.21	.15

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Machaeranthera canescens	$_{a}$1	$_{a}$1	$_{b}$34	.02	.03	.43
F	Machaeranthera grindelioides	-	2	-	-	.00	-
F	Microsteris gracilis (a)	$_{a}$33	$_{b}$60	$_{a}$16	.10	.14	.04
F	Penstemon humilis	$_{a}$-	$_{b}$5	$_{ab}$3	.00	.06	.03
F	Penstemon sp.	-	-	1	-	-	.03
F	Phlox longifolia	-	-	3	-	-	.03
F	Polygonum douglasii (a)	$_{a}$50	$_{a}$28	$_{b}$96	.13	.06	.25
F	Senecio multilobatus	-	3	-	-	.03	-
F	Taraxacum officinale	1	3	-	.00	.01	-
F	Tragopogon dubius	21	18	17	.40	.23	.19
F	Veronica biloba (a)	$_{b}$166	$_{a}$121	$_{b}$202	.42	.33	1.20
F	Viguiera multiflora	5	-	5	.04	-	.18
F	Wyethia amplexicaulis	1	1	1	.18	.15	.18
Total for Annual Forbs		619	552	642	3.56	1.91	2.23
Total for Perennial Forbs		287	301	410	5.22	4.40	8.68
Total for Forbs		906	853	1052	8.79	6.31	10.91

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

BROWSE TRENDS --
Management unit 02 , Study no: 40

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	3	1	1	.15	-	.03
B	Artemisia tridentata vaseyana	76	74	73	14.11	20.20	15.32
B	Chrysothamnus nauseosus consimilis	2	1	1	-	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	24	24	24	1.19	1.91	1.70
B	Eriogonum heracleoides	1	0	0	.63	-	-
B	Mahonia repens	5	3	6	.09	.24	.24
B	Prunus virginiana	4	6	6	.38	.36	.36
B	Purshia tridentata	9	9	8	1.69	2.79	2.11
B	Rosa woodsii	2	1	1	.63	.03	.03
B	Symphoricarpos oreophilus	26	25	25	2.10	3.73	4.36
Total for Browse		152	144	145	20.98	29.29	24.18

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 40

Species	Percent Cover '06
Amelanchier alnifolia	.08
Artemisia tridentata vaseyana	19.36
Chrysothamnus nauseosus consimilis	.01
Chrysothamnus viscidiflorus viscidiflorus	2.83
Mahonia repens	.16
Prunus virginiana	.75
Purshia tridentata	2.36
Symphoricarpos oreophilus	6.53

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 40

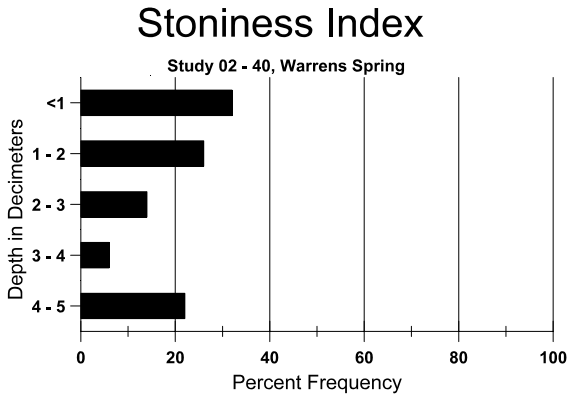
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.5	1.9
Purshia tridentata	1.8	3.9

BASIC COVER --
Management unit 02 , Study no: 40

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	38.24	41.59	40.48
Rock	5.32	7.12	7.66
Pavement	2.70	2.44	2.95
Litter	48.71	46.20	36.77
Cryptogams	.10	.00	0
Bare Ground	19.22	28.33	30.67

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 40, Warrens Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.1	59.8 (15.6)	6.8	29.9	35.7	34.4	4.7	12.9	279.4	0.7



PELLET GROUP DATA --
Management unit 02 , Study no: 40

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Rabbit	2	1	1	-	-
Elk	4	1	3	11)28)	1 (2)
Deer	22	14	14	44 (107)	52 (127)
Cattle	1	3	-	9 (23)	7 (18)
Moose	-	-	-	1 (1)	-

BROWSE CHARACTERISTICS --
Management unit 02 , Study no: 40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**60**	-	-	60	-	20	100	0	-	-	0	36/29
01	**20**	-	-	20	-	-	100	0	-	-	0	38/41
06	**20**	-	-	20	-	-	0	100	-	-	0	34/39
Artemisia tridentata vaseyana												
96	**2460**	60	340	1800	320	220	24	0	13	2	2	23/38
01	**2560**	20	100	2080	380	140	5	0	15	4	4	23/35
06	**2700**	80	180	1980	540	400	7	0	20	8	10	26/38
Chrysothamnus nauseosus consimilis												
96	**40**	-	-	40	-	-	50	0	-	-	0	33/58
01	**20**	-	-	20	-	-	0	0	-	-	0	22/18
06	**20**	-	-	20	-	-	0	0	-	-	0	24/30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
96	**880**	-	40	820	20	-	0	0	2	-	5	16/23
01	**840**	-	40	780	20	-	0	0	2	-	0	13/22
06	**800**	60	100	700	-	20	0	0	0	-	0	15/24
Eriogonum heracleoides												
96	**20**	-	-	20	-	-	0	0	-	-	0	2/4
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
96	**520**	-	60	460	-	-	0	0	-	-	0	5/8
01	**660**	-	40	620	-	-	0	0	-	-	0	3/5
06	**1040**	60	-	1040	-	-	0	0	-	-	0	3/5
Prunus virginiana												
96	**120**	-	80	40	-	-	0	0	-	-	0	30/28
01	**320**	20	280	40	-	-	6	0	-	-	0	32/31
06	**360**	-	100	260	-	-	11	17	-	-	0	23/14
Purshia tridentata												
96	**180**	-	-	140	40	20	22	22	22	22	22	24/52
01	**180**	-	-	160	20	20	22	67	11	-	0	23/49
06	**180**	-	-	160	20	-	22	67	11	-	0	20/49
Rosa woodsii												
96	**40**	-	-	40	-	-	0	0	-	-	0	14/4
01	**20**	-	20	-	-	-	0	0	-	-	0	22/11
06	**40**	-	-	40	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
96	**760**	-	40	600	120	-	0	0	16	3	8	21/35
01	**840**	20	40	700	100	-	0	0	12	7	7	22/36
06	**960**	-	80	880	-	-	0	0	0	-	0	18/34

Trend Study 2R-5-06

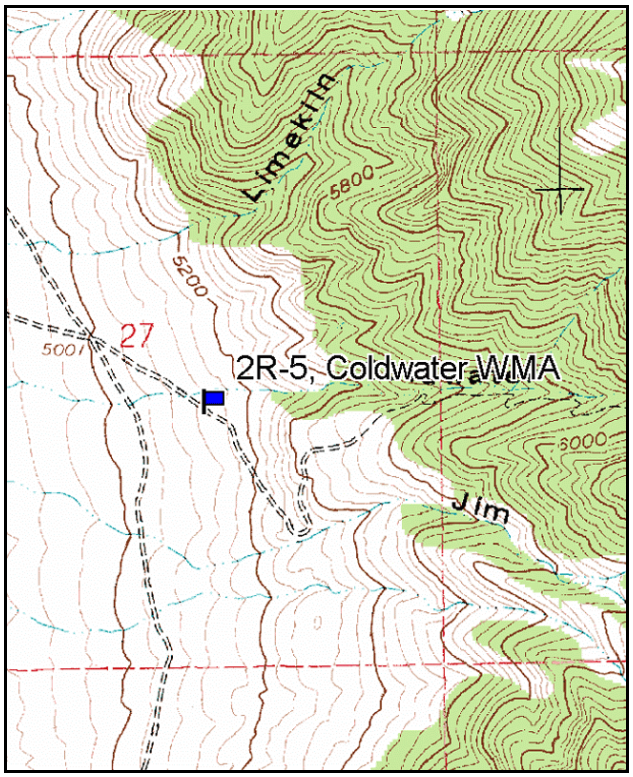
Study site name: Coldwater WMA . Vegetation type: Big Sagebrush .

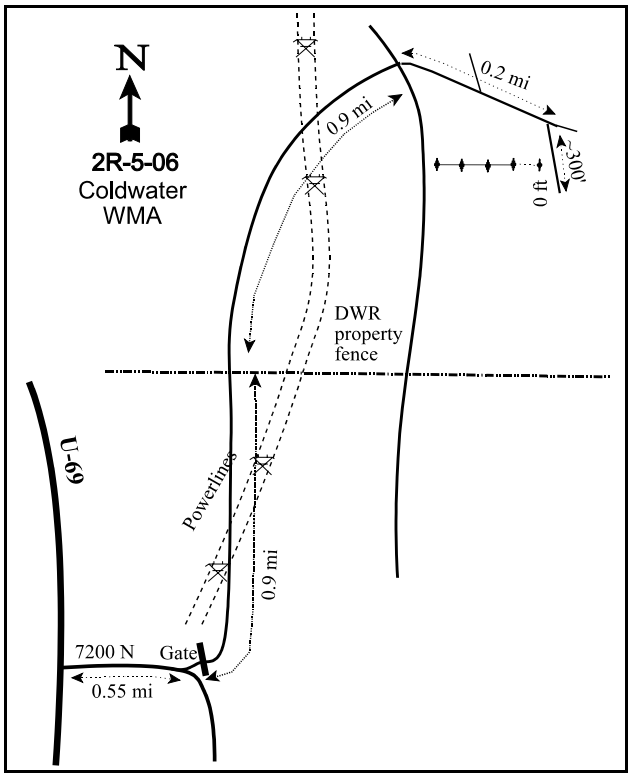
Compass bearing: frequency baseline 240 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of 7200 North and U-69 in Honeyville, proceed east and north for 0.55 miles to a gate. Proceed 0.9 miles to the north to a fence. Continue another 0.9 miles and as the road turn south keep left for 0.2 miles to a fork, keep right for approximately 300 feet to a witness post. Walk 11 paces at 210 degrees magnetic to the 0' stake. The baseline runs 240 degrees magnetic.





Map name: Honeyville

Diagrammatic Sketch

Township 11N , Range 2W , Section 34

GPS: NAD 27, UTM 12S 4632412 N, 486340 E

DISCUSSION

Cold Water WMA - Trend Study No. 2R-5

Study Information

This study is located northeast of Honeyville, near the mouth of Coldwater Canyon (elevation: 5,100 feet, slope: 18%, aspect: southwest). The vegetation type is a mountain big sagebrush community. The area is administered by the DWR as a Wildlife Management Area for wintering mule deer. The spring near the study has been developed into a trough and the study is nearly surrounded by roads. Pellet group data in 1998 estimated at only 1 deer day use/acre (3 ddu/ha). Pellet group data in 2006 was estimated at 13 deer and 1 cow days use/acre (31 ddu/ha and 2 cdu/ha).

Soil

Soil is classified in the Sterling series, a very deep, well drained soil that formed in alluvium, colluvium, and lacustrine deposits derived mainly from limestone and other sedimentary rocks (USDA-NRCS 2006). The texture is a loam with a neutral pH of 7.1. Organic matter is relatively high at 6.7%. Effective rooting depth was only 8 inches, but was limited by the rocky nature of the area. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground has increased from 5.7 in 1998 to 8.8 in 2006. An erosion condition class completed in 2006 determined erosion to be stable.

Browse

The key browse species is mountain big sagebrush and is located just below the juniper covered steeper slopes. A few junipers are encroaching into the sagebrush community. Mountain big sagebrush density in 1998 averaged 2,820 plants/acre and had changed very little in 2006 to 2,780 plants/acre. As the plants have grown, cover has more than doubled from 12% in 1998 to 30% in 2006. Sagebrush cover this high may be detrimental to herbaceous understory production. Utilization is light and decadence has been low at 4-6%. Young recruitment averaged 11% in 1998, while no young plants were observed in 2006. Annual leader growth averaged 2 inches in 2006. Other shrubs include: rubber rabbitbrush, broom snakeweed, and smooth sumac. Smooth sumac was abundant in 1998 with 3,340 plants/acre, but all of them were young plants and none of those sampled in 1998 survived to maturity.

Herbaceous Understory

The herbaceous understory is composed mainly of annual weeds or perennial increasers. In 1998, perennial grass cover only averaged 3%, while annual grass cover averaged 18%. Forbs were dominated by two species, ragweed and white sweetclover. In 2006, the herbaceous understory was not any healthier, but the composition was different. Annual grass cover decreased from 18% to 8%, due to a significant decreases in Japanese brome and cheatgrass nested frequencies. Perennial grasse cover increased to 15%, but much of the increase was due to bulbous and Sandberg bluegrass. Bulbous bluegrass can form a dense mat in disturbed areas and prevent other species from establishing. Ragweed decreased from 8% cover to 1%, but spreading dogbane increased from 0% to 3%. Spreading dogbane is a native species, but is considered poisonous to browsing animals. Dyer's woad was sampled for the first time in 2006.

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, is stable. Density has remained similar to 1998, but cover has increased from 12% to 30%. The population is predominately mature and no young plants were observed in 2006. Trend for grasses is up. Annual grass cover decreased by half, while Sandberg bluegrass increased significantly. Bulbous bluegrass increased significantly and may continue to increase without some competition from perennial species. Trend for forbs is slightly down. Perennial forb sum of nested frequency decreased by 10% and the species composition is extremely poor. As well, dyer's woad was sampled for the first time in 2006. The Desirable Components Index rated this study as poor in 1998 and fair in 2006. The change was due to the browse cover increasing in 2006 and perennial grass cover increasing five-fold.

1998 winter range condition (DC Index) - poor (38) Mid-level potential scale

2006 winter range condition (DC Index) - fair (63) Mid-level potential scale
browse - stable (0) grasses - up (+2) forbs - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 02R, Study no: 5

Type	Species	Nested Frequency		Average Cover %	
		'98	'06	'98	'06
G	Bromus brizaeformis (a)	20	13	.45	.11
G	Bromus japonicus (a)	b320	a128	6.78	1.61
G	Bromus tectorum (a)	b415	a216	10.87	6.23
G	Poa bulbosa	a-	b177	-	6.16
G	Poa fendleriana	3	3	.06	.03
G	Poa pratensis	80	80	1.67	2.69
G	Poa secunda	a48	b120	1.00	5.05
G	Sporobolus cryptandrus	-	5	-	.63
Total for Annual Grasses		755	357	18.12	7.95
Total for Perennial Grasses		131	385	2.73	14.58
Total for Grasses		886	742	20.86	22.53
F	Alyssum alyssoides (a)	63	83	.26	.21
F	Allium sp.	-	2	-	.00
F	Ambrosia psilostachya	b178	a37	8.10	1.23
F	Apocynum androsaemifolium pumilum	a-	b76	-	3.07
F	Artemisia ludoviciana	8	10	.53	.93
F	Asclepias asperula	4	11	.18	.59
F	Astragalus sp.	3	-	.03	-
F	Carduus nutans (a)	4	-	.00	-
F	Calochortus nuttallii	-	-	-	.00
F	Cirsium undulatum	1	2	.00	.15
F	Collomia linearis (a)	3	-	.00	-
F	Collinsia parviflora (a)	-	2	-	.00
F	Cymopterus sp.	-	2	-	.00
F	Draba sp. (a)	-	3	-	.00
F	Epilobium brachycarpum (a)	79	90	.44	.22
F	Erodium cicutarium (a)	a-	b26	-	.32
F	Helianthus annuus (a)	22	9	.26	.16
F	Holosteum umbellatum (a)	7	5	.15	.01
F	Isatis tinctoria	-	-	-	.00
F	Lactuca serriola	15	-	.09	-
F	Melilotus alba	17	8	1.47	1.25

Type	Species	Nested Frequency		Average Cover %	
		'98	'06	'98	'06
F	Melilotus officinalis	$_{a}$12	$_{b}$34	.90	.87
F	Microsteris gracilis (a)	-	9	-	.01
F	Penstemon sp.	6	-	.03	-
F	Phlox longifolia	-	4	-	.00
F	Tragopogon dubius	9	3	.09	.00
F	Viola sp.	-	4	-	.03
F	Zigadenus paniculatus	$_{a}$7	$_{b}$40	.03	.73
Total for Annual Forbs		178	227	1.13	0.95
Total for Perennial Forbs		260	233	11.49	8.90
Total for Forbs		438	460	12.63	9.85

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

BROWSE TRENDS --
Management unit 02R, Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'98	'06	'98	'06
B	Artemisia tridentata vaseyana	70	67	11.63	29.52
B	Chrysothamnus nauseosus albicaulis	15	15	5.74	3.78
B	Gutierrezia sarothrae	35	12	4.34	.39
B	Rhus trilobata	15	1	1.25	.30
Total for Browse		135	95	22.97	34.00

CANOPY COVER, LINE INTERCEPT --
Management unit 02R, Study no: 5

Species	Percent Cover '06
Artemisia tridentata vaseyana	32.31
Chrysothamnus nauseosus albicaulis	6.46
Gutierrezia sarothrae	.13
Rhus trilobata	.43

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02R , Study no: 5

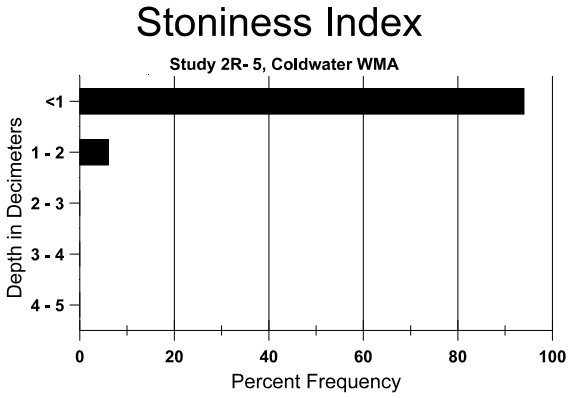
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	-	2.1

BASIC COVER --
Management unit 02R, Study no: 5

Cover Type	Average Cover %	
	'98	'06
Vegetation	53.35	65.52
Rock	11.89	8.32
Pavement	6.50	3.90
Litter	42.60	43.31
Cryptogams	.00	0
Bare Ground	8.63	3.10

SOIL ANALYSIS DATA --
Herd Unit 02R, Study no: 5, Cold Water WMA

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
7.7	75.8 (9.4)	7.1	38.7	36.7	24.6	6.7	11.5	150.4	0.88



PELLET GROUP DATA --
Management unit 02R, Study no: 5

Type	Quadrat Frequency	
	'98	'06
Rabbit	-	17
Deer	-	6
Cattle	-	-

Days use per acre (ha)	
'98	'06
-	-
-	13 (31)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 02R, Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
98	**2820**	100	300	2360	160	980	9	0	6	5	8	30/37
06	**2780**	260	-	2660	120	600	6	0	4	1	1	33/41
Chrysothamnus nauseosus albicaulis												
98	**400**	-	-	360	40	80	0	0	10	-	0	45/68
06	**420**	-	-	80	340	-	0	0	81	81	81	36/58
Gutierrezia sarothrae												
98	**1960**	-	40	1920	-	20	0	0	0	-	0	18/22
06	**320**	-	-	200	120	140	0	0	38	31	31	12/12
Rhus trilobata												
98	**3340**	40	3340	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	47/87

SUMMARY

MANAGEMENT UNIT 2 - CACHE

Management unit 2 is large, covering the Wellsville Mountains, the Cache Valley, the Cache National Forest, and the extensive rangeland around Woodruff, Randolph, and Bear Lake. Twenty six studies were monitored in 2006 and the majority of the studies were established in 1984. The Cache Valley and Bear Lake studies are typically mountain big sagebrush communities that have poor herbaceous understory dominated by annual grasses and weedy forbs. The Woodruff and Randolph area is dominated by Wyoming big sagebrush communities and have good perennial grass understories.

Precipitation data from Cache county average 19 inches of annual precipitation (Fig. 1). Drought conditions (less than 75% of annual precipitation) were experienced in 1988-1990, 1992, and 2000-2002. Spring precipitation is essential for shrub and perennial grass and forb recruitment. Lower than normal precipitation, especially in consecutive years, likely plays a primary role in increased decadence and decreased reproduction in shrub populations, primarily big sagebrush. Spring (April-June) precipitation was less than 75% of normal in 1982, 1985, 1989, 1992, 1994, 2000-2004, and 2006. Annual precipitation for Rich county averages about 10 inches. Drought conditions were experienced in 1988, 1992, and 2000-2002. Spring (April-June) precipitation in Rich county was less than 75% of normal in 1984, 1985, 1987, 1988, 1992, 1994, 1996, and 2000-2002.

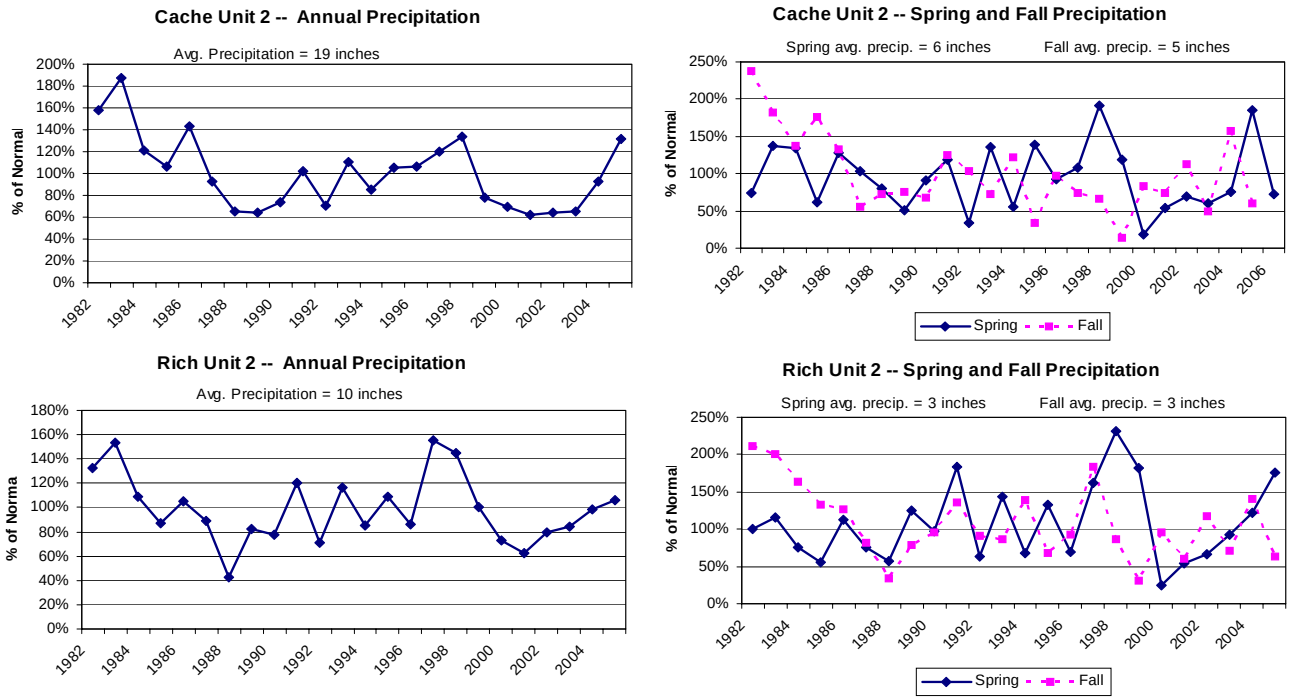


Figure 1. Precipitation graphs for the Cache and Rich unit. Data is percent of normal precipitation averaged for weather stations in Logan and Brigham City for Cache (above) and Woodruff for Rich (below). Spring months include April-June and fall months include September-November (Utah Climate Summaries 2006).

The Desirable Component Index (DCI) for the mid-potential studies (mountain big sagebrush) in unit 2 averaged a poor rating from 1996 to 2006 (Fig. 2). These studies typically only average 6-7% browse cover (Fig. 3) and the herbaceous understory's are dominated by annual grasses and weedy forbs. Recruitment from young sagebrush and other shrubs has been minimal the last 3 readings and the competitive understory may be

limiting them from replenishing the population. The low-potential studies (Woodruff area) averaged a good rating from 1996 to 2006 (Fig. 2). The average Wyoming big sagebrush density decreased in 2006 (Fig. 3), but still averages 4,000 plants/acre.

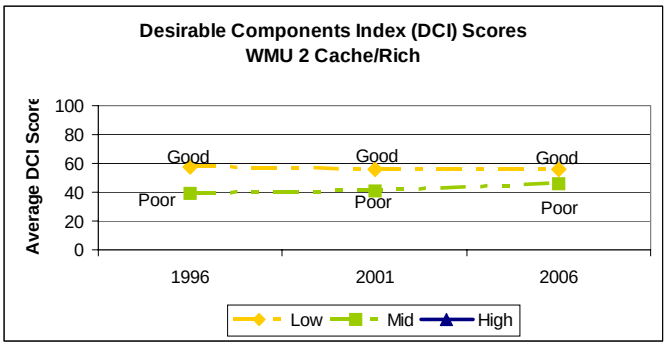


Figure 2. The Desirable Components Index ratings are divided into categories because of different ecological potential, these include: low, mid, and high.

The cumulative browse trend for Wyoming big sagebrush studies has remained relatively stable until 2006, when they declined (Fig. 4). Drought conditions were experienced for 3 years in 2000-2002 and the decrease in sagebrush cover and density (Fig. 3) were likely a result. Decadence continued to remain near 35% (Fig. 5) in 2006. The browse trends for the mountain big sagebrush studies have steadily been declining since 1996. Only 6 out of 17 studies in 2006 had young shrubs to replace

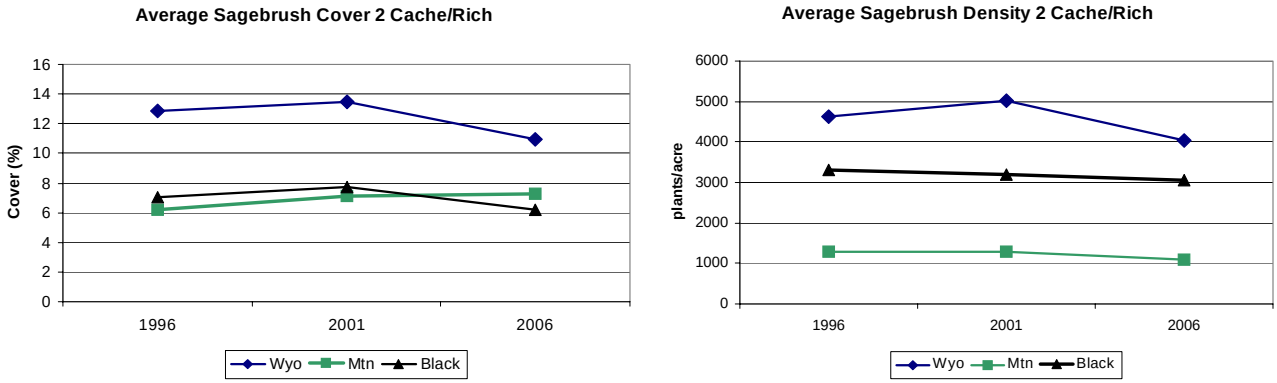


Figure 3. Average sagebrush cover (left) and density (right) for big sagebrush subspecies and black sagebrush across unit 2 from 1996 to 2006.

old, dying plants in the population. As mentioned before, the weedy herbaceous understory is most likely the main culprit (Hall et al. 1999).

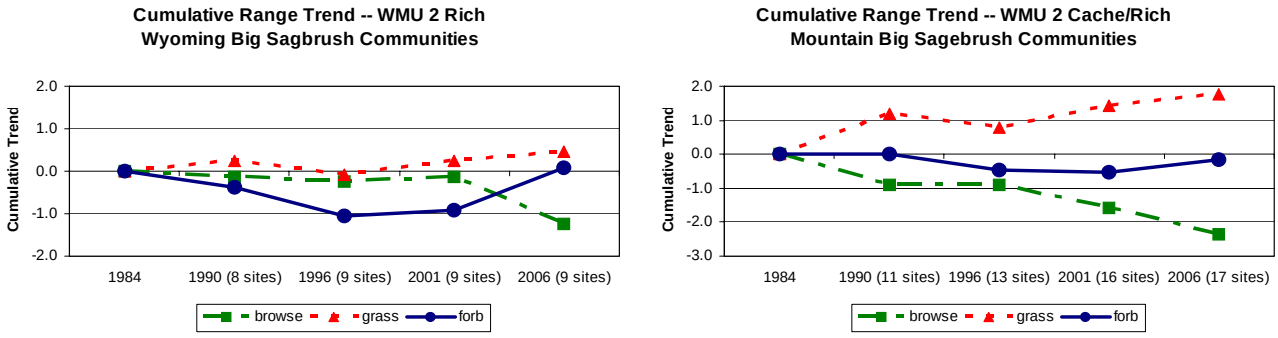


Figure 4 Cumulative range trend for unit separated by sagebrush subspecies, Wyoming big sagebrush (left) and mountain big sagebrush (right), and counties.

Grass trends for both the Wyoming and mountain big sagebrush communities have remained fairly stable (Fig. 4). Average perennial grass cover is very good and has increased slightly from 13% in 1996 to just under 18% in 2006, even though nested frequency has remained very similar year to year (Fig. 6). Cheatgrass is very minimal on the Wyoming big sagebrush studies (Fig. 6), but is prevalent on the mountain big sagebrush

studies. Cheatgrass cover averaged nearly 16% in 1996 on 17 mountain big sagebrush studies and appears to be decreasing as cover averaged 10% in 2001 and 7% in 2006 (Fig. 7). Cheatgrass nested frequency had similar trends as cover from 1996 to 2001, but seemed to level off from 2001 to 2006 (Fig. 7).

Forb trends decreased in 1996 and remained similar in 2001 (Fig. 4). Both cover and nested frequency on both the Wyoming and mountain big sagebrush community types followed this pattern (Fig. 6 and Fig. 7). In 2006, the forb trends, cover, and nested frequency all increased. Changes in forb cover and nested frequency usually fluctuate with increases and decreases in precipitation.

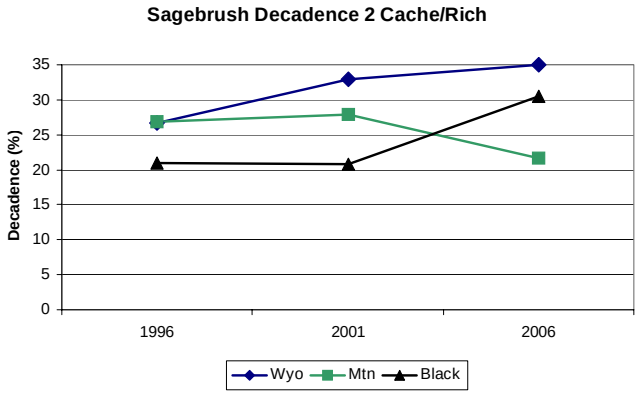


Figure 5. Sagebrush decadence by subspecies in unit 2.

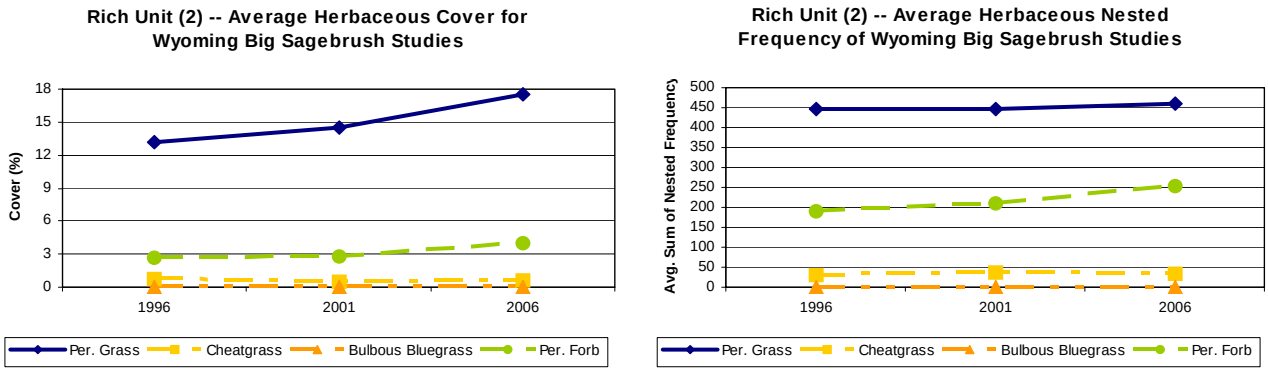


Figure 6. Average herbaceous cover (left) and nested frequency (right) for Wyoming big sagebrush communities in Rich county.

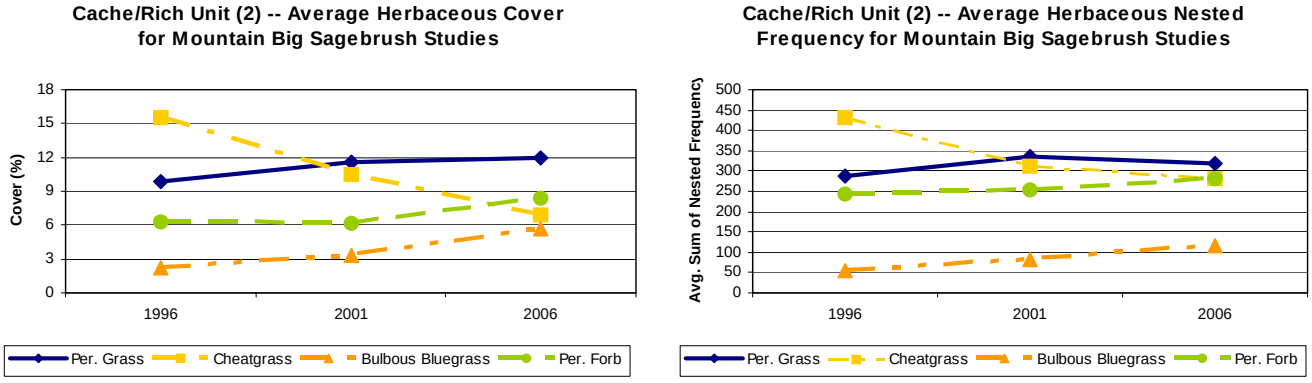
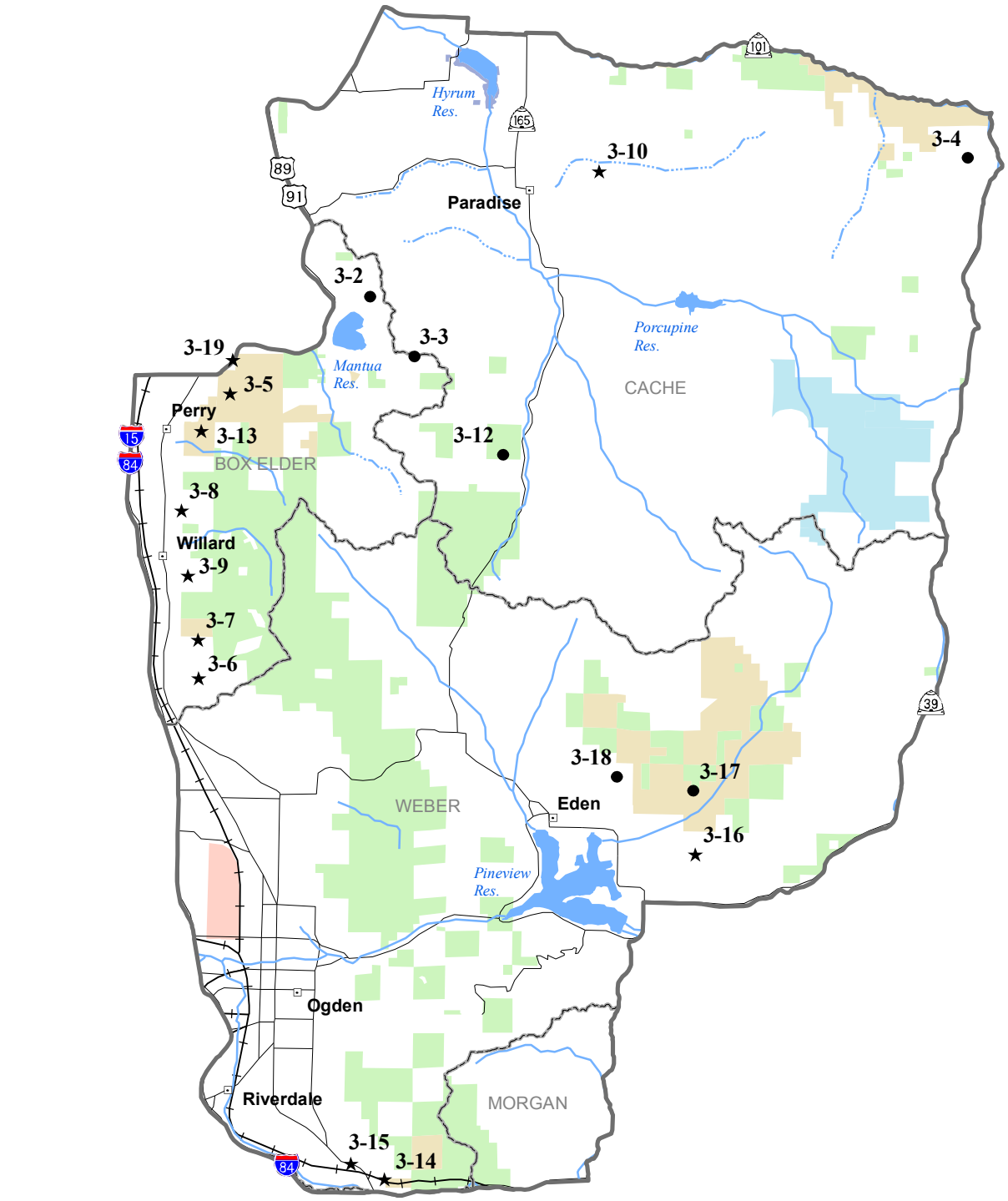


Figure 7. Average herbaceous cover (left) and nested frequency (right) for mountain big sagebrush communities in Cache county and Rich county (Bear Lake area).

Management Unit 3

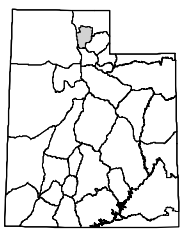


- Transect location
- Suspended site
- Forest Service
- Utah DWR
- State of Utah
- Private
- Military
- Utah State Park
- Water body
- Perennial stream
- Intermittent stream
- Road
- County boundary
- Railroad

N

Map Scale 1:300,000
(1 inch = 4.7 miles)

Unit Location



WILDLIFE MANAGEMENT UNIT 3 - OGDEN

Boundary Description

Weber, Box Elder, Cache and Morgan counties - Boundary begins at Hyrum and SR-101; east on SR-101 to the Ant Flat Road (at Hardware Ranch); south on this road to SR-39; west and south on SR-39 to SR-167 (Trappers Loop Road); south on SR-167 to SR-30 at Mountain Green; west along SR-30 to Interstate 84; west on I-84 to Interstate 15; north on I-15 to US-91; east and north on US-91 to SR-101; east on SR-101 to Hyrum.

The Ogden deer herd unit is located within Weber, Cache, Box Elder and Morgan counties. Municipalities located within or along the unit boundaries include: Hyrum, Wellsville, Mantua, Perry, Willard, Ogden, Mountain Green and Huntsville. The major drainages are the Little Bear River, Ogden River and Box Elder Creek. Smaller drainages are Davenport Creek, Paradise Dry Canyon, Hyrum Dry Canyon, Hyrum Green Canyon, Perry Canyon and Willard Canyon. The topography is steep and rough on the western face of the Wasatch Mountains above Willard, Perry, Ogden, east of Avon and Paradise, and more gentle in-between. Elevation ranges from 4,400 feet near Willard to 9,764 feet on Willard Peak. According to the most recent Utah Big Game Management Plan (1998), there is approximately 233,469 acres of useable deer winter range in the unit. Summer range totals 152,887 acres. A majority of the winter range (82%) and summer range (72%) is on private land. The U.S. Forest Service administers 19% of the summer range and 13% of the winter range. The Division of Wildlife Resources maintains 6% of the deer summer range and 5% of the winter range on the unit.

Major deer wintering areas are found between 4,600 feet and 7,000 feet on the Wasatch face above Willard and Perry; between 5,100 to 7,000 feet north and east of Mantua Reservoir; from 5,600 to 7,000 feet in Threemile Canyon; and between 5,400 and 7,000 feet along the slopes on the southeast side of Cache Valley above Paradise and Avon. During severe winters, snow restricts deer use to Threemile Canyon, the East Fork of the Little Bear River, the area south of Porcupine Reservoir, Paradise Dry Canyon, Hyrum Dry Canyon, Perry Canyon and the southeast corner of the unit south of Willard (King and Muir 1971).

Management unit 3 supports approximately 135,907 acres of useable elk summer range and 165,542 acres of elk winter range. Approximately 80% of the summer and 81% of the winter range is privately owned. Most of the remaining range is administered by the U.S. Forest Service and the Division of Wildlife Resources.

Big Game Management Objectives

The unit management objectives for mule deer are to achieve a modeled target population size of 11,000 wintering deer, and a post-season buck-doe ratio of 15:100 with 30% of these bucks being 2-point or better. Unit management elk objectives call for 1,200 wintering elk with the post-season herd composition consisting of a bull to cow ratio of 8:100, with at least half of these bulls being 2½ years of age or older (DeBloois et. al 2001). The overall fawn to doe ratio trend for mule deer over the past decade appears to be fairly stable, averaging just over 70 fawns/100 does. The highest ratio was 96 fawns/100 does in 1998-99, while the low was 45 in 1993-94 (Evans et. al 1996, DeBloois et. al 2001). Continued urbanization and loss of critical winter range on this unit may jeopardize target herd unit objectives.

Study Site Description

Management unit 3 contains a total of 17 trend studies, all of which are located within the winter range. Twelve of these studies were established in 1984, the other five in 1985. All were reread in 1990 and 1996. In 2001, 8 studies were reread, while 9 studies were suspended. In 2006, 6 studies were re-read and 2 additional studies were suspended. Studies were suspended for several reasons. These include the lack of wildlife use, urban development, and sites not being rehabilitated following wildfires resulting in the loss of key browse, primarily sagebrush. Suspended sites will be reevaluated during the next rotation in 2011 to determine whether they will be reread or permanently suspended.

Trend Study 3-2-06

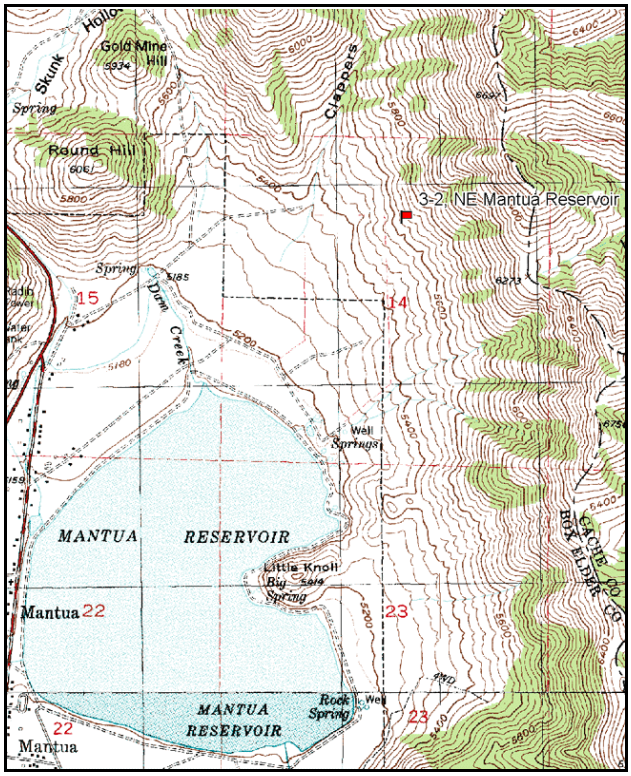
Study site name: NE Mantua Reservoir . Vegetation type: Big Sagebrush-Grass .

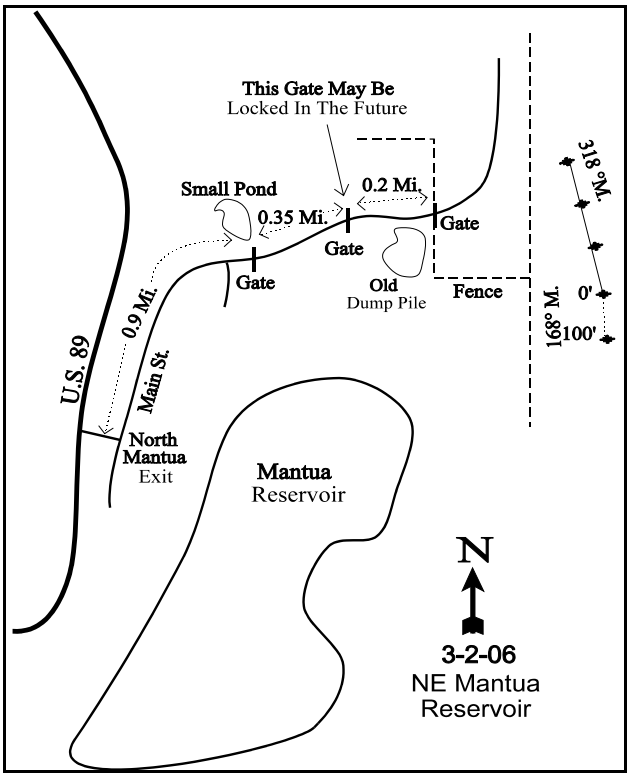
Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

Turn east off of U.S. 89-91 at the north Mantua exit and travel east to main street in Mantua. Turn left (north) on main street and proceed 0.9 miles to a gate with a small pond to the left. Proceed through the gate, stopping at another gate after 0.35 miles (this gate may be locked in the future). Proceed 0.2 mile to another gate with an old dump to the south. From the gate walk south-east to a "T" in the fence. From the "T" in the fence, walk 60 paces at a bearing of 112 degrees magnetic to the 0-foot baseline stake. Baseline 0-foot stake is marked by browse tag #7105. The first 100 feet of the baseline runs south at a bearing of 165 degrees magnetic. The last 300 feet run north off of the 0-foot stake at a bearing of 318 degrees magnetic.





Map Name: Mount Pisgah

Diagrammatic Sketch

Township 9N , Range 1W , Section 14

UTM NAD 27, UTM 12T 4596798 N 423322 E

DISCUSSION

Northeast Mantua Reservoir - Trend Study No. 3-2

Study Information

This study samples a mountain big sagebrush community about 1 mile northeast of Mantua Reservoir (elevation 5,600 feet, slope 25%, aspect west). Big game use has been light from 1996 to 2006. Pellet group data in 2001 estimated 21 deer days use/acre (51 ddu/ha) and 25 deer days use/acre in 2006 (63 ddu/ha). Domestic livestock use the surrounding area in summer, but appear to have little impact on the immediate area.

Soil

The soils is part of the Goring series, which is derived from alluvial deposited sandstone and quartzite parent material (USDA-NRCS 2006). Soil reaction is slightly alkaline (pH of 7.4) and contains moderately high organic matter (3.6%). Soils are deep and well drained and have a clay texture in the upper horizons with a clay loam, grading to a more gravelly clay below. Complete drying of the soil seldom occurs below a depth of 12 inches. Although the erosion hazard is moderate (Chadwick et al. 1975), an erosion condition classification determined soils to be stable in 2001 and 2006. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground has remained high at 4 to 1.

Browse

Browse composition from 1984 to 2001 was dominated by a moderately dense population of mountain big sagebrush. The population decreased from 1,840 plants/acre in 2001 to 940 plants/acre in 2006. Subsequently, cover also decreased from 16% in 1996 and 2001 to 4% in 2006. Vigor has been good in the past, but in 2006, 38% were classified with poor vigor and decadent plants accounted for over half (55%) of the population. Utilization was heavy in 1984, but has been light to moderate until 2006 when use increased to moderate to heavy. This is understandable, because deer are only using 25% of what was originally present in 2001. Recruitment of young sagebrush was relatively high in 1996 at 17% and 15% in 2001, but was slightly lower in 2006 at 9%. Annual leader growth averaged about 3 inches in 2001 and 2006.

Only a single bitterbrush plant has been sampled since 1996 and it displayed heavy use. A larger population of bitterbrush occurs around the study. Other shrubs include bigtooth maple and chokecherry. Of particular interest is a small population of Stansbury cliffrose and cliffrose/bitterbrush hybrids growing slightly north of the study site. Broom snakeweed density was estimated at 740 plants/acre in 1996 and 2001. In 2006, it had decreased to 140 plants/acre.

Herbaceous Understory

The herbaceous understory associated with this mountain big sagebrush community is diverse and vigorous. Perennial grass cover increased from 9 % in 1996 to 23% in 2006. The main increase in perennial grass cover was bluebunch wheatgrass, although its nested frequency remained similar to previous readings. Bulbous bluegrass cover increased from 4% in 1996 to 8% in 2001 and 2006. This species is a weedy, introduced, short-lived perennial that is not desirable. Annual grasses are abundant. Cheatgrass cover and nested frequency have continued to expand since 1996. In 1996, cheatgrass cover was less than 1% and increased to over 8% in 2006. Japanese brome cover was abundant in 1996 at 16%, but decreased to 3% in 2006. Medsuahead, a noxious weed, was not sampled in the quadrats, but was observed around the study area in 2006.

A wide variety of forbs were sampled. Total forb cover was only about 5% in 1996, but increased to 14% in 2001 and 16% in 2006. This increase in forb cover is due to increases in both perennial and annual species. The most common perennial forbs include western yarrow, arrowleaf balsamroot, wayside gromwell, and yellow salsify. The most abundant annual species were autumn willowherb and storksbill. Dyer's woad, a noxious weed, was present in low numbers.

1990 TREND ASSESSMENT

Trend is up for browse. Density of mature big sagebrush increased by 19% on the density plots (from 1,732 to 2,132 plants/acre). Plants show light to moderate hedging and have good vigor. There is a robust population of young sagebrush and few decadent plants. Trend for perennial grasses is up. Perennial grasses doubled in nested frequency. Trend for perennial forbs is down. Sum of nested frequency for perennial forbs decreased by 28%.

browse - up (+2) grasses - up (+2) forbs - down (-2)

1996 TREND ASSESSMENT

The sagebrush density has remained similar between readings, utilization is light to moderate, vigor good, and percent decadence low at 14%. Reproduction remains high at 17%, which is adequate to maintain the population. The herbaceous understory is dominated by annual brome grasses. This was the first reading that annual grass and forb data was collected, so changes in annual species are unknown. Trend for perennial grasses is down. Nested frequency decreased by 29%. A low value species, bulbous bluegrass, is the only perennial species that increased in sum of nested frequency, while bluebunch wheatgrass decreased significantly. Trend for perennial forbs is down. Nested frequency decreased by 45%. Forbs are diverse but not abundant. Dyer's woad is still not abundant, although it has doubled in nested frequency since 1990. The Desirable Components Index rated this site as poor with a score of 44 due to good browse cover, low decadence, and moderate perennial grass and forb cover.

winter range condition (DC Index) - poor (46) Mid Potential scale
browse - stable (0) grasses - down (-2) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for browse is stable. Mountain big sagebrush shows mostly light to moderate use, good vigor, and adequate recruitment from young plants. Decadence did increase from 14% to 26%, but the current level is not excessive even with 2 years of below average precipitation. Trend for grasses is slightly up. Sandberg bluegrass increased significantly as did bulbosa bluegrass, which is invasive much like cheatgrass. Cheatgrass and Japanese brome total nested frequency has remained similar to 1996, but Japanese brome decreased while cheatgrass increased. Trend for forbs is up. Annual and perennial forb cover and nested frequency have both double. Yellow salsify and storksbill were the two main species that increased. The Desirable Components Index rated this site as fair with a score of 52 due to good browse cover and moderate perennial grass cover and good forb cover.

winter range condition (DC Index) - fair (52) Mid Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - up (+2)

2006 TREND ASSESSMENT

Trend for browse is down. Density of mountain big sagebrush has decreased from 1,840 plants/acre in 2001 to 940 plants/acre in 2006. Cover decreased from 16% to 4%. Over half (55%) the population was decadent and 38% were classified as dying. Trend for grasses is stable. Cover increased from 26% in 2001 to 34% in 2006 with above average precipitation, although nested frequency values remained similar to previous years. Trend for forbs is stable. Perennial forb cover and nested frequency remained similar. The nested frequency of annuals nearly doubled, but cover remained at 5%. The Desirable Components Index rated this site as poor with a score of 44 due to low browse cover, high decadence, and good perennial grass and forb cover.

winter range condition (DC Index) - poor (44) Mid Potential scale
browse - down (-2) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a140	b204	ab163	ab167	ab168	5.26	6.80	13.30
G	Bromus japonicus (a)	-	-	c349	b201	a139	16.42	3.60	2.69
G	Bromus tectorum (a)	-	-	a36	b179	b181	.86	7.52	8.30
G	Koeleria cristata	-	-	2	6	5	.00	.12	.18
G	Melica bulbosa	a7	a3	a-	a-	b26	-	-	1.14
G	Oryzopsis hymenoides	-	-	-	-	2	-	-	.03
G	Poa bulbosa	a5	a41	b79	c192	c177	4.22	7.69	7.80
G	Poa fendleriana	4	-	-	-	-	-	-	-
G	Poa secunda	ab20	c113	a12	b41	ab42	.05	.35	.76
Total for Annual Grasses		0	0	385	380	320	17.28	11.13	10.99
Total for Perennial Grasses		176	361	256	406	420	9.54	14.97	23.22
Total for Grasses		176	361	641	786	740	26.82	26.10	34.21
F	Achillea millefolium	c119	ab47	ab57	b82	a44	1.41	1.87	.90
F	Agoseris glauca	a-	a3	a1	a-	b13	.00	-	.05
F	Allium acuminatum	2	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a94	b205	b216	.20	1.60	.83
F	Arabis sp.	-	-	-	-	4	-	-	.03
F	Artemisia ludoviciana	1	5	3	4	6	.15	.41	.53
F	Aster chilensis	-	-	-	7	6	-	.30	.30
F	Astragalus sp.	b32	b30	a-	a8	a1	-	.07	.03
F	Balsamorhiza sagittata	ab17	a20	a13	a14	b32	.66	1.94	3.53
F	Camelina microcarpa (a)	-	-	-	-	-	-	.03	-
F	Calochortus nuttallii	ab5	a-	ab3	b10	a4	.00	.05	.01
F	Cirsium undulatum	-	-	2	-	-	.00	-	-
F	Collomia linearis (a)	-	-	a5	b22	ab17	.01	.07	.05
F	Comandra pallida	-	-	-	9	8	-	.04	.07
F	Collinsia parviflora (a)	-	-	a-	a1	b19	-	.00	.04
F	Cryptantha sp.(a)	-	-	a-	a-	b16	-	-	.03
F	Cymopterus sp.	-	-	-	2	5	-	.00	.06
F	Draba sp. (a)	-	-	-	-	2	-	-	.00
F	Epilobium brachycarpum (a)	-	-	b155	a64	c232	1.39	.21	2.00
F	Erodium cicutarium (a)	-	-	a3	b76	c131	.03	2.55	1.75
F	Eriogonum umbellatum	-	-	-	1	-	-	.00	-
F	Galium aparine (a)	-	-	a-	a3	b11	-	.03	.08
F	Gilia sp. (a)	-	-	-	-	3	-	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Hackelia patens	$_{a}$3	$_{b}$35	$_{a}$3	$_{a}$11	$_{b}$49	.06	.16	.93
F	Helianthus annuus (a)	-	-	-	-	1	-	-	.00
F	Hedysarum boreale	-	-	-	2	-	-	.03	-
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{b}$15	$_{b}$12	-	.20	.03
F	Isatis tinctoria	3	9	18	9	20	.24	.08	.42
F	Lappula occidentalis (a)	-	-	5	5	10	.01	.39	.02
F	Lactuca serriola	$_{a}$-	$_{a}$3	$_{a}$-	$_{b}$30	$_{c}$68	-	.24	.60
F	Lithospermum ruderale	$_{a}$2	$_{a}$-	$_{a}$2	$_{ab}$11	$_{b}$17	.18	.38	1.74
F	Lupinus argenteus	$_{a}$-	$_{a}$-	$_{ab}$4	$_{b}$9	$_{b}$9	.21	.39	.63
F	Madia glomerata (a)	-	-	2	-	-	.00	-	-
F	Microsteris gracilis (a)	$_{b}$54	$_{a}$-	$_{a}$3	$_{a}$6	$_{b}$35	.00	.01	.10
F	Polygonum douglasii (a)	-	-	7	8	7	.03	.04	.01
F	Ranunculus testiculatus (a)	-	-	2	5	3	.00	.01	.00
F	Rumex sp.	-	-	-	3	-	-	.03	-
F	Senecio multilobatus	-	-	-	1	-	-	.03	-
F	Tragopogon dubius	$_{c}$122	$_{b}$74	$_{a}$12	$_{c}$109	$_{b}$69	.04	2.66	1.00
F	Unknown forb-perennial	-	5	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	$_{a}$9	$_{a}$27	$_{b}$46	.01	.12	.15
F	Wyethia amplexicaulis	$_{b}$14	$_{a}$-	$_{a}$3	$_{a}$-	$_{a}$2	.03	-	.15
F	Zigadenus paniculatus	-	-	7	-	3	.04	.01	.03
Total for Annual Forbs		54	0	285	437	761	1.70	5.30	5.14
Total for Perennial Forbs		320	231	128	322	360	3.05	8.73	11.05
Total for Forbs		374	231	413	759	1121	4.76	14.04	16.20

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

BROWSE TRENDS --
Management unit 03 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	60	55	37	16.34	15.71	4.01
B	Gutierrezia sarothrae	11	13	4	.36	.78	.30
B	Prunus virginiana	2	2	2	.00	.15	.38
B	Purshia tridentata	1	1	1	.66	.85	.15
Total for Browse		74	71	44	17.37	17.49	4.85

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 2

Species	Percent Cover '06
Artemisia tridentata vaseyana	4.73
Gutierrezia sarothrae	.20
Prunus virginiana	.05
Purshia tridentata	.96

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 2

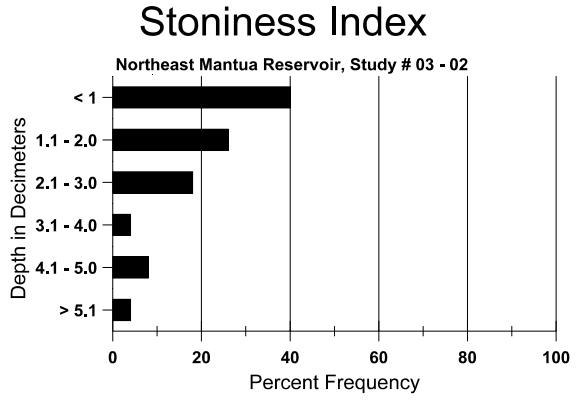
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	3.4	2.9

BASIC COVER --
Management unit 03 , Study no: 2

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.25	10.25	50.70	55.77	59.57
Rock	6.75	4.75	5.68	4.36	4.72
Pavement	6.50	11.75	3.84	3.82	3.36
Litter	66.00	57.25	58.45	45.47	41.06
Cryptogams	0	0	0	0	.03
Bare Ground	17.50	16.00	5.36	9.88	11.09

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 02, NE Mantua Reservoir

Effective rooting depth (in)	Temp °F (depth)	PH	Clay			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.1	66.0 (14.0)	7.4	22.0	36.4	41.6	3.6	29.4	179.2	0.5



PELLET GROUP DATA --
Management unit 03 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	2	-
Elk	-	1	1
Deer	5	10	7
Cattle	2	-	-
Sheep	-	-	-

Days use per acre (ha)	
'01	'06
-	-
-	-
21 (51)	25 (63)
-	-
-	1 (3)

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	37/37
01	**0**	-	-	-	-	-	0	0	-	-	0	30/35
06	**0**	-	-	-	-	-	0	0	-	-	0	41/40
Artemisia tridentata vaseyana												
84	**1732**	3133	66	1400	266	-	19	81	15	-	4	33/36
90	**2132**	133	933	866	333	-	3	0	16	-	3	35/36
96	**1860**	20	320	1280	260	200	32	0	14	2	4	27/49
01	**1840**	40	280	1080	480	420	42	8	26	3	3	27/44
06	**940**	240	80	340	520	780	55	11	55	38	38	22/31
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	13/21
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**740**	-	320	420	-	-	0	0	0	-	0	11/15
01	**740**	-	-	680	60	20	0	0	8	5	5	11/17
06	**140**	-	-	140	-	-	0	0	0	-	0	13/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Prunus virginiana												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	60	-	-	-	0	0	-	-	0	20/13
01	**120**	-	-	120	-	-	0	0	-	-	0	-/-
06	**200**	-	200	-	-	-	60	0	-	-	0	30/7
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**20**	-	-	20	-	-	0	100	0	-	0	75/98
01	**20**	-	-	-	20	20	0	0	100	-	0	-/-
06	**20**	-	-	20	-	-	0	100	0	-	0	44/66

Trend Study 3-3-06

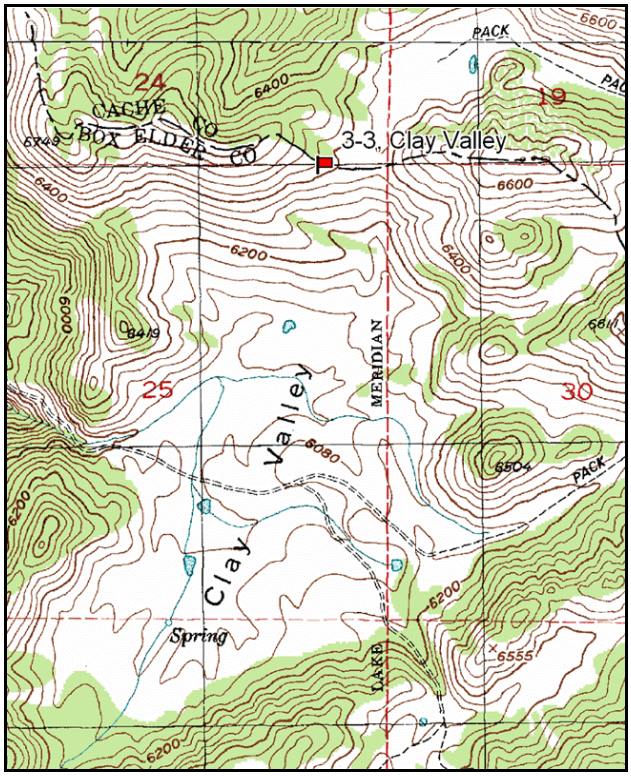
Study site name: Clay Valley . Vegetation type: Big Sagebrush-Grass .

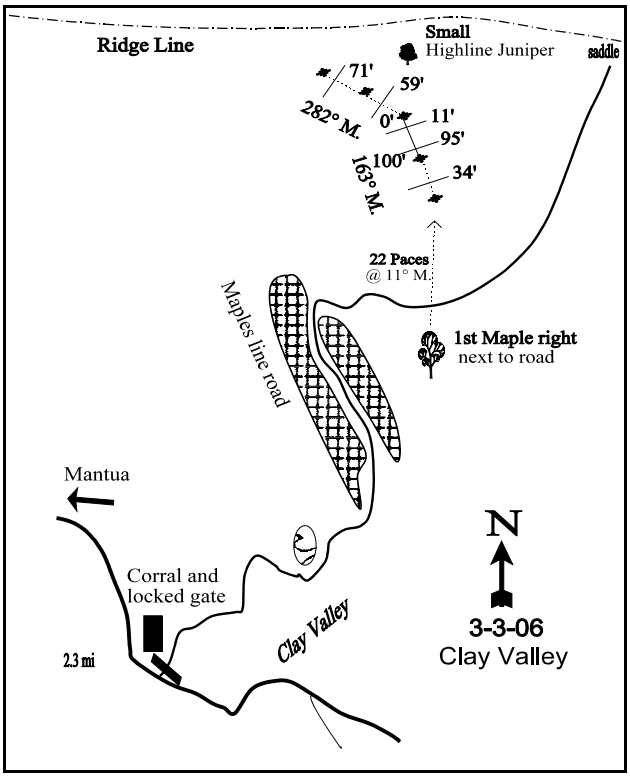
Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

From Mantua Hatchery, proceed 0.65 mile (towards Mantua) to first possible right turn. Turn right and proceed 2.3 miles up the canyon to Clay Valley and stop at a locked gate on the east end of the corral. Cross the gate and begin walking down the road in a northern direction. You will pass a stock pond on the left side of the road. After approximately 0.75 miles, the road will pass through a dense stand of maples. Hook sharply to the right and break out of the maples. Proceed 54 paces past switchback to first lone maple on right side of the road. From the maple, walk approximately 22 paces on a bearing of 11 degrees magnetic to the 200-foot stake of the baseline. The 0-foot baseline stake is 200 feet at a bearing of 343 degrees magnetic and is marked by browse tag #7997. The first 200 feet of the baseline run 163 degrees magnetic. The second 200 feet run off the 0-foot baseline stake at a bearing of 282 degrees magnetic.





Map Name: Mantua

Diagrammatic Sketch

Township 9N , Range 1W , Section 25

UTM NAD 27, UTM 12T 4593957 N 425426 E

DISCUSSION

Clay Valley - Trend Study No. 3-3

Study Information

The Clay Valley study is located east of Mantua in a mountain big sagebrush-grass community (elevation 6,420 feet, slope 30%, aspect south). This critical winter range is privately owned and grazed by sheep from May to early June to control dyer's woad. Cattle graze the property from early July to fall, but typically stay at lower elevations. Although the area is within the limits of deer winter range, there were few signs of any significant deer use from 1984-1996. A deer fence was installed along Sardine Canyon, which forces the deer to winter more in the area. Since then, deer use has been considered moderate. Pellet group data from 2001 was estimated at 61 deer, 3 elk, and 2 cow days use/acre (150 ddu/ha, 8 edu/ha, and 5 cdu/ha). Pellet group data from 2006 was estimated at 32 deer, 1 elk, 2 cow, and 12 sheep days use/acre (78 ddu/ha, 3 edu/ha, 4 cdu/ha, and 30 sdu/ha).

Soil

The soil is classified in the Yeates Hollow series, a well-drained, moderately deep soil derived from sandstone and quartzite. It is rocky or cobbly on the surface, and usually dries completely in the upper 4 to 12 inches after 60 to 90 consecutive days in summer (Chadwick et al. 1975; USDA-NRCS 2006). Although this soil type has a moderate erosion hazard, the erosion condition in 2001 and 2006 was classified as stable. Protective cover provided by vegetation and litter prevent all but minor erosion. Soils have a clay loam texture and a soil reaction that is slightly acidic (pH of 6.3). Effective rooting depth was estimated at just over 12 inches. Gravel is abundant throughout the profile. Bare ground is rare and usually associated with cattle trails. Organic matter is relatively high at over 5%. Bare ground cover has remained fairly low, but has steadily increased since 1996 from 2% to 10% in 2006. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground is high at 4 to 1.

Browse

The key browse species is mountain big sagebrush. Sagebrush density was estimated at 2,900 plants/acre in 1996 with only a small loss in 2001 down to 2,620 plants/acre. However in 2006, sagebrush density dropped to 1,620 plants/acre. Cover declined similarly to density. In 2001, cover was estimated at 23% and dropped to 10% in 2006. Mountain big sagebrush received light use during earlier readings, but increased slightly to light to moderate use in 2006. Recruitment from young plants has fluctuated year to year and both 1996 and 2006 had approximately 20% of the population classified as young. Only 2% or less were classified as young in 1984, 1990, and 2001. Several dead plants were sampled in 2006 and 10% of the population was classified as dying. Decadence in 1990 was high at 42%, but declined to 18% in 1996 and 2001. Decadence in 2006 increased slightly to 23%. Seed production was abundant in both 2001 and 2006. Sagebrush leader growth was 2.1 inches in 2001 and 3.0 inches 2006. Other shrubs such as mountain snowberry and stickyleaf low rabbitbrush are sparsely distributed throughout the area.

Herbaceous Understory

Perennial grasses have a wide variety of species. Among the most abundant are bluebunch wheatgrass, bulbous bluegrass, Sandberg bluegrass, oniongrass, and Kentucky bluegrass. Bulbous bluegrass has significantly increased in nested frequency every year since the study was established in 1984, but decreased significantly in 2006. Bluebunch wheatgrass is second in abundance to bulbous bluegrass. In 1996, Japanese brome cover was extremely abundant with 13%, but significantly decreased in 2001 and 2006. Cheatgrass has not been abundant in previous years, but nested frequency increased significantly in 2006. Slightly lower on the slope is a large abundance of slender wheatgrass, mountain brome, smooth brome, subalpine needlegrass, crested wheatgrass, and Great Basin wildrye. Grasses show evidence of light to negligible grazing use.

Forbs are diverse, yet have not been particularly abundant. Weedy forb species include western yarrow, thistle, willowweed, dyer's woad, prickly lettuce, sunflower, tarweed, and yellow salsify. Silvery lupine was

the most abundant forb in 2001 and 2006. Many of the more palatable forbs were moderately grazed by sheep in 1984. Over the last 10 years, the land owners have forced sheep into patches of dyer's woad, which has kept it from greatly expanding.

1990 TREND ASSESSMENT

Mountain big sagebrush has remained stable and vigorous since 1984. Seedling and young sagebrush commonly occur in limited areas, but were not sampled by the density plots. The majority of the sagebrush have a light or moderately hedged growth form. Trend for grasses is up. Nested frequency for bluebunch wheatgrass and Sandberg bluegrass, both desirable perennial grass, significantly increased. Bulbous bluegrass, an introduced perennial, increased also. It has the ability to dominate the understory much like cheatgrass and is a commonly occurring undesirable species. Trend for forbs is slightly down. Nested frequency of Dyer's woad (a noxious weed) and prickly lettuce both increased significantly.

browse - stable (0) grasses - up (+2) forbs - slightly down (-1)

1996 TREND ASSESSMENT

Trend for mountain big sagebrush is stable. Population declined somewhat, but much of the decline is due to the much larger sample size used in 1996, which gives a much better estimate of sagebrush densities. Dead plants are fairly rare (220 plants/acre or 7% of the population), indicative of a stable population. Utilization is mostly light, decadence has declined from 42% to 18%, and recruitment is moderately high at 23%. Trend for grasses is slightly down. The herbaceous understory is dominated by bulbous bluegrass and Japanese brome. Nested frequency for bluebunch wheatgrass has increased significantly since 1990, but nested frequency for Kentucky bluegrass and Sandberg bluegrass have declined. Trend for forbs is down. Sum of nested frequency for perennial forbs significantly decreased. This was partially good, because Dyer's woad decreased significantly. Desirable species that decreased include tapertip onion, false dandelion, and yellow salsify. The Desirable Components Index rated this site as fair-good with a score of 63 due to good browse cover, low decadence, and good perennial grass and forb cover.

winter range condition (DC Index) - fair-good (63) Mid Potential scale
browse - stable (0) grasses - slightly down (-1) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush, remains at a nearly stable density. Percent recruitment declined from 23% to 2%, but percent decadence is unchanged since 1996. Vigor is good in the majority of the population as use remains light to moderate. Trend for the grasses is slightly up. Sum of nested frequency for perennial grasses increased in 2001 by 11%, not including the significant increase in bulbous bluegrass. Japanese brome dramatically decreased in nested and quadrat frequencies in 2001. Trend for forbs is up. Silver lupine in 1996 was a minor component, but increased significantly in 2001. Several of the weedy annual forbs decreased. The Desirable Components Index rated this site as good-excellent with a score of 78 due to good browse cover, moderate decadence, and good perennial grass and forb cover.

winter range condition (DC Index) - good-excellent (78) Mid Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - up (+2)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush, is down. Density decreased by 38%, from 2,620 plants/acre in 2001 to 1,620 in 2006. Over 1,000 dead plants/acre were sampled and 10% of the population was classified as dying. Cover of sagebrush also decreased from 23% in 2001 to 10% in 2006. Trend for grasses is stable. Cheatgrass and Japanese brome increased significantly in 2006. Bulbous bluegrass decreased significantly, while oniongrass and Sandberg bluegrass increased significantly. Bluebunch wheatgrass has remained stable at 12-14% cover. Trend for forbs is slightly up. Silver lupine increased significantly again, while several of

the annual forbs reappeared with above average precipitation. Dyer's woad increased significantly since being a minor component in 1996 and 2001. The Desirable Components Index rated this site as good with a score of 67 due to moderate browse cover, moderate decadence, but with good perennial grass and forb cover.

winter range condition (DC Index) - good (67) Mid Potential scale
browse - down (-2) grasses - stable (0) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a28	b87	c156	c176	c182	8.15	11.82	13.86
G	Agropyron trachycaulum	2	2	-	1	-	-	.00	.00
G	Bromus carinatus	-	3	-	-	-	-	-	-
G	Bromus japonicus (a)	-	-	c293	a64	b176	12.51	.86	3.59
G	Bromus tectorum (a)	-	-	a25	a29	b103	.31	.64	2.76
G	Koeleria cristata	1	-	-	-	2	-	-	.06
G	Melica bulbosa	ab44	ab36	a15	a28	b63	.22	.17	2.33
G	Poa bulbosa	a18	b63	c213	d307	c202	12.98	19.38	7.78
G	Poa pratensis	abc79	c97	a44	bc86	ab50	1.30	3.42	1.33
G	Poa secunda	a20	b129	b87	a41	b89	2.44	.68	1.47
G	Stipa columbiana	-	-	-	3	-	-	.15	.01
Total for Annual Grasses		0	0	318	93	279	12.83	1.50	6.36
Total for Perennial Grasses		192	417	515	642	588	25.12	35.64	26.87
Total for Grasses		192	417	833	735	867	37.95	37.15	33.24
F	Achillea millefolium	c99	bc87	ab51	ab51	a43	.89	1.21	1.51
F	Agoseris glauca	b50	b37	a10	b32	a8	.02	.26	.03
F	Allium acuminatum	c44	b14	a-	ab3	b11	-	.03	.03
F	Alyssum alyssoides (a)	-	-	ab25	a11	b36	.05	.06	.12
F	Arabis sp.	-	-	-	-	-	-	.00	-
F	Aster sp.	1	-	-	-	-	-	-	-
F	Astragalus sp.	b20	b28	a-	a-	a-	-	-	-
F	Camelina microcarpa (a)	-	-	a3	a-	b12	.00	-	.10
F	Calochortus nuttallii	ab5	b6	a-	a-	a-	-	-	-
F	Cirsium undulatum	a3	b23	ab16	ab11	a8	.77	.30	.10
F	Collomia linearis (a)	-	-	b28	a1	c83	.08	.00	.41
F	Collinsia parviflora (a)	-	-	a1	a9	b59	.00	.01	.15
F	Crepis acuminata	3	-	1	-	-	.00	-	-
F	Cryptantha sp.(a)	-	-	a-	a-	b43	-	-	.24
F	Cryptantha sp.	a-	a-	a3	a3	b25	.03	.00	.16

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Descurainia pinnata (a)	-	-	-	-	3	-	-	.00
F	Draba sp. (a)	-	-	$_{a}$1	$_{ab}$10	$_{b}$15	.00	.02	.03
F	Epilobium brachycarpum (a)	-	-	$_{b}$39	$_{a}$6	$_{c}$55	.35	.04	.20
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{ab}$5	$_{b}$15	-	.06	.13
F	Galium aparine (a)	-	-	$_{b}$11	$_{a}$-	$_{b}$14	.10	-	.08
F	Geranium sp.	3	-	3	-	-	.01	-	-
F	Gilia sp. (a)	-	-	-	1	-	-	.00	-
F	Grindelia squarrosa	-	2	-	4	-	-	.53	-
F	Hackelia patens	-	-	-	-	2	-	-	.03
F	Helianthus annuus (a)	-	$_{ab}$5	$_{b}$13	$_{ab}$3	$_{a}$-	.10	.00	-
F	Holosteum umbellatum (a)	-	-	$_{a}$41	$_{a}$35	$_{b}$84	.22	.15	.16
F	Isatis tinctoria	$_{ab}$9	$_{c}$109	$_{a}$6	$_{a}$5	$_{b}$31	.04	.03	1.04
F	Lappula occidentalis (a)	-	-	1	1	-	.00	.00	-
F	Lactuca serriola	$_{a}$-	$_{c}$75	$_{a}$1	$_{a}$3	$_{b}$32	.00	.00	.17
F	Lupinus argenteus	$_{a}$23	$_{a}$33	$_{a}$21	$_{b}$118	$_{c}$186	.47	7.05	11.05
F	Madia glomerata (a)	-	$_{ab}$11	$_{b}$19	$_{a}$3	$_{ab}$12	.21	.00	.07
F	Microsteris gracilis (a)	$_{a}$9	$_{a}$-	$_{a}$6	$_{a}$-	$_{b}$56	.03	-	.14
F	Phlox longifolia	-	2	-	-	-	-	-	-
F	Polygonum douglasii (a)	-	-	$_{b}$35	$_{a}$-	$_{b}$26	.10	-	.10
F	Senecio multilobatus	$_{c}$53	$_{ab}$7	$_{a}$-	$_{ab}$8	$_{b}$9	-	.02	.02
F	Taraxacum officinale	$_{ab}$3	$_{b}$13	$_{ab}$1	$_{a}$-	$_{ab}$9	.00	-	.01
F	Tragopogon dubius	$_{a}$11	$_{c}$117	$_{a}$13	$_{b}$63	$_{a}$14	.08	1.63	.16
F	Unknown forb-annual (a)	-	-	-	-	5	-	-	.01
F	Unknown forb-perennial	$_{a}$-	$_{b}$25	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Veronica biloba (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$17	-	-	.09
F	Viola sp.	$_{a}$-	$_{b}$19	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
Total for Annual Forbs		9	16	223	85	535	1.28	0.37	2.08
Total for Perennial Forbs		327	597	126	301	378	2.34	11.10	14.34
Total for Forbs		336	613	349	386	913	3.62	11.48	16.42

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

BROWSE TRENDS --
Management unit 03 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Acer grandidentatum	1	1	1	.03	.15	.15
B	Artemisia tridentata vaseyana	78	73	58	16.62	23.46	10.02
B	Chrysothamnus nauseosus albicaulis	2	2	1	.03	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	2	3	3	.03	.00	-
B	Gutierrezia sarothrae	1	0	0	-	-	-
B	Juniperus osteosperma	1	1	1	.53	.03	.15
B	Symphoricarpos oreophilus	6	9	14	.21	1.50	3.45
Total for Browse		91	89	78	17.45	25.14	13.78

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 3

Species	Percent Cover	
	'01	'06
Acer grandidentatum	.60	.36
Artemisia tridentata vaseyana	-	12.38
Chrysothamnus nauseosus albicaulis	-	.31
Juniperus osteosperma	1.39	1.26
Symphoricarpos oreophilus	-	3.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 3

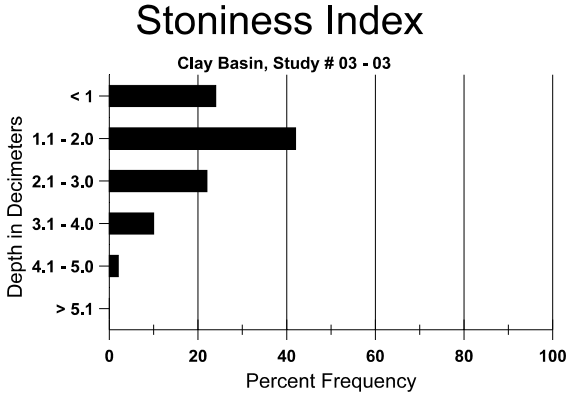
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.1	3.0

BASIC COVER --
Management unit 03 , Study no: 3

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	14.25	58.50	67.65	65.38
Rock	3.75	1.75	.58	.28	.28
Pavement	3.50	10.75	3.86	1.87	1.83
Litter	76.25	61.50	66.88	55.39	46.95
Cryptogams	.50	0	.07	.15	.04
Bare Ground	13.00	11.75	2.17	5.49	10.38

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 03, Clay Basin

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.3	61.0 (13.4)	6.3	28.7	42.0	29.3	5.3	29.3	240.0	0.5



PELLET GROUP DATA --
Management unit 03 , Study no: 3

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	1	-	2
Elk	3	-	-
Deer	7	22	16
Cattle	4	1	2

Days use per acre (ha)	
'01	'06
-	12 (30)
3 (8)	1 (3)
61 (150)	32 (78)
2 (5)	2 (4)

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Acer grandidentatum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	20	-	-	-	0	0	-	-	0	22/29
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	20	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
84	**3532**	-	66	3066	400	-	34	13	11	-	4	29/43
90	**3800**	-	-	2200	1600	-	12	2	42	-	4	39/38
96	**2900**	100	660	1720	520	220	7	0	18	2	2	22/41
01	**2620**	40	40	2120	460	380	18	0	18	4	5	27/42
06	**1620**	760	320	920	380	1160	33	7	23	10	11	28/43
Chrysothamnus nauseosus albicaulis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	20	20	-	0	0	50	-	0	32/60
01	**40**	-	-	20	20	-	0	0	50	50	50	29/41
06	**40**	-	-	40	-	-	0	0	0	-	0	26/43
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	20	20	-	0	0	50	50	50	12/24
01	**80**	-	-	60	20	-	0	0	25	25	25	15/24
06	**60**	-	-	60	-	-	0	0	0	-	0	13/23
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	13/20
01	**0**	-	-	-	-	-	0	0	-	-	0	8/118
06	**0**	-	-	-	-	-	0	0	-	-	0	11/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**140**	-	-	80	60	100	14	14	43	29	29	22/47
01	**240**	-	-	240	-	-	25	0	0	-	0	61/48
06	**380**	-	-	380	-	20	5	0	0	-	0	28/55

Trend Study 3-4-06

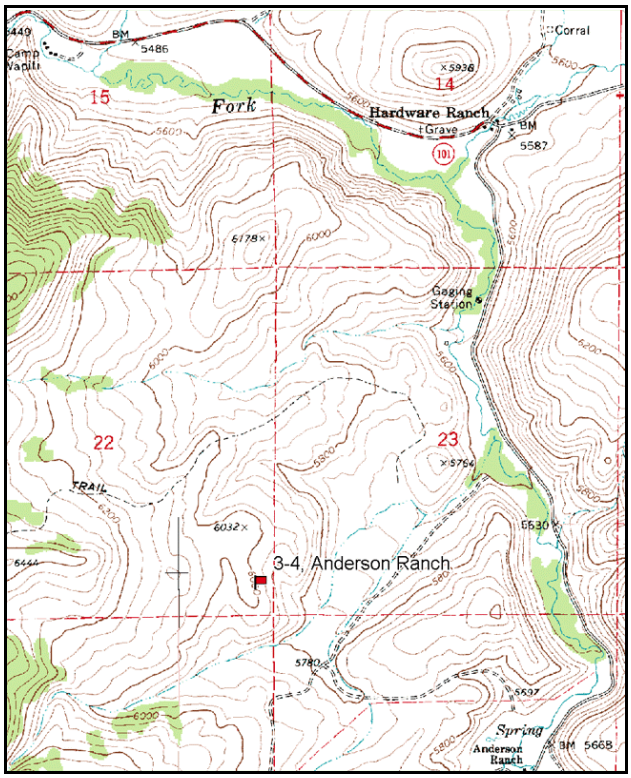
Study site name: Anderson Ranch . Vegetation type: Sagebrush-Bitterbrush .

Compass bearing: frequency baseline 168 degrees magnetic.

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

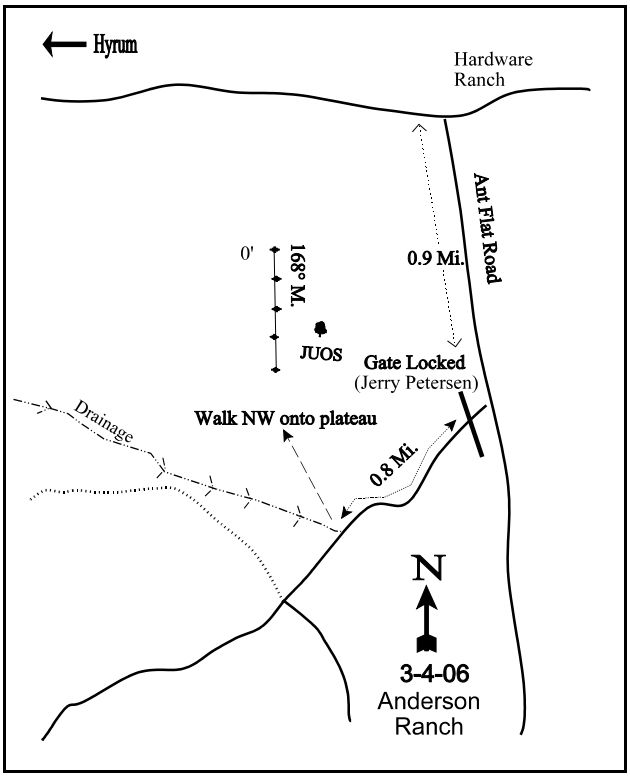
LOCATION DESCRIPTION

From Hardware Ranch, travel south on the Ant Flat Road for 0.9 miles. Turn right and go through a locked gate. Cross the Blacksmith Fork River and then proceed up the canyon 0.8 to where the drainage and road separate. Walk approximately 1500 ft. at 310 degrees to the 0 foot stake. The 0-foot stake is marked by browse tag #7932. Baseline bearing is 168 degrees magnetic.



Map Name: Hardware Ranch

Township 10N , Range 3E , Section 22



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4603382 N 451731 E

DISCUSSION

Anderson Ranch - Trend Study No. 3-4

Study Information

This study is located on what was formerly called the Anderson Ranch and is now part of the Coldwater Ranch. It is located on deer and elk winter range in upper Blacksmith Fork Canyon (elevation 6,000 feet, slope 25%, aspect nearly level). The plant community is dominated by mountain big sagebrush, antelope bitterbrush, and grasses. Mule deer use was moderate in 1996 and 2006, but was heavy in 2001. Pellet group data taken in 2001 estimated 140 deer, 32 elk, 20 sheep days use/acre, and 1 sage grouse pellet grouping (346 ddu/ha, 79edu/ha, and 50 sdu/ha). Pellet group data from 2006 estimated 55 deer, 38 elk, 27 sheep, and 1 cow days use/acre (136 ddu/ha, 94 edu/ha, 68 sdu/ha, and 2 cdu/ha). Sheep and deer pellet numbers may have some overlap due to the difficultly in distinguishing between the two species.

Soil

The soil is classified in the Ant Flat series, a well drained, slowly permeable soils on terraces and mountain slopes. They formed in colluvium, residuum, and alluvium from calcareous sandstone and some quartzite, conglomerate, limestone and shale (USDA-NRCS 2006). This soil has a porous surface horizon about 7 inches thick. Below this depth, the subsoil is increasingly clay in texture and has concentrations of leached calcium carbonate at about 60 inches. Plant root penetration is not a problem until the calcareous zone is reached. Effective rooting depth was estimated at over 11 inches in 1996. Soils have an extremely rocky and compacted clay loam texture with a neutral soil reaction (pH of 7.0). Although the erosion hazard is moderate for this soil type (Erickson and Mortensen, 1974), the erosion condition classification in 2001 and 2006 shows stable soils with minimal erosion occurring. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground is high at 4 to 1.

Browse

The key browse species are bitterbrush and mountain big sagebrush, which average 11% browse cover combined. Bitterbrush cover averaged 6% in 2006 with 420 plants/acre. This is an increase in density from 320 plants/acre in 1996 and 2001. Decadence in the bitterbrush population was very high in 1984 and 1990, at 92% and 67%, respectively. The high decadence in 1984 to 1990 might have been correlated to the decreases in density in 1996. Decadence was less than 6% in 1996 and 2001, but slightly increased to 19% in 2006. Use on bitterbrush has been moderate to heavy in all sampling years. Vigor has been good and bitterbrush annual leader growth has averaged just over 4 inches in 2001 and 2006.

Mountain big sagebrush was also heavily utilized in 1984; all plants sampled displayed a heavily hedged growth form. Utilization has since stabilized at a more moderate level. Sagebrush density was estimated at 620 plants/acre in 2006, which is a slight increase from 400 plants/acre in 1996 and 2001. Decadent plants made up 67% of the population in 1984, but decreased to around 20% in 1990, 2001, and 2006. Young recruitment has averaged about 23% during sampling years since 1990. Sagebrush seedlings were also very numerous in 2006. Annual leader growth averaged just over 2 inches in 2001 and 2006.

The most abundant shrub is stickyleaf low rabbitbrush. It has provided around 4% cover and density has averaged between 2,300 to 3,100 plants/acre since 1996. This species appears to be stable with a predominantly mature population. Plants are only lightly utilized and vigor is normal.

Herbaceous Understory

Understory composition is dominated by perennial grasses, most notably bluebunch wheatgrass and Sandberg bluegrass. Annual grasses were first included in the sample in 1996 and were abundant at 8% cover. In 2001, Japanese brome and cheatgrass each decreased to less than 1% cover and have remained less than 1% in 2006. Bulbous bluegrass, a low value perennial, increased significantly in nested frequency between 2001 and 2006. In 2001, cover was estimated at 3% and increased to 15% in 2006.

Considering elevation and annual precipitation, the forb composition is not very abundant and its composition is poor. A long history of sheep grazing has possibly given grasses a competitive advantage. The most common forb in 1996 and 2006 was western yarrow, which is reputedly unpalatable to livestock but is used by deer and elk. Storksbill was also common and provided the most forb cover in 2001. Most forbs are occasional in their occurrence and provide relatively little forage.

1990 TREND ASSESSMENT

Trend for browse is up. Mountain big sagebrush and bitterbrush density have both increased while percent decadence has decreased. The sagebrush and bitterbrush have a more balanced age class structure now. Low rabbitbrush remains a prominent factor in the understory as it also increased. There is still a high percentage of decadence in the bitterbrush population. The sagebrush and bitterbrush have a heavily hedged growth form, as some forage production is unavailable. The grasses trend is slightly up. Sandberg bluegrass did significantly increase in nested frequency. Forbs also slightly increased mostly due to an increase in false dandelion. The understory provides adequate vegetative and litter ground cover.

browse - up (+2) grasses - slightly up (+1) forbs - slightly up (+1)

1996 TREND ASSESSMENT

The browse trend appears stable. Bitterbrush density declined from 999 plants/acre in 1990 to 320 by 1996. However, the lack of a high number of dead plants (only 100 plants/acre) would indicate that most of the change in density is due to the much larger sample size giving a more accurate population estimate. Utilization is moderate to heavy, vigor normal, with no decadent plants encountered. The mountain big sagebrush population has declined 60% since 1990. The large number of dead plants (460 plants/acre) would suggest that this change is less related to sample size, and more closely associated with many years of drought (1987 to 1990). Stickyleaf low rabbitbrush is currently the most abundant shrub. It appears to have a stable population. Trend for grasses is slightly down. Sum of nested frequency for perennial grasses has declined since 1990. Bluebunch wheatgrass has maintained a stable nested frequency. However, prairie junegrass and Sandberg bluegrass have declined. Annual grasses are also common but were not included in the previous samples so no comparisons can be made. Trend for perennial forbs is down. The forb component is still poor. Sum of nested frequency for perennial forbs has declined 53% in nested frequency since 1990. The Desirable Components Index rated this site as fair with a score of 61 due to moderate browse cover, low decadence, and good perennial grass cover.

winter range condition (DC Index) - fair (61) Mid Potential scale
browse - stable (0) grasses - slightly down (-1) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species is stable. Densities for bitterbrush and mountain big sagebrush remain stable. Percent decadence increased for both species in 2001 due to the drought conditions the past few years. Although these increases are small, the vigor remains good. Trend for grasses is slightly up. Sum of nested frequency for perennial grasses slightly increased, with the most abundant species, bluebunch wheatgrass, remaining stable. Sandberg bluegrass and bulbous bluegrass both significantly increased in nested frequency. Another positive aspect is the significant decrease in annual brome grasses due to drought. Trend for forbs is stable. Perennial forbs remained similar to 1996, while the annual forbs decreased by 36%. The Desirable Components Index rated this site as good-fair with a score of 65 due to moderate browse cover, low decadence, and good perennial grass cover.

winter range condition (DC Index) - good-fair (65) Mid Potential scale
browse - stable (0) grasses - slightly up (+1) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse mountain big sagebrush and bitterbrush is up. Density for both species increased by at least 20%. Sagebrush decadence decreased to 13%, while bitterbrush increased slightly to 19%. Vigor is good and young recruitment makes up 26% of the sagebrush population and 10% for bitterbrush. Trend for grasses is stable. The sum of nested frequency of perennial grasses remained the same with the exception of bulbous bluegrass. Bulbous bluegrass, a low value perennial, increased significantly in nested frequency and cover increased from 3% in 2001 to 15% in 2006. Annual grass (cheatgrass and Japanese brome) nested frequency continues to decline. Trend for forbs is up. Sum of nested frequency of perennial forbs increased, but remain under 3% cover. Annual forbs also increased with the return of normal precipitation. The Desirable Components Index rated this site as good-fair with a score of 69 due to moderate browse cover, moderate decadence, and good perennial grass cover.

winter range condition (DC Index) - good-fair (69) Mid Potential scale
browse - up (+2) grasses - stable (0) forbs - up (+2)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	a-	a-	a-	a-	b19	-	-	.16
G	Agropyron spicatum	271	276	267	237	224	12.89	12.87	16.86
G	Bromus japonicus (a)	-	-	c186	b81	a20	5.14	.85	.12
G	Bromus tectorum (a)	-	-	b114	a46	a35	2.62	.73	.91
G	Elymus cinereus	-	-	2	3	2	.53	.85	1.00
G	Hordeum jubatum	4	5	-	-	-	-	-	-
G	Koeleria cristata	52	53	28	32	42	.79	.55	.94
G	Poa bulbosa	a-	a-	b52	b85	c225	1.55	2.82	15.37
G	Poa pratensis	-	-	-	4	10	-	.04	.04
G	Poa secunda	ab202	c267	a160	b213	ab162	3.42	4.59	7.33
G	Stipa comata	-	-	-	1	-	-	.00	-
G	Stipa lettermani	-	-	-	-	1	-	-	.00
Total for Annual Grasses		0	0	300	127	55	7.76	1.59	1.03
Total for Perennial Grasses		529	601	509	575	685	19.20	21.74	41.72
Total for Grasses		529	601	809	702	740	26.96	23.33	42.76
F	Achillea millefolium	b191	a84	a49	a55	a56	.60	.42	1.07
F	Agoseris glauca	a-	c126	a1	a2	b25	.00	.00	.08
F	Allium acuminatum	b23	a4	a-	a1	a6	-	.00	.03
F	Alyssum alyssoides (a)	-	-	b114	a67	a39	.32	.18	.08
F	Antennaria rosea	-	-	-	2	4	-	.03	.03
F	Arabis drummondi	a-	ab1	b9	a-	ab1	.02	-	.00
F	Aster chilensis	-	1	3	3	1	.00	.03	.00
F	Astragalus convallarius	a-	ab17	ab10	a2	b18	.05	.03	.13

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Aster sp.	-	-	-	-	1	-	-	.00
F	Calochortus nuttallii	3	-	-	1	-	-	.00	-
F	Cirsium sp.	-	-	-	-	5	-	-	.16
F	Cirsium undulatum	12	12	14	7	7	.39	.24	.21
F	Collomia linearis (a)	-	-	$_{a}$9	$_{a}$4	$_{b}$80	.02	.01	.19
F	Collinsia parviflora (a)	-	-	60	58	58	.11	.16	.17
F	Cordylanthus sp. (a)	-	-	$_{b}$19	$_{a}$-	$_{b}$13	.30	-	.57
F	Crepis acuminata	$_{a}$-	$_{b}$10	$_{a}$-	$_{a}$-	$_{ab}$5	-	-	.09
F	Cryptantha sp.	-	6	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	3	-	-	.00	-	-
F	Draba sp. (a)	-	-	-	3	11	-	.00	.02
F	Epilobium brachycarpum (a)	-	-	$_{a}$13	$_{a}$19	$_{b}$46	.03	.16	.18
F	Eriogonum cernuum (a)	-	-	1	-	-	.00	-	-
F	Erodium cicutarium (a)	-	-	$_{a}$7	$_{b}$50	$_{b}$42	.07	1.65	.76
F	Erigeron sp.	-	-	-	3	4	-	.06	.03
F	Eriogonum umbellatum	-	3	1	2	2	.03	.00	.15
F	Holosteum umbellatum (a)	-	-	$_{b}$76	$_{a}$29	$_{a}$17	.28	.44	.10
F	Lappula occidentalis (a)	-	-	$_{ab}$2	$_{b}$11	$_{a}$-	.00	.03	-
F	Lactuca serriola	-	-	-	3	3	-	.01	.03
F	Lithospermum ruderale	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$-	$_{a}$1	.24	-	.03
F	Lomatium triternatum	-	-	-	-	9	-	-	.01
F	Lupinus argenteus	9	7	8	3	6	.06	.04	.05
F	Microsteris gracilis (a)	-	-	$_{b}$44	$_{a}$4	$_{a}$3	.08	.01	.01
F	Orthocarpus tolmiei (a)	-	-	-	-	-	-	.03	-
F	Phlox longifolia	-	5	-	-	9	-	-	.01
F	Polygonum douglasii (a)	-	-	$_{b}$32	$_{a}$5	$_{b}$43	.07	.01	.11
F	Ranunculus testiculatus (a)	-	-	9	-	6	.01	-	.01
F	Taraxacum officinale	-	9	-	-	-	-	-	-
F	Tragopogon dubius	$_{ab}$21	$_{a}$3	$_{a}$9	$_{b}$33	$_{a}$17	.05	.34	.24
F	Trifolium gymnocarpon	-	-	4	-	-	.01	-	-
F	Trifolium sp.	-	-	-	-	2	-	-	.00
F	Unknown forb-perennial	-	2	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	1	-	6	.00	-	.01
F	Zigadenus paniculatus	-	3	-	-	-	-	-	-
Total for Annual Forbs		0	0	390	250	364	1.34	2.71	2.22
Total for Perennial Forbs		259	293	118	117	182	1.48	1.24	2.42

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
Total for Forbs		259	293	508	367	546	2.82	3.95	4.65

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

BROWSE TRENDS --
Management unit 03 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	19	15	22	3.47	5.05	4.53
B	Chrysothamnus viscidiflorus viscidiflorus	66	57	65	4.69	3.65	4.42
B	Eriogonum heracleoides	0	1	0	-	-	-
B	Gutierrezia sarothrae	9	1	6	.24	-	.15
B	Purshia tridentata	15	16	14	4.09	5.25	6.25
B	Ribes sp.	0	0	1	-	-	.38
B	Tetradymia canescens	2	4	6	-	-	.03
Total for Browse		111	94	114	12.50	13.97	15.76

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 4

Species	Percent Cover '06
Artemisia tridentata vaseyana	5.86
Chrysothamnus viscidiflorus viscidiflorus	5.76
Purshia tridentata	8.66
Tetradymia canescens	.43

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 4

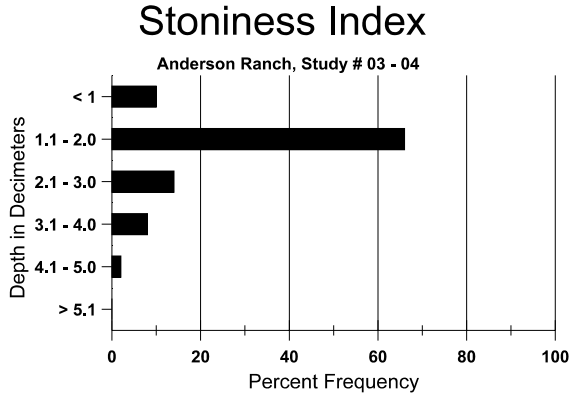
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.3	2.4
Purshia tridentata	4.2	4.3

BASIC COVER --
Management unit 03 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	6.25	19.75	43.24	47.43	61.08
Rock	1.00	.75	.86	.36	.49
Pavement	1.25	0	.95	.93	1.17
Litter	70.75	50.75	51.29	52.27	36.35
Cryptogams	5.50	7.00	12.98	6.75	5.71
Bare Ground	15.25	21.75	10.92	14.55	10.28

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 04, Anderson Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.5	57.4 (15.1)	7.0	42.7	24.0	33.3	3.7	14.3	115.2	0.6



PELLET GROUP DATA --
Management unit 03 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	4	3	1
Rabbit	5	8	11
Grouse	-	1	-
Elk	23	10	13
Deer	38	53	47
Cattle	2	-	-

Days use per acre (ha)	
'01	'06
20 (50)	27 (68)
-	-
9 (22) groups/acre	-
32 (79)	38 (94)
140 (346)	55 (136)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**399**	-	-	133	266	-	0	100	67	-	0	28/35
90	**999**	-	266	533	200	-	20	0	20	-	0	28/31
96	**400**	160	100	300	-	460	65	0	0	-	0	35/50
01	**420**	-	60	280	80	180	29	0	19	-	0	33/50
06	**620**	500	160	380	80	180	23	23	13	3	3	36/54
Chrysothamnus viscidiflorus viscidiflorus												
84	**2466**	-	466	2000	-	-	0	0	0	-	0	12/13
90	**3399**	-	666	2600	133	-	6	0	4	.58	2	13/17
96	**3120**	20	80	2980	60	40	8	0	2	-	0	15/23
01	**2380**	-	60	2020	300	140	2	0	13	.84	.84	12/20
06	**2620**	-	180	2260	180	-	4	3	7	2	4	15/23
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	4/10
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**440**	-	20	420	-	-	0	0	-	-	0	7/9
01	**20**	-	-	20	-	-	0	0	-	-	0	4/5
06	**140**	-	-	140	-	-	0	0	-	-	0	10/16
Juniperus scopulorum												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**66**	-	-	66	-	-	0	0	-	-	0	134/81
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**866**	-	-	66	800	-	8	92	92	-	8	32/37
90	**999**	-	200	133	666	-	33	33	67	4	13	15/26
96	**320**	-	20	300	-	100	44	25	0	-	0	29/55
01	**340**	-	40	280	20	60	12	53	6	6	6	36/62
06	**420**	-	40	300	80	100	48	14	19	5	5	37/62
Ribes sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	48/22
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	15/16
01	**0**	-	-	-	-	-	0	0	-	-	0	19/28
06	**0**	-	-	-	-	-	0	0	-	-	0	24/24
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	40	-	-	0	0	0	-	0	18/33
01	**80**	-	-	80	-	-	0	0	0	-	0	17/33
06	**180**	-	60	40	80	-	0	0	44	44	44	21/34

Trend Study 3-12-06

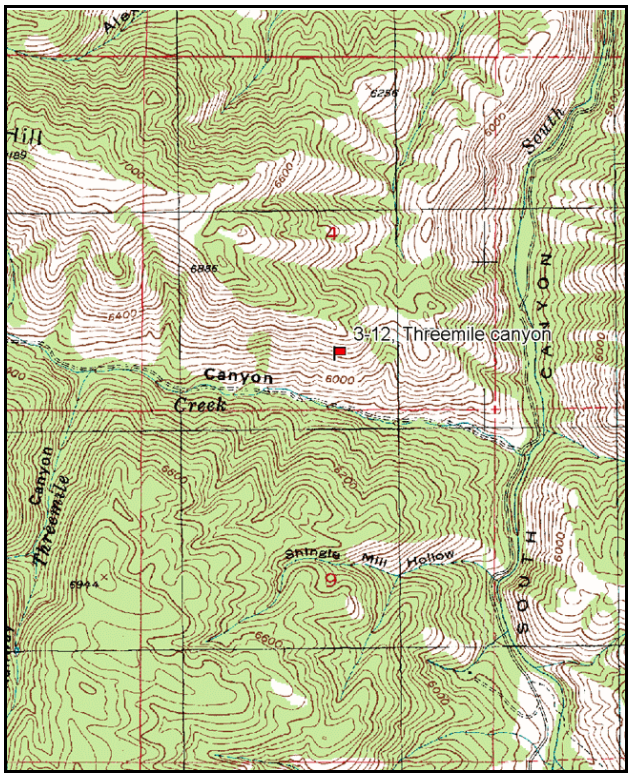
Study site name: Threemile Canyon . Vegetation type: Bitterbrush .

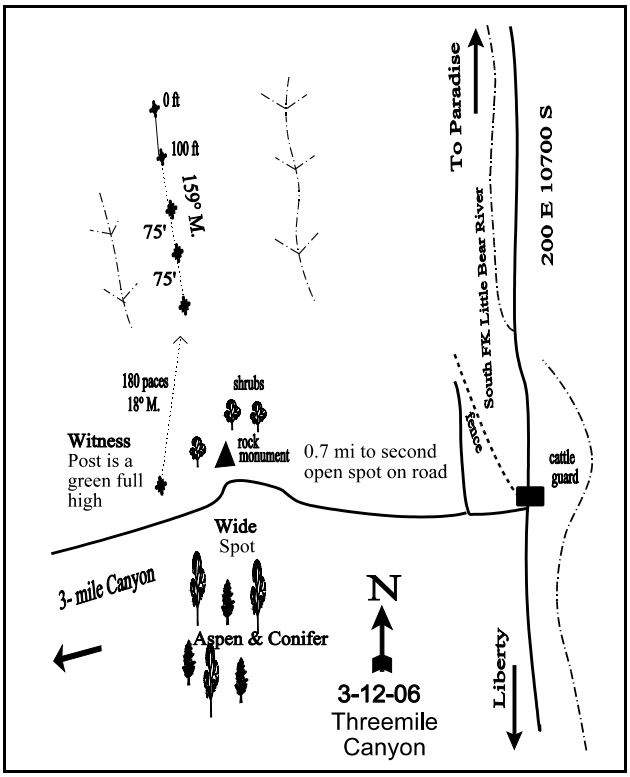
Compass bearing: frequency baseline 159 degrees magnetic.

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 200 East and 10700 South in Avon, proceed south (towards Liberty) on a dirt road for 7.0 miles. Cross the cattle guard and turn immediately right (west). Travel. 0.7 miles up Three-mile Canyon and stop adjacent to a green and white witness post on the right side of road. Walk 180 paces at 18 degrees magnetic from the witness post to the last baseline stake. From the last baseline stake to the 0-foot baseline stake walk 400 feet at an azimuth 340 degrees magnetic. The 0-foot stake is marked by browse tag #7982.





Map Name: James Peak

Diagrammatic Sketch

Township 8N , Range 1E , Section 4

UTM NAD 27, UTM 12T 4589284 N 429627 E

DISCUSSION

Threemile Canyon - Trend Study No. 3-12

Study Information

This study samples a sparse but heavily used bitterbrush/sagebrush community in Threemile Canyon, a tributary of the South Fork of the Little Bear River (elevation 6,100 feet, slope 60%, aspect south). Use of the available browse was very heavy in 1984 and moderately heavy in 1990. Deer use was light in 1996, 2001, and 2006. Elk use has also been very light. Pellet group transect data taken in 2001 estimated 26 deer and 2 elk days use/acre (65 ddu/ha and 5 edu/ha). Pellet group data in 2006 was estimated at 13 deer and 1 elk days use/acre (33 ddu/ha and 2 edu/ha).

Soil

The soil is classified in the Sheep Creek series, a moderately deep (28-40 inches to fractured limestone bedrock), well drained soils that formed in residuum and colluvium derived from calcareous sandstone, limestone, or quartzite (USDA-NRCS 2006). This soil often has a calcareous accumulation at approximately 22 inches depth. Soils have a clay loam texture with a neutral soil reaction (7.2 pH). Effective rooting depth was estimated at 16 inches in 1996. Rocks are common on the surface and within the profile. Although the soil has a high erosion hazard, an erosion condition class assessment done in 2001 and 2006 showed the soil to be stable with little erosion. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground is moderately high at 3 to 1, but has decreased from 5 to 1 in 2001. Bare ground and rock/pavement cover have both increased with each reading since 1996.

Browse

Browse composition consists of a moderate stand of antelope bitterbrush interspersed with a low density of mountain big sagebrush. Small amounts of mountain snowberry, Wood's rose, and serviceberry are also present. Bitterbrush density was estimated at 820 plants/acre in 1996 and 2006, with a slight decline in 2001 to 700 plants/acre. Cover has averaged 8% since 1996. Those plants sampled in 1984 all displayed heavy use, but this has declined to moderate use. Decadence was quite high at over 40% in 1984 and 1990. However, it declined to 5-7% in 1996 and 2006, with a slight increase to 17% in 2001. Recruitment from young plants was low in 2001 and 2006 and may have difficultly establishing with a thick understory of weeds (Hall et al. 1999). Vigor remains normal on mature plants. Average leader growth on bitterbrush was about 3-4 inches in 2001 and 2006.

Mountain big sagebrush density has steadily declined since 1984, until no plants were sampled in 2006. Density was estimated at 180 plants/acre in 1996 and 100 plants/acre in 2001. Cover has averaged less than 1% since 1996. Utilization was heavy in 1984, but has been light since 1996. Decadence ranged from 40-50% in all sampling years and young recruitment was minimal. The average number of young plants since 1984 was not adequate to replace the dying plants within the population.

Herbaceous Understory

The herbaceous understory is dominated by introduced weedy species including: cheatgrass, Japanese brome, bulbous bluegrass, tarweed, and dyer's woad. Desired perennial grasses such as bluebunch wheatgrass, Sandberg bluegrass, and Great Basin wildrye are present. They have maintained fairly stable frequencies from 1996 to 2006, except bluebunch wheatgrass which increased significantly in 2006. Both Sandberg bluegrass and Great Basin wildrye combined have provided less than 1% cover. Nested frequency of bulbous bluegrasses increased significantly in 2001 and again in 2006. Forbs are fairly diverse and abundant, but are mainly low growing and/or increaser species which include Louisiana sagebrush, yellow salsify, and prickly lettuce. Arrowleaf balsamroot is perhaps the most desirable forb, but it occurs only occasionally.

1990 TREND ASSESSMENT

Bitterbrush and mountain big sagebrush populations both decreased, 22% and 67% respectively. Together, it

indicates a definite downward trend for these key browse species. A moderating factor is that, while in 1984 all the bitterbrush were classified as heavily hedged, in 1990 all form classes were represented, suggesting generally lighter utilization. Bitterbrush canopy cover was estimated at 5%. Sagebrush cover was too low to measure with the variable plot method. Trend for grasses is slightly down. Bluebunch wheatgrass decreased significantly while bulbous bluegrass increased. Trend for forbs is up. Most species are desirable and increased significantly, especially yellow salsify.

browse - down (-2) grasses - slightly down (-1) forbs - up (+2)

1996 TREND ASSESSMENT

Trend for browse is stable but limited. Density of bitterbrush is estimated at 820 plants/acre with the new, much larger sample size. Utilization is mostly moderate and percent decadence low at 5%. Recruitment appears sufficient to maintain the population. Mountain big sagebrush has a density of only 180 plants/acre, providing little forage. Reproduction is limited and likely hindered by the abundant herbaceous understory. Trend for grasses is slightly down. Perennial grasses nested frequency decreased by 20%, mostly bluebunch wheatgrass. Annual grasses, cheatgrass and Japanese brome, are abundant and this was the first year they were included in the study. Trend for the forbs is stable. Nested frequency for perennial forbs remained similar to 1990. Annual forbs were included in the study this year and most are weedy and abundant. The Desirable Components Index rated this site as very poor with a score of 33 due to moderate browse cover, moderate Decadence, moderate perennial grass cover, and high annual grass cover.

winter range condition (DC Index) - very poor (33) Mid Potential scale
browse - stable (0) grasses - slightly down (-1) forbs - stable (0)

2001 TREND ASSESSMENT

Trend for browse is slightly down. Bitterbrush density slightly decreased with a reduction in the number of young plants and percent decadence increased. Decadence in the mountain big sagebrush population remains at a moderately high level (40%). Those classified with poor vigor increased from 0% to 20%. These negative parameters are likely drought related and should improve with normal precipitation in the future. Trend for grasses is slightly down. Perennial grasses stayed the same except for bulbous bluegrass, which increased significantly. Annual grasses are abundant and it appears the nested frequency of Japanese brome is decreasing while cheatgrass is increasing. Trend for forbs is slightly down. Forbs nested frequency decreased by 20% since 1996. The Desirable Components Index rated this site as very poor with a score of 31 due to moderate browse cover, moderate decadence, moderate perennial grass cover, and high annual grass cover.

winter range condition (DC Index) - very poor (31) Mid Potential scale
browse - slightly down (-1) grasses - slightly down (-1) forbs - slightly down (-1)

2006 TREND ASSESSMENT

Trend for key browse species is slightly up. Bitterbrush density increased from 700 plants/acre to 820 plants/acre. Decadence decreased from 17% to 7% and vigor is good despite moderate utilization. A small population of mountain big sagebrush was sampled in previous years, but was not sampled this year. Trend for grasses is slightly up. Nested frequency of bluebunch wheatgrass increased significantly. Cheatgrass nested frequency remained the same as 2001, while Japanese brome continued to decrease. Bulbous bluegrass continues to significantly increase at each observation. Trend for forbs is slightly down. Perennial forb sum of nested frequency increased by 40%, but were due to two undesirable species, dyer's woad and pale stickseed. The Desirable Components Index rated this site as poor-fair with a score of 48 due to fairly low browse cover, low decadence, moderate perennial grass cover, and moderate annual grass cover.

winter range condition (DC Index) - poor-fair (48) Mid Potential scale
browse - slightly up (+1) grasses - slightly up (+1) forbs - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 12

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	c220	ab164	a120	a131	bc178	4.64	7.90	9.40
G	Bromus japonicus (a)	-	-	c354	b205	a90	20.07	8.06	.52
G	Bromus tectorum (a)	-	-	a209	b276	b300	6.28	22.38	9.89
G	Carex sp.	-	-	-	3	-	-	.00	-
G	Elymus cinereus	a-	a1	b22	ab13	ab8	1.63	1.83	.36
G	Poa bulbosa	a-	b18	b11	c75	d121	.12	1.57	2.61
G	Poa secunda	a-	b32	b18	b18	b30	.20	.20	.55
Total for Annual Grasses		0	0	563	481	390	26.36	30.44	10.41
Total for Perennial Grasses		220	215	171	240	337	6.60	11.52	12.92
Total for Grasses		220	215	734	721	727	32.96	41.97	23.34
F	Achillea millefolium	-	-	6	6	2	.03	.06	.15
F	Agoseris glauca	c34	bc19	ab5	a1	abc17	.01	.01	.10
F	Allium acuminatum	b17	a-	a-	a-	ab4	-	-	.01
F	Alyssum alyssoides (a)	-	-	ab88	b109	a50	.30	1.23	.18
F	Artemisia ludoviciana	a25	ab30	ab29	b56	ab31	.88	3.27	1.70
F	Aster chilensis	-	-	1	1	-	.06	.00	-
F	Balsamorhiza sagittata	14	16	6	14	11	1.75	2.82	2.75
F	Camelina microcarpa (a)	-	-	1	5	6	.00	.04	.02
F	Calochortus nuttallii	a-	b8	a-	ab2	ab9	-	.00	.04
F	Cirsium sp.	a1	b29	a13	a2	a5	.37	.06	.42
F	Collomia linearis (a)	-	-	b44	a10	b67	.18	.02	.28
F	Collinsia parviflora (a)	-	-	a3	a1	b54	.00	.00	.13
F	Crepis acuminata	a-	b29	ab21	a6	ab7	.22	.09	.45
F	Epilobium brachycarpum (a)	-	-	b104	a18	c166	.91	.04	3.18
F	Erodium cicutarium (a)	-	-	a-	b10	c83	-	.13	1.60
F	Galium aparine (a)	-	-	a3	a-	b34	.03	-	.20
F	Hackelia patens	a-	a-	a-	a6	b41	-	.06	.80
F	Holosteum umbellatum (a)	-	-	a7	b77	b104	.02	.33	.35
F	Isatis tinctoria	a-	a4	a7	ab16	b32	.16	.22	1.38
F	Lappula occidentalis (a)	-	-	a2	b18	ab12	.00	.06	.03
F	Lactuca serriola	a-	b43	c99	c113	c133	1.13	2.82	2.46
F	Lesquerella sp.	-	-	-	2	-	-	.00	-
F	Lithospermum ruderale	-	-	12	6	5	1.06	.45	.93
F	Lomatium grayi	-	1	-	-	6	-	-	.16
F	Madia glomerata (a)	-	-	a-	a-	b17	-	-	1.14

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Microsteris gracilis (a)	-	-	a-	a-	b41	-	-	.15
F	Polygonum douglasii (a)	-	-	-	1	6	.00	.00	.01
F	Ranunculus testiculatus (a)	-	-	-	3	4	-	.00	.00
F	Senecio multilobatus	b41	a-	a-	a2	a-	-	.00	-
F	Sisymbrium altissimum (a)	-	-	-	-	5	-	-	.48
F	Tragopogon dubius	a32	c185	c195	b76	b95	5.07	2.05	2.01
F	Unknown forb-perennial	a-	a-	a-	b16	a-	-	.13	-
F	Veronica biloba (a)	-	-	a21	a45	b170	.70	.14	1.11
Total for Annual Forbs		0	0	273	297	819	2.17	2.01	8.92
Total for Perennial Forbs		164	364	394	325	398	10.78	12.09	13.42
Total for Forbs		164	364	667	622	1217	12.96	14.11	22.34

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

BROWSE TRENDS --
Management unit 03 , Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	8	5	0	.41	-	-
B	Mahonia repens	2	2	2	.15	.03	.18
B	Purshia tridentata	25	27	26	8.01	7.73	8.06
B	Rosa woodsii	5	4	5	.24	.03	.30
Total for Browse		40	38	33	8.81	7.79	8.55

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 12

Species	Percent Cover '06
Mahonia repens	.18
Purshia tridentata	11.78
Rosa woodsii	.43

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 12

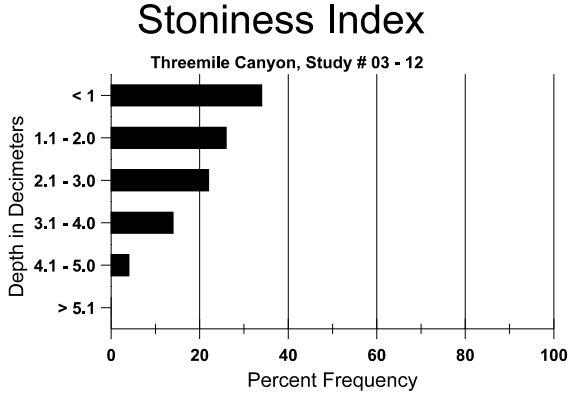
Species	Average leader growth (in)	
	'01	'06
Purshia tridentata	3.9	3.1

BASIC COVER --
Management unit 03 , Study no: 12

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.50	9.00	56.96	62.90	55.22
Rock	15.25	12.75	5.47	8.76	14.80
Pavement	10.25	17.00	.50	5.16	3.67
Litter	49.75	40.50	64.06	33.45	35.54
Cryptogams	.75	0	0	0	.03
Bare Ground	20.50	20.75	4.86	7.33	14.36

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 12, Threemile Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
16.1	67.4 (16.3)	7.2	27.3	40.7	32.0	3.1	15.8	201.6	0.6



PELLET GROUP DATA --
Management unit 03 , Study no: 12

Type	Quadrat Frequency		
	'96	'01	'06
Elk	1	-	-
Deer	5	13	5
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
2 (5)	1 (2)
26 (65)	13 (33)
-	-

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	29/34
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	42/42
Artemisia tridentata vaseyana												
84	**999**	-	-	566	433	-	13	87	43	-	0	26/32
90	**332**	-	-	166	166	-	70	10	50	18	30	21/17
96	**180**	-	20	80	80	60	22	0	44	-	0	18/22
01	**100**	-	-	60	40	80	0	0	40	20	20	19/22
06	**0**	-	-	-	-	-	0	0	0	-	0	28/43
Mahonia repens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**320**	-	-	320	-	-	0	0	-	-	0	6/6
01	**440**	-	20	420	-	-	0	0	-	-	0	-/-
06	**620**	-	-	620	-	-	0	0	-	-	0	3/5
Purshia tridentata												
84	**599**	-	-	333	266	-	0	100	44	-	0	30/48
90	**466**	-	-	266	200	-	21	36	43	4	7	25/48
96	**820**	20	100	680	40	160	51	15	5	-	0	32/59
01	**700**	-	20	560	120	80	37	17	17	-	0	34/57
06	**820**	-	40	720	60	120	61	22	7	2	2	32/53
Rosa woodsii												
84	**332**	-	166	166	-	-	0	0	-	-	0	7/4
90	**1100**	-	1100	-	-	-	0	0	-	-	0	-/-
96	**420**	-	160	260	-	-	33	0	-	-	0	12/11
01	**340**	-	140	200	-	-	0	0	-	-	0	17/12
06	**400**	-	-	400	-	20	0	0	-	-	0	23/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
84	**233**	-	100	100	33	-	14	29	14	-	0	18/43
90	**100**	-	100	-	-	-	33	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	37/51

Trend Study 3-17-06

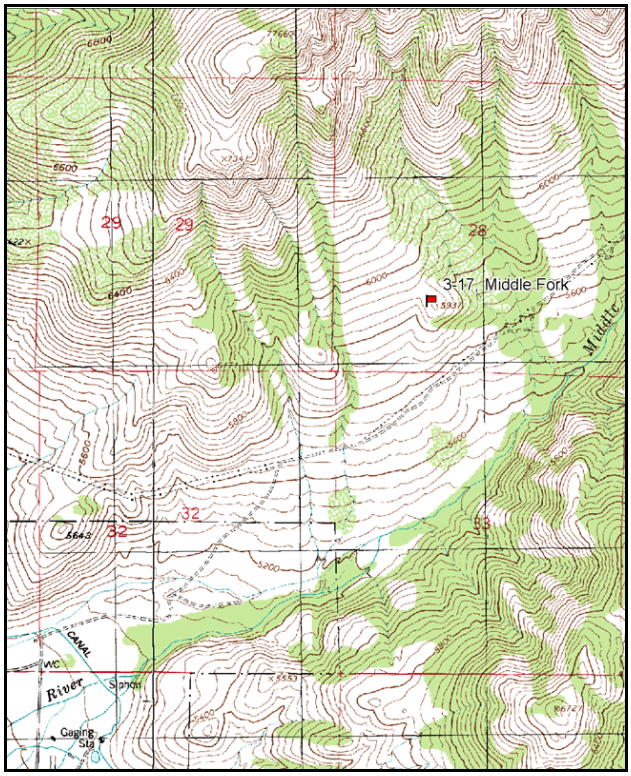
Study site name: Middle Fork . Vegetation type: Low Sagebrush .

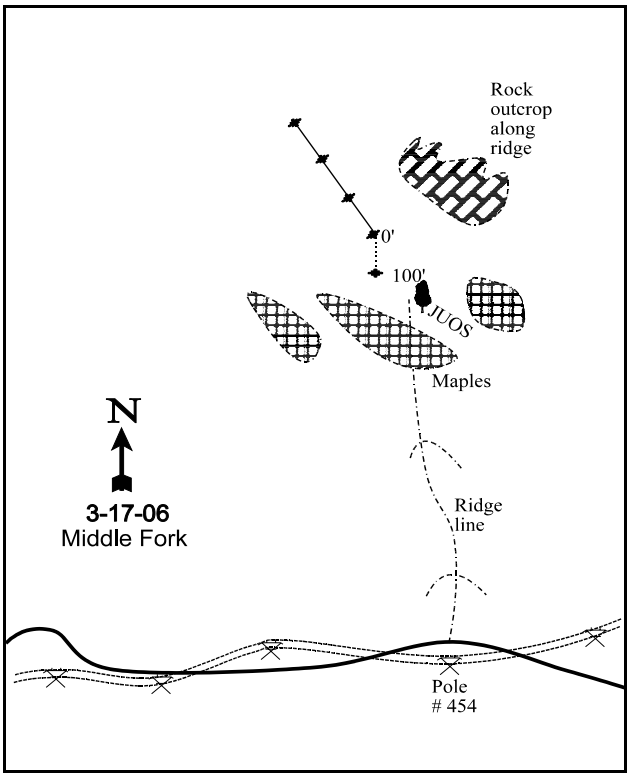
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 5500 East and 2200 North in Eden, proceed 0.4 miles to a bend. Continue east, 1.9 miles further, to where the main road bends to the southeast. Continue straight for 1.9 miles to the state land (middle fork wildlife management area). From the sign, drive 0.1 miles to a three way intersection. Stay left and go through the gate. Continue east 0.05 miles to a fork. Stay left. From the fork continue 0.05 miles to a creek. Cross the creek and continue down a ripped rough road which is now a horse trail for 0.8 miles, going under power lines, to pole #454. Park here and walk up the ridge line beyond the maples to a lone juniper. The 100-foot stake of the frequency baseline is 30 paces away at a bearing of 337 degrees magnetic.





Map Name: Brown's Hole

Diagrammatic Sketch

Township 7N , Range 2E , Section 28

UTM NAD 27, UTM 12T 4573300 N 438694 E

DISCUSSION

Middle Fork - Trend Study No. 3-17

Study Information

This study samples a low sagebrush/grass community overlooking the Middle Fork of the Ogden River (elevation 5,900 feet, slope 20%, aspect southwest). The study lies within the DWR Middle Fork Wildlife Management Area. Although it was heavily grazed to some extent in the past, there are no signs of livestock use since 1996. In 1996, quadrat frequency of elk pellet groups was moderate and deer was light. Pellet group data in 2001 was estimated at 7 elk and 15 deer days use/acre (18 edu/ha and 36 ddu/ha). Moose and grouse pellet groups were also identified in 2001 and 2006. Pellet group data from 2006 was estimated at 13 elk and 13 deer days use/acre (31 edu/ha and 33 ddu/ha).

Soil

The soil is classified in the Durfee series, which consists of deep, well drained soils that formed in material weathered from sandstone and quartzite. These soils are on very steep mountain slopes that are shallow and rocky with abundant rock outcrops (USDA-NRCS 2006). Soil texture is a clay loam, with a slightly acidic soil reaction (pH of 6.4). Estimated effective rooting depth was less than 9 inches. An erosion condition classification conducted in 2001 and 2006 determined soils to be stable with minimal erosion. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground is high at 6 to 1.

Browse

The most abundant browse species is low sagebrush (*Artemisia arbuscula*), which has averaged 12-15% cover since 1996. Density of mature and decadent plants has steadily increased since 1996 with 5,200 plants/acre in 1996 to 7,120 plants/acre in 2006. Decadence increased slightly in 2006 to 21%, but is not a big concern for the population. Mature plants average about one foot in height and show mostly light with some moderate utilization. Young recruitment in 1996 and 2001 was high at 20% of the population, but declined in 2006 to 6%. Average leader growth was just over 1 inch in 2001 and 2006.

Other more valuable species in terms of preference for wildlife are mountain big sagebrush, antelope bitterbrush, and serviceberry. However, these species are found in small numbers and are not abundant enough to be considered key species. High competition from a dense weedy understory makes establishment of seedlings very difficult. They have been moderately to heavily hedged in the past, yet use has been light to moderate since 2001. An open stand of bigtooth maple provides fair resting cover, but thermal cover would be limited in the winter.

Herbaceous Understory

Grasses are moderately abundant and diverse. The most common species is bulbous bluegrass, providing over 50% of the grass cover since 1996. Bulbous bluegrass nested frequency increased significantly in 2001. Nested frequency remained similar in 2006, but cover decreased from 20% to 12%. Cheatgrass and Japanese brome produced 3% cover in 1996. However, in 2001 and 2006, they produced less than 1% cover and nested frequency decreased significantly with each observation. Bluebunch wheatgrass is abundant and has averaged 9% cover since 2001. Other somewhat common perennial grasses include thickspike wheatgrass, Sandberg bluegrass, and subalpine needlegrass. Forbs are also fairly abundant and diverse. The composition is fair with pacific aster, western yarrow, arrowleaf balsamroot, and mulesears wyethia providing the majority of the forb cover. Yellow salsify was common in 2001, but decreased significantly in nested frequency and cover in 2006.

1990 TREND ASSESSMENT

Sagebrush canopy cover on this study, comprised of low sagebrush and a smaller amount of mountain big sagebrush, averages almost 15%. The low sagebrush population is relatively stable in terms of numbers, but the percentage of decadent plants has increased to 53%. This could be explained by the very high densities in

conjunction with the extended drought. No young mountain big sagebrush could be identified and the population shows an increase in the percentage of decadent shrubs. The sagebrush display average vigor and moderate hedging. Bitterbrush is uncommon, but several young plants were encountered. The oaks on top of the hill are kept short by heavy use. Trend for grasses is up. Grasses are dense, including several species of annual bromes. Trend for forbs is down. Sixteen species of perennial forbs were encountered. Wild onion was the only species that decreased significantly in nested frequency.

browse - stable (0) grasses - up (+2) forbs - down (-2)

1996 TREND ASSESSMENT

Trend for low sagebrush is up slightly. Density has declined slightly as has percent decadence (53% to 11%). Recruitment is currently excellent with 1,260 seedlings/acre and 21% of the population consists of young plants. Utilization is light to moderate. The more preferred mountain big sagebrush and antelope bitterbrush occur in very small numbers. Some of the change in density in these species is the result of the much larger, more representative sample used in 1996. The lack of dead bitterbrush plants suggest that the previous samples overestimated the density. Both bitterbrush and mountain big sagebrush seem to be just hanging on and without better reproduction in the future, both may further decline in their respective densities. Trend for grasses is down. The preferred bluebunch wheatgrass has declined significantly in nested frequency. Sandberg bluegrass has also declined significantly in nested frequency, while bulbous bluegrass has increased dramatically from a quadrat frequency of only 14% in 1990 to 81% in 1996. Cheatgrass and Japanese brome are also common. Trend for forbs is up. Sum of nested frequency for perennial forbs has increased since 1990. However, most of the increase comes from a significant 15-fold increase in nested frequency for yellow salsify (11 to 169). Currently, western yarrow, pacific aster, yellow salsify, and mulesears wyethia provide the majority of the forb cover. The Desirable Components Index rated this site as fair with a score of 60 due to moderate browse cover, low decadence, moderate perennial grass cover, and low annual grass cover.

winter range condition (DC Index) - fair (60) Mid Potential scale
browse - slightly up (+1) grasses - down (-2) forbs - up (+2)

2001 TREND ASSESSMENT

Trend for browse is up. The combined density for mature and decadent low sagebrush increased by 34% and has a high but stable proportion of young plants in the population. Percent decadence remains stable, vigor is generally good, and use remains light to moderate. More preferred species such as mountain big sagebrush and bitterbrush remain in very low densities without much of a chance of expanding in the future. High competition from the abundant and weedy understory makes reproduction of these preferred, low density species, very difficult. Trend for grasses is up. Sum of nested frequency for perennial grasses increased with significant increases in Sandberg bluegrass, while the annual grasses decreased significantly. Bulbous bluegrass also increased significantly in nested frequency. Trend for forbs is down. Sum of nested frequency for perennial forbs decreased, mostly due to a significant decrease in yellow salsify. The Desirable Components Index rated this site as good-excellent with a score of 78 due to moderate browse cover, low decadence, an increase in perennial grass cover, and low annual grass cover.

winter range condition (DC Index) - good-excellent (78) Mid Potential scale
browse - stable (0) grasses - up (+2) forbs - down (-2)

2006 TREND ASSESSMENT

Trend for key browse, low sagebrush, is slightly down. Mature and decadent plants remained similar to 2001, but recruitment from young plants decreased to 6%. Decadence increased slightly to 21%, but remains within acceptable levels. Both mountain big sagebrush and one young bitterbrush sampled have decreased to densities so low that no plants were sampled in 2006. Trend for grasses is slightly down. Perennial grass nested frequency decreased slightly and bulbous bluegrasses remained at similar levels. Sandberg bluegrass

was the main grass that decreased significantly. Annual grasses, cheatgrass and Japanese brome, decreased significantly again from 2001 estimates and are a minor component in the herbaceous understory. Trend for forbs is stable. Perennial forbs nested frequency remained similar to 2001, although annual forbs increased with additional precipitation. The Desirable Components Index rated this site as good with a score of 68 due to moderate browse cover, moderate decadence, good perennial grass cover, and low annual grass cover.

winter range condition (DC Index) - good (68) Mid Potential scale
browse - slightly down (-1) grasses - slightly down (-1) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 17

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a-	a-	ab10	b8	c46	.09	.07	1.77
G	Agropyron spicatum	bc233	c254	a173	ab216	a181	4.50	9.06	8.59
G	Agropyron trachycaulum	-	-	-	6	2	-	.13	.03
G	Bromus japonicus (a)	-	-	c211	b42	a5	1.26	.17	.01
G	Bromus tectorum (a)	-	-	c132	b53	a6	1.42	.60	.02
G	Danthonia californica	-	-	-	1	9	-	.03	.21
G	Dactylis glomerata	a-	a-	a-	b15	ab1	-	1.55	.00
G	Danthonia unispicata	-	-	-	-	9	-	-	.12
G	Koeleria cristata	-	-	2	-	-	.00	-	-
G	Melica bulbosa	b42	ab26	ab28	a8	a10	.20	.07	.20
G	Poa bulbosa	a4	a30	b265	c315	c291	9.23	20.61	12.34
G	Poa pratensis	-	-	-	-	1	-	.00	.00
G	Poa secunda	b155	c239	a32	b143	a42	.53	3.48	.79
G	Stipa lettermani	a1	a1	b43	a-	b37	1.00	-	.58
Total for Annual Grasses		0	0	343	95	11	2.69	0.77	0.03
Total for Perennial Grasses		435	550	553	712	629	15.58	35.03	24.67
Total for Grasses		435	550	896	807	640	18.27	35.81	24.70
F	Achillea millefolium	ab9	a3	b19	ab9	ab8	.31	.16	.16
F	Agoseris glauca	ab20	b33	ab21	a11	ab34	.13	.07	.22
F	Allium sp.	c38	a-	a-	ab3	b15	-	.00	.07
F	Arabis sp.	-	-	1	-	1	.00	-	.00
F	Artemisia ludoviciana	b71	b45	a5	a11	a20	.06	.33	.65
F	Astragalus beckwithii	-	-	3	-	-	.03	-	-
F	Aster chilensis	b69	b70	a21	ab46	a33	.92	2.21	1.50
F	Balsamorhiza macrophylla	-	-	-	-	1	-	-	.15
F	Balsamorhiza sagittata	b18	ab6	a1	a4	ab10	.21	.45	1.66
F	Borago officinalis	8	-	-	-	-	-	-	-
F	Calochortus nuttallii	5	2	-	-	-	-	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
F	Castilleja sp.	$_{a}$-	$_{ab}$4	$_{ab}$1	$_{ab}$2	$_{b}$9	.03	.06	.10
F	Cirsium sp.	10	10	5	3	8	.04	.03	.30
F	Collomia linearis (a)	-	-	$_{b}$23	$_{ab}$10	$_{a}$3	.71	.05	.00
F	Comandra pallida	7	4	7	-	3	.18	-	.03
F	Collinsia parviflora (a)	-	-	1	5	14	.00	.02	.03
F	Crepis acuminata	3	-	-	-	3	-	-	.03
F	Descurainia pinnata (a)	-	-	-	3	-	-	.00	-
F	Draba sp. (a)	-	-	$_{a}$41	$_{a}$45	$_{b}$93	.12	.14	.21
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$30	-	-	.11
F	Eriogonum cernuum (a)	-	-	-	-	-	-	-	-
F	Erodium cicutarium (a)	-	-	$_{a}$1	$_{b}$21	$_{a}$7	.00	.34	.01
F	Erigeron strigosis	$_{a}$-	$_{a}$-	$_{b}$11	$_{ab}$5	$_{ab}$3	.22	.01	.00
F	Galium aparine (a)	-	-	$_{a}$1	$_{a}$-	$_{b}$15	.00	.00	.08
F	Grindelia squarrosa	-	-	4	-	-	.03	-	-
F	Hackelia patens	$_{a}$-	$_{b}$26	$_{ab}$7	$_{ab}$4	$_{ab}$5	.19	.06	.22
F	Holosteum umbellatum (a)	-	-	14	-	1	.16	-	.00
F	Lappula occidentalis (a)	-	-	-	2	1	-	.03	.00
F	Lactuca serriola	-	9	2	1	-	.00	.00	-
F	Lomatium dissectum	$_{a}$-	$_{a}$2	$_{ab}$33	$_{b}$31	$_{c}$51	.37	1.47	1.52
F	Lupinus argenteus	1	5	3	4	4	.15	.63	.15
F	Machaeranthera spp	$_{a}$-	$_{a}$-	$_{b}$57	$_{a}$-	$_{a}$-	.23	-	-
F	Madia glomerata (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$13	-	-	.10
F	Microsteris gracilis (a)	-	-	-	1	4	-	.00	.01
F	Phlox longifolia	-	-	-	1	-	-	.00	-
F	Polygonum douglasii (a)	-	-	$_{b}$14	$_{a}$-	$_{b}$26	.03	-	.09
F	Senecio integerrimus	3	3	-	-	-	-	-	-
F	Taraxacum officinale	$_{a}$-	$_{a}$-	$_{ab}$8	$_{b}$12	$_{a}$-	.08	.02	-
F	Tragopogon dubius	$_{a}$4	$_{a}$11	$_{c}$169	$_{b}$81	$_{a}$20	2.69	1.62	.21
F	Unknown forb-perennial	$_{b}$29	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Verbascum blattaria	-	-	-	-	2	-	-	.03
F	Viola sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$1	$_{b}$9	-	.00	.05
F	Wyethia amplexicaulis	$_{a}$14	$_{a}$10	$_{b}$44	$_{b}$35	$_{b}$40	3.80	3.68	3.55
Total for Annual Forbs		0	0	95	87	207	1.04	0.61	0.66
Total for Perennial Forbs		309	243	422	264	279	9.72	10.86	10.66
Total for Forbs		309	243	517	351	486	10.77	11.47	11.33

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

BROWSE TRENDS --
Management unit 03 , Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Acer grandidentatum	2	1	1	1.25	1.70	1.37
B	Artemisia arbuscula	92	88	92	11.80	13.00	14.63
B	Artemisia tridentata vaseyana	7	1	0	1.49	.38	-
B	Gutierrezia sarothrae	9	17	15	.26	.53	.28
B	Purshia tridentata	1	1	1	-	-	-
Total for Browse		111	108	109	14.81	15.62	16.29

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 17

Species	Percent Cover
	'06
Acer grandidentatum	2.90
Artemisia arbuscula	19.75
Gutierrezia sarothrae	.73

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 17

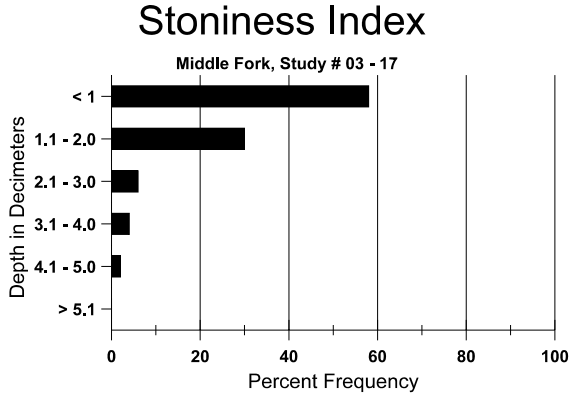
Species	Average leader growth (in)	
	'01	'06
Artemisia arbuscula	1.4	0.6

BASIC COVER --
Management unit 03 , Study no: 17

Cover Type	Average Cover %				
	'85	'90	'96	'01	'06
Vegetation	9.25	12.00	48.04	56.20	45.90
Rock	14.50	15.75	19.16	19.40	21.18
Pavement	2.75	9.50	2.04	2.82	6.87
Litter	55.50	56.50	57.15	45.01	36.81
Cryptogams	1.00	.50	.52	1.67	1.75
Bare Ground	17.00	5.75	.34	2.26	3.52

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 17, Middle Fork

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.8	76.2 (9.1)	6.4	38.6	32.4	29.0	3.6	13.8	105.6	0.4



PELLET GROUP DATA --
Management unit 03 , Study no: 17

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	-	1
Moose	-	-	1
Elk	25	9	12
Deer	8	4	14
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
-	-
7 (18)	13 (31)
15 (36)	13 (33)
-	-

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Acer grandidentatum												
85	**999**	200	933	66	-	-	0	0	-	-	0	14/10
90	**666**	-	666	-	-	-	0	0	-	-	0	-/-
96	**40**	-	20	20	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	20	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	**599**	-	466	-	133	-	44	56	22	3	11	-/-
90	**799**	-	533	-	266	-	92	0	33	3	8	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	46/33
Artemisia arbuscula												
85	**6865**	66	1066	5133	666	-	0	0	10	-	14	10/14
90	**7199**	133	66	3333	3800	-	47	6	53	6	20	12/18
96	**6620**	1260	1420	4440	760	780	34	.60	11	2	11	13/21
01	**8560**	-	1600	5860	1100	500	14	.46	13	3	5	12/26
06	**7560**	460	440	5560	1560	640	11	1	21	12	12	13/24
Artemisia tridentata vaseyana												
85	**533**	-	-	400	133	-	0	0	25	-	0	26/19
90	**466**	-	-	266	200	-	14	0	43	4	14	29/41
96	**200**	-	20	180	-	40	30	0	0	-	0	26/47
01	**120**	-	40	80	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Gutierrezia sarothrae												
85	**133**	-	-	133	-	-	0	0	0	-	0	12/9
90	**66**	-	-	66	-	-	0	0	0	-	0	9/11
96	**400**	920	200	200	-	-	0	0	0	-	0	9/11
01	**760**	-	-	760	-	-	0	0	0	-	0	9/25
06	**760**	20	140	600	20	-	0	0	3	-	0	9/12
Purshia tridentata												
85	**132**	-	-	66	66	-	0	100	50	-	0	8/24
90	**332**	-	133	66	133	-	40	0	40	6	20	11/31
96	**40**	-	-	40	-	-	100	0	0	-	0	20/54
01	**20**	-	-	20	-	-	100	0	0	-	0	14/55
06	**20**	-	20	-	-	-	0	0	0	-	0	24/40
Quercus gambelii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	20	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 3-18-06

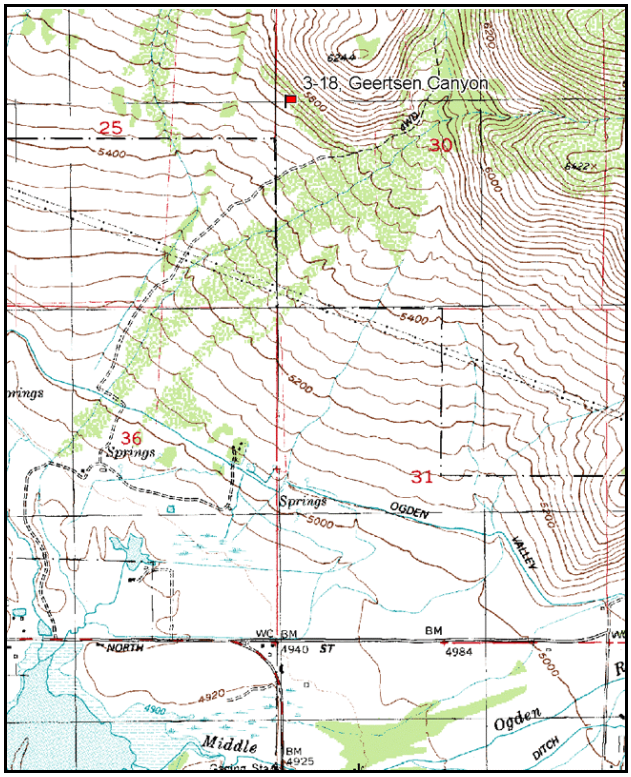
Study site name: Geertsen Canyon . Vegetation type: Big Sagebrush-Grass .

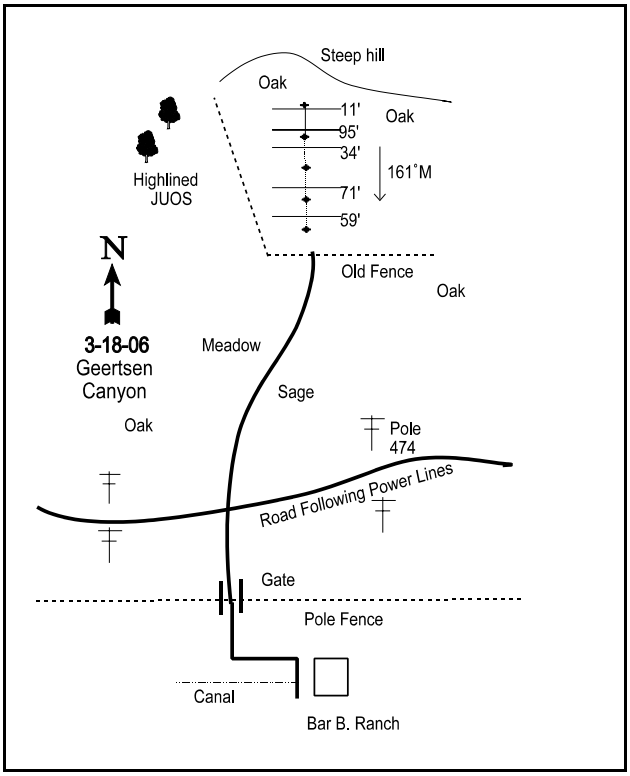
Compass bearing: frequency baseline 161 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft). Rebar: belt 1 on 1 ft., belt 2 on 0 ft., belt 3 on 2 ft., no rebar on belt 4, belt 5 on 3 ft.

LOCATION DESCRIPTION

Contact Bill Hadlock before doing this site. From the intersection of 5500 East and 2200 North in Eden, go south for 0.35 miles, then turn left and go 0.75 miles east to the Huntsville Stake Center. Continue east 0.2 miles to the gate of Bar B Ranch. Turn left through the gate and go 0.9 miles north up the ranch road past a farm house on the left to another gate. Park here and walk through this gate 0.2 miles to a road along a canal. Turn left and walk 0.1 miles north to a dirt road, then turn right and go 0.55 miles to the high tension power lines. Just to the east is power pole # 474. From pole 474, walk 1/3 of a mile at 11 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline is marked by a 4-foot rebar stake (tagged #7026) located 100 feet down from the oak edge and 100 feet southwest of a large maple. The baseline runs 161 degrees magnetic.





Map Name: Huntsville

Diagrammatic Sketch

Township 7N , Range 2E , Section 30

UTM NAD 27, UTM 12T 4573966 N 435053 E

DISCUSSION

Geertsen Canyon - Trend Study No. 3-18

Study Information

This study samples a mountain big sagebrush/grass community located on a hillside north of the mouth of Geertsen Canyon (elevation 5,600 feet, slope 25%, aspect southwest). This study is on the Wolf Creek conservation easement that is managed by the DWR for wildlife and recreation. The area has been heavily grazed by horses and cattle in the past, but livestock use has been light since 2001. The Geertsen Hollow area is known for a concentrations of wintering deer. The permanent nearby pellet group transect has measured high levels of use in the past. The average from 1980-85 was 39 deer days use/acre (97 ddu/ha), the highest on the herd unit (Jense et al. 1985). Two deer antlers and one large elk antler were found during the 1985 reading. In 1996, elk pellet frequencies were moderate (27% quadrat frequency), while those of deer were low (4%). Pellet group data in 2001 was estimated at 13 elk, 15 deer, and 3 cow days use/acre (31 edu/ha, 36 ddu/ha, and 7 cdu/ha). Wild turkeys were seen on the hike into the study in 2001. Pellet group data from 2006 was estimated at 5 elk, 25 deer, and 13 cow days use/acre (13edu/ha, 61 ddu/ha, and 32 cdu/ha).

Soil

The soil is classified in the Yeates Hollow series, which consists of deep, well drained, slowly permeable soils that formed in alluvium, colluvium and residuum from conglomerate, sandstone and quartzite. These soils are on fan remnants, hills, and mountain slopes (USDA-NRCS 2006). Soils are extremely rocky on the surface and throughout the profile. Rocks average 15% of the surface cover. Due to the rocky nature of the soil, effective rooting depth was estimated at less than 6 inches. The soil has a sandy clay loam to clay loam texture and is slightly acidic in reactivity (pH of 6.2). The hazard of erosion is high if unprotected, but the area has an adequate covering of vegetation and litter. An erosion condition classification determined soils to be in stable condition in 2001 and 2006. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground is high at 8 to 1.

Browse

Mountain big sagebrush is the only key browse species and has averaged just over 2% cover since 1996. Density for mature and decadent plants increased from 720 plant/acre in 1996 to 1,020 plants/acre in 2001 and had a very abundant young population in 1996. Density remained similar in 2006, but 35% of the population was classified as decadent and dying. These high values may lower sagebrush densities in the future, unless young recruitment increases to offset the possible loss. Young recruitment in 2001 and 2006 was low at less than 4% of the population. Sagebrush reproduction may be difficult with shallow-rocky soils and with competition with weedy annuals. Use has been light to moderate since 1996 with good vigor, until 2006 when 41% of the population displayed poor vigor. The mountain big sagebrush exhibits a rather low growth form, most likely due to the shallow-rocky soils. Mature sagebrush have averaged 1.5 feet tall by 2 feet wide. Average leader growth was 2.5 inches in 2001 and 3 inches in 2006.

Oak and maple are found further up the slope and along the creek. Some of the oak and junipers nearby have been high-lined. Broom snakeweed was sampled in 1996 with the larger sample size.

Herbaceous Understory

The herbaceous vegetation accounts for most of the cover on the site. However, composition is extremely poor. Bulbous bluegrass has been the most abundant perennial grass since 1985. In 1985, cover averaged 32% and increased to 42% in 2001 and 2006. This species alone accounts for over half of the vegetation cover. Bulbous bluegrass can provide early spring forage and fair erosion control. Like cheatgrass, it dries up early in the season and can form a dense mat when abundant. It can become highly competitive and exclude desirable perennial grasses and forbs, including shrubs. Other, more high-yielding, long-lived perennial species are few. These include: bluebunch wheatgrass, thickspike wheatgrass, Kentucky bluegrass, and Letterman needlegrass. Japanese brome has been very abundant since 1996, while cheatgrass has remained

low.

Forb composition is extremely poor. Many of the common forbs are considered weeds, although they may provide some big game forage in the spring. Weedy increasers include ragweed, pacific aster, tarweed, curlycup gumweed, yellow salsify, and moth Mullen. The noxious weed, Dyer's woad, is present in small numbers. Annual forbs are very abundant, especially storksbill, which reached a high in 2001 at 16% cover. Tarweed was abundant in 1996 and 2006, but had significantly decreased in 2001. Tarweed produces toxic agents that reduce grass seed germination (Goodrich 1999). It was reported in the summer of 1985 that caterpillars and grasshoppers did considerable damage to the herbaceous vegetation. In 1996, some of the yellow salsify was utilized, most likely by elk.

1990 TREND ASSESSMENT

Mountain big sagebrush has a downward trend. Compared to 1985, there are substantially fewer young sagebrush and a large increase in decadent plants, which has gone from 10% to 77% of the population. Increased decadence, reduced vigor, and low growth is due mostly to moisture stress. Trend for grasses is stable. Bulbous bluegrass forms a dense mat and almost completely covers the ground. Other grasses are relatively uncommon. Trend for forbs is stable. Nested frequency remained similar to 1985, when the unknown perennial forb is removed. The unknown perennial forb is believed to be tarweed, an annual. Data collected in 1990 did not include sampling annual species.

browse - down (-2) grasses - stable (0) forbs - stable (0)

1996 TREND ASSESSMENT

Trend for mountain big sagebrush is up due to an increase in density, a decline in decadence, and an improvement in vigor. The stand contains an adequate number of seedlings and abundant young plants. Utilization is currently light to moderate. Trend for grasses is stable. However, composition is extremely poor. The grass component is dominated by bulbous bluegrass and annual brome grasses which combine to produce 97% of the grass cover. Sum of nested frequency for perennial grasses is similar to 1990 estimates. Trend for forbs is slightly down. Two perennial species that increased significantly were yellow salsify and hoary aster. The forb composition is poor with undesirable weeds dominating the understory. It appears that tarweed was present in 1985, but was identified as an unknown forb. In 1990, tarweed was likely present but not counted because it is an annual. Sum of nested frequency of perennial forbs has increased dramatically, but most are undesirable weeds including ragweed, curlycup gumweed, and pacific aster. The Desirable Components Index rated this site as very poor with a score of 8 due to low browse cover, low perennial grass cover excluding bulbous bluegrass, and moderate annual grass cover.

winter range condition (DC Index) - very poor (8) Mid Potential scale
browse - up (+2) grasses - stable (0) forbs - slightly down (-1)

2001 TREND ASSESSMENT

Trend for the key browse, mountain big sagebrush, is slightly down. Recruitment from young plants decreased from 61% in 1996 to 0% in 2001. Strip frequency of sagebrush decreased from 41% to 30%, and percent decadence increased slightly to 16%. A decline in strip frequency is due most likely to the loss of young plants in the population which is a result of drought and high competition from the abundant and weedy understory. Better precipitation in the future may help increase the number of young plants somewhat, but the young plants will likely have a difficult time persisting due to the dominance of bulbous bluegrass. Trend for the grasses is stable, but remains in poor condition as bulbous bluegrass continues to dominate the site. Desired perennial grasses are present in low numbers and will likely not increase. Trend for forbs is slightly up. Forbs are dominated by annuals and weedy perennials. Perennial forbs decreased in sum of nested frequency, which included yellow salsify and pacific aster. Tarweed also decreased significantly. The Desirable Components Index rated this site as very poor with a score of 15 due to low browse cover, low

perennial grass cover excluding bulbous bluegrass, and moderate annual grass cover.

winter range condition (DC Index) - very poor (15) Mid Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - slightly up (+1)

2006 TREND ASSESSMENT

Trend for the key browse mountain big sagebrush is slightly down. Density of sagebrush remained similar to 2001, although dying plants increased from 6% in 2001 to 35% of population in 2006. Young recruitment stayed low at 4% of the population and is not enough to replace those plants that were classified as dying. Trend for grasses is stable. Bulbous bluegrass continues to dominate the herbaceous understory. Other higher value perennial grasses are few in number. Trend for forbs is slightly down. Perennial forb sum of nested frequency increased, but was most due to tarweed and ragweed, two weedy species. Tarweed also increased significantly. The Desirable Components Index rated this site as very poor with a score of 17 due to low browse cover, low perennial grass cover excluding bulbous bluegrass, and moderate annual grass and forb cover.

winter range condition (DC Index) - very poor (17) Mid Potential scale
browse - slightly down (-1) grasses - stable (0) forbs - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 03 , Study no: 18

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	3	-	1	-	2	.00	-	.00
G	Agropyron spicatum	a-	b11	ab2	ab5	ab8	.18	.44	.59
G	Bromus inermis	-	-	-	-	5	-	-	.18
G	Bromus japonicus (a)	-	-	c328	a211	b269	8.00	3.34	5.65
G	Bromus tectorum (a)	-	-	29	9	25	.29	.07	.11
G	Danthonia californica	-	-	-	4	4	-	.06	.18
G	Danthonia unispicata	-	-	-	-	4	-	-	.15
G	Melica bulbosa	-	-	-	-	4	-	-	.03
G	Poa bulbosa	366	355	365	361	354	32.20	42.65	41.71
G	Poa pratensis	a-	a-	a5	b15	ab11	.03	.08	.06
G	Poa secunda	5	14	14	18	10	.02	.40	.12
G	Stipa lettermani	a-	a-	b28	ab11	b18	.96	.42	.74
Total for Annual Grasses		0	0	357	220	294	8.29	3.42	5.77
Total for Perennial Grasses		374	380	415	414	420	33.41	44.06	43.79
Total for Grasses		374	380	772	634	714	41.71	47.48	49.57
F	Achillea millefolium	a12	ab13	b32	ab14	a7	.38	.31	.51
F	Agoseris glauca	1	5	3	1	6	.00	.00	.05
F	Allium sp.	b12	a-	a-	a-	ab2	-	-	.00
F	Ambrosia psilostachya	b97	a11	b125	b102	c239	2.45	1.58	9.12
F	Artemisia ludoviciana	39	24	35	41	24	.79	1.74	1.08

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
F	Astragalus beckwithii	-	-	-	-	3	-	-	.18
F	Aster chilensis	$_{a}$-	$_{b}$121	$_{c}$199	$_{bc}$170	$_{c}$205	4.63	3.09	7.36
F	Calochortus nuttallii	-	-	-	-	-	-	.00	-
F	Cirsium sp.	-	-	2	-	-	.00	-	-
F	Collomia linearis (a)	-	-	10	6	1	.21	.04	.03
F	Comandra pallida	-	-	-	3	-	-	.03	-
F	Crepis acuminata	-	-	-	-	-	-	.03	-
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{b}$41	$_{c}$163	-	.10	1.10
F	Erodium cicutarium (a)	$_{b}$19	$_{a}$-	$_{b}$29	$_{d}$301	$_{c}$176	.23	16.00	1.84
F	Erigeron strigosis	$_{ab}$10	$_{a}$-	$_{ab}$3	$_{b}$10	$_{ab}$3	.03	.05	.15
F	Eriogonum umbellatum	-	1	-	-	-	-	-	-
F	Galium sp.	-	-	-	-	2	-	-	.00
F	Grindelia squarrosa	$_{a}$-	$_{a}$1	$_{b}$30	$_{a}$-	$_{b}$40	.50	-	1.54
F	Helianthus annuus (a)	-	-	-	-	3	-	-	.00
F	Isatis tinctoria	-	-	1	-	3	.06	-	.03
F	Lappula occidentalis (a)	-	-	$_{b}$19	$_{a}$-	$_{ab}$8	.21	-	.02
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{c}$45	$_{c}$66	$_{b}$20	.20	1.44	.27
F	Lomatium ambiguum	$_{a}$-	$_{ab}$5	$_{a}$1	$_{ab}$6	$_{b}$14	.00	.18	1.17
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$190	$_{a}$-	$_{a}$-	1.07	-	-
F	Madia glomerata (a)	-	-	$_{b}$269	$_{a}$55	$_{b}$231	3.99	.24	7.11
F	Melilotus officinalis	-	-	-	3	5	-	.03	.15
F	Navarretia intertexta (a)	-	-	-	-	2	-	-	.00
F	Phlox longifolia	-	-	-	2	-	-	.00	-
F	Polygonum douglasii (a)	-	-	2	-	3	.00	-	.00
F	Ranunculus testiculatus (a)	-	-	-	2	-	-	.00	-
F	Rumex crispus	-	-	2	1	-	.03	.04	-
F	Taraxacum officinale	-	-	-	4	-	-	.01	-
F	Tragopogon dubius	$_{b}$26	$_{a}$5	$_{c}$126	$_{ab}$12	$_{ab}$33	1.43	.11	.29
F	Unknown forb-perennial 2	$_{b}$166	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Unknown forb-perennial	$_{b}$171	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Veronica biloba (a)	-	-	-	-	4	-	-	.33
F	Verbascum blattaria	$_{a}$3	$_{a}$-	$_{b}$33	$_{ab}$16	$_{ab}$21	.79	.20	.91
Total for Annual Forbs		19	0	329	405	591	4.65	16.39	10.46
Total for Perennial Forbs		537	186	827	451	627	12.40	8.88	22.89
Total for Forbs		556	186	1156	856	1218	17.06	25.28	33.35

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

BROWSE TRENDS --
Management unit 03 , Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	41	30	26	2.25	2.86	1.93
B	Gutierrezia sarothrae	12	0	6	.24	-	.53
Total for Browse		53	30	32	2.49	2.86	2.46

CANOPY COVER, LINE INTERCEPT --
Management unit 03 , Study no: 18

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	3.68
Gutierrezia sarothrae	.16

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 03 , Study no: 18

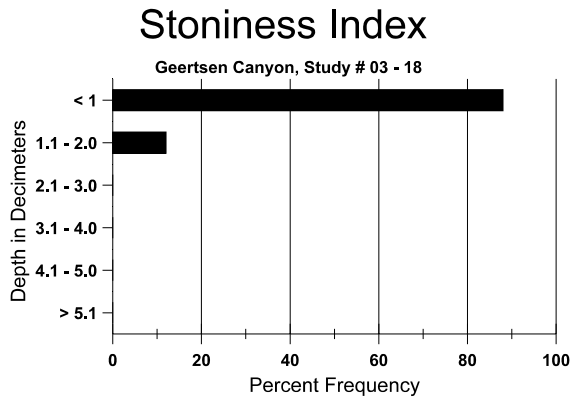
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.5	2.9

BASIC COVER --
Management unit 03 , Study no: 18

Cover Type	Average Cover %				
	'85	'90	'96	'01	'06
Vegetation	16.75	7.75	62.06	70.66	73.15
Rock	11.25	10.25	11.92	13.47	16.10
Pavement	4.25	4.25	.96	.93	.66
Litter	48.50	65.50	35.29	32.29	19.60
Cryptogams	1.00	.25	.04	0	.23
Bare Ground	18.25	12.00	1.08	1.07	1.68

SOIL ANALYSIS DATA --
Herd Unit 03, Study no: 18, Geertsen Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
5.6	79.8 (4.22)	6.2	44.7	27.0	28.3	3.0	14.5	153.6	0.6



PELLET GROUP DATA --
Management unit 03 , Study no: 18

Type	Quadrat Frequency				
	'85	'90	'96	'01	'06
Elk	-	-	27	2	5
Deer	-	-	4	11	4
Cattle	-	-	4	7	4

Days use per acre (ha)	
'01	'06
13 (31)	5 (13)
15 (36)	25 (61)
3 (7)	13 (32)

BROWSE CHARACTERISTICS --
Management unit 03 , Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	58/75
Artemisia tridentata vaseyana												
85	**1999**	66	533	1266	200	-	3	0	10	-	3	19/22
90	**1132**	-	133	133	866	-	24	0	77	21	71	12/16
96	**1860**	140	1140	600	120	260	22	3	6	2	6	18/38
01	**1020**	-	-	860	160	100	57	2	16	6	6	17/24
06	**980**	40	40	600	340	360	31	16	35	35	41	16/26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**740**	60	180	560	-	-	0	0	-	-	0	11/16
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**120**	-	-	120	-	40	0	0	-	-	0	13/20
Rosa woodsii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	22/21

SUMMARY

WILDLIFE MANAGEMENT UNIT - 3 - OGDEN

A major factor influencing vegetative trends is precipitation. Precipitation data from Pine View Dam, Weber Basin Pump Plant #3, and Brigham City Waste show alternating wet and dry cycles since the range trend study sites were first established in 1984 (Fig. 1). Drought conditions (less than 75% of annual precipitation) were experienced in 1989, 1990, 1992, 2002, and 2003. From 1999 to 2003, precipitation was less than 90% normal. Spring (April-June) precipitation was less than 75% of normal in 1985, 1989, 1992, 1994, and 2000 (Utah Climate Summaries 2006). Spring precipitation is essential for shrub and perennial grass and forb recruitment. Lower than normal precipitation, especially in consecutive years, likely plays a primary role in

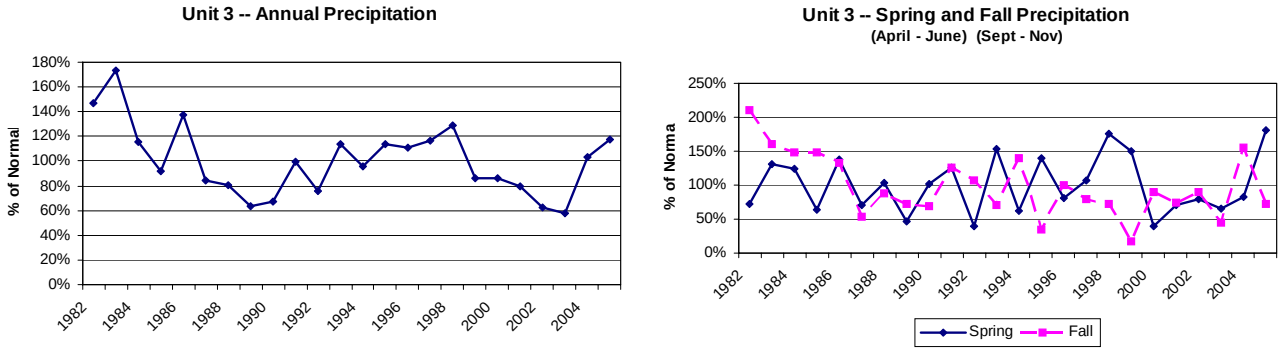


Figure 1. Annual precipitation (left) and Spring/Fall precipitation (right) for the Odgen unit using precipitation from weather stations at Pine View Dam, Weber Basin Pump Plant # 3, and Brigham City Waste.

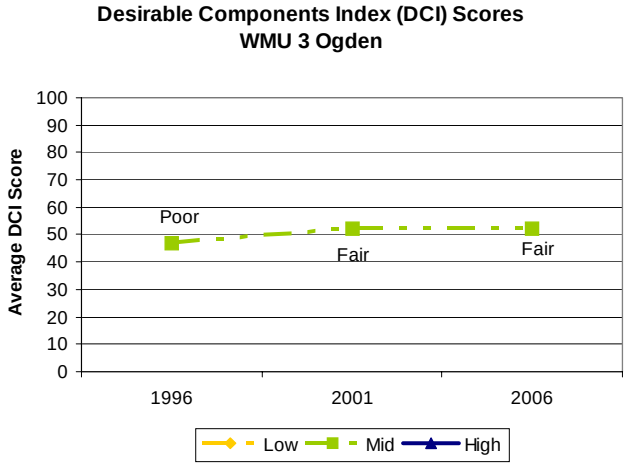


Figure 2. The Desirable Components Index Ratings are divided into three categories because of different ecological potential, these include: low, mid, and high potential categories.

The browse trend (Fig. 3) increased in 1996, but since then has continually been decreasing. In 2006, 2 of the 6 studies had downward trends, 2 were stable, and 2 had upward trends. Density of mountain big sagebrush (Fig. 4) on average has been decreasing increased decadence and decreased reproduction in shrub populations, primarily big sagebrush.

The Desirable Component Index (DCI) for the Ogden unit averaged a poor to fair rating from 1996 to 2006 for mid potential studies (Fig. 2). Preferred browse cover has remained at moderate levels with a slight decrease in 2006. Moderate decadence on shrubs like sagebrush has kept the score at lower levels. Although cheatgrass cover has decreased with each observation since 1996. High annual grass cover and noxious weeds continue to be a major factor in negatively affecting the score.

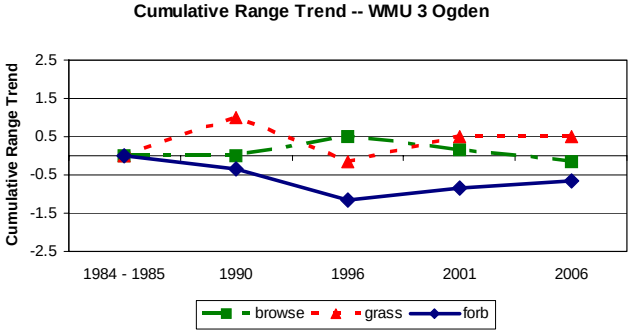


Figure 3. Cumulative Range Trend for WMU 3 Ogden.

since 1996, while percent decadence has been increasing (Fig. 5). Cover increased in 2001, but decreased to its lowest level in 2006 (Fig. 6). Perennial grasses and forbs have been up since 1996. Cheatgrass has shown decreases in cover and nested frequency and this may be due to the competitive influence of increasing bulbous bluegrass (Figs. 7 and 8).

A common trend in the Ogden unit was a continual increase of bulbous bluegrass nested frequency from 1984 to 2006 (Fig. 9). This occurred on 5 of the 6 studies. Geertsen Canyon (3-18) did not have an increasing bulbous bluegrass nested frequency trend, but has had a high nested frequency value since 1984. This species is a low value perennial that has many characteristics of annual species. It is highly competitive, has low forage value after spring, and can increase the fire hazard when overly abundant. Studies in this unit have the added problem of poor forb composition. Weedy increasers, both annual and perennial species, are widespread and make up the majority of the forb component on most of the sites in the Ogden unit. These species include ragweed, prickly lettuce, western yarrow, pacific aster, tarweed, curlycup gumweed, thistle, storksbill, and dyer's woad. Dyer's woad is a noxious weed and is spreading rapidly in some areas of the unit.

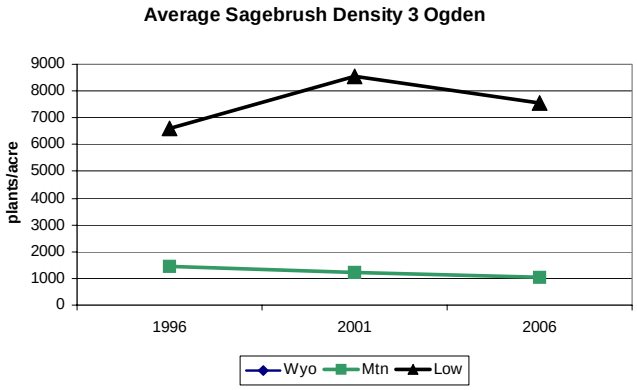


Figure 4. Average sagebrush density for mountain big sagebrush and low sagebrush for WMU 3 Ogden.

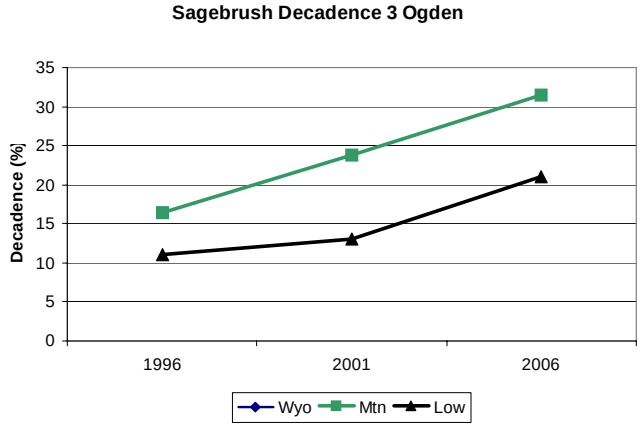


Figure 5. Average percent decadence for sagebrush for WMU 3 Ogden.

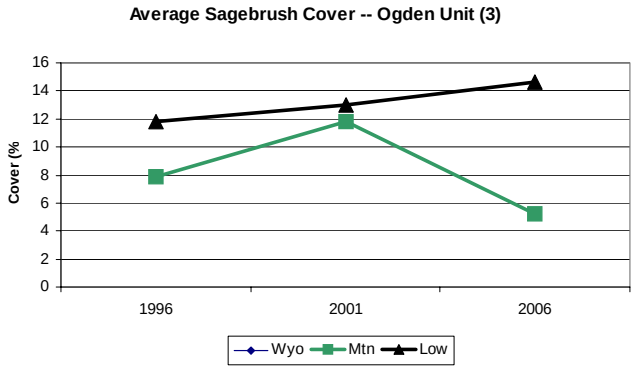


Figure 6. Average percent sagebrush cover for WMU 3 Ogden.

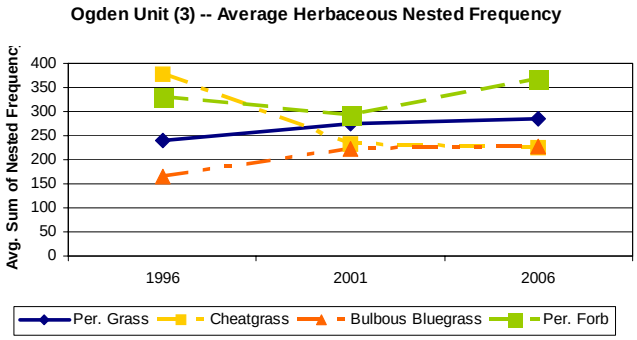


Figure 7. Average herbaceous nested frequency for WMU 3 Ogden.

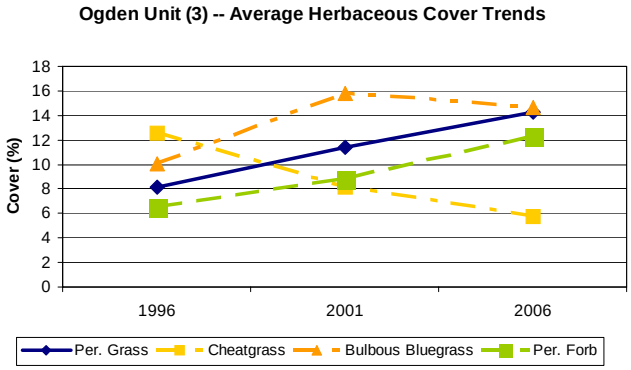


Figure 8. Average herbaceous cover for WMU 3 Ogden.

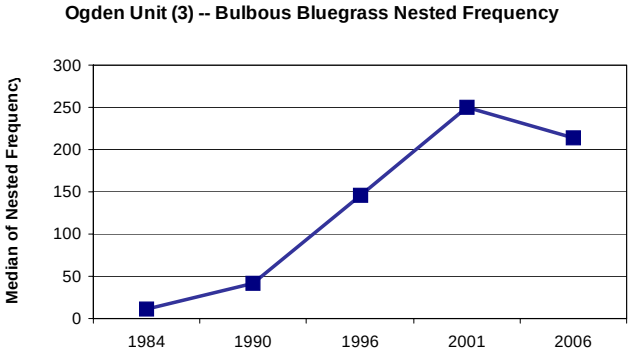
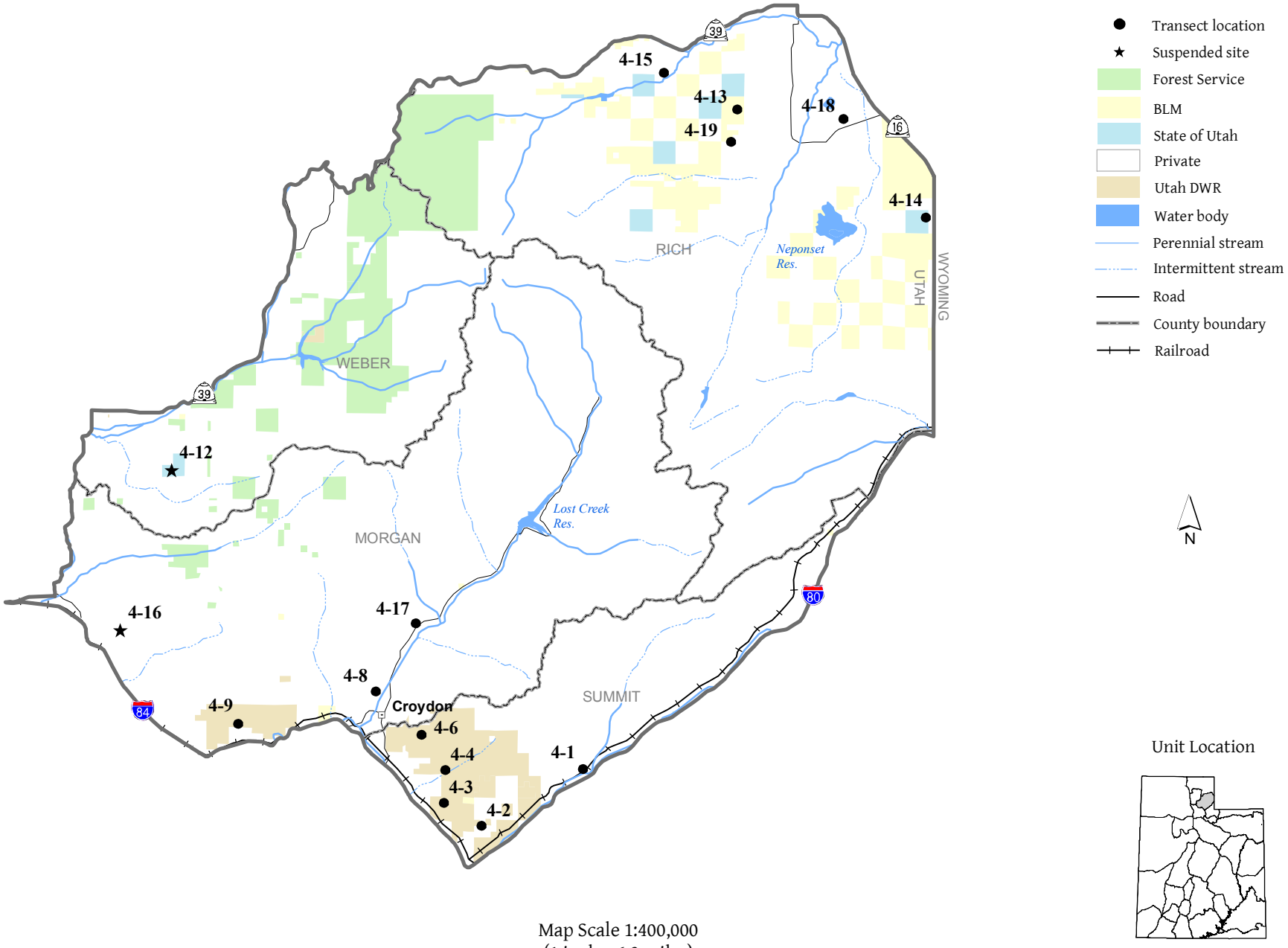


Figure 9. Median sum of nested frequency for bulbous bluegrass for WMU 3 Ogden.

Management Unit 4



Map Scale 1:400,000
(1 inch = 6.3 miles)

MANAGEMENT UNIT - 4 - MORGAN RICH

Boundary Description

Morgan, Rich, Summit and Weber counties - Boundary begins at the junction of I-80 and I-84 near Echo, Utah; northeast on I-80 to the Utah-Wyoming state line; north along this state line to SR-16; north on SR-16 to SR-39 near Woodruff; west along SR-39 to SR-167 (Trappers Loop road); south on SR-167 to SR-30 at Mountain Green; west on SR-30 to I-84; east on I-84 to I-80 and beginning point.

Unit Description

In 1993, unit boundaries were changed and unit 4 was created from parts of the old units 5, 6 and 7. The new unit incorporates a section of Weber county southeast of Huntsville, the northern halves of Morgan and Summit counties, and the southern portion of Rich county southwest of Woodruff. Municipalities along the unit boundaries include Woodruff, Huntsville, Mountain Green, Croydon and Echo.

Eight of the 13 study sites in the unit occur along the I-84 corridor on critical winter range. Most winter range is located in the major drainages and on the slopes north of the Weber River. A detached, smaller wintering area is found on the south-facing slopes above Cottonwood Creek. These are the areas highly developed. Highway I-80 and I-84, which run through Echo Canyon and along the Weber River, form the unit's southern boundary. There are several towns along the highways. Surrounding Croydon, the majority of the Lost Creek bottoms have been converted to alfalfa fields. Lost Creek Reservoir, managed by the Division of Parks and Recreation, is primitively developed and the road is not maintained in winter. However, approximately 1,320 snowmobilers, winter fishermen, and other recreationists used the facilities during the 1985 winter months. Two areas of land in the unit are managed by the Division of Wildlife Resources. The Round Valley WMA is north of I-84, just east of Morgan. The Henefer-Echo WMA is located east of Henefer and is managed primarily as a big game habitat. Controlled grazing, vehicle restrictions, and revegetation projects are major management tools in this area.

Earlier inventory studies described six vegetation types. The sagebrush type is most common and is found over the whole area. It forms part of a continuum, based on moisture conditions, between the mountain browse/sagebrush and mountain browse types. The lower elevation sagebrush and mountain browse/sagebrush types are productive and utilized heavily by deer, while the mountain browse type mostly provides cover and is unavailable in many winters. The other vegetation types occupy comparatively little area, but have the potential to increase. Burns occur frequently in the unit and, unless seeded, production of desirable species is very low. Deer use the burned areas infrequently, possibly because of lack of cover. A small population of mahogany is in Cottonwood Canyon, but it is important to wintering deer. The scattered juniper areas are also important in providing thermal cover, but provide little forage.

In severe winters, the area of available winter range is greatly reduced. The upper limit is 6,500 feet on most of the unit. The available acreage of all vegetation types, except agricultural land, is reduced during severe winters. All range trend studies in the unit were established on winter range. Most studies sample critical and/or heavily used areas.

The Lost Creek, Weber River, and Echo Canyon areas are traditional deer wintering areas. There is considerable migration both from higher elevations in the unit and from other herd units to this area, especially during severe winters. The largest number of deer probably come from the East Canyon unit, where deer summer on the east side of the Wasatch Mountains. Development in Morgan Valley is disrupting this migration route. Deer also come from the Ogden and Coalville units which also have adequate summer range, but limited winter range.

Big Game Trends

The Lost Creek area provides critical habitat for wintering big game. The abundance of summer range, high productivity of the herds, and generally increasing numbers of big game lead to heavy use on this limited

winter range. Development, the predominance of private land, and heavy impact from both livestock and big game has led to problems every winter. Approximately 86% of the deer summer range and 80% of the winter range is privately owned.

The current management objective is to maintain a winter herd population of approximately 12,000 deer with a post season minimum classification of 20 bucks per 100 does. Of those bucks, 30% should be 3-point or better. The management objective for elk is to achieve a target winter herd of 3,500 elk with a minimum of 40 bulls per 100 cows. Of those bulls, 50% will be 2 ½ years of age or older (1998 Utah Big Game Management Plan).

Study Site Description

Thirteen trend study sites were read in 2006. Eight of these sites were originally established in 1984, 2 were established in 1990, 3 additional sites were added in 1996, and 2 sites were established in 1997. All trend studies monitor big game winter range. Maps, trend assessments, and data for each study site follow. It should be noted that precipitation was above normal prior to the establishment of trend studies in 1984 (See Figure 1 in the Summary). Precipitation data from Morgan show above-normal annual precipitation from 1982-1984. Precipitation was below normal during the 1990 readings and dry conditions prevailed from 1987 to 1994 at Morgan. Above normal precipitation was received during 1996 when the studies were reread. Dry conditions returned in 1999 and continued until 2001. Spring precipitation was poor in both 2000 and 2001. Annual precipitation was at or below drought conditions (75% of normal) in 2002 and 2003. In 2005, annual precipitation was normal for weather stations in unit 4 (Utah climate summaries 2006). The precipitation patterns for the unit between the years of 2001 and 2006 are covered in more detail in the unit summary.

Trend Study 4-1-06

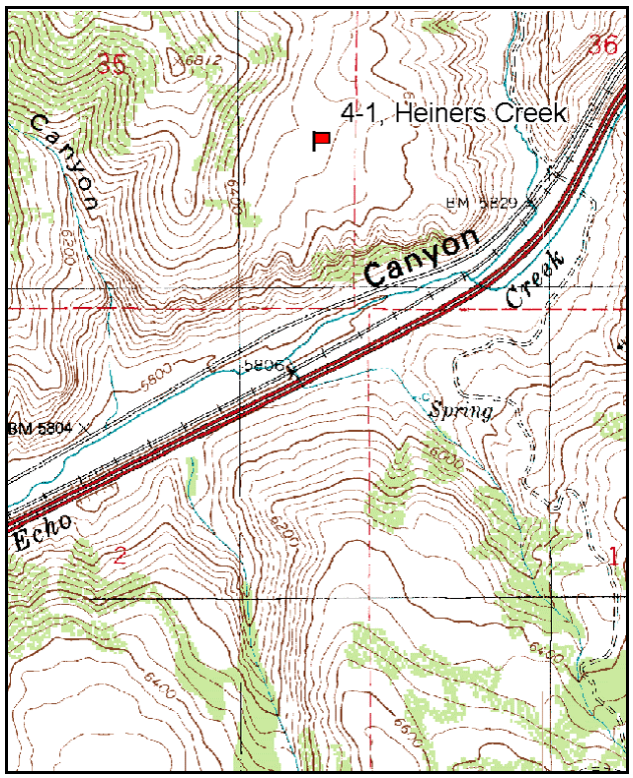
Study site name: Heiner's Creek . Vegetation type: Mountain Brush .

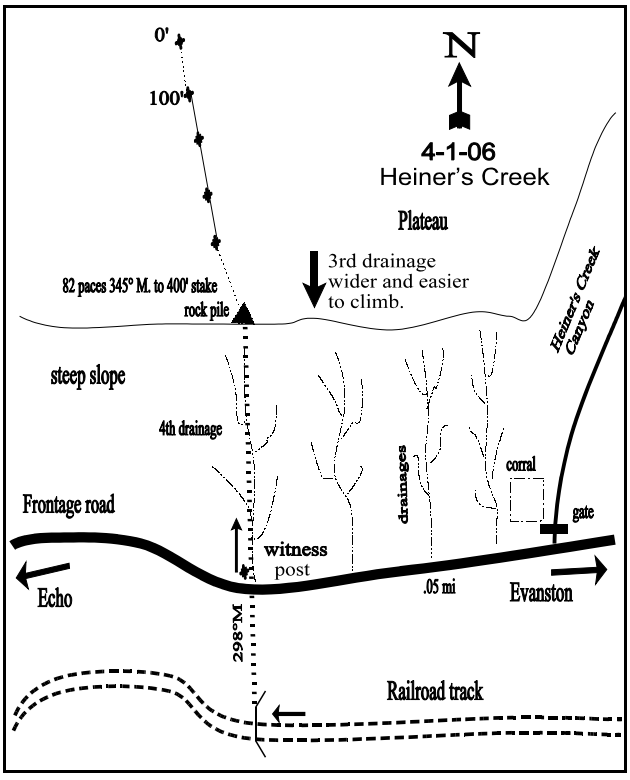
Compass bearing: frequency baseline 164 degrees magnetic

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

LOCATION DESCRIPTION

From exit 169 on I-80, travel 6.2 miles northeast on the frontage road to a witness post on the north side of the road next to a large rock. Hike up the third drainage west of Heiner's Creek. This drainage is wider and easier to hike up. Once on the top of the bench walk west to the head of the next drainage to the west. The 400-foot stake is located at the head of this gully. The 0-foot baseline stake is 400 feet to the north at a bearing of 326 degrees magnetic. Browse tag #7941.





Map Name: Heiner's Creek Diagrammatic Sketch

Township 4N , Range 5E , Section 35 UTM NAD 27, UTM 12T 4542443 N 471242 E

DISCUSSION

Heiner's Creek - Trend Study No. 4-1

Study Information

This study samples critical deer winter range on the north side of Echo Canyon, just west of Heiner's Creek (elevation: 6,300 feet, slope: 10%, aspect: southeast). It is located above the steep bluffs, or cliffs, prevalent in Echo Canyon. The range type is mixed mountain brush, which appears to have been burned prior to the 1984 reading. After the fire, the dominant community changed from increaser species to mountain big sagebrush. The area is considered important winter range for deer and, to a lesser extent, elk. It is also used by cattle during the summer and had been heavily utilized by cattle prior to the 1996 reading. Pellet group data in 2001 estimated 2 elk, 41 deer, and 5 cow days use/acre (5 edu/ha, 101 ddu/ha, and 13 cdu/acre). Pellet group data from 2006 estimated 16 elk, 46 deer, and 6 cow days use/acre (40 edu/ha, 112 ddu/ha, and 14 cdu/ha). Most of the deer pellet groups appear to be from winter or early spring use.

Soil

The soil is in the Fewkes series which consists of very deep, well drained soils that formed in slope alluvium, residuum, and colluvium derived from quarzite, sandstone, and shale (USDA-NRCS 2006). It has a clay loam texture with a neutral soil reaction (pH of 6.6). A compacted clay horizon was estimated at 10 inches below the surface. There are abundant signs of soil movement, including soil pedestalling around shrubs, rills, and an active gully near the end of the base line. However, much of the exposed bare ground is not connected due to the moderately abundant herbaceous cover. The relative bare ground cover was 19% in 1996 and 22% in 2001 and 2006. The soil erosion condition class was determined to be moderate in 2001 and 2006.

Browse

The key browse species is mountain big sagebrush with scattered antelope bitterbrush and serviceberry. Mountain big sagebrush density was about 300 plants/acre in both 1984 and 1990, all of which were remnants of the fire. Most of these shrubs were classified as mature. Due to the larger sample size used in 1996, accuracy for estimating shrub densities with clumped or discontinuous distributions was greatly improved. As a result of these changes in methods and some recovery from the fire, the estimated density of sagebrush increased to 1,060 plants/acre in 1996. Nearly 80% were classified as mature plants and only 2% were classified as decadent. Seedlings and young were abundant. The shrub density increased to 4,120 plants/acre by 2001 (a 74% increase); young plants provided 2,740 plants/acre (67% of the population). In 2006, the sagebrush density increased again to 4,360 plants/acre, 50% of which were classified as mature. Because of the high recruitment, many of the mature individuals were relatively small and had recently begun flowering. Use has continued to be light, vigor normal, and decadence low.

Bitterbrush individuals are scarce with only 33 plants/acre estimated in 1990, 100 plants/acre in 1996 and 2001, and 40 plants/acre in 2006. These shrubs were very heavily utilized in 1990. During the 1996 reading no bitterbrush were producing seed and 40% were heavily hedged. Due to the heavy use and dry conditions in the late 1980's and early 1990's, 20% displayed poor vigor. Use of bitterbrush was moderate to heavy and no seeds were identified in 2001, but vigor improved. Use in 2006 was heavy. Serviceberry also occurs in limited numbers and had an estimated density of 80 plants/acre in 1996, 320 plants/acre in 2001, then 100 plants/acre in 2006. Most plants have showed light use, but utilization was heavy in 2006.

The most abundant shrubs are increaser species, Woods rose and stickyleaf low rabbitbrush. These shrubs provided the bulk of browse forage. Stickyleaf low rabbitbrush cover has decreased steadily from 22% in 1996, to 20% in 2001, to 14% in 2006. The rabbitbrush population density was about 14,500 plants/acre in 1996 and 2001, and 13,180 plants/acre in 2006 . The population displayed a 61% increase from 1990 to 1996, partly due to the increased sample size. Woods rose is also abundant, but has only provided about 2% cover. The population density has ranged from 8,565 plants/acre in 1990 to 3,780 plants/acre in 1996. The bulk of the population has consistently been within the young age class.

Herbaceous Understory

The herbaceous understory vegetation is patchy and includes several low-growing weedy species. Grasses are diverse and abundant and provided 12% cover in 1996, 20% in 2001, and 17% in 2006. Common grasses include bluebunch wheatgrass, Sandberg bluegrass, mutton bluegrass, and Kentucky bluegrass. Forb diversity was low in 1984 (after the fire) with 12 sampled species, but has steadily increased to 27 species in 2006. The most abundant perennial forbs have been western yarrow, pacific aster, thistle, and longleaf phlox. Bur buttercup was the most abundant annual forb in 2001 and 2006.

1990 TREND ASSESSMENT

Mountain big sagebrush has remained at a similar density to that of 1984. The mature sagebrush are vigorous and moderately to heavily hedged. Sagebrush canopy cover averages 3%. No seedling or young sagebrush were sampled. The few bitterbrush sampled were all heavily hedged. The increaser species, stickyleaf low rabbitbrush, has declined slightly in density. Trend for browse is stable. The grass trend is up. The sum of the nested frequency of perennial grasses increased 35%. The nested frequency of Sandberg bluegrass and mutton bluegrass increased significantly, but the nested frequency of bottlebrush squirreltail, bluebunch wheatgrass, and thickspike wheatgrass all decreased significantly. The forb trend is down. The nested frequency of perennial forbs decreased by 33%. The site is still recovering from the fire.

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

1996 TREND ASSESSMENT

Trend for browse is slightly up. Density has increased 72% since 1990, but this is partially due to the larger sample size used in 1996. Nonetheless, the sagebrush population increased substantially. Age class analysis indicates a slightly increasing population. Utilization is mostly light, vigor normal, and decadence low at only 2%. The other preferred browse, antelope bitterbrush and serviceberry, occur in small numbers and have received continued heavy use. The increaser, stickyleaf low rabbitbrush, still dominates by providing the majority of the browse cover. As with the sagebrush, much of the rabbitbrush density increase is due to the increase in sample size. The grass trend is slightly up. The nested frequency of perennial grasses increased 33%. This increase is due mainly to significantly increases in the nested frequencies of bluebunch wheatgrass, thickspike wheatgrass, and Kentucky bluegrass. Some of the increase is a product of the increased sample area. The forb trend is stable. The nested frequency of perennial forbs remained similar to that of 1990. The Desirable Components Index score is good due to moderate browse cover, low decadence, and high perennial grass cover.

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

2001 TREND ASSESSMENT

The trend for browse is up. Density has increased 74% from 1,060 plants/acre in 1996 to 4,120 plants/acre in 2001. In addition, young plants currently account for 67% of the population and seedlings are also numerous. This indicates an expanding population. Serviceberry and bitterbrush still occur in limited numbers but they do provide some additional browse forage. Serviceberry has increased in density while bitterbrush has remained stable. The increaser, stickyleaf low rabbitbrush is still the most abundant species with a stable population of 14,840 plants/acre. The grass trend is slightly down. The nested frequency of perennial grasses decreased 18%. Much of this loss was in the nested frequency of bluebunch wheatgrass, thickspike wheatgrass, and mutton bluegrass. However, cheatgrass nested frequency decreased significantly. The forb trend is slightly up. The nested frequency of perennial forbs increased by 44%, but some of the increases were in species which are less desirable for big game. The undesirable bur buttercup increased significantly in nested frequency. The Desirable Components Index score improved to excellent due to increases in browse cover, young individuals, and perennial grass and forb cover.

winter range condition (DC Index) - excellent (84) Mid-level potential scale
browse - up (+2) grass - slightly down (-1) forb - slightly up (+1)

2006 TREND ASSESSMENT

The trend for browse is stable. The mountain big sagebrush density remained unchanged, but shifted from a predominantly young population to one more mature. Fifty percent of the population was classified as mature, as opposed to 31% in 2001. Bitterbrush and serviceberry densities continued to be low. The grass trend is slightly up. The nested frequency of perennial forbs increased 15% and cheatgrass nested frequency remained unchanged. The forb trend is stable. The nested frequency and composition of perennial forbs remained similar. The Desirable Components Index score remained excellent.

winter range condition (DC Index) - excellent (95) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 1

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{b}$41	$_{a}$2	$_{cd}$92	$_{bc}$68	$_{d}$98	.55	.71	1.28
G	Agropyron spicatum	$_{c}$169	$_{a}$69	$_{c}$130	$_{ab}$80	$_{bc}$108	2.67	3.33	2.97
G	Bromus tectorum (a)	-	-	$_{b}$140	$_{a}$61	$_{a}$69	1.60	.80	.26
G	Carex sp.	-	-	3	-	10	.03	-	.09
G	Elymus cinereus	3	1	9	6	8	.21	.18	.36
G	Koeleria cristata	1	3	3	9	7	.03	.10	.07
G	Melica bulbosa	-	-	3	-	-	.01	-	-
G	Poa fendleriana	$_{a}$14	$_{c}$152	$_{b}$88	$_{a}$19	$_{a}$38	1.73	.98	1.10
G	Poa pratensis	$_{a}$6	$_{a}$7	$_{b}$42	$_{b}$64	$_{b}$62	1.00	4.11	1.98
G	Poa secunda	$_{a}$82	$_{b}$208	$_{b}$209	$_{b}$249	$_{b}$229	5.17	10.55	8.90
G	Sitanion hystrix	$_{b}$14	$_{a}$3	$_{a}$1	$_{a}$1	$_{a}$-	.00	.00	-
G	Stipa comata	9	12	-	-	-	-	-	-
G	Stipa lettermani	$_{a}$-	$_{a}$-	$_{b}$30	$_{a}$6	$_{ab}$17	.66	.41	.22
Total for Annual Grasses		0	0	140	61	69	1.60	0.80	0.26
Total for Perennial Grasses		339	457	610	502	577	12.09	20.38	17.01
Total for Grasses		339	457	750	563	646	13.69	21.19	17.28
F	Achillea millefolium	$_{c}$137	$_{a}$40	$_{b}$71	$_{ab}$61	$_{a}$31	.80	.96	.59
F	Agoseris glauca	-	-	-	-	1	-	-	.00
F	Allium acuminatum	$_{bc}$54	$_{a}$-	$_{a}$2	$_{b}$32	$_{c}$63	.01	.18	.22
F	Antennaria rosea	4	2	1	5	-	.00	.03	-
F	Arabis sp.	$_{a}$5	$_{a}$2	$_{a}$4	$_{b}$45	$_{a}$14	.03	.18	.02
F	Artemisia ludoviciana	3	4	-	-	-	-	-	-
F	Aster chilensis	$_{a}$87	$_{a}$67	$_{ab}$100	$_{b}$128	$_{a}$91	1.87	2.64	3.00

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Astragalus convallarius	$_{a}$12	$_{a}$7	$_{a}$4	$_{a}$11	$_{b}$31	.01	.22	.41
F	Astragalus lentiginosus	-	2	-	6	8	-	.09	.30
F	Calochortus nuttallii	-	-	-	-	2	-	-	.00
F	Cirsium sp.	$_{ab}$13	$_{b}$31	$_{ab}$18	$_{a}$3	$_{a}$1	.52	.09	.01
F	Collomia linearis (a)	-	-	$_{a}$-	$_{b}$10	$_{ab}$6	-	.02	.01
F	Comandra pallida	$_{b}$68	$_{b}$51	$_{a}$4	$_{a}$18	$_{a}$4	.01	.09	.09
F	Collinsia parviflora (a)	-	-	$_{a}$5	$_{b}$118	$_{b}$123	.01	.46	.30
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$11	$_{c}$32	-	.19	.06
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$163	-	-	.47
F	Eriogonum umbellatum	$_{b}$19	$_{ab}$14	$_{ab}$10	$_{a}$5	$_{a}$7	.23	.09	.24
F	Hackelia patens	-	-	7	-	4	.06	-	.06
F	Helianthella uniflora	$_{b}$28	$_{b}$32	$_{a}$-	$_{a}$-	$_{a}$2	-	-	.03
F	Heterotheca villosa	-	-	3	-	-	.00	-	-
F	Lappula occidentalis (a)	-	-	-	4	-	-	.03	-
F	Lithospermum ruderale	-	-	1	1	1	.03	.15	.03
F	Lupinus argenteus	$_{a}$3	$_{a}$3	$_{ab}$11	$_{b}$39	$_{c}$49	.10	.78	1.12
F	Machaeranthera canescens	-	-	5	-	-	.01	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$16	$_{c}$134	-	.03	.39
F	Phlox longifolia	$_{a}$-	$_{b}$33	$_{bc}$52	$_{bc}$65	$_{c}$75	.14	.32	.30
F	Polygonum douglasii (a)	-	-	$_{c}$39	$_{a}$-	$_{b}$6	.12	-	.02
F	Ranunculus testiculatus (a)	-	-	$_{a}$105	$_{b}$194	$_{b}$220	.37	1.91	2.17
F	Senecio integerrimus	-	-	-	-	7	-	-	.09
F	Sphaeralcea coccinea	-	-	-	-	1	-	.03	.15
F	Taraxacum officinale	-	-	-	1	5	-	.00	.03
F	Tragopogon dubius	-	-	-	3	7	-	.00	.07
Total for Annual Forbs		0	0	149	353	684	0.50	2.67	3.45
Total for Perennial Forbs		433	288	293	423	404	3.88	5.88	6.80
Total for Forbs		433	288	442	776	1088	4.39	8.55	10.26

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

BROWSE TRENDS --
Management unit 04 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	4	7	4	.41	.71	1.03
B	Artemisia tridentata vaseyana	34	62	69	4.92	8.73	17.01
B	Chrysothamnus nauseosus albicaulis	1	1	0	.38	.38	-
B	Chrysothamnus viscidiflorus viscidiflorus	99	100	94	22.09	19.86	14.38
B	Purshia tridentata	5	4	2	.00	.00	.03
B	Rosa woodsii	29	30	31	1.77	1.62	2.40
B	Symphoricarpos oreophilus	8	8	8	.67	.53	.18
B	Tetradymia canescens	0	0	1	-	-	.03
Total for Browse		180	212	209	30.26	31.85	35.08

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 1

Species	Percent Cover '06
Amelanchier alnifolia	.43
Artemisia tridentata vaseyana	17.10
Chrysothamnus viscidiflorus viscidiflorus	17.95
Purshia tridentata	.18
Rosa woodsii	2.13
Symphoricarpos oreophilus	1.01

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 1

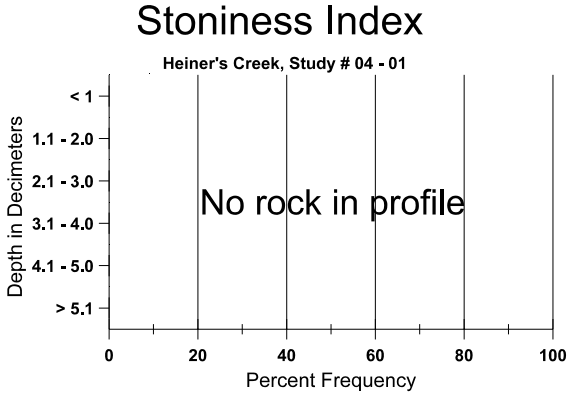
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	3.5	4.2
Artemisia tridentata vaseyana	3.3	2.1
Purshia tridentata	1.8	2.5

BASIC COVER --
Management unit 04 , Study no: 1

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	6.75	10.25	48.59	55.00	51.95
Rock	0	0	.14	.64	.10
Pavement	3.00	1.25	.72	.59	1.17
Litter	58.75	51.75	45.24	38.59	35.07
Cryptogams	.75	.75	.34	.31	1.85
Bare Ground	30.75	36.00	22.39	26.87	25.97

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 01, Heiner's Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.1	66.2 (14.1)	6.6	31.9	32.1	36.0	3.2	19.9	144.0	0.4



PELLET GROUP DATA --
Management unit 04 , Study no: 1

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	2	56
Horse	3	-	-
Elk	-	2	23
Deer	15	17	32
Cattle	1	2	4

Days use per acre (ha)	
'01	'06
-	-
-	-
1 (3)	16 (40)
41 (101)	46 (112)
5 (13)	6 (14)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**33**	-	-	33	-	-	0	0	-	-	0	14/20
96	**80**	-	20	60	-	-	0	25	-	-	0	18/30
01	**320**	-	140	180	-	-	31	6	-	-	0	20/27
06	**100**	-	40	60	-	-	40	60	-	-	0	28/39
Artemisia tridentata vaseyana												
84	**333**	-	133	200	-	-	0	0	0	-	0	19/17
90	**299**	-	-	266	33	-	22	33	11	-	0	24/23
96	**1060**	180	200	840	20	20	23	0	2	2	2	26/35
01	**4120**	1000	2740	1260	120	60	4	0	3	2	5	29/39
06	**4360**	760	1840	2180	340	80	15	2	8	3	4	25/38
Chrysothamnus nauseosus albicaulis												
84	**33**	-	-	33	-	-	0	0	0	-	0	20/31
90	**33**	-	-	-	33	-	0	0	100	-	0	-/-
96	**20**	-	-	-	20	-	0	0	100	-	0	25/35
01	**20**	-	-	20	-	-	0	0	0	-	0	18/24
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
84	**6899**	66	1033	5300	566	-	0	0	8	-	0	15/24
90	**5566**	-	1100	3500	966	-	7	0	17	-	0	11/15
96	**14240**	160	2060	11760	420	20	3	0	3	-	.28	14/23
01	**14840**	120	1240	13060	540	160	1	0	4	.13	.67	11/19
06	**13180**	120	1780	10580	820	100	5	0	6	2	2	10/18
Purshia tridentata												
84	**66**	-	-	66	-	-	100	0	-	-	0	8/21
90	**33**	-	-	33	-	-	0	100	-	-	0	13/39
96	**100**	-	40	60	-	-	20	40	-	-	20	14/41
01	**100**	-	20	80	-	-	20	60	-	-	0	13/38
06	**40**	-	-	40	-	-	0	100	-	-	0	15/52

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
84	**7499**	766	7333	166	-	-	0	0	0	-	0	14/11
90	**8565**	-	8066	233	266	-	0	0	3	-	0	12/8
96	**3780**	500	1180	2600	-	-	0	0	0	-	0	14/16
01	**5960**	-	5620	340	-	20	55	0	0	-	0	15/9
06	**6980**	420	5120	1840	20	-	.57	0	0	.28	.57	9/8
Symphoricarpos oreophilus												
84	**399**	-	33	366	-	-	50	8	-	-	0	14/29
90	**200**	-	-	200	-	-	17	33	-	-	0	17/27
96	**200**	-	20	180	-	-	30	0	-	-	0	17/36
01	**240**	-	-	240	-	-	42	0	-	-	0	14/29
06	**220**	-	20	200	-	-	0	0	-	-	0	16/31
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**20**	-	-	-	20	-	0	0	100	-	0	-/-

Trend Study 4-2-06

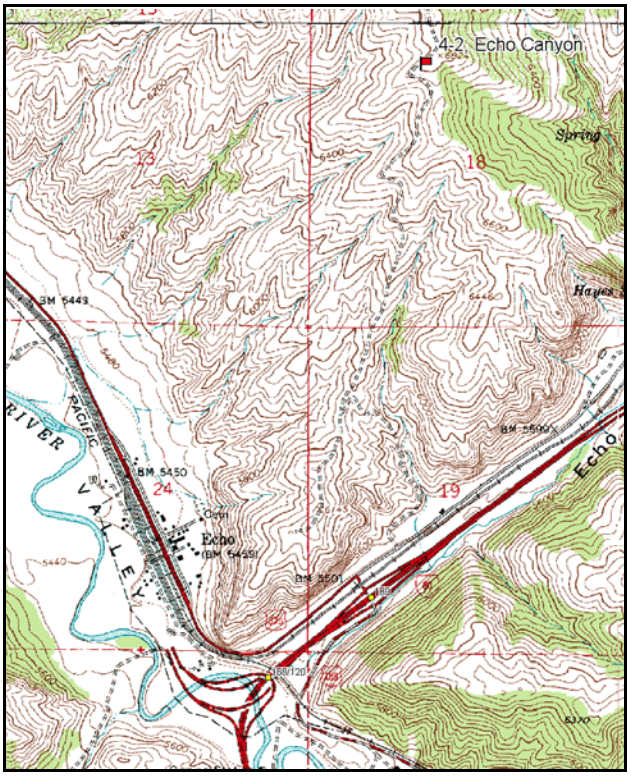
Study site name: Echo Canyon . Vegetation type: Big Sagebrush-Grass .

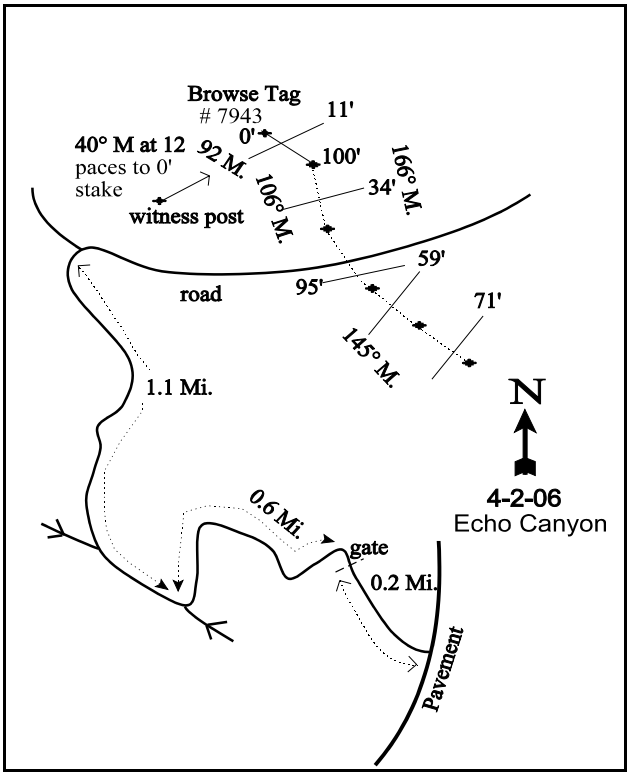
Compass bearing: frequency baseline 92 degrees magnetic.

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

LOCATION DESCRIPTION

From I-80 exit 169, just east of the I-80/I-84 junction, travel northeast towards Emery 0.1 miles, and turn left onto a dirt road. Proceed up the mountain 0.2 miles to a gate. Proceed 0.6 miles to a fork, and turn right. Proceed north 1.1 miles to a fork in the road and stop. From this point, walk 12 paces at 40 degrees magnetic to the witness post. The 0-foot baseline stake is 18 paces at 40 degrees magnetic from the witness post. The 0-foot baseline stake is marked by browse tag #7943. The baseline doglegs along the hillside. Line 1 runs 92 degrees magnetic. Line 2 runs 106 degrees magnetic. Line three runs 166 degrees magnetic. Lines 4 and 5 run 145 degrees magnetic.





Map Name: Coalville

Township 3N , Range 5E , Section 18

Diagrammatic Sketch

UTM NAD 27, UTM 12T 4538406 N 464007 E

DISCUSSION

Echo Canyon - Trend Study No. 4-2

Study Information

This study samples critical deer winter range located approximately one mile north of Echo Junction (elevation: 6,800 feet, slope: 38%, aspect: southwest). It is dominated by a moderately dense population of mountain big sagebrush. Pellet group quadrat frequency was 17% for deer and elk in 1996. Sign of cattle use was also found on the area during the 1996 reading. Pellet group data in 2001, estimated 50 deer, 6 elk, and 5 cow days use/acre (124 ddu/ha, 15 edu/ha, and 13 cdu/ha). In 2006, the estimated pellet group data was 84 deer and 28 elk days use/acre (208 ddu/ha and 69 edu/ha). The majority of the elk pellets were measured on the ridge top.

Soil

The soil is in the Horrocks-Cutoff series complex which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quarzite, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is a sandy clay loam with a neutral soil reaction (pH of 7.0). Effective rooting depth is estimated at over 10 inches. Vegetation and litter cover are sufficient to protect the soil from serious erosion. The relative bare ground cover was 12% in 1984, 4% in 1990, 2% in 1996, 8% in 2001, and 6% in 2006. The erosion condition class was determined to be slight in 2001 and stable in 2006.

Browse

Mountain big sagebrush provides the majority of the browse cover. Sagebrush cover was 14-15% in 1996 and 2001 and decreased to 10% in 2006. Sagebrush density was estimated at nearly 6,000 plants/acre in 1984, 3,000 plants/acre in 1990, 3,300 plants/acre in 1996, 2,780 plants/acre in 2001, and 1,880 plants/acre in 2006. This is a 43% decrease in sagebrush density from 1996 to2006. Utilization was extremely heavy in 1984 with 76% of the sagebrush displaying heavy use. Utilization was moderate to heavy in 1990 and has been moderate since. The percentage of plants classified as decadent has been high during every sampling, but was exceptionally high at 64% in 1990. Plants classified as dying made up less than 10% of the population every year previous to 2006, but was 30% in 2006. Annual leader growth averaged 1.7 inches in both 2001 and 2006.

Herbaceous Understory

Perennial grasses provide substantial forage. Bluebunch wheatgrass is the major forage producer; it provided 7% cover in 1996 and 2001 and increased to 15% in 2006. Sandberg bluegrass is also abundant and has provided some forage. Photographs taken from 1984 show little cheatgrass, however annuals were not sampled in 1984 and 1990. Cheatgrass cover was 14% in 1996 and decreased to 4% in 2001 and 2006. Bulbous bluegrass cover has increased from 1% in 1996, to 3% in 2001, to 5% in 2006. Bulbous bluegrass quadrat frequency increased from 20% in 1996 to 35% in 2001, to 64% in 2006. Forbs are relatively diverse. Twenty-seven species of forbs were sampled in 1996, 37 species in 2001, and 28 species in 2006. Common perennial forb species include Louisiana sage, three species of milkvetch, and silvery lupine.

1990 TREND ASSESSMENT

The mountain big sagebrush density declined 51% since 1984. Decadence has also increased from 29% to 64%, but almost 2,000 seedlings per acre were sampled in 1990. Hedging was mainly moderate, but most plants displayed good vigor. The grass trend is up. The nested frequency of perennial grasses increased 43%. The majority of this increase was due to a significant increase in the nested frequency of bluebunch wheatgrass. The forb trend is down. The nested frequency of perennial forbs decreased 60%, but diversity increased from 9 to 12 species sampled.

browse - down (-2) grass - up (+2) forb - down (-2)

1996 TREND ASSESSMENT

Trend for browse is stable. Sagebrush density has increased slightly (which is likely a product of the increased sample size), utilization is lighter, percent decadence lower, and vigor improved. Few seedlings were encountered in 1996, but young plants are fairly numerous. The grass trend is slightly up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 31%. Sandberg bluegrass increased significantly. However, cheatgrass nested frequency was very high; quadrat frequency was 91% and cover was 14%. Bulbous bluegrass was also sampled for the first time. The forb trend is up. The nested frequency of perennial forbs increased more than two-fold. The Desirable Components Index score is fair due to good browse cover, fair decadence, moderate perennial grass cover, excellent perennial forb cover, but high annual grass cover prevented it from being higher.

winter range condition (DC Index) - fair (58) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - up (+2)

2001 TREND ASSESSMENT

The browse trend is slightly down. The mountain big sagebrush density decreased 16%, most of which was in the young age class. The density of mature sagebrush individuals decreased by 200 plants/acre, but plants classified as decadent increased by 200 plants/acre. The percentage of plants classified as dying increased from 1 to 7% of the population. The strip frequency of sagebrush remained unchanged, as did sagebrush cover. The grass trend is up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 36% due to a significant increase in the nested frequency of Sandberg bluegrass. Cheatgrass nested frequency decreased significantly and cover decreased from 14 to 4%. The forb trend is down. The nested frequency of perennial forbs decreased 24%. The Desirable Components Index score improved due to fair to good due to an increase in perennial grass cover and a decrease in annual grass cover.

winter range condition (DC Index) - fair to good (65) Mid-level potential scale
browse - slightly down (-1) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is down. The mountain big sagebrush density decreased 32% with an increase in decadence from 31% in 2001 to 48% in 2006. Plants classified as dying made up 30% of the sagebrush sampled and very few young and seedlings were sampled. Use was moderate to high. The loss of sagebrush recruitment is likely due to spring precipitation levels less than 75% of normal (drought conditions) in 2000-2002 and 2004. The grass trend is stable. The nested frequency of perennial grasses (excluding bulbous bluegrass) is unchanged. The nested frequency of bulbous bluegrass increased significantly. The forb trend is stable. The nested frequency of perennial forbs is unchanged and the nested frequency of annual forbs decreased 38%. The Desirable Components Index score declined due to a decrease in browse cover and increase in browse decadence.

winter range condition (DC Index) - fair (52) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a125	b179	b182	b184	b226	7.53	7.38	15.21
G	Bromus japonicus (a)	-	-	a16	b33	a6	.08	.36	.04
G	Bromus tectorum (a)	-	-	b330	a169	a179	13.71	4.04	4.49
G	Poa bulbosa	a-	a-	b58	b85	c160	1.31	2.56	4.97
G	Poa fendleriana	a-	a-	ab6	ab3	b16	.01	.03	.15
G	Poa pratensis	7	17	10	17	4	.12	.66	.38
G	Poa secunda	a20	a22	b83	d169	c121	1.81	7.96	4.49
G	Sitanion hystrix	-	-	1	-	-	.00	-	-
G	Sporobolus cryptandrus	-	-	4	8	3	.03	.07	.15
G	Stipa lettermani	-	-	-	7	-	-	.06	-
Total for Annual Grasses		0	0	346	202	185	13.79	4.40	4.54
Total for Perennial Grasses		152	218	344	473	530	10.82	18.72	25.36
Total for Grasses		152	218	690	675	715	24.62	23.13	29.91
F	Achillea millefolium	-	2	4	4	3	.01	.01	.03
F	Agoseris glauca	6	9	6	13	14	.01	.10	.14
F	Allium acuminatum	b145	a6	a-	a21	a2	-	.11	.00
F	Alyssum alyssoides (a)	-	-	b199	b167	a79	5.09	1.06	.25
F	Ambrosia psilostachya	-	-	-	-	-	-	.00	-
F	Antennaria rosea	-	-	-	3	1	-	.03	.00
F	Artemisia ludoviciana	bc45	c65	a19	ab26	ab25	1.32	1.85	.70
F	Astragalus beckwithii	a-	a-	ab9	ab9	b12	.07	.24	1.16
F	Astragalus cibarius	c163	a-	b15	b22	b17	.09	.34	.54
F	Astragalus utahensis	a6	a5	c75	b39	a16	1.76	1.37	.43
F	Castilleja linariaefolia	-	-	2	4	-	.00	.04	-
F	Camelina microcarpa (a)	-	-	-	8	5	-	.07	.01
F	Calochortus nuttallii	1	-	1	6	1	.00	.02	.00
F	Cirsium undulatum	6	17	13	5	2	.29	.18	.03
F	Collomia linearis (a)	-	-	b14	c39	a-	.04	.18	-
F	Collinsia parviflora (a)	-	-	a22	b97	a50	.07	.72	.10
F	Crepis acuminata	-	-	1	2	-	.00	.00	-
F	Cymopterus sp.	a-	a-	a-	b13	c69	-	.06	.92
F	Descurainia pinnata (a)	-	-	-	3	-	-	.01	-
F	Draba sp. (a)	-	-	106	93	74	.31	.24	.34
F	Epilobium brachycarpum (a)	-	-	a-	b10	ab4	-	.02	.01
F	Erodium cicutarium (a)	-	-	c97	b57	a37	2.56	2.00	.35

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Erigeron pumilus	-	-	-	3	-	-	.00	-
F	Eriogonum umbellatum	-	-	-	2	-	-	.00	-
F	Galium sp.	$_{a}$-	$_{a}$-	$_{b}$14	$_{a}$2	$_{a}$-	.08	.00	-
F	Grindelia squarrosa	$_{a}$-	$_{a}$-	$_{b}$22	$_{ab}$10	$_{a}$1	.10	.34	.03
F	Helianthus annuus (a)	-	-	-	-	5	-	-	.01
F	Heterotheca villosa	-	1	3	2	-	.00	.15	-
F	Holosteum umbellatum (a)	-	-	$_{b}$239	$_{a}$106	$_{a}$80	1.67	.66	.25
F	Lactuca serriola	-	-	3	-	-	.01	-	-
F	Lomatium sp.	$_{a}$-	$_{a}$3	$_{b}$28	$_{ab}$19	$_{a}$3	.09	.14	.02
F	Lupinus argenteus	$_{a}$1	$_{a}$3	$_{b}$25	$_{b}$31	$_{b}$29	.97	1.37	.76
F	Machaeranthera spp	$_{a}$-	$_{a}$-	$_{b}$42	$_{a}$-	$_{a}$-	.10	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$22	$_{b}$26	-	.05	.05
F	Oenothera sp.	-	-	-	-	9	-	-	.07
F	Penstemon sp.	$_{b}$19	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$24	$_{b}$53	$_{ab}$50	.10	.53	.36
F	Senecio integerrimus	-	-	-	2	-	-	.00	-
F	Sphaeralcea grossulariifolia	-	-	4	-	-	.18	-	-
F	Taraxacum officinale	-	-	-	2	-	-	.00	-
F	Tragopogon dubius	$_{a}$-	$_{bc}$35	$_{c}$61	$_{bc}$31	$_{b}$13	.37	.49	.18
F	Veronica biloba (a)	-	-	-	1	-	-	.00	-
F	Verbascum thapsus	-	-	-	4	-	-	.01	-
F	Vicia americana	$_{a}$-	$_{ab}$10	$_{c}$63	$_{b}$36	$_{c}$63	.57	.36	1.71
F	Zigadenus paniculatus	-	1	-	-	3	-	-	.00
Total for Annual Forbs		0	0	701	656	410	9.86	5.57	1.75
Total for Perennial Forbs		392	157	410	311	283	6.07	7.27	6.76
Total for Forbs		392	157	1111	967	693	15.94	12.85	8.51

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

BROWSE TRENDS --
Management unit 04 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	75	77	60	14.32	15.01	9.60
B	Chrysothamnus nauseosus albicaulis	4	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	4	2	5	.45	.53	.74
B	Gutierrezia sarothrae	20	34	5	.29	.90	-
B	Opuntia sp.	6	6	4	-	-	.15
B	Symphoricarpos oreophilus	4	5	4	.18	.04	.06
Total for Browse		113	125	79	15.25	16.48	10.55

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 2

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	11.75
Chrysothamnus viscidiflorus viscidiflorus	.08
Gutierrezia sarothrae	.05
Opuntia sp.	.23
Symphoricarpos oreophilus	1.18

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 2

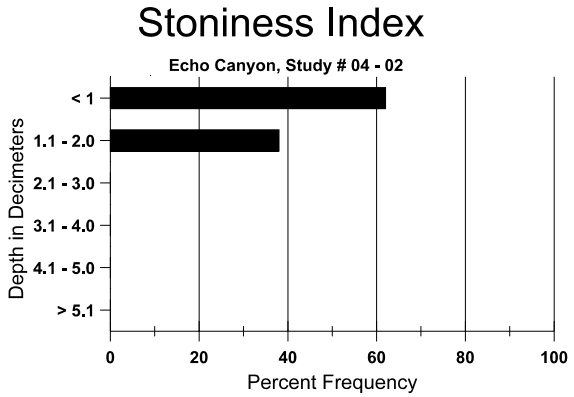
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.7	1.8

BASIC COVER --
Management unit 04 , Study no: 2

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.50	10.50	49.46	50.97	47.50
Rock	23.00	13.50	9.88	11.98	8.98
Pavement	13.25	9.25	6.84	11.67	11.53
Litter	49.75	63.00	59.37	43.15	42.29
Cryptogams	0	0	.03	.10	.08
Bare Ground	11.50	3.75	2.89	9.38	6.46

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 02, Echo Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.5	47.4 (10.6)	7.0	46.7	27.0	26.3	3.1	25.9	192.0	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	-	1
Rabbit	-	-	5
Elk	17	1	22
Deer	17	29	35
Cattle	2	1	1

Days use per acre (ha)	
'01	'06
-	-
-	-
6 (15)	28 (69)
50 (124)	84 (208)
5 (13)	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	32/29
01	**0**	-	-	-	-	-	0	0	-	-	0	34/37
06	**0**	-	-	-	-	-	0	0	-	-	0	50/52
Artemisia tridentata vaseyana												
84	**5999**	266	66	4200	1733	-	23	76	29	-	0	26/35
90	**2932**	1933	-	1066	1866	-	66	23	64	2	7	26/35
96	**3300**	20	540	2120	640	860	44	4	19	.60	1	18/37
01	**2780**	80	-	1920	860	320	53	12	31	7	9	23/44
06	**1880**	280	20	960	900	480	40	37	48	30	30	24/39
Chrysothamnus nauseosus albicaulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	-	80	-	20	0	0	-	-	0	18/30
01	**20**	-	-	20	-	-	0	0	-	-	0	29/41
06	**20**	-	-	20	-	20	0	0	-	-	0	31/47
Chrysothamnus viscidiflorus viscidiflorus												
84	**66**	-	-	66	-	-	0	0	-	-	0	7/9
90	**66**	-	-	66	-	-	0	0	-	-	100	9/20
96	**80**	-	-	80	-	-	0	0	-	-	0	12/22
01	**40**	-	-	40	-	-	0	0	-	-	0	10/19
06	**100**	-	-	100	-	-	0	0	-	-	0	13/24
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**1340**	980	520	820	-	-	0	0	0	-	0	8/11
01	**1540**	-	40	1400	100	80	0	0	6	3	3	7/9
06	**140**	-	20	120	-	-	0	0	0	-	0	7/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**240**	-	20	220	-	-	0	0	-	-	0	6/12
01	**260**	-	40	220	-	-	8	0	-	-	23	4/10
06	**80**	-	-	80	-	-	0	0	-	-	0	5/17
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	60	20	-	-	0	0	-	-	0	25/25
01	**120**	-	-	120	-	-	0	0	-	-	0	16/22
06	**80**	-	-	80	-	-	0	0	-	-	0	24/43

Trend Study 4-3-06

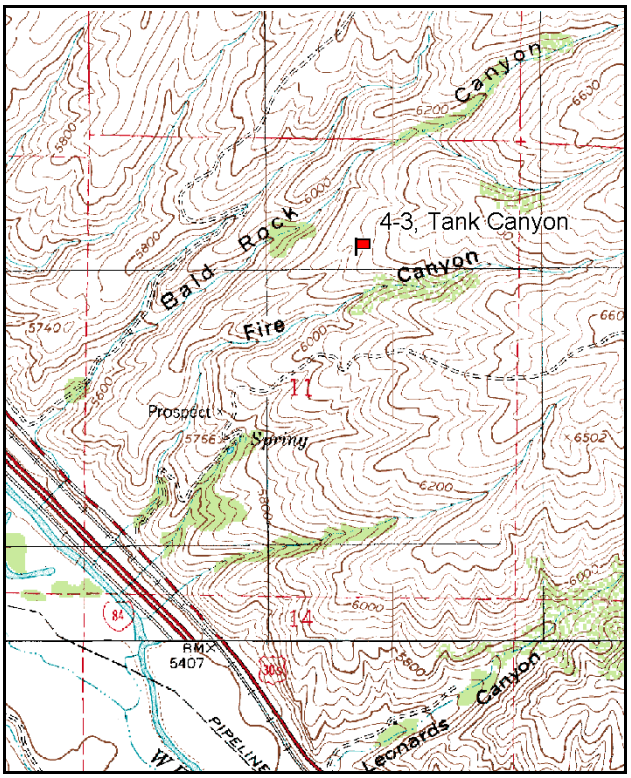
Study site name: Tank Canyon . Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 146 degrees magnetic.

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

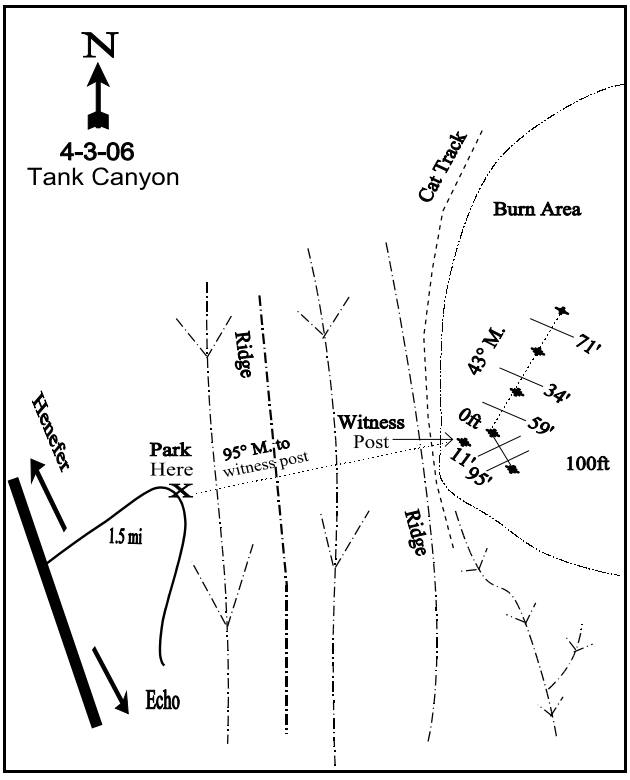
LOCATION DESCRIPTION

From the East Henefer/Echo Exit, travel east parallel to the freeway. Turn left (north) up fire canyon to the DWR gate. Proceed 0.8 miles to the Fire Canyon Access road to a point where the road switchbacks. Park at 3 full high posts before the switchback. Walk at a bearing of 11 degrees magnetic walking down and back up the ravine to the next ridge to an open area that has been burned. A witness post is in the opening. The 0-foot baseline stake is just north of the witness post. The 0-foot baseline stake is marked with browse tag #7944. Line 1 runs at a bearing of 146 degrees magnetic. The rest of the baseline runs off the 0-foot baseline in a direction of 43 degrees magnetic.



Map Name: Henefer

Township 3N , Range 4E , Section 11



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4540050 N 461327 E

DISCUSSION

Tank Canyon - Trend Study No. 4-3

Study Information

This study samples critical deer winter range on the Henefer-Echo wildlife management area between Tank Canyon and Bald Rock Canyon (elevation: 6,100 feet, slope: 23%, aspect: west). The area was dominated by mountain big sagebrush prior to a 1982 fire and appears to have been seeded afterward. Another small fire burned 40 acres of the area, including the study, some time between 1984 and 1990. In 1990, the frequency data was collected where it had burned and density data was collected mainly in an unburned area, which caused an incongruity between the two. During the 1996 reading, the sampling area was enlarged and the entire study was moved completely into the burned area. Therefore, all data and trends from 1984 and 1990 can be found in previous reports, but will not be compared to data after 1996. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA from April 15 to July 15. On the original studies, pellet groups were abundant and several winter-killed carcasses were seen in the immediate vicinity. Pellet group quadrat frequencies were low for deer and elk in 1996, but some sheep had used the area during the summer. The pellet group transect data in 2001 estimated 46 elk and 21 deer days use/acre (112 edu/ha and 51 ddu/ha). The 2006 pellet group data estimates were 56 elk, 15 deer, and 35 cow days/use acre (137 edu/ha, 38 ddu/ha, and 86 cdu/ha). Most of the deer pellet groups appeared to be from spring use. About half of the elk pellet groups were from spring use and the other half were from winter use.

Soil

The soil is in the Horrocks-Cutoff series complex which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quarzite, sandstone, and conglomerate (USDA-NRCS 2006). It is excessively drained and probably holds little available water in mid-summer. Soil texture is a clay loam with a neutral soil reaction (pH of 7.0). The effective rooting depth is estimated at just over 16 inches. Soil erosion is minimal due to the abundant herbaceous understory cover, which was 50% in 1996, 76% in 2001, and 62% in 2006. The relative bare ground cover has been at or below 4% since 1996. The erosion condition class was determined to be stable in 2001 and 2006.

Browse

Prior to the burn, the browse composition consisted primarily of mountain big sagebrush with lesser densities of stickyleaf low rabbitbrush, mountain snowberry, and Saskatoon serviceberry. In 1996, the sagebrush density was 220 plants/acre, over half of which were mature, and utilization was light. In 2001 and 2006, only 60 plants/acre were sampled each year and utilization was light. The sagebrush cover has not exceeded 1% since the study location was changed.

The most abundant shrub is stickyleaf low rabbitbrush, which had a density of 3,500 plants/acre in 1996, 1,900 plants/acre in 2001, and 2,060 plants/acre in 2006. The population appears to have increased following the fire, but has stabilized at around 2,000 plants/acre.

Herbaceous Understory

Grasses and forbs were rare prior to the burn. In the new study established in 1996, crested wheatgrass cover was 14% and bulbous bluegrass cover was 19%. During the 2001 reading, crested wheatgrass and bulbous bluegrass nested frequencies increased significantly and the nested frequency of bulbous had surpassed that of crested wheatgrass. The bulbous bluegrass appears to be preventing sagebrush seedling establishment. The aggressive growth of the bulbous bluegrass could prevent continued growth of more desirable species. The nested frequency of cheatgrass decreased significantly in 2001 and was sampled in only 1 quadrat. In 2006, bulbous bluegrass cover (29%) surpassed that of crested wheatgrass (15%). Alfalfa has been the dominant forb; it provided 12% cover 1996, 16% in 2001, and 10% in 2006. American vetch is also abundant.

2001 TREND ASSESSMENT

Density of mountain big sagebrush has declined slightly to 60 plants/acre. Density of serviceberry has increased from 60 plants/acre in 1996 to 220 plants/acre. The most abundant shrub on the site is still stickyleaf low rabbitbrush, which declined 46% since 1996. The browse trend is stable. The grass trend is slightly down. The nested frequency of perennial grasses, excluding bulbous bluegrass, remained unchanged. Bulbous bluegrass has begun to dominate the area and is preventing the establishment of more desirable grass, forb, and browse species. The forb trend is slightly down. The nested frequency of perennial forbs decreased 18%, mainly due to significant decreases in the nested frequency of yellow salsify and American vetch. The Desirable Components Index score was poor in 1996 and 2001.

1996 winter range condition (DC Index) - poor (41) Mid-level potential scale
2001 winter range condition (DC Index) - poor (42) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is stable. The mountain big sagebrush and serviceberry populations continue to be extremely low. Recruitment is very low and the opportunity for seedling establishment in the dense grass is low. The grass trend is stable. The nested frequency of perennial grasses remained unchanged. Crested wheatgrass and bulbous bluegrass nested frequencies remained unchanged. Cheatgrass was not sampled. The forb trend is down. The nested frequency of perennial forbs decreased 38%. Alfalfa and American vetch nested frequencies both decreased significantly. The Desirable Components Index score remained unchanged.

winter range condition (DC Index) - poor (41) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 3

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{a}$327	$_{b}$389	$_{ab}$384	14.40	28.78	14.76
G	Agropyron dasystachyum	13	-	-	.10	-	-
G	Agropyron intermedium	64	79	48	.77	2.92	1.03
G	Agropyron spicatum	16	4	-	1.08	.18	-
G	Bromus inermis	$_{b}$58	$_{a}$22	$_{a}$38	.70	.38	.61
G	Bromus japonicus (a)	3	-	-	.00	-	-
G	Bromus tectorum (a)	$_{b}$17	$_{a}$1	$_{a}$-	.21	.00	-
G	Festuca ovina	3	3	-	.18	.00	-
G	Poa bulbosa	$_{a}$346	$_{b}$440	404	18.70	24.53	29.17
G	Poa secunda	-	19	62	-	.81	5.03
G	Sitanion hystrix	1	1	-	.00	.00	-
Total for Annual Grasses		20	1	0	0.21	0.00	0
Total for Perennial Grasses		828	957	936	35.96	57.62	50.63
Total for Grasses		848	958	936	36.18	57.62	50.63

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Alyssum alyssoides (a)	$_{b}$75	$_{b}$58	$_{a}$27	.26	.18	.05
F	Astragalus cibarius	-	-	-	-	-	.00
F	Astragalus sp.	-	-	2	-	-	.00
F	Calochortus nuttallii	-	3	-	-	.01	-
F	Cirsium undulatum	2	4	4	.00	.30	.01
F	Collomia linearis (a)	-	2	-	-	.00	-
F	Comandra pallida	1	-	-	.00	-	-
F	Collinsia parviflora (a)	$_{a}$-	$_{a}$2	$_{b}$13	-	.00	.03
F	Cymopterus sp.	-	5	3	-	.04	.01
F	Descurainia pinnata (a)	-	1	-	-	.00	-
F	Epilobium brachycarpum (a)	-	-	9	-	-	.01
F	Erodium cicutarium (a)	-	7	1	-	.04	.00
F	Eriogonum ovalifolium	3	-	-	.00	-	-
F	Lesquerella sp.	-	3	-	-	.00	-
F	Medicago sativa	$_{b}$186	$_{b}$201	$_{a}$138	11.81	16.42	10.31
F	Microsteris gracilis (a)	-	-	4	-	-	.00
F	Pedicularis centranthera	-	-	1	-	-	.15
F	Polygonum douglasii (a)	5	-	3	.01	-	.01
F	Sanguisorba minor	9	6	-	.06	.18	-
F	Sisymbrium altissimum (a)	-	1	-	-	.00	-
F	Sphaeralcea coccinea	2	-	-	.03	-	-
F	Tragopogon dubius	$_{b}$25	$_{a}$7	$_{a}$1	.11	.09	.00
F	Vicia americana	$_{c}$183	$_{b}$111	$_{a}$55	1.22	1.50	.42
Total for Annual Forbs		80	71	57	0.26	0.24	0.11
Total for Perennial Forbs		411	340	204	13.26	18.55	10.93
Total for Forbs		491	411	261	13.53	18.80	11.04

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

BROWSE TRENDS --
Management unit 04 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	3	1	1	-	-	-
B	Artemisia tridentata vaseyana	10	3	3	.68	1.13	.38
B	Chrysothamnus nauseosus albicaulis	6	6	5	.48	.39	.94
B	Chrysothamnus viscidiflorus viscidiflorus	66	38	51	3.00	1.44	2.59
B	Gutierrezia sarothrae	6	6	4	.01	-	-
Total for Browse		91	54	64	4.18	2.97	3.92

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 3

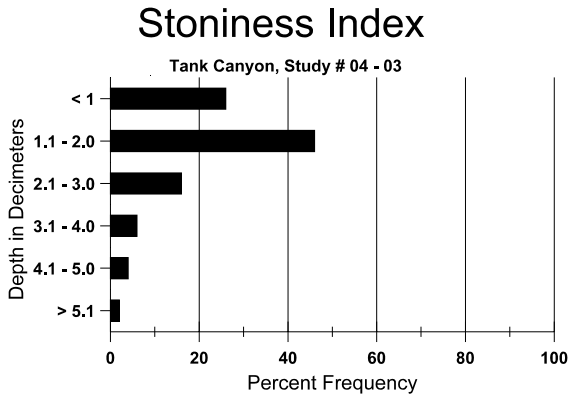
Species	Percent Cover '06
Artemisia tridentata vaseyana	.18
Chrysothamnus nauseosus albicaulis	.88
Chrysothamnus viscidiflorus viscidiflorus	1.26
Gutierrezia sarothrae	.11

BASIC COVER --
Management unit 04 , Study no: 3

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	53.31	68.63	66.61
Rock	3.11	2.72	3.68
Pavement	1.29	3.76	4.38
Litter	63.50	34.77	29.13
Cryptogams	.40	.58	.30
Bare Ground	1.60	3.50	4.73

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 03, Tank Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
16.3	64.0 (16.0)	7.0	41.9	29.7	28.4	3.8	9.8	108.8	0.6



PELLET GROUP DATA --
Management unit 04 , Study no: 3

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	26	-	-
Rabbit	-	6	26
Elk	9	15	63
Deer	11	12	12
Cattle	-	4	24

Days use per acre (ha)	
'01	'06
-	-
-	-
46 (112)	56 (137)
21 (51)	15 (38)
-	35 (86)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**60**	-	-	60	-	-	67	33	-	-	0	22/26
01	**220**	-	220	-	-	-	0	0	-	-	0	14/20
06	**20**	-	-	20	-	-	0	0	-	-	0	13/24
Artemisia tridentata vaseyana												
96	**200**	-	80	120	-	1940	10	0	0	-	0	21/27
01	**60**	-	-	60	-	1280	0	33	0	-	0	22/22
06	**60**	160	20	20	20	-	0	0	33	33	33	26/39
Chrysothamnus nauseosus albicaulis												
96	**140**	-	20	100	20	-	0	0	14	-	0	24/36
01	**140**	-	20	60	60	40	0	0	43	-	0	24/27
06	**140**	-	40	80	20	-	57	0	14	-	0	25/39

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
96	**3500**	140	560	2860	80	-	26	0	2	-	2	13/19
01	**1900**	-	120	1680	100	60	0	0	5	1	1	8/11
06	**2060**	20	220	1780	60	-	10	0	3	.97	.97	8/12
Gutierrezia sarothrae												
96	**220**	40	140	80	-	-	0	0	0	-	0	7/10
01	**280**	-	20	260	-	-	0	0	0	-	0	9/9
06	**120**	-	-	100	20	-	0	0	17	17	17	10/11
Opuntia sp.												
96	**0**	-	-	-	-	-	0	0	-	-	0	6/21
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	3/7
Symphoricarpos oreophilus												
96	**0**	-	-	-	-	-	0	0	-	-	0	18/45
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	15/26
Tetradymia canescens												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	13/20

Trend Study 4-4-06

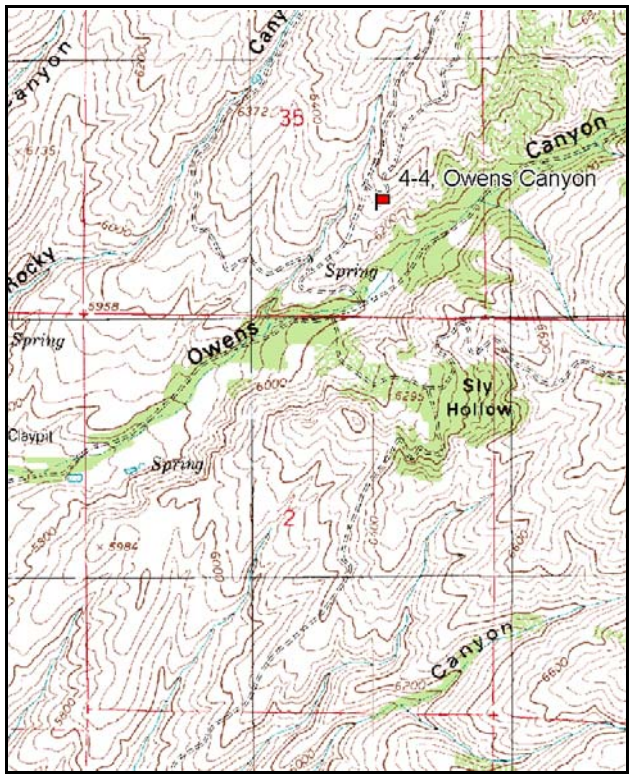
Study site name: Owen's Canyon . Vegetation type: Burned and Seeded .

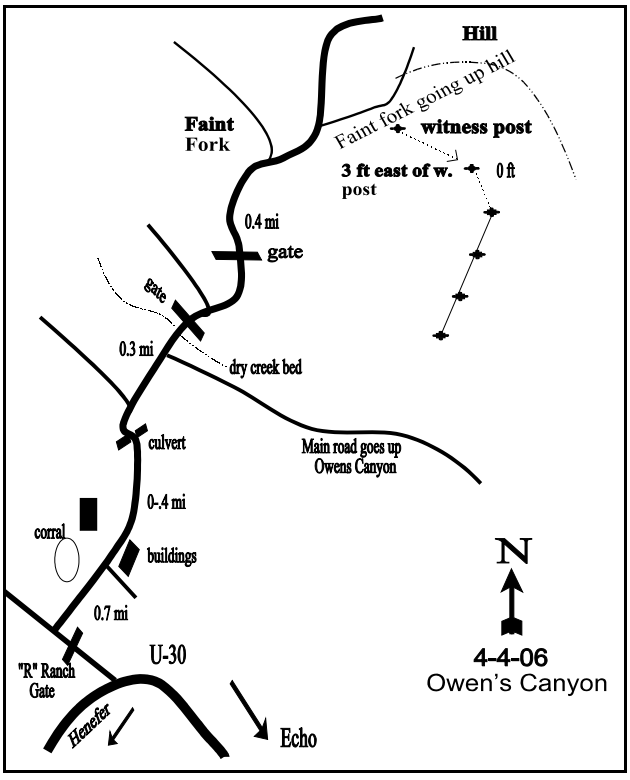
Compass bearing: frequency baseline 160 degrees magnetic.

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

LOCATION DESCRIPTION

From the "R" Ranch main gate (contact Tiny Wostinhume for key or access through Tank Canyon), proceed 0.7 miles to the ranch buildings and a fork. Take the left fork through a white post entrance Continue straight 0.4 miles to a culvert, then 0.45 miles further to a DWR gate. Continue through the gate 0.25 miles, turn left, cross the wash, stay on main road (left fork leads to DWR cabin). Proceed 0.4 miles to a fork in the road. Continue right for 0.3 miles. A witness post is three feet from the 0-foot stake. The 0-foot baseline stake is marked by browse tag #7945. The baseline doglegs after the 100-foot baseline stake and runs 214 degrees magnetic.





Map Name: Henefer Diagrammatic Sketch

Township 4N , Range 4E , Section 35 UTM NAD 27, UTM 12T 4542410 N 461470 E

DISCUSSION

Owen's Canyon - Trend Study No. 4-4

Study Information

This study samples a mountain big sagebrush/grass type on important winter range. It is located on Division of Wildlife Resources property on the north side of Owen's Canyon (elevation: 6,300 feet, slope: 30%, aspect: south). A fire burned the entire area prior to the 2001 reading and decimated the sagebrush and other browse species. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA from April 15 to July 15. Deer pellet groups were moderately abundant during the 1984 reading and forage utilization was not exceptionally heavy. During the 1996 reading, few deer and elk pellet groups were encountered. Some cattle also grazed the area in 1996. The pellet group transect in 2001 estimated 9 elk and 4 deer days use/acre (23 edu/ha and 10 ddu/ha). In 2006, 66 elk, 5 deer, and 9 cow days use/acre (164 edu/ha, 12 ddu/ha, and 23 cdu/ha) were estimated from the pellet group transect sampling.

Soil

The soil is in the Horrocks-Cutoff series complex which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quarzite, sandstone, and conglomerate (USDA-NRCS 2006). It is gravelly and the effective rooting depth was estimated at only about 10 inches. Soil texture is a clay loam with a neutral soil reaction (pH of 6.7). Drainage is probably excessive and soil moisture may be limited in the upper horizons during midsummer. The soil erosion potential is high because of the soil texture and steep slope, but the high vegetation and litter cover prevents high soil loss. The bare ground cover increased after the fire from 1% in 1996 to 13-16% in 2001 and 2006. The erosion condition class was determined as stable in 2001 and 2006.

Browse

The sagebrush was classified as mountain big sagebrush, but also had characteristics of basin big sagebrush. Prior to the burn in 1996, mountain big sagebrush provided 20% cover. The population density previous to the fire was around 4,000 plants/acre in 1984 and 1990 and 3,420 plants/acre in 1996. In 1996, the population was mostly mature, lightly to moderately hedged, in good vigor, with a low percent decadency. In 2001, the first reading following the fire, only 60 young sagebrush plants/acre and 140 seedlings/acre were sampled. In 2006, sagebrush density increased to 180 plants/acre, all of which were classified as mature.

Forage kochia was seeded following the fire and has become the key browse species. In 2001, 1,460 plants/acre were sampled, 71% of which were classified as young. In 2006, 2,520 plants/acre were sampled, 67% of which were mature; an estimated 6,380 seedlings/acre were also sampled. The kochia appears to be establishing well despite the dense herbaceous understory. Kochia cover was about 1% in 2006. Stickyleaf rabbitbrush density did not change after the fire.

Herbaceous Understory

Grasses have dominated the herbaceous understory. Cheatgrass and Japanese brome were common and provided a combined 20% cover in 1996. After the burn, cheatgrass and Japanese brome provided only 3% cover. The most abundant herbaceous plants are the exotic perennial grasses crested wheatgrass, intermediate wheatgrass, and smooth brome, all of which were seeded previous to the burn. They provided the majority of forage for big game. Several other native perennial grasses are found, but only western wheatgrass is abundant. The majority of forbs are weedy biennials and annuals. The only common perennial forbs are yellow salsify and American vetch. Pale alyssum and storksbill are very common annual forbs.

1990 TREND ASSESSMENT

The sagebrush population on this important winter range is stable. Decadence increased from 17% to 43% of the population, but the density of decadent plants is equal to the sum of seedling and young age class plants. Twenty-one percent of the available sagebrush have a heavily hedged growth form. Sagebrush canopy cover

is estimated at 18%. Broom snakeweed is uncommon, but has actually decreased. Crested wheatgrass shows a significant increase in sum of nested frequency. There is an adequate amount of litter cover with no evidence of erosion. The grass trend is up. The nested frequency of perennial grasses increased 73%, most of which was crested wheatgrass. The forb trend is stable. The nested frequency of perennial forbs changed little.

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

1996 TREND ASSESSMENT

Trend for browse is stable. Sagebrush density has declined slightly, but the changes in density are likely due to the larger sample size used beginning in 1992, which better estimates shrub populations with clumped and/or discontinuous distributions. Heavy use and percent decadence have declined and vigor has improved. Seedlings and young are not abundant and likely have a difficult time competing with the extremely high densities of winter annuals. The grass trend is slightly up. The nested frequency of perennial grasses increased 26%. The nested frequency and cover of annual grasses is high, which increases the potential for the site to burn and increases competition with sagebrush seedlings. The forb trend is up. The nested frequency of perennial forbs incread nearly five-fold. Northern sweetvetch and American vetch increased significantly. The Desirable Components Index score was fair due to low browse cover, moderate browse decadence, good perennial grass cover, but high annual grass cover prevented a higher score.

winter range condition (DC Index) - fair (54) Mid-level potential scale
browse - stable (0) grass -slightly up (+1) forb - up (+2)

2001 TREND ASSESSMENT

Trend for browse is down due to loss of nearly all browse to fire. The site currently supports a few seedling and young sagebrush, resprouting stickyleaf low rabbit brush, and seeded forage kochia. A healthy kohcia population established (1,460 plants/acre), but this does not replace the sagebrush. The grass trend is up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 16%, even with a significant decrease of crested wheatgrass. The nested frequency of annual grasses decreased 70%, both Japanese brome and cheatgrass decreased significantly. Annual grass cover decreased from 20 to 3%. The forb trend is stable. The nested frequency of perennial forbs did not change despite the fire, although the weedy western ragweed, prickly lettuce, and curly cup gumweed established after the fire. Yellow sweetclover and small burnet, both preferred species, were seeded and established. Weedy annual species increased substantially because of the fire. The Desirable Components Index score decreased to very poor to poor due to a complete loss of browse cover.

winter range condition (DC Index) - very poor to poor (33) Mid-level potential scale
browse - down (-2) grass - up (+2) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is slightly up. The mountain big sagebrush density remains very low despite heavy use. The forage kochia density increased 42% and the majority of the population consists of established mature plants. Although the kochia has increased substantially in density, it still only provides 1% cover and mature plants average 10 inches in height. Stickyleaf rabbitbrush densities have not changed. The grass trend is slightly up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 14%. However, cheatgrass increased significantly, but the nested frequency value was nearly half that of 1996. The forb trend is up. The nested frequency of perennial forbs increased 23% and the nested frequencies of yellow salsify and American sweetvetch increased significantly. The Desirable Components Index score is very poor due to an increase in annual grass cover.

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

HERBACEOUS TRENDS --
Management unit 04 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	a70	c132	bc133	ab87	bc127	6.62	5.27	8.26
G	Agropyron intermedium	a1	a8	a15	b55	b77	.69	3.37	5.58
G	Agropyron smithii	a-	a-	b29	b45	b42	.39	4.52	3.94
G	Agropyron spicatum	3	-	2	-	4	.01	-	.76
G	Bromus inermis	a50	ab83	b99	b105	b113	3.80	9.85	8.68
G	Bromus japonicus (a)	-	-	b203	a73	a89	4.48	.50	.79
G	Bromus tectorum (a)	-	-	c321	a84	b178	15.25	1.99	9.26
G	Dactylis glomerata	a-	a-	a-	b21	a1	-	.35	.15
G	Oryzopsis hymenoides	-	2	4	10	4	.03	.36	.15
G	Poa bulbosa	a-	a-	a2	ab26	b39	.01	1.43	1.12
G	Poa fendleriana	-	-	-	4	-	-	.15	-
G	Poa pratensis	-	2	5	8	1	.09	.18	.03
G	Poa secunda	a-	a1	a2	a-	b13	.03	-	.30
G	Sitanion hystrix	b9	a2	a-	a-	a-	-	-	.00
Total for Annual Grasses		0	0	524	157	267	19.74	2.50	10.05
Total for Perennial Grasses		133	230	291	361	421	11.68	25.51	29.01
Total for Grasses		133	230	815	518	688	31.43	28.01	39.06
F	Agoseris glauca	-	-	-	3	-	-	.00	-
F	Alyssum alyssoides (a)	-	-	a157	c324	b279	.81	25.80	2.18
F	Allium sp.	a-	a-	a-	c32	b9	-	.20	.02
F	Ambrosia psilostachya	-	-	-	7	-	-	.04	-
F	Arabis sp.	ab2	b13	ab2	a-	a-	.01	-	-
F	Arenaria sp.	-	-	-	-	4	-	-	.03
F	Aster sp.	-	-	4	7	6	.03	.18	.18
F	Astragalus sp.	-	-	2	1	-	.03	.03	-
F	Camelina microcarpa (a)	-	-	a4	b23	a-	.38	.06	-
F	Carduus nutans (a)	-	-	-	-	-	-	.03	-
F	Calochortus nuttallii	-	-	-	3	-	-	.00	-
F	Cirsium undulatum	-	2	8	5	-	.06	.01	-
F	Collomia linearis (a)	-	-	a-	b14	b19	-	.02	.08
F	Collinsia parviflora (a)	-	-	a3	b45	c60	.00	.68	.15
F	Cymopterus sp.	-	-	1	-	7	.00	-	.07
F	Descurainia pinnata (a)	-	-	-	10	3	-	.04	.00
F	Draba sp. (a)	-	-	a-	b18	c41	-	.04	.08
F	Epilobium brachycarpum (a)	-	-	a-	b39	b57	-	.75	.31

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{b}$70	$_{b}$69	-	3.65	1.08
F	Erigeron strigosis	-	-	5	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	-	-	2	-	-	.00
F	Grindelia squarrosa	8	-	-	3	1	-	.03	.03
F	Helianthus annuus (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$16	-	-	.07
F	Hedysarum boreale	$_{a}$-	$_{a}$-	$_{b}$40	$_{a}$-	$_{a}$-	.42	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$31	$_{b}$69	$_{c}$128	.36	.43	.47
F	Lappula occidentalis (a)	-	-	-	-	2	-	-	.00
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$17	$_{b}$14	-	.06	.04
F	Machaeranthera spp	-	-	6	-	-	.01	-	-
F	Melilotus officinalis	-	-	-	5	-	-	.18	.03
F	Medicago sativa	-	-	-	-	-	-	-	.15
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$12	$_{c}$44	-	.08	.09
F	Oenothera caespitosa	3	-	-	-	-	-	-	-
F	Penstemon sp.	-	-	-	1	-	-	.03	-
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$14	$_{a}$-	-	.36	-
F	Polygonum douglasii (a)	-	-	3	3	6	.00	.01	.01
F	Ranunculus testiculatus (a)	-	-	$_{a}$3	$_{a}$8	$_{b}$90	.00	.04	.50
F	Sanguisorba minor	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$7	$_{a}$-	-	.66	-
F	Sisymbrium altissimum (a)	-	-	$_{a}$-	$_{b}$25	$_{a}$1	-	.21	.00
F	Sphaeralcea coccinea	-	-	-	4	1	-	.21	.00
F	Tragopogon dubius	$_{a}$6	$_{a}$6	$_{a}$20	$_{a}$12	$_{b}$81	.16	.10	1.50
F	Vicia americana	$_{a}$-	$_{ab}$4	$_{c}$61	$_{b}$29	$_{c}$62	.36	.26	.94
Total for Annual Forbs		0	0	201	660	817	1.57	31.87	5.06
Total for Perennial Forbs		19	25	149	150	185	1.14	2.39	3.02
Total for Forbs		19	25	350	810	1002	2.72	34.26	8.08

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

BROWSE TRENDS --
Management unit 04 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	3	0	1	-	-	.15
B	Artemisia tridentata vaseyana	82	3	7	19.85	-	.15
B	Chrysothamnus nauseosus albicaulis	7	0	0	.83	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	16	16	14	.97	.36	.59
B	Gutierrezia sarothrae	1	1	0	.07	-	-
B	Kochia prostrata	0	37	43	-	.35	1.04
B	Symphoricarpos oreophilus	1	0	0	-	-	-
Total for Browse		110	57	65	21.72	0.70	1.94

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 4

Species	Percent Cover '06
Amelanchier alnifolia	.18
Artemisia tridentata vaseyana	.31
Chrysothamnus viscidiflorus viscidiflorus	1.03
Kochia prostrata	2.29

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 4

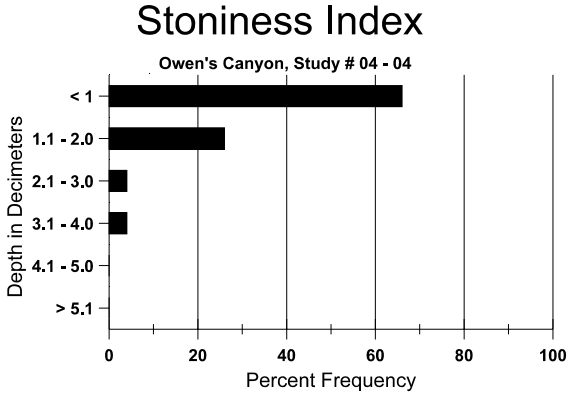
Species	Average leader growth (in) '06
Artemisia tridentata vaseyana	2.7

BASIC COVER --
Management unit 04 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	.75	8.50	50.47	63.19	44.72
Rock	0	7.00	2.49	4.01	4.59
Pavement	25.50	11.75	2.90	5.78	5.42
Litter	0	61.50	68.31	32.54	42.84
Cryptogams	2.00	0	.95	.00	.00
Bare Ground	0	11.25	1.56	15.32	18.73

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 04, Owen's Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.8	66.0 (9.35)	6.7	44.6	27.4	28.0	3.2	22.4	176.0	0.4



PELLET GROUP DATA --
Management unit 04 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	-	1
Elk	4	3	49
Deer	12	3	2
Cattle	1	-	4

Days use per acre (ha)	
'01	'06
-	-
9 (23)	66 (164)
4 (10)	5 (12)
-	9 (23)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	20	40	-	-	0	0	-	-	0	25/20
01	**0**	-	-	-	-	-	0	0	-	-	0	12/9
06	**20**	-	-	20	-	-	100	0	-	-	0	17/26
Artemisia tridentata vaseyana												
84	**3966**	133	1000	2300	666	-	61	11	17	-	3	23/32
90	**4098**	1066	866	1466	1766	-	56	20	43	8	17	14/17
96	**3420**	120	320	2360	740	1180	13	2	22	3	6	26/45
01	**60**	140	60	-	-	-	0	0	0	-	0	-/-
06	**180**	-	-	180	-	-	11	78	0	-	0	14/13
Chrysothamnus nauseosus albicaulis												
84	**33**	-	-	33	-	-	0	0	0	-	0	9/6
90	**99**	33	33	-	66	-	0	0	67	-	0	-/-
96	**160**	-	20	80	60	-	0	0	38	-	0	24/34
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	21/23
Chrysothamnus viscidiflorus viscidiflorus												
84	**33**	-	-	-	33	-	0	0	100	-	0	-/-
90	**33**	-	-	33	-	-	100	0	0	-	100	6/8
96	**420**	-	40	340	40	20	0	0	10	-	0	14/22
01	**460**	-	-	460	-	-	0	0	0	-	0	11/16
06	**400**	-	40	340	20	-	10	0	5	5	5	14/24
Gutierrezia sarothrae												
84	**1133**	-	-	1100	33	-	0	0	3	-	0	12/6
90	**33**	33	-	33	-	-	0	0	0	-	0	5/6
96	**200**	180	40	160	-	-	0	0	0	-	0	10/12
01	**20**	-	-	20	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Kochia prostrata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**1460**	20	1040	420	-	-	0	0	-	-	0	4/6
06	**2520**	6380	820	1700	-	-	40	21	-	-	0	10/13
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	17/16
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	18/27

Trend Study 4-6-06

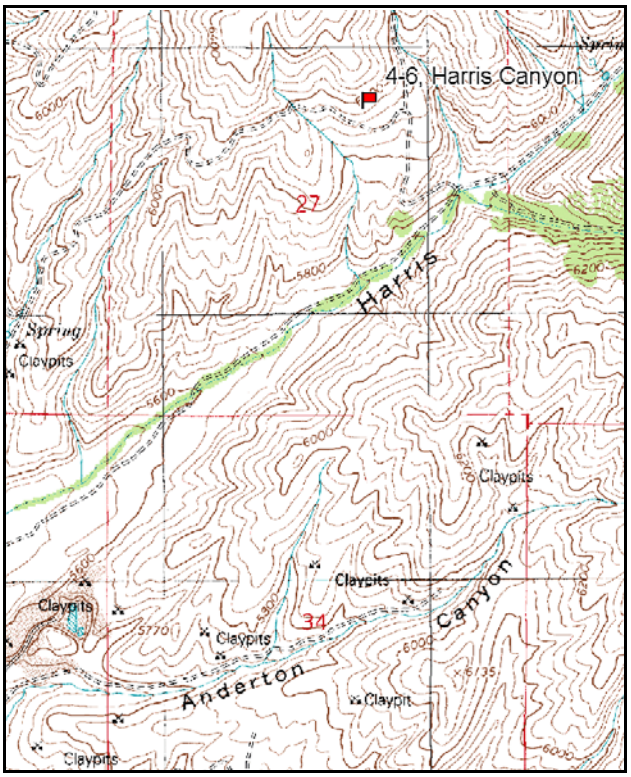
Study site name: Harris Canyon . Vegetation type: Big Sagebrush-Grass .

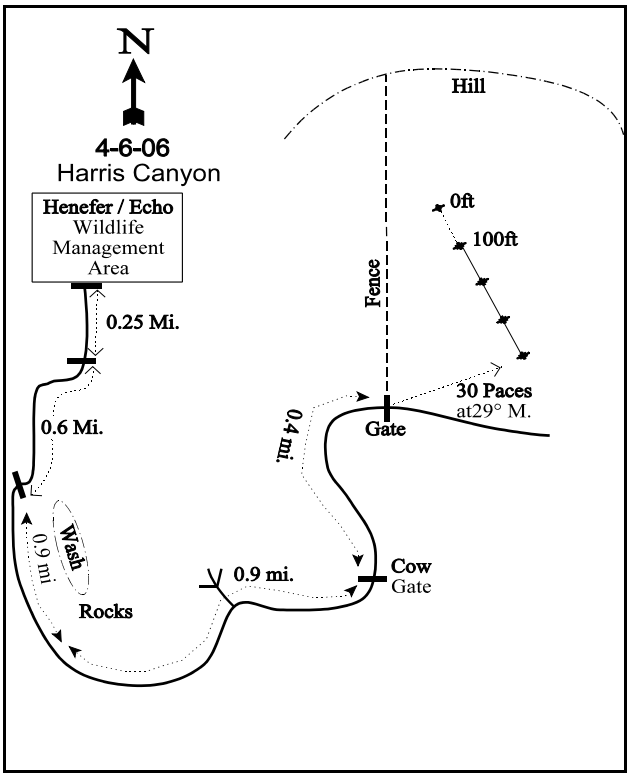
Compass bearing: frequency baseline 164 degrees magnetic.

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

LOCATION DESCRIPTION

From the "R" Ranch main gate, proceed northwest for 3.5 miles (towards Croyden) to the Croyden access road. At the DWR/R-Ranch property, turn right and travel 0.25 miles. Turn right at the DWR fence line and proceed 0.6 miles to another gate. Stay to the right, traveling around a wash for 0.9 miles. Travel 1.2 miles to a cow gate. Continue for 0.4 miles to a fence with a gate. Stop here and park. From the gate walk 30 paces (at 29 degrees magnetic) to the 400-foot baseline stake. Walk 400 feet to the north at a bearing of 342 degrees magnetic to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7975.





Map Name: Henefer

Diagrammatic Sketch

Township 4N , Range 4E , Section 27

UTM NAD 27, UTM 12T 4544767 N 459759 E

DISCUSSION

Harris Canyon - Trend Study No. 4-6

Study Information

This study samples a mountain big sagebrush/grass type within the Echo-Henefer Wildlife Management Area (elevation: 6,200 feet, slope: 35%, aspect: south). Deer use has been exceptionally heavy in the past, which, coupled with low precipitation from 1987 to 1990, has greatly impacted the health and vigor of the browse in the area. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA from April 15 to July 15. Deer pellet groups have been sampled in approximately 25% of the quadrats since 1996. Elk pellet groups were also present in relatively few quadrats in 1996, but approximately the same as deer pellet groups since 2001. Some cattle were observed near the study site during the 1996 reading. A pellet group transect read in 2001, estimated 79 deer and 22 elk days use/acre (195 ddu/ha and 55 edu/ha). Most elk and deer pellet groups appeared to be from spring. In 2006, 46 deer and 29 elk days use/acre (112 ddu/ha and 71 edu/ha) were estimated from pellet group transect readings.

Soil

The soil is in the Horrocks-Cutoff series complex which is moderately deep, well drained, moderately permeable, and formed in glacial deposits, residuum, and colluvium. It is derived from andesite, quarzite, sandstone, and conglomerate parent materials (USDA-NRCS 2006). It is moderately rocky and most surface rocks are rounded and cobblestone-like. The soil texture is a clay loam with a neutral soil reaction (pH of 7.2). The effective rooting depth is estimated at a little over 12 inches. The phosphorus concentration was 6.9 ppm, which is marginal and may limit normal plant growth and development (Tiedemann and Lopez 2004). Organic matter content is relatively high at 4%. The color of the surface soil is reddish, which indicates some iron oxide. The relative bare ground cover was 4% in 1996, 13% in 2001, and 12% in 2006. Surface erosion does not appear excessive. The erosion condition class was slight in 2001 and 2006.

Browse

The total browse density is well below optimum for this location. Although species composition includes four desirable shrubs, it also includes two increasers. The key species are mountain big sagebrush and antelope bitterbrush. Sagebrush density has remained relatively low. In 1996, sagebrush density was 840 plants/acre, decreased slightly to 680 plants/acre in 2001, then decreased to 440 plants/acre in 2006. Use was heavy in 1984 and 1990, but has been light-moderate since 1996. Since 1996, the percent decadence has been low and those classified as dying has been below 10% of the population. Recruitment was good in 1996; young individuals made up 24% of the population. Young individuals only made up 6% of the population in 2001 and 9% in 2006. Forty plants/acre were identified with the sagebrush defoliator moth (*Aroga websterii*) in 2006, but many individuals in the population appeared infested.

Bitterbrush had an estimated density of 380 plants/acre in 1996, 300 plants/acre in 2001, and 280 plants/acre in 2006. These shrubs have a prostate growth form and have averaged only about 17 inches in height, yet they have a crown of almost 3 feet. They have been consistently heavily hedged, due to their high palatability and low numbers. Vigor has been good on all plants sampled and percent decadence has been low. White stem rubber rabbitbrush offers some additional browse forage. Unfortunately, the population has decreased steadily from 1,180 plants/acre in 1996 to 640 plants/acre in 2006. A few serviceberry plants are also present.

Stickyleaf low rabbitbrush and broom snakeweed are both common. Broom snakeweed decreased dramatically from 2,600 plants/acre in 1996 to 80 plants/acre in 2006. Stickyleaf low rabbitbrush has also decreased, but less dramatically; from 1,380 plants/acre in 1996 to 900 plants/acre in 2006.

Herbaceous Understory

The understory is dominated by bluebunch wheatgrass, which has provided 12-13% cover since 1996. Other perennial grasses are rare. Annual grasses, Japanese brome and cheatgrass, are also abundant; they provided

around 9% cover in 1996 and 2001, and 19% cover in 2006. The annual grass cover is high enough to provide fine fuels to carry a devastating fire. A fair number of forbs are also present, but few are abundant. Among these are yellow salsify, Utah milkvetch, thistle, and Louisiana sage. Annual forbs are quite abundant; pale alyssum is the dominant annual forb.

1990 TREND ASSESSMENT

The relatively low density of mountain big sagebrush has been heavily used, remains in poor condition, and has a high rate of decadence. Precipitation data from Morgan indicate that drier-than-normal conditions have existed since 1987. There was no seed production in 1990, but seedling and young plants currently make up 37% of the population. The seedlings have reduced vigor due to the prolonged drought conditions. Rubber rabbitbrush and stickyleaf low rabbitbrush are the most common browse plants and both have increased in density. Even the less desirable stickyleaf low rabbitbrush has been heavily hedged. Bitterbrush is infrequent and heavy hedging has led to a high percentage of decadent plants. Bluebunch wheatgrass is common and the sum of the nested frequency of perennial grasses increased 16%. The nested frequency of perennial forbs decreased 57%, the majority of which was in the desired species yellow salsify.

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

1996 TREND ASSESSMENT

The trend for browse is stable for the two key species mountain big sagebrush and antelope bitterbrush. Density of both species has increased, but this is likely due to the larger sample size used beginning in 1992, which better estimates shrub populations with clumped and/or discontinuous distributions. Heavy use and percent decadence have declined and vigor improved. The grass trend is slightly down. The nested frequency of perennial grasses decreased 27%, but some of that change is likely due to the larger sample area. Bluebunch wheatgrass and Sandberg bluegrass both decreased significantly. Annual grasses were sampled for the first time and were moderately to highly abundant. The forb trend is up. The nested frequency of perennial forbs increased more than two-fold and the nested frequency of yellow salsify returned to values similar to those in 1984. The Desirable Components Index score was fair due to moderate preferred browse cover, low browse decadence, good perennial grass cover, and moderate perennial forb cover.

winter range condition (DC Index) - fair (55) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - up (+2)

2001 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush and bitterbrush, is stable. Density of mountain big sagebrush has declined slightly due to a reduction in the number of young plants. Utilization is light to moderate, vigor is normal on most plants, and percent decadence, although higher than 1996, is only moderate at 21%. All bitterbrush sampled display heavy use, but the population has remained fairly stable, vigor is normal on all plants, and there were no decadent plants sampled. The grass trend is slightly up. The nested frequency of perennial grasses increased and the nested frequency of Sandberg bluegrass increased significantly. The sum of the nested frequency of annual grasses remained unchanged, although the nested frequency of cheatgrass decreased significantly. The forb trend is slightly down. The nested frequency of perennial grasses decreased 10% and the nested frequency of yellow salsify decreased significantly. Storksbill increased significantly. Kimball and Schiffmann (2003) showed that high densities of storksbill can outcompete native species and prevent native seed establishment, specifically native perennial grasses, under grazing pressure. The Desirable Components Index score remained fair.

winter range condition (DC Index) - fair (59) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is down. The density of mountain big sagebrush decreased 35%, the decreases were all in the mature and decadent age classes. Decadence remained about 20% and vigor changed little. Nearly 10% of the population was identified as infested by the sagebrush defoliator moth. The grass trend is stable. The nested frequency of perennial and annual grasses did not change. Japanese brome decreased significantly, but cheatgrass compensated by increasing significantly. The forb trend is down. The nested frequency of perennial forbs decreased 25%, mainly due to a significant decrease in yellow salsify. The Desirable Components Index score decreased to poor to fair due to a decrease in preferred browse cover and an increase in annual grass cover.

winter range condition (DC Index) - poor to fair (50) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	-	-	-	-	3	-	-	.03
G	Agropyron intermedium	$_{a}$3	$_{a}$2	$_{a}$5	$_{a}$7	$_{b}$20	.03	.33	.97
G	Agropyron spicatum	$_{ab}$218	$_{b}$231	$_{a}$182	$_{ab}$189	$_{ab}$219	11.84	11.55	12.99
G	Bromus brizaeformis (a)	-	-	4	3	3	.01	.03	.00
G	Bromus japonicus (a)	-	-	$_{b}$205	$_{b}$227	$_{a}$151	2.62	3.64	1.90
G	Bromus tectorum (a)	-	-	$_{b}$267	$_{a}$239	$_{b}$310	6.97	5.10	16.68
G	Elymus cinereus	-	-	-	4	-	-	.38	.38
G	Elymus junceus	-	-	-	-	2	-	-	.00
G	Festuca ovina	-	-	-	2	-	-	.03	-
G	Oryzopsis hymenoides	4	16	11	20	5	.36	.50	.29
G	Poa pratensis	$_{b}$17	$_{ab}$5	$_{a}$-	$_{a}$2	$_{a}$-	-	.03	-
G	Poa secunda	$_{a}$-	$_{b}$26	$_{a}$6	$_{b}$28	$_{a}$7	.06	.77	.04
Total for Annual Grasses		0	0	476	469	464	9.60	8.77	18.59
Total for Perennial Grasses		242	280	204	252	256	12.31	13.61	14.72
Total for Grasses		242	280	680	721	720	21.92	22.39	33.32
F	Achillea millefolium	$_{b}$7	$_{a}$-	$_{ab}$6	$_{ab}$2	$_{ab}$2	.01	.15	.15
F	Agoseris glauca	-	1	-	5	1	-	.01	.00
F	Alyssum alyssoides (a)	-	-	$_{a}$245	$_{b}$304	$_{b}$291	1.12	6.27	2.84
F	Allium sp.	-	-	4	11	4	-	.03	.01
F	Arabis drummondi	-	-	-	-	-	-	-	.03
F	Arenaria sp.	-	-	-	-	3	-	-	.03
F	Artemisia ludoviciana	$_{a}$24	$_{a}$23	$_{a}$30	$_{b}$68	$_{a}$45	.53	2.45	1.49
F	Astragalus beckwithii	-	-	-	-	6	-	-	.36
F	Aster chilensis	$_{b}$15	$_{a}$2	$_{a}$1	$_{a}$1	$_{a}$-	.00	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Astragalus sp.	$_{b}$31	$_{a}$-	$_{a}$7	$_{a}$-	$_{a}$-	.21	-	-
F	Astragalus utahensis	2	1	3	2	-	.03	.03	.00
F	Castilleja linariaefolia	-	-	4	-	3	.18	-	.15
F	Camelina microcarpa (a)	-	-	2	17	5	.00	.04	.01
F	Cirsium undulatum	$_{b}$23	$_{ab}$27	$_{ab}$16	$_{a}$5	$_{ab}$7	.21	.24	.37
F	Collomia linearis (a)	-	-	-	2	-	-	.01	-
F	Collinsia parviflora (a)	-	-	10	7	10	.02	.07	.05
F	Crepis acuminata	-	-	-	-	4	-	-	.09
F	Cryptantha sp.	$_{b}$10	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Cymopterus sp.	$_{a}$-	$_{b}$8	$_{ab}$3	$_{ab}$2	$_{ab}$2	.03	.03	.03
F	Cynoglossum officinale	-	-	2	2	2	.00	.03	.15
F	Descurainia pinnata (a)	-	-	-	9	1	-	.04	.00
F	Draba sp. (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$14	-	-	.03
F	Erodium cicutarium (a)	-	-	$_{a}$24	$_{b}$77	$_{a}$38	.10	1.62	.22
F	Hackelia patens	-	-	7	-	-	.04	-	-
F	Helianthus annuus (a)	-	1	-	-	-	-	-	-
F	Hedysarum boreale	-	7	2	6	1	.15	.04	.03
F	Holosteum umbellatum (a)	-	-	$_{a}$32	$_{b}$130	$_{c}$181	.09	.60	.66
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{a}$6	$_{b}$16	$_{a}$-	.01	.08	-
F	Lithospermum ruderale	6	6	-	-	-	-	-	.03
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$35	$_{b}$21	-	.20	.09
F	Oenothera caespitosa	6	-	1	-	2	.03	-	.03
F	Penstemon sp.	5	-	-	-	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	3	2	-	.00	.01
F	Streptanthus cordatus	-	2	-	-	-	-	-	-
F	Taraxacum officinale	-	-	-	2	3	-	.03	.03
F	Tragopogon dubius	$_{c}$134	$_{ab}$37	$_{c}$96	$_{b}$66	$_{a}$11	1.27	.48	.09
F	Vicia americana	$_{a}$-	$_{a}$-	$_{bc}$52	$_{b}$29	$_{c}$67	.65	.42	2.18
Total for Annual Forbs		0	1	313	584	563	1.34	8.88	3.94
Total for Perennial Forbs		263	114	240	217	163	3.39	4.06	5.28
Total for Forbs		263	115	553	801	726	4.74	12.94	9.22

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

BROWSE TRENDS --
Management unit 04 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	4	1	1	.41	.15	.63
B	Artemisia tridentata vaseyana	30	30	16	3.45	7.90	4.65
B	Chrysothamnus nauseosus albicaulis	37	31	25	1.99	5.21	2.04
B	Chrysothamnus viscidiflorus viscidiflorus	32	28	24	1.61	.95	1.42
B	Gutierrezia sarothrae	41	35	3	1.43	.75	.15
B	Leptodactylon pungens	0	0	0	-	.15	-
B	Mahonia repens	4	5	6	.06	.27	.63
B	Purshia tridentata	10	8	10	.69	.22	1.14
Total for Browse		158	138	85	9.66	15.61	10.67

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 6

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	7.68
Chrysothamnus nauseosus albicaulis	3.54
Chrysothamnus viscidiflorus viscidiflorus	1.76
Mahonia repens	.11
Purshia tridentata	.93

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 6

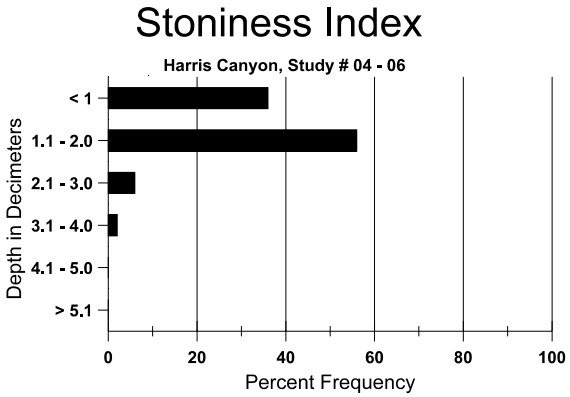
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.6	2.0
Purshia tridentata	-	2.7

BASIC COVER --
Management unit 04 , Study no: 6

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	10.00	40.52	52.22	47.18
Rock	19.00	16.50	13.25	18.04	20.68
Pavement	5.25	5.00	.59	.80	.70
Litter	55.00	38.50	48.43	33.40	33.34
Cryptogams	0	0	.33	.14	.51
Bare Ground	18.50	30.00	4.82	14.94	14.47

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 06, Harris Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.4	67.6 (12.3)	7.2	43.3	26.7	30.0	4.0	6.9	163.2	0.8



PELLET GROUP DATA --
Management unit 04 , Study no: 6

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	9
Elk	4	20	31
Deer	25	22	25
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
22 (55)	29 (71)
79 (195)	46 (112)
-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
84	**33**	-	-	-	33	-	0	100	100	-	100	-/-
90	**33**	-	-	-	33	-	0	100	100	61	100	-/-
96	**80**	-	-	40	40	-	50	25	50	-	0	27/28
01	**20**	-	-	-	20	-	0	0	100	-	0	48/29
06	**20**	-	-	20	-	-	100	0	0	-	0	40/37
Artemisia tridentata vaseyana												
84	**632**	-	166	66	400	-	11	63	63	-	0	6/6
90	**698**	133	166	166	366	-	10	81	52	6	24	26/31
96	**840**	-	200	560	80	560	17	2	10	5	5	25/44
01	**680**	-	40	500	140	320	26	3	21	9	9	28/46
06	**440**	20	40	320	80	220	32	5	18	5	5	30/44
Chrysothamnus nauseosus albicaulis												
84	**232**	-	33	133	66	-	0	100	28	-	0	36/27
90	**932**	-	766	66	100	-	4	0	11	-	0	40/52
96	**1180**	20	220	900	60	-	20	0	5	-	0	22/35
01	**800**	-	60	480	260	40	30	18	33	13	13	25/34
06	**640**	-	40	340	260	80	13	0	41	16	16	25/33
Chrysothamnus viscidiflorus viscidiflorus												
84	**33**	-	-	-	33	-	100	0	100	-	100	-/-
90	**765**	-	166	233	366	-	13	65	48	5	35	6/8
96	**1380**	20	240	1140	-	-	4	3	0	-	0	11/17
01	**1020**	-	60	940	20	-	2	0	2	-	0	9/14
06	**900**	20	20	880	-	-	0	0	0	-	0	15/18
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**1132**	-	133	966	33	-	0	0	3	-	0	7/12
96	**2600**	4100	1380	1140	80	100	0	0	3	3	3	10/13
01	**2140**	-	140	1920	80	40	0	0	4	3	3	8/9
06	**80**	-	-	80	-	-	0	0	0	-	0	10/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**660**	-	660	-	-	-	0	0	-	-	0	-/-
01	**3300**	-	220	3080	-	-	0	0	-	-	0	3/4
06	**2540**	-	-	2540	-	-	0	0	-	-	0	2/4
Purshia tridentata												
84	**132**	-	-	66	66	-	0	100	50	-	0	15/15
90	**166**	-	33	33	100	-	20	80	60	24	60	11/28
96	**380**	-	20	340	20	-	42	47	5	-	0	16/29
01	**300**	-	-	300	-	-	0	100	0	-	0	15/30
06	**280**	40	-	220	60	-	14	86	21	-	0	19/35
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	15/22
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	17/24
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	8/13

Trend Study 4-8-06

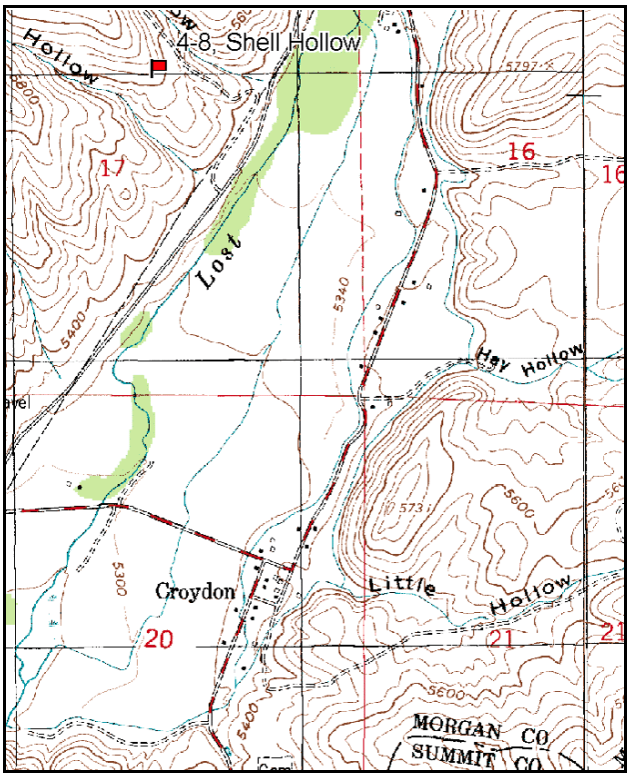
Study site name: Shell Hollow . Vegetation type: Big Sagebrush .

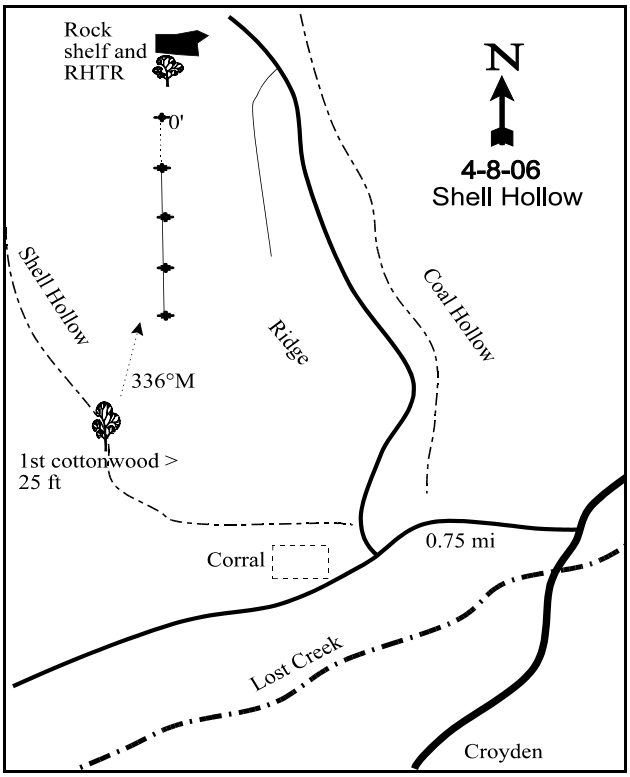
Compass bearing: frequency baseline 159 degrees magnetic.

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

LOCATION DESCRIPTION

From 6900 East and 1900 South in Croyden, proceed east 1.55 miles to a road paralleling Lost Creek. Turn left here and travel 0.75 miles to Coal Hollow Road. Just east of the road is a corral. Northwest of the corral is the ravine, Shell Hollow. Walk up Shell Hollow to the first cottonwood tree over 25 feet tall. Nearby should be a small drainage up the slope to the right. From the tree, take a bearing of 351 degrees true and walk approximately 150 yards up-slope to the 0-foot stake of the baseline marked by browse tag #7947. Ten feet north of the 0-foot stake is a sumac and a rocky shelf behind. Just east of the 0-foot stake is a large rock with a perfect seat carved by the wind. Contact the land owner prior to accessing the site.





Map Name: Devil's Slide

Diagrammatic Sketch

Township 4N , Range 4E , Section 17

UTM NAD 27, UTM 12T 4547986 N 456489 E

DISCUSSION

Shell Hollow - Trend Study No. 4-8

Study Information

This study is located on a small privately owned ridge between Shell Hollow and Coal Hollow on the west side of Lost Creek within critical deer winter range. It samples a mountain big sagebrush/basin big sagebrush hybrid community on a hillside 150 yards above Shell Hollow (elevation: 5,600 feet, slope: 30%, aspect: south). In past years, winter deer and spring sheep use was heavy on the key browse species and understory plants. Few perennial grasses and forbs remain. Cattle were present along the creek during the 1996 reading and had already utilized the available understory forage. Few deer pellet groups were encountered in 1996. A pellet group transect in 2001 estimated 21 deer and 2 cow days use/acre (51 ddu/ha and 5 cdu/ha). In 2006, pellet group estimates were 35 deer, 6 elk, 2 cow, and 8 sheep days use/acre (86 ddu/ha, 15 edu/ha, 5 cdu/ha, and 20 sdu/ha). The elk and deer use were primarily during the winter and sheep use in fall or summer. Three deer carcasses were identified below the study area and a skeleton was identified in the study area in 2006.

Soil

The soil is in the Kilfoil series, which consists of moderately deep, well drained soils that formed from weathered sandstone and shale (USDA-NRCS 2006). The average effective rooting depth is estimated at almost 11 inches, at which a hard pan layer was encountered. Soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH of 7.8). It is very gravely, derived from a conglomerate parent material. Some large boulders are exposed. Relative bare ground cover was 7% in 1996, 15% in 2001, and 13% in 2006. The erosion condition class was determined as stable in 2001 and 2006.

Browse

The key browse species is mountain big sagebrush. It appears to be hybridizing with basin big sagebrush *(Artemisia tridentata tridentata)* since many are tall and have the upright growth form of basin big sagebrush. Sagebrush has provided most of the total shrub cover since 1996. Sagebrush density was relatively stable between 1984 and 1996, but then began decreasing: 4,800 plants/acre (1984), 3,798 (1990), 4,780 (1996), 3,340 (2001), and 2,820 (2006). This is a 41% decrease from 1996 to 2006. Utilization was heavy on 24% of the shrubs in 1984, but light to moderate since 1996. Decadence has declined from a high of 54% in 1990 to 20% in 2001, then increased to 39% in 2006. Plants classified with poor vigor steadily increased, reaching a high of 28% in 1996. In 2001, only 8% of the shrubs sampled displayed poor vigor, but had increased to 15% by 2006. The percentage of the population classified as dying has increased from 1% in 1996 to 13% in 2006. Part of the poor vigor of the sagebrush in 2006 might have been a product of the presence of the sagebrush defoliator moth *(Aroga websterii*), which was identified on the study, but not on any individuals sampled in density measurments. The decreasing population is likely due to low recruitment, which was has been at or below 3% since 2001. The high cheatgrass cover and frequent dry conditions are likely preventing sagebrush recruitment and the replacement of dying individuals with young. Small populations of Saskatoon serviceberry and white rubber rabbitbrush have also been sampled. Stickyleaf low rabbitbrush, an increaser, density was high in 1996 at 5,360 plants/acre and has steadily decreased to 4,080 plants/acre by 2006.

Herbaceous Understory

Perennial grasses and forbs are rare. Apart from the occasional perennial grass, herbaceous forage production came almost entirely from Japanese brome and cheatgrass in 1996. Due to the dry conditions and timing of precipitation in 2001, nested frequency and cover of Japanese brome declined significantly, while frequency and cover of annual forbs increased dramatically. In 2006, Japanese brome and cheatgrass both increased significantly. Annual grasses provided 26% cover in 1996 and 2006, but only 2% in 2001. American vetch provided 6% cover in 2006, more than any other perennial grass or forb species.

1990 TREND ASSESSMENT
The sagebrush on this privately owned winter range has generally good vigor and a moderately hedged growth form. Sagebrush density decreased 21%. Sagebrush canopy cover averages 29%. Recently, the range has been grazed by cattle. There is very little herbaceous understory vegetation, although several species of weedy forbs were encountered in 1990. The understory is in poor condition, providing limited protective ground cover. Perennial grass nested frequency remained low and the nested frequency of perennial forbs increased largely due to significant increases in American vetch, longleaf phlox, and pale stickseed.

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

1996 TREND ASSESSMENT
Trend for the mountain big sagebrush is slightly up. Sagebrush density appears to have increased 21%, but some of these large changes in density for this shrub are likely due to the larger sample size this year, which better estimates shrub populations with clumped and/or discontinuous distributions. Presently, canopy cover of sagebrush averages just over 22%. Utilization is light to moderate and percent decadency has dropped to 24%. A high number of shrubs display poor vigor. The grass trend is stable. The nested frequency of perennial grasses increased, but this change is also due to the increased sample area. The forb trend is stable. The nested frequency of perennial forbs increased, but again many new species were sampled because of the larger sample area. The Desirable Components Index score is very poor due to very high cheatgrass cover and low perennial forb cover.

winter range condition (DC Index) - very poor (30) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT
Trend for mountain big sagebrush is down. Sagebrush density decreased 30%, the majority of which was in the mature and decadent age classes. Utilization is mostly light to moderate, vigor has improved, and percent decadence has declined slightly. Density of the increaser, stickyleaf low rabbitbrush, has remained stable. The grass trend is slightly up. The nested frequency of perennial grasses remained unchanged, but the nested frequency of annual grasses decreased 40%. Japanese brome nested frequency decreased significantly and cheatgrass remained unchanged. The forb trend is stable. The nested frequency of perennial forbs increased slightly, as did the nested frequency of annual forbs. The forb composition is poor for big game. The DCI score increased to poor to fair because perennial grass cover increased, perennial forb cover increased, and annual grass cover decreased.

winter range condition (DC Index) - poor to fair (51) Mid-level potential scale
browse - down (-2) grass - slightly up (+1) forb - stable (0)

2006 TREND ASSESSMENT
The browse trend is slightly down. The density of mountain big sagebrush decreased 16%, decadence increased to 39% of the population, and plants classified as dying increased to 13% of the population. The grass trend is slightly down. The nested frequency of perennial grasses increased slightly, but the nested frequencies of Japanese brome and cheatgrass both increased significantly. Annual grasses provided 26% cover. The forb trend is slightly up. The nested frequency of the most beneficial perennial forb, American vetch, increased significantly and the detrimental invasive annual forb, bur buttercup, decreased significantly. The DCI score decreased to very poor to poor because annual grass cover increased, as did browse decadence.

winter range condition (DC Index) - very poor to poor (34) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{a}$-	$_{a}$-	$_{b}$18	$_{b}$18	$_{b}$27	1.52	1.67	1.50
G	Agropyron spicatum	-	4	10	7	9	.18	.18	.51
G	Bromus brizaeformis (a)	-	-	4	12	4	.01	.10	.01
G	Bromus japonicus (a)	-	-	$_{c}$382	$_{a}$198	$_{b}$239	26.01	1.53	7.88
G	Bromus tectorum (a)	-	-	$_{a}$6	$_{a}$25	$_{b}$246	.03	.51	17.92
G	Elymus cinereus	3	1	7	7	10	.06	.83	2.21
G	Oryzopsis hymenoides	-	-	1	6	4	.03	.18	.33
G	Poa pratensis	-	-	-	-	1	-	-	.00
G	Poa secunda	$_{a}$-	$_{a}$-	$_{b}$13	$_{b}$12	$_{ab}$4	.08	.13	.03
Total for Annual Grasses		0	0	392	235	489	26.05	2.15	25.81
Total for Perennial Grasses		3	5	49	50	55	1.89	3.00	4.60
Total for Grasses		3	5	441	285	544	27.95	5.15	30.42
F	Achillea millefolium	-	5	3	3	2	.03	.15	.03
F	Allium acuminatum	$_{a}$1	$_{a}$4	$_{b}$25	$_{c}$123	$_{b}$20	.07	.55	.08
F	Alyssum alyssoides (a)	-	-	$_{b}$212	$_{a}$78	$_{b}$180	.96	.21	.76
F	Astragalus beckwithii	$_{a}$3	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$7	-	.15	.17
F	Aster chilensis	-	3	-	-	-	-	-	-
F	Astragalus convallarius	-	-	6	-	-	.06	-	-
F	Aster sp.	-	-	-	-	1	-	-	.03
F	Astragalus utahensis	-	-	2	1	-	.01	.00	-
F	Camelina microcarpa (a)	-	-	15	13	13	.03	.04	.08
F	Calochortus nuttallii	-	-	-	2	-	-	.00	-
F	Cirsium undulatum	8	4	15	6	4	.12	.10	.01
F	Collomia grandiflora (a)	-	-	-	-	10	-	-	.02
F	Collomia linearis (a)	-	-	$_{a}$8	$_{b}$30	$_{a}$2	.01	.12	.00
F	Comandra pallida	$_{a}$-	$_{a}$-	$_{ab}$10	$_{b}$11	$_{ab}$3	.07	.10	.15
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$34	$_{b}$38	-	.18	.13
F	Descurainia pinnata (a)	-	-	-	2	2	-	.01	.00
F	Draba sp. (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$19	-	-	.04
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{a}$4	$_{b}$22	-	.01	.05
F	Erodium cicutarium (a)	-	-	$_{ab}$16	$_{a}$7	$_{b}$26	.10	.03	.44
F	Galium aparine (a)	-	-	3	1	6	.00	.03	.02
F	Gayophytum ramosissimum(a)	-	-	11	-	-	.02	-	-
F	Hackelia patens	$_{a}$-	$_{b}$15	$_{b}$14	$_{b}$12	$_{b}$7	.16	.25	.13
F	Helianthus annuus (a)	-	1	-	1	3	-	.00	.03

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{b}$18	$_{b}$26	-	.08	.12
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$9	$_{a}$-	$_{a}$-	.02	.00	-
F	Machaeranthera canescens	-	-	1	-	-	.00	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$55	$_{b}$54	-	.32	.11
F	Phlox longifolia	$_{a}$-	$_{c}$117	$_{a}$4	$_{b}$38	$_{b}$43	.01	.13	.28
F	Ranunculus testiculatus (a)	-	-	$_{a}$53	$_{c}$220	$_{b}$103	.13	4.38	.43
F	Tragopogon dubius	1	3	9	3	8	.02	.00	.07
F	Veronica biloba (a)	-	-	$_{a}$7	$_{c}$341	$_{b}$72	.04	7.48	.42
F	Verbascum thapsus	$_{a}$-	$_{a}$-	$_{b}$31	$_{a}$-	$_{a}$-	.09	-	-
F	Vicia americana	$_{a}$-	$_{b}$31	$_{c}$92	$_{c}$98	$_{d}$158	1.06	1.46	6.17
F	Viola sp.	-	-	-	-	7	-	-	.21
Total for Annual Forbs		0	1	325	804	576	1.31	12.92	2.69
Total for Perennial Forbs		13	182	221	307	260	1.74	2.92	7.34
Total for Forbs		13	183	546	1111	836	3.06	15.84	10.03

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

BROWSE TRENDS --
Management unit 04 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	1	1	0	-	-	-
B	Artemisia tridentata vaseyana	97	88	78	22.27	26.68	20.50
B	Chrysothamnus nauseosus albicaulis	8	10	11	1.83	1.88	1.79
B	Chrysothamnus viscidiflorus viscidiflorus	76	65	69	6.00	2.82	6.31
B	Gutierrezia sarothrae	3	9	1	-	.36	.03
Total for Browse		185	173	159	30.11	31.75	28.64

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 8

Species	Percent Cover '06
Artemisia tridentata vaseyana	19.21
Chrysothamnus nauseosus albicaulis	.83
Chrysothamnus viscidiflorus viscidiflorus	5.38

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 8

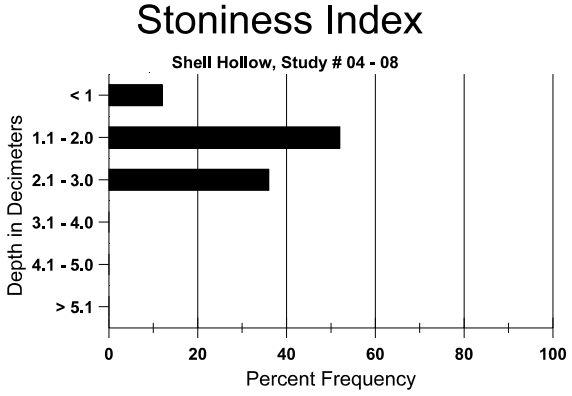
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.8	2.3

BASIC COVER --
Management unit 04 , Study no: 8

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.50	5.75	55.91	52.17	54.70
Rock	2.50	1.50	1.75	1.55	1.64
Pavement	10.75	13.50	1.62	5.81	4.17
Litter	58.00	47.75	51.50	46.72	47.29
Cryptogams	0	0	.06	.03	.00
Bare Ground	27.25	31.50	8.15	18.02	16.39

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 08, Shell Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.6	78.2 (11.9)	7.8	49.6	23.4	27.0	2.5	18.1	217.6	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 8

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	-	1
Rabbit	-	6	8
Elk	-	-	2
Deer	10	6	8
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	8 (20)
-	-
-	6 (15)
21 (51)	35 (86)
2 (5)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	100	-	-	0	23/40
01	**20**	-	20	-	-	-	0	0	-	-	0	25/43
06	**0**	-	-	-	-	-	0	0	-	-	0	25/29
Artemisia tridentata vaseyana												
84	**4800**	-	400	2800	1600	-	74	24	33	-	3	30/34
90	**3798**	533	266	1466	2066	-	60	2	54	5	19	29/37
96	**4780**	20	380	3240	1160	460	43	8	24	1	28	29/48
01	**3340**	-	100	2580	660	540	20	2	20	7	8	35/47
06	**2820**	40	60	1660	1100	860	28	4	39	13	15	33/45
Chrysothamnus nauseosus albicaulis												
84	**132**	-	66	66	-	-	50	0	0	-	0	21/27
90	**266**	-	-	-	266	-	50	0	100	15	50	-/-
96	**220**	-	20	160	40	40	0	0	18	-	9	29/38
01	**200**	-	20	80	100	20	10	0	50	10	10	32/44
06	**240**	-	60	140	40	-	25	0	17	8	17	23/28
Chrysothamnus viscidiflorus viscidiflorus												
84	**1799**	-	66	1600	133	-	56	0	7	-	0	14/17
90	**3533**	-	200	2000	1333	-	21	2	38	7	30	10/12
96	**5360**	-	640	4560	160	20	2	0	3	.74	5	13/16
01	**4560**	-	160	4260	140	-	4	0	3	2	2	9/13
06	**4080**	-	140	3900	40	-	2	0	1	.49	3	13/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**140**	60	-	140	-	-	0	0	0	-	0	11/9
01	**280**	-	-	220	60	-	0	0	21	7	7	8/10
06	**20**	-	-	20	-	-	0	0	0	-	0	8/7
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	4/9
01	**0**	-	-	-	-	-	0	0	-	-	0	4/14
06	**0**	-	-	-	-	-	0	0	-	-	0	8/20
Rhus trilobata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	72/128
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	62/115
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	23/41

Trend Study 4-9-06

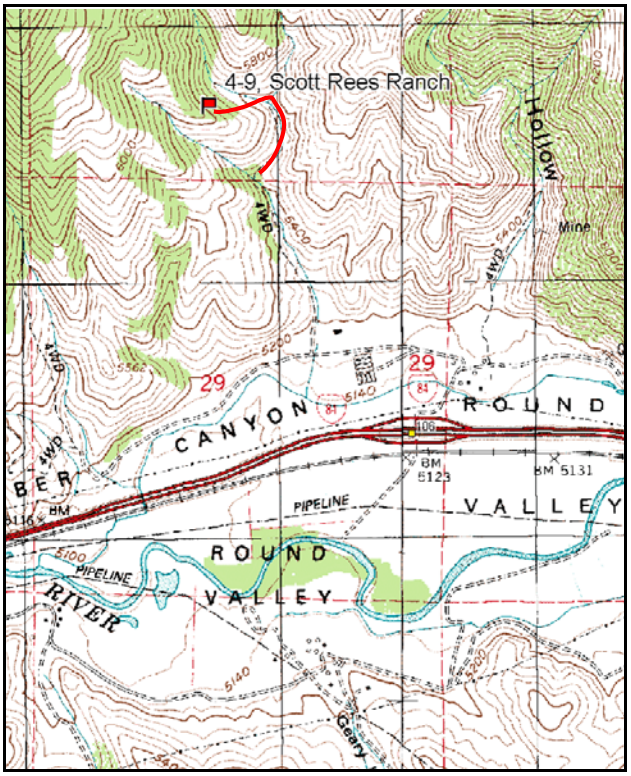
Study site name: Scott Rees Ranch . Vegetation type: Gambel Oak .

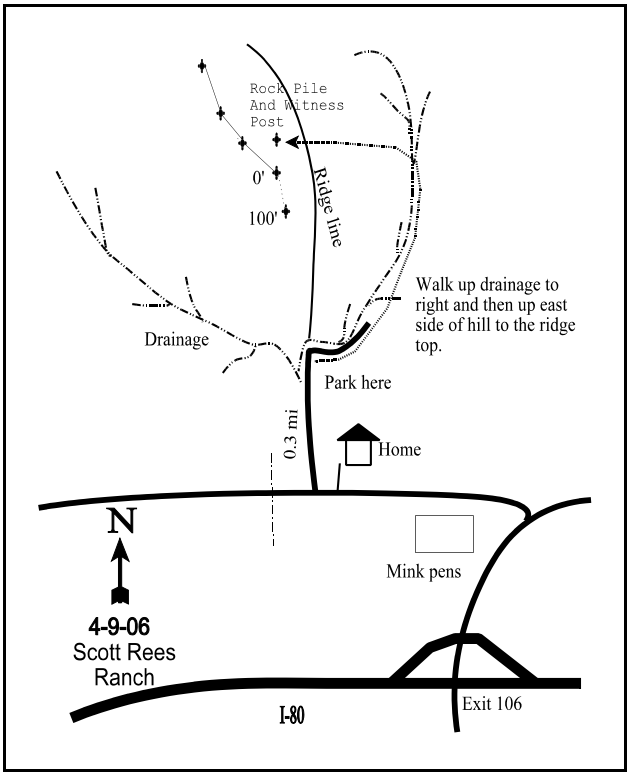
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

On I-84 between Morgan and Henefer, take exit 106 and go north to the Scott Rees Ranch. Turn left (west) on the road north of the mink pens. Drive on this road approximately 0.3 miles past the main house and turn right (north). Drive up a rough road 0.3 miles to the end of the road at a fork in the canyon and where a 4-wheeler trail takes off. From here walk up the road past the draw and continue around the hill. Start walking up the east slope of the hill to the ridge top. On top of a knoll in low growing oak, there is a rock pile with a witness post sticking out of it. The 0-foot baseline stake is just south of the rock monument, and is marked by browse tag #7971. The first 100 feet of the baseline runs 165 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 258 degrees magnetic. Line 3 runs 252 degrees magnetic. Line 4 runs 277 degrees magnetic. Contact the land owner prior to accessing the site.





Map Name: Morgan

Diagrammatic Sketch

Township 4N , Range 3E , Section 20

UTM NAD 27, UTM 12T 4545657 N 446713 E

DISCUSSION

Scott Rees Ranch - Trend Study No. 4-9

Study Information

This study samples critical deer winter range in Upper Weber Canyon, east of Morgan and north of Round Valley (elevation: 5,800 feet, slope: 40%, aspect: south). It is dominated by low growing Gambel oak interspersed with occasional mountain big sagebrush and white rubber rabbitbrush. Deer use was moderate to heavy in 1984, but had little significant impact on the vigor or reproduction of oak. Numerous winter killed deer were observed during the 1984 reading. This area is part of the Round Valley WMA, which is owned by the DWR. It was historically grazed by sheep crossing the WMA from round valley to a property to the north, but this is no longer the case. It is occasionally grazed by stray cattle from the valley. Longer durations of grazing are not practical because of a lack of water in the WMA. Sheep sign was noted in 1996. A pellet group transect in 2001 estimated 32 deer and 4 elk days use/acre (79 ddu/ha and 10 edu/ha). Most of the deer pellet groups were found in open areas where there was no oak brush. It also appeared that deer use this area primarily in the spring. Four deer were seen on the study area in 2001. In 2006, 56 deer and 58 elk days use/acre were estimated (139 ddu/ha and 144 edu/ha). All pellet groups were from spring or fall use and the majority of elk pellet groups were sampled on the ridge. A fawn carcass was also identified in 2006.

Soil

The soil is in the Agassiz series which consists of very shallow and shallow, somewhat excessively drained, moderate or moderately rapidly permeable soils on mountainsides (USDA-NRCS 2006). It is very rocky on the surface and throughout the profile. The effective rooting depth is estimated at only 8 inches. Soil texture is a clay loam with a neutral soil reaction (pH of 6.9). Where the oak occurs, litter cover is also good and little erosion occurs. Current erosion is confined primarily to spaces between oak patches and terracing occurs on the steeper slopes. The relative bare ground cover has been at or below 1% since 1996. The soil erosion condition class was determined as stable in 2001 and 2006.

Browse

The browse composition consists almost entirely of low growing Gambel oak. The average height of mature oak is only about 23 inches, which is likely caused by the shallow soil. It has good vigor and a high abundance of young. This species may even be spreading into interspaces. The density of stems/acre has fluctuated considerably since 1990, possibly due to sampling errors in counting the very abundant oak stems. Even though stem density was much lower in 1996 than 2001 and 2006, the strip frequency and average cover have remained fairly similar. Oak received moderate use in 1990 and 1996, but only light use in 2001 and 2006. It is difficult to judge utilization of oak brush, especially low growing plants. The stunted growth form of the low oak brush has an appearance of being hedged when it actually is not. Vigor has been normal during all readings and percent decadence is low.

Other shrubs occur rarely. These include broom snakeweed, white rubber rabbitbrush, Saskatoon serviceberry, bitterbrush, and mountain big sagebrush. The latter three have sustained exceptionally heavy use and decadence is quite common.

Herbaceous Understory

The herbaceous understory contains six perennial grasses, of which bluebunch wheatgrass is the most abundant. Annual grasses (rattlesnake and Japanese brome, cheatgrass, and rattail fescue) dominate the grass component. Annual grasses provided 24% cover in 1996, 13% in 2001, and 8% in 2006. Perennial forbs have provided the majority of forb cover. Louisiana sage, thistle, low fleabane, and yellow salsify are the most common perennial forbs. Perennial grasses and forbs are most common in the oak brush patches and the open interspaces are dominated by annual grasses and forbs.

1990 TREND ASSESSMENT
The area is dominated by Gambel oak, with a lack of other browse species on the slopes. The density of Gambel oak decreased 42%. The low-growing oak is moderately hedged. The majority of the plants display reduced vigor and decadence due to heavy insect infestation. Cheatgrass and bluebunch wheatgrass are the most abundant understory plants.

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

1996 TREND ASSESSMENT
Trend for oak is stable. The change in density is likely due to the larger sample used in 1996 and some sampling error. Utilization is mostly moderate and vigor has improved since 1990. The grass trend is slightly down. The nested frequency of perennial grasses decreased 20%, most of which was due to a significant decrease bluebunch wheatgrass. This decrease could be due in part to the increase in sample size. The nested frequency of annual grasses is high. The forb trend is slightly up. The nested frequency of perennial forbs increased two-fold, but most of this is likely due to the increased sample size in 1996. The Desirable Components Index score is fair due to excellent browse cover, but moderate decadence, moderate percent young, very high annual grass cover, and only moderate perennial grass cover.

winter range condition (DC Index) - fair (58) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

2001 TREND ASSESSMENT
Trend for Gambel oak is slightly up. The 65% increase in density appears to be caused, in part, by observer error in 1996. Comparisons between the 1996 and 2001 photos show some increase in oak, but not a 65% increase. Oak cover has increased 3% and strip frequency increased by one, which indicate a slight increase. Use of the stunted oak was light in 2001. There are no other significant sources of browse forage. The grass trend is up. The nested frequency of perennial grasses, excluding that of bulbous bluegrass, increased 36%. The nested frequency of bluebunch wheatgrass and Sandberg bluegrass increased significantly. The nested frequencies of Japanese brome, cheatgrass, and rattlesnake brome all decreased significantly. The sum of the nested frequency of annual grasses decreased 27%. The forb trend is stable. The nested frequency of perennial forbs increased, but none of the species beneficial to big game increased. The nested frequency of storksbill, an undesirable annual, increased significantly. The DCI score increased to good due to increased perennial grass cover and decreased annual grass cover.

winter range condition (DC Index) - good (72) Mid-level potential scale
browse - slightly up (+1) grass - up (+2) forb - stable (0)

2006 TREND ASSESSMENT
The browse trend is stable. The density of Gambel oak is unchanged. Use is light, percent decadence is low, and vigor good. The grass trend is slightly down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 11% and the nested frequency of annual grasses is unchanged. The nested frequency of Sandberg bluegrass decreased significantly. The forb trend is slightly up. The nested frequency of perennial forbs increased 12%, due in part to significant increases in western yarrow and pale agoseris. The nested frequency of storksbill also decreased significantly. The DCI score remained good.

winter range condition (DC Index) - good (70) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 9

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{ab}$201	$_{b}$227	$_{a}$168	$_{b}$221	$_{ab}$213	7.03	9.83	6.78
G	Bromus brizaeformis (a)	-	-	$_{c}$102	$_{b}$49	$_{a}$14	.83	.13	.03
G	Bromus japonicus (a)	-	-	$_{b}$120	$_{a}$77	$_{ab}$91	2.13	.38	.31
G	Bromus tectorum (a)	-	-	$_{b}$347	$_{a}$207	$_{a}$244	21.03	9.11	5.27
G	Carex sp.	-	-	-	4	-	-	.15	-
G	Festuca myuros (a)	-	-	$_{a}$15	$_{b}$94	$_{b}$82	.37	3.53	2.08
G	Koeleria cristata	-	-	-	6	2	-	.06	.03
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$9	$_{b}$18	-	.04	.06
G	Poa pratensis	$_{b}$24	$_{a}$-	$_{b}$19	$_{b}$17	$_{b}$34	.38	.15	.25
G	Poa secunda	$_{a}$7	$_{b}$31	$_{ab}$19	$_{b}$32	$_{a}$1	.09	.40	.00
Total for Annual Grasses		0	0	584	427	431	24.36	13.15	7.71
Total for Perennial Grasses		232	258	206	289	268	7.50	10.64	7.13
Total for Grasses		232	258	790	716	699	31.87	23.80	14.84
F	Achillea millefolium	$_{a}$6	$_{a}$2	$_{a}$20	$_{a}$25	$_{b}$40	.26	.72	1.37
F	Agoseris glauca	$_{a}$-	$_{a}$3	$_{ab}$9	$_{b}$20	$_{c}$48	.02	.15	.46
F	Alyssum alyssoides (a)	-	-	$_{a}$-	$_{b}$16	$_{c}$85	-	.22	.70
F	Allium sp.	-	-	$_{a}$-	$_{b}$14	$_{b}$13	-	.08	.04
F	Amsinckia menziesii	-	-	-	3	-	-	.00	-
F	Artemisia ludoviciana	$_{c}$109	$_{a}$38	$_{ab}$64	$_{bc}$92	$_{bc}$81	2.07	2.48	2.01
F	Astragalus utahensis	2	-	6	4	3	.06	.18	.15
F	Balsamorhiza sagittata	8	5	4	6	2	.25	.51	.72
F	Camelina microcarpa (a)	-	-	-	3	-	-	.00	-
F	Calochortus nuttallii	$_{ab}$4	$_{a}$-	$_{ab}$1	$_{b}$7	$_{b}$11	.00	.03	.10
F	Cirsium undulatum	$_{ab}$19	$_{b}$27	$_{b}$34	$_{ab}$17	$_{a}$7	1.17	.93	.05
F	Collomia linearis (a)	-	-	$_{a}$14	$_{b}$52	$_{a}$14	.03	.13	.08
F	Comandra pallida	$_{b}$55	$_{a}$3	$_{a}$9	$_{a}$10	$_{a}$12	.07	.08	.08
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{c}$66	$_{b}$33	-	.40	.12
F	Cryptantha sp.	-	3	-	-	6	-	-	.01
F	Cymopterus sp.	-	-	-	3	4	-	.03	.15
F	Delphinium nuttallianum	-	-	4	-	-	.06	-	-
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{b}$38	$_{a}$2	-	.11	.00
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$10	$_{b}$13	-	.07	.03
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{b}$47	$_{c}$163	-	.21	1.41
F	Erodium cicutarium (a)	-	-	$_{a}$7	$_{b}$51	$_{a}$19	.06	1.42	.05
F	Erigeron pumilus	$_{a}$13	$_{a}$6	$_{b}$70	$_{a}$3	$_{a}$12	1.95	.06	.25

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Unknown fern	-	-	-	4	5	-	.01	.03
F	Galium aparine (a)	-	-	$_{a}$11	$_{b}$49	$_{b}$54	.05	.79	1.00
F	Gayophytum ramosissimum(a)	-	-	$_{b}$48	$_{b}$34	$_{a}$-	.22	.16	-
F	Geranium sp.	-	-	-	2	-	-	.00	-
F	Hackelia patens	3	-	-	-	-	-	-	-
F	Helianthella uniflora	1	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$28	$_{b}$51	$_{ab}$50	.08	.20	.20
F	Lathyrus brachycalyx	-	-	-	3	3	-	.03	.03
F	Lappula occidentalis (a)	-	-	2	-	-	.01	-	-
F	Lactuca serriola	$_{a}$-	$_{ab}$3	$_{ab}$8	$_{b}$17	$_{b}$19	.04	.06	.06
F	Lychnis drummondii	-	-	-	-	9	-	-	.02
F	Machaeranthera spp	-	-	1	-	-	.00	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{ab}$3	$_{b}$9	-	.03	.02
F	Penstemon sp.	-	-	3	2	1	.03	.03	.00
F	Scutellaria antirrhinoides	-	-	$_{a}$-	$_{ab}$11	$_{b}$18	-	.09	.44
F	Taraxacum officinale	-	-	-	-	-	-	-	.00
F	Tragopogon dubius	$_{a}$18	$_{b}$74	$_{c}$116	$_{c}$152	$_{c}$150	1.51	4.15	4.38
F	Zigadenus paniculatus	-	2	-	3	3	-	.06	.03
Total for Annual Forbs		0	0	110	420	442	0.46	3.78	3.64
Total for Perennial Forbs		238	166	349	398	447	7.53	9.73	10.44
Total for Forbs		238	166	459	818	889	8.00	13.51	14.09

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

BROWSE TRENDS --
Management unit 04 , Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	1	1	1	-	-	-
B	Artemisia tridentata vaseyana	11	7	7	.53	-	.15
B	Chrysothamnus nauseosus albicaulis	0	1	1	-	-	-
B	Gutierrezia sarothrae	17	18	11	.67	.78	.18
B	Purshia tridentata	1	1	1	.15	.15	.15
B	Quercus gambelii	91	92	92	27.84	31.14	26.60
Total for Browse		121	120	113	29.19	32.07	27.09

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 9

Species	Percent Cover '06
Artemisia tridentata vaseyana	.45
Gutierrezia sarothrae	.15
Purshia tridentata	.05
Quercus gambelii	45.06

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 9

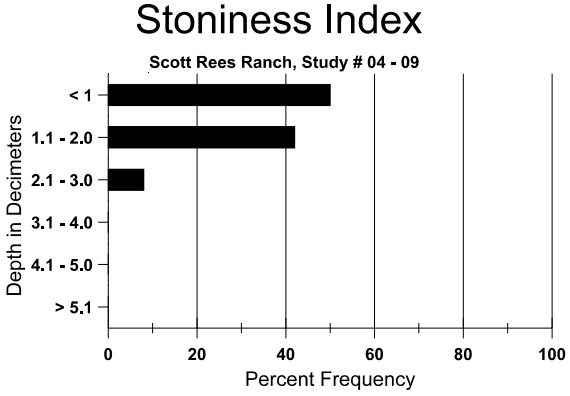
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	3.3	1.4
Purshia tridentata	-	2.9

BASIC COVER --
Management unit 04 , Study no: 9

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	2.75	56.99	63.45	48.63
Rock	31.25	30.75	15.05	15.46	18.86
Pavement	1.50	.75	.10	.01	.06
Litter	52.50	59.75	64.02	58.97	51.39
Cryptogams	2.25	0	.26	.14	.84
Bare Ground	10.25	6.00	.32	1.12	.63

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 09, Scott Rees Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.4	74.2 (7.9)	6.9	38.6	34.1	27.4	2.9	22.5	217.6	0.6



PELLET GROUP DATA --
Management unit 04 , Study no: 9

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	4	-	-
Rabbit	-	-	5
Elk	4	1	12
Deer	11	15	10
Cattle	-	-	2

Days use per acre (ha)	
'01	'06
-	-
-	-
4 (10)	58 (144)
32 (79)	56 (139)
-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**66**	-	-	66	-	-	100	0	0	-	0	28/33
96	**20**	-	-	20	-	-	0	100	0	-	0	52/18
01	**20**	-	-	-	20	-	0	100	100	-	0	-/-
06	**20**	-	-	20	-	-	0	0	0	-	0	31/30
Artemisia tridentata vaseyana												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**220**	-	-	140	80	320	64	18	36	-	0	22/27
01	**180**	-	-	80	100	100	0	11	56	11	11	22/25
06	**160**	-	-	100	60	120	38	63	38	-	0	25/31
Cercocarpus ledifolius												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	19/49
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus albicaulis												
84	**66**	-	-	66	-	-	0	0	-	-	0	31/31
90	**66**	-	-	66	-	-	100	0	-	-	0	35/41
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	20	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	16/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**132**	-	-	66	66	-	50	0	50	-	0	12/7
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**960**	20	-	960	-	-	0	0	0	-	0	15/20
01	**600**	-	20	580	-	-	0	0	0	-	0	11/14
06	**280**	-	-	220	60	-	0	0	21	21	21	12/14
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**20**	-	-	-	20	-	0	100	100	100	100	37/54
01	**20**	-	-	20	-	-	0	100	0	-	0	47/61
06	**20**	-	-	20	-	-	0	100	0	-	0	26/35
Quercus gambelii												
84	**27532**	-	12066	11933	3533	-	8	45	13	-	0	21/11
90	**15999**	-	9466	2733	3800	-	62	1	24	2	6	21/22
96	**9240**	620	1780	6800	660	460	71	6	7	-	0	24/31
01	**26120**	20	3380	22240	500	920	1	0	2	.07	.07	23/16
06	**25460**	620	3920	20980	560	4280	0	1	2	.15	.39	23/18

Trend Study 4-13-06

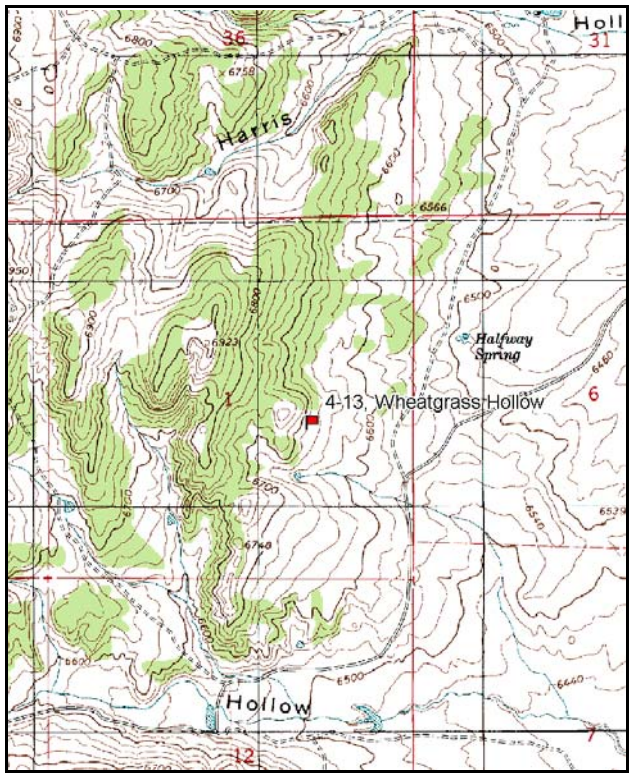
Study site name: Wheatgrass Hollow . Vegetation type: Big Sagebrush .

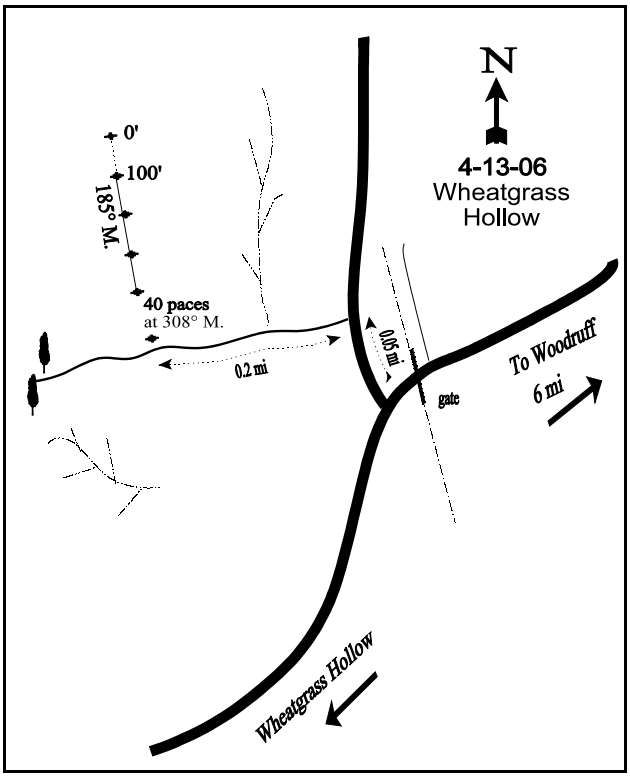
Compass bearing: frequency baseline 135 degrees magnetic.

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

LOCATION DESCRIPTION

Where Highway U-16 bends to the east on the south side of Woodruff, continue straight on Deseret Road (South Main). Go 2.5 miles and turn right (west) onto the Wheatgrass Road. Go 3.25 miles, crossing several cattleguards, to the fourth cattleguard. Continue past this cattleguard to a fork. Go north 0.05 miles to a fork with a faint road on the left. Go 0.2 miles west on the faint road to a witness post. From the witness post, walk 40 paces at 308 degrees magnetic to the 400-foot baseline stake. The 0-foot baseline stake is located 400 feet to the north at a bearing of 315 degrees magnetic.





Map Name: Neponset Reservoir NW

Diagrammatic Sketch

Township 8N , Range 6E , Section 1

UTM NAD 27, UTM 12T 4589340 N 482214 E

DISCUSSION

Wheatgrass Hollow - Trend Study No. 4-13

Study Information

This study was established in 1990 on BLM-managed winter range which is surrounded by Deseret Land and Livestock properties (elevation: 6,700 feet, slope: 10%, aspect: southeast). The vegetation type is Wyoming big sagebrush with scattered juniper and pinyon and a sparse understory. The woodland is moderately dense on the ridge above the study area. Deer use the area in most winters. Pellet group frequency was 38% for deer in 1996, 20% in 2001, and 17% in 2006. Only a few elk pellet groups or cattle pats have been sampled. The pellet group transect in 2001 estimated 58 deer days use/acre (144 ddu/ha) and only 1 elk pellet group was sampled. In 2006, 28 deer and 2 elk days use/acre were estimated (69 ddu/ha and 5 edu/ha). Most of the deer pellet groups appeared to be from winter use.

Soil

The soil is in the Lariat series, which consists of moderately deep, well drained, moderately rapid permeability soils that formed in residuum from sandstone on rolling uplands and foothills (USDA-NRCS 2006). The effective rooting depth was estimated at just over 10 inches. Soil texture is a sandy clay loam with a neutral soil reaction (pH 7.2). Pavement is a significant ground cover component. Indicators of soil erosion include small shallow gullies and pedestalling around plants. There is good ground cover under shrub crowns, but the interspaces are largely bare. The relative bare ground cover was 13% in 1996 and 2006 and 21% in 2001. Due to the gentle terrain, erosion is not significant and the erosion condition class was stable in 2001 and 2006.

Browse

Wyoming big sagebrush is the only abundant shrub. It has a moderately high density with canopy cover that averaged 23% in 1996 and 26% in 2001 and 2006. Decadence was high in 1990 and 26% of the population had reduced vigor due to insect damage. Sagebrush density increased from 5,940 plants/acre in 1996 to 8,560 in 2001, and 8,100 in 2006. During the 1996 and 2001 readings, utilization of sagebrush was moderate and in 2006 utilization was light. Vigor has been normal on most plants and decadence has fluctuated from 55% in 1990 to 23% in 2001. Recruitment has been good with adequate numbers of seedlings and young plants to maintain the population.

A few shadscale, narrowleaf low rabbitbrush, greasewood, and prickly pear also occupy the site. Point-quarter data estimated the scattered junipers to have a density of 32 trees/acre in 1990, 47 trees/acre in 1996, 58 trees/acre in 2001, and 61 trees/acre in 2006. The average diameter of juniper was 3.8 inches in 2001 and 2.3 inches in 2006. Some of these trees have been highlined.

Herbaceous Understory

The understory is comprised mainly of the native grasses Sandberg bluegrass and bluebunch wheatgrass. Perennial grasses have provided 10-12% cover since 1996. Spring forb forage is lacking. The most abundant species are longleaf phlox, Hood's phlox, and rose pussytoes. Grasses and forbs combined produced only about 12% ground cover in 1996 and 2001, and 15% in 2006.

1996 TREND ASSESSMENT

Trend for Wyoming big sagebrush is also stable. Density is slightly lower, but vigor has improved and decadence has declined from 55% to 25% of the population. The grass trend is stable. The nested frequency of perennial grasses did not change. The forb trend is stable. The nested frequency of perennial forbs increased 34%, but most of the increase was due to a significant increase in Hood's phlox which has only a poor to fair palatability for mule deer in Utah (Howard 1992). The Desirable Components Index score is excellent due to excellent browse cover, moderate browse decadence, good perennial grass cover, and moderate perennial forb cover.

winter range condition (DC Index) - excellent (67) Lower potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

The trend for Wyoming big sagebrush is up. Utilization is light to moderate. Density has increased 31%, vigor is normal on most plants, and decadence is relatively low at 23%. Approximately 7% of the population were classified as dying, but young plants account for 23% of the population. The grass trend is stable. The nested frequency of perennial grasses remained unchanged. The nested frequency of bluebunch wheatgrass increased significantly and bottlebrush squirreltail decreased significantly. The forb trend is stable. The nested frequency of perennial forbs decreased slightly, but this was due mainly to a significant decrease in longleaf phlox, which provides little winter forage for mule deer. The DCI score remained excellent.

winter range condition (DC Index) - excellent (73) Lower potential scale
browse - up (+2) grass - stable (0) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is stable. Wyoming big sagebrush density changed little, percent decadence increased slightly, plants with poor vigor increased slightly, but use decreased to light. The grass trend is slightly up. The nested frequency of perennial grasses increased 12%, which is due to significant increases in the nested frequencies of western wheatgrass and bottlebrush squirreltail. Cheatgrass nested frequency also increased, but provides less than 1% cover. The forb trend is stable. The nested frequency of perennial forbs increased due to a significant increase in rose pussytoes, but this species provides little forage for big game. The DCI score remained excellent.

winter range condition (DC Index) - excellent (71) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 13

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	-	-	-	3	-	-	.03
G	Agropyron smithii	a-	a-	b14	c36	-	.08	.43
G	Agropyron spicatum	c71	a15	b47	ab24	.26	1.02	.55
G	Bromus tectorum (a)	-	a27	a29	b45	.05	.10	.18
G	Carex sp.	1	-	-	1	-	-	.00
G	Oryzopsis hymenoides	7	8	3	5	.22	.01	.06
G	Poa secunda	ab307	b310	ab294	a281	8.73	8.43	8.80
G	Sitanion hystrix	ab23	b38	a7	c63	.39	.21	1.27
G	Stipa comata	16	15	36	35	.54	.52	.76
Total for Annual Grasses		0	27	29	45	0.05	0.10	0.18
Total for Perennial Grasses		425	386	401	448	10.15	10.28	11.92
Total for Grasses		425	413	430	493	10.21	10.39	12.10

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	Agoseris glauca	-	1	-	-	.00	-	-
F	Allium sp.	-	-	-	5	-	-	.02
F	Antennaria rosea	$_{a}$17	$_{a}$24	$_{ab}$32	$_{b}$52	.38	.20	.66
F	Arabis sp.	4	3	-	-	.00	-	-
F	Astragalus convallarius	-	-	2	6	-	.03	.06
F	Astragalus spatulatus	$_{a}$-	$_{ab}$9	$_{b}$14	$_{a}$-	.09	.07	.00
F	Astragalus utahensis	-	3	3	-	.00	.00	-
F	Cordylanthus ramosus (a)	-	-	$_{b}$49	$_{a}$22	-	.59	.28
F	Cryptantha sp.	-	1	-	8	.03	-	.07
F	Erigeron pumilus	13	10	6	13	.02	.01	.05
F	Lappula occidentalis (a)	-	-	1	-	-	.00	-
F	Orobanche sp.	-	3	-	-	.00	-	-
F	Phlox hoodii	$_{a}$90	$_{b}$119	$_{ab}$114	$_{ab}$96	1.39	1.26	1.84
F	Phlox longifolia	$_{b}$43	$_{b}$50	$_{a}$14	$_{ab}$37	.12	.06	.25
Total for Annual Forbs		0	0	50	22	0	0.59	0.28
Total for Perennial Forbs		167	223	185	217	2.05	1.64	2.97
Total for Forbs		167	223	235	239	2.05	2.24	3.25

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

BROWSE TRENDS --
Management unit 04 , Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	99	95	98	23.40	25.77	26.35
B	Atriplex confertifolia	3	2	2	-	.03	.03
B	Chrysothamnus viscidiflorus viscidiflorus	15	10	10	.09	.33	.18
B	Juniperus osteosperma	1	1	2	.00	-	.30
B	Opuntia sp.	18	18	21	.04	.07	.20
B	Sarcobatus vermiculatus	1	0	0	-	-	-
Total for Browse		137	126	133	23.54	26.20	27.07

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 13

Species	Percent Cover '06
Artemisia tridentata wyomingensis	24.10
Atriplex confertifolia	.16
Chrysothamnus viscidiflorus viscidiflorus	.60
Opuntia sp.	.11

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 13

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	0.8	0.6

POINT-QUARTER TREE DATA --
Management unit 04 , Study no: 13

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	58	61

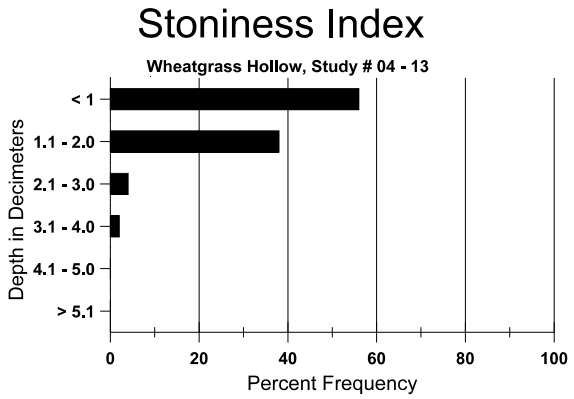
Average diameter (in)	
'01	'06
3.8	2.3

BASIC COVER --
Management unit 04 , Study no: 13

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	8.00	34.17	39.87	43.31
Rock	5.50	3.24	2.07	2.56
Pavement	27.00	17.76	18.94	23.85
Litter	34.50	25.90	27.56	21.83
Cryptogams	8.50	8.83	8.57	6.66
Bare Ground	16.50	15.49	26.14	14.37

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 13, Wheatgrass Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.4	58.6 (11.5)	7.2	49.0	22.0	29.0	4.5	10.3	204.8	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 13

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Rabbit	10	3	26	-	-
Horse	-	1	1	1 (3)	-
Elk	4	4	4	1 (2)	2 (5)
Deer	38	20	17	58 (144)	28 (69)
Cattle	1	1	-	-	-
Antelope	-	-	1	-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
90	**6599**	266	1666	1333	3600	-	24	19	55	.90	19	19/23
96	**5940**	1120	640	3840	1460	1180	60	8	25	5	5	14/33
01	**8560**	260	1960	4660	1940	860	28	6	23	7	7	15/28
06	**8100**	4680	1000	4580	2520	760	2	1	31	11	12	13/28
Atriplex confertifolia												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	-	60	-	-	0	0	-	-	0	11/10
01	**40**	-	-	40	-	40	0	0	-	-	0	15/12
06	**40**	-	-	40	-	-	0	50	-	-	0	14/15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	3/35
06	**0**	-	-	-	-	-	0	0	-	-	0	25/35
Chrysothamnus viscidiflorus viscidiflorus												
90	**66**	66	-	66	-	-	100	0	0	-	0	6/8
96	**460**	-	60	340	60	-	0	0	13	9	9	10/16
01	**280**	-	40	220	20	-	14	0	7	-	0	10/18
06	**240**	-	20	140	80	-	0	0	33	8	17	10/17
Juniperus osteosperma												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	20	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
90	**333**	66	133	200	-	-	0	0	0	-	0	3/2
96	**540**	40	-	540	-	-	0	0	0	-	0	4/13
01	**720**	-	60	540	120	-	8	0	17	-	0	3/12
06	**620**	60	60	500	60	-	0	0	10	-	0	4/14
Sarcobatus vermiculatus												
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	24/18
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	30/23

Trend Study 4-14-06

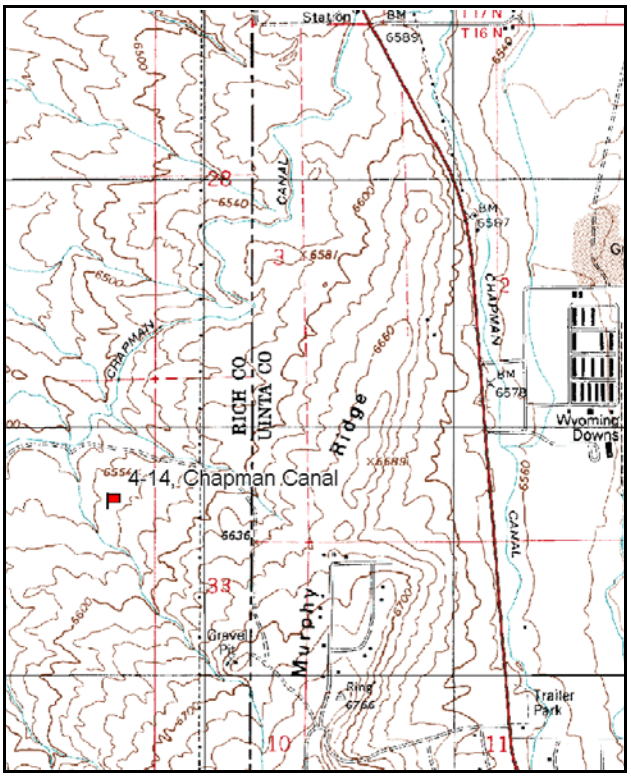
Study site name: Chapman Canal . Vegetation type: Big Sagebrush-Grass .

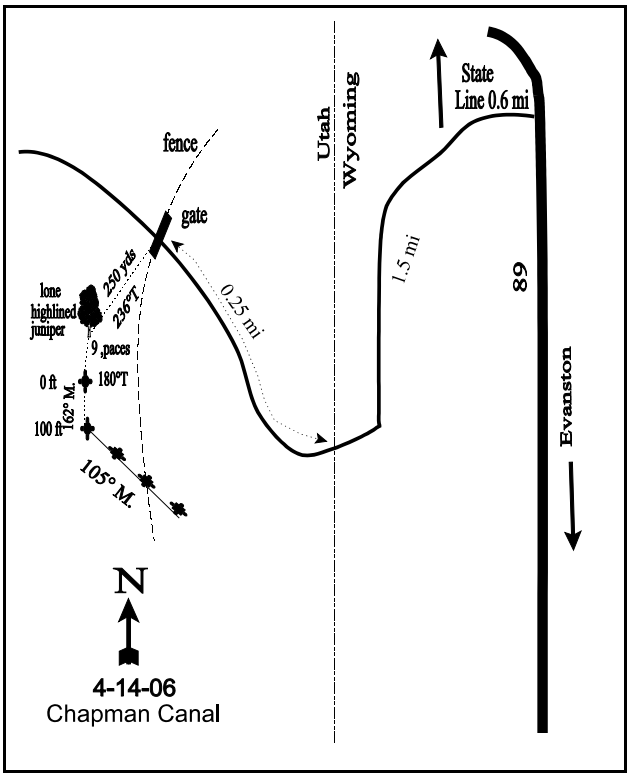
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the state line southbound on Highway 16/89, proceed 0.6 miles towards Evanston and turn right (west). Proceed 1.5 miles, crossing Chapman Canal, to a gate (DL&L). Go through the gate and travel 0.25 miles to a fence/gate. From the gate walk approximately 130 paces at 218 degrees magnetic to a lone high lined juniper. This is the only juniper present in the area. From the tree walk 9 paces at 165 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7939. The baseline doglegs after 100 feet an runs 105 degrees magnetic.





Map Name: Neponset Reservoir NE

Diagrammatic Sketch

Township 8N , Range 8E , Section 32

UTM NAD 27, UTM 12T 4581670 N 495612 E

DISCUSSION

Chapman Canal - Trend Study No. 4-14

Study Information

This study is located 3 miles east of Neponset Reservoir near the Utah-Wyoming state line (elevation: 6,550 feet, slope: 8%, aspect: west). This area of rolling hills is dominated by an extensive big sagebrush-grass type that extends for miles before any cover from trees or terrain is discernible. This section of land was owned by the School and Institutional Trust Lands Administration (SITLA) until 2006, when it was purchased by Deseret Land and Livestock. Deer, elk, antelope, sage grouse, horses, and cattle all utilize the area. A brood of Hungarian partridge and five winter killed deer carcasses were also observed at the time of study establishment in 1984. Deer/antelope use was moderately heavy in 1996 with a pellet group quadrat frequency of 24%. Pellet group frequency was 25% in 2001 and 53% in 2006. A few elk pellet groups have also been identified. The pellet group transect in 2001 estimated 30 deer/antelope, 5 elk, and 5 cow days use/acre (74 ddu/ha, 13 edu/ha and 13 cdu/ha). All deer/antelope pellet groups appeared to be from winter use. About half of the elk pellet groups appeared to be from winter use, while the other half were from spring or early summer use. The pellet group data in 2006 was estimated at 126 deer/antelope, 15 elk, and 3 cow says use/acre (311 ddu/ha, 38 edu/ha, and 7 cdu/ha). Deer pellets were from fall or winter and elk were from late winter. An antelope carcass was identified in the area.

Soil

The soil is in the Duckree Gravelly Loam series, a category typified by very deep, well drained, moderately permeable soils, formed in alluvium and colluvium from quartzite, chert, and sandstone (USDA-NRCS 2006). It is strongly calcareous and alkaline at all depths. Available water capacity is low and the erosion hazard is moderate (Campbell and Lacey 1982). The effective rooting depth is nearly 11 inches. Soil texture is a clay loam with a moderately alkaline soil reaction (pH of 8.0). Phosphorus could be a limiting factor at only 5.5 ppm because values of less than 6 ppm may limit plant growth and development (Tiedemann and Lopez 2004). Organic matter is also relatively low at only 1.9%. Ground cover is poor and comes primarily from the shrub crowns. Most shrub interspaces are barren and soil compaction from trampling is evident. Relative bare ground cover was 37% in 1996, 26% in 2001, and 29% in 2006. Sheet and gully erosion is noticeable throughout the area, but is not excessive. The soil erosion condition class was determined as slight in 2001 and stable in 2006.

Browse

The key browse species is Wyoming big sagebrush, which contributes the most browse cover. Sagebrush individuals were generally low in stature and heavily browsed in 1984. Vigor was poor on 18% of the population; although there was noticeable decadence among larger plants, there appeared to be adequate reproduction. In 1990, the population had changed little, other than a more moderate and improved vigor. The 1996 population density was 3,700 plants/acre, which was a 46% decline from 1990. This is primarily due to the reduction of young from 2,133 to 60 plants/acre and a larger sample size measured in 1996, which gives a better estimate of browse populations. Density was estimated at 4,040 plants/acre in 2001. Utilization of the sagebrush was light to moderate, vigor good on most plants, and percent decadence dropped slightly. No seedlings were sampled and young plants were still lacking. In 2006, sagebrush density decreased to 3,500 plants/acre, decadent individuals made up 89% of the population, plants classified with poor vigor made up 93% of the population and plants classified as dying made up 64% of the population. The sagebrush defoliator moth (*Aroga websterii*) had definitely infested 29% of the population and was likely the cause of the decadent/dying appearance of most sagebrush individuals. The study was sampled late in the summer, after the moth had defoliated many of the sagebrush individuals.

Narrowleaf low rabbitbrush is abundant and its population has remained fairly stable since 1984 at about 4,200 plants/acre. Mature plants are small, mostly unutilized, and in good vigor. Winterfat has been sampled in low densities since 1996.

Herbaceous Understory
The herbaceous understory is characterized by an adequate diversity of grasses, but few quality forbs. The most abundant grasses are Sandberg bluegrass and western wheatgrass. Cheatgrass was sampled in 2001, but it only occurred in small numbers and was not sampled again in 2006. The most abundant forbs include Hoods phlox and longleaf phlox, two low value perennial forbs for big game.

1990 TREND ASSESSMENT
The Wyoming big sagebrush population is dynamic in terms of age class structure, but fairly stable in total density. The sagebrush has a moderate to heavily hedged growth form. Sagebrush canopy cover averaged about 15%. Western wheatgrass and Sandberg bluegrass are very abundant and lightly used. Even with the fair understory, shrub interspaces are bare with 41% bare soil.

browse - stable (0) grass - stable (0) forb - stable (0)

1996 TREND ASSESSMENT
Trend for browse is stable. The density of sagebrush has decreased 46%. These large changes in density are likely due to the larger sample size used beginning in 1992, which better estimates shrub populations with clumped and/or discontinuous distributions. The grass trend is stable. The nested frequency of perennial grasses increased 12%, which is due mainly to a significant increase in the nested frequency of Sandberg bluegrass. These increases are also likely a product of the increased sample area used this year. The forb trend is stable. The nested frequency of perennial forbs increased, but this is due to the increased sample area. The Desirable Components Index score is good due to good browse cover, moderate percent browse decadence, moderate perennial grass cover, no annual grass cover, and good perennial forb cover.

winter range condition (DC Index) - good (51) Lower potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT
Trend for Wyoming big sagebrush is stable with a similar density to 1996. Utilization continues to be light to moderate, vigor good on most plants, and decadence has declined slightly from 31% to 26%. Recruitment is poor with no seedlings encountered and young plants accounting for only 1% of the population. Without an improvement in reproduction, this population will likely decline slightly in the future (since 3% plants were classified as dying). The grass trend is stable. The nested frequency of perennial grasses changed little. Unfortunately, cheatgrass was sampled for the first time. The forb trend is stable. The nested frequency of perennial forbs decreased 11%, but none of the beneficial perennial forb species showed significant decreases. The DCI score remained good.

winter range condition (DC Index) - good (62) Lower potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2006 TREND ASSESSMENT
The browse trend is slightly down. The Wyoming big sagebrush density decreased 13%, most of the population (89%) was decadent, and 64% of the population was classified as dying. The high decadence and dying classifications were likely due to the infestation of the defoliator moth, but at this time it is difficult to determine which plants were dead and which plants were temporarily defoliated and will return to normal vigor. The grass trend is slightly up. The nested frequency of perennial grasses increased 14% and the nested frequency of cheatgrass decreased significantly. The forb trend is slightly up. The nested frequency of perennial forbs increased 42%, most of which is due to significant increases in longleaf phlox and rose pussytoes. Longleaf phlox increased significantly, which is beneficial for sage grouse hens previous to egg laying (Barnett and Crawford 1994). There are few species which provide significant forage for big game. The DCI score decreased to fair to good due to a large decrease in browse cover, large increase in decadence,

but an increase in perennial grass cover.

winter range condition (DC Index) - fair to good (44) Lower potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - slightly up(+1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 14

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	-	-	-	2	1	.00	.15	.15
G	Agropyron smithii	a206	a220	a202	ab215	b256	1.81	2.99	9.06
G	Agropyron spicatum	c30	b13	a-	ab1	ab6	-	.00	.33
G	Bromus tectorum (a)	-	-	a-	b16	a-	-	.04	-
G	Oryzopsis hymenoides	a4	ab11	b27	ab19	b24	.21	.21	1.24
G	Poa fendleriana	-	-	-	7	-	-	.06	-
G	Poa secunda	ab205	a178	b234	b231	b244	4.33	7.26	7.30
G	Sitanion hystrix	b15	ab1	ab13	a-	ab8	.07	-	.33
G	Stipa comata	-	3	-	6	9	-	.18	.09
Total for Annual Grasses		0	0	0	16	0	0	0.04	0
Total for Perennial Grasses		460	426	476	481	548	6.43	10.87	18.53
Total for Grasses		460	426	476	497	548	6.43	10.92	18.53
F	Alyssum alyssoides (a)	-	-	a19	b164	c212	.04	.44	.87
F	Antennaria rosea	c38	bc38	ab9	a4	c32	.24	.18	.73
F	Arabis drummondi	-	-	2	-	1	.01	-	.00
F	Arenaria sp.	3	-	-	-	-	-	-	-
F	Astragalus convallarius	-	5	-	1	2	-	.01	.03
F	Astragalus sp.	7	7	3	8	6	.00	.12	.01
F	Astragalus utahensis	-	1	-	-	-	-	-	-
F	Cordylanthus ramosus (a)	-	-	-	2	-	-	.03	-
F	Cryptantha sp.	b11	b14	ab4	a-	ab5	.06	-	.06
F	Cymopterus sp.	a-	a-	ab3	ab5	b11	.01	.04	.02
F	Descurainia pinnata (a)	-	-	-	7	3	-	.02	.01
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Erigeron pumilus	a-	ab5	ab7	b11	ab4	.01	.12	.01
F	Haplopappus acaulis	1	4	3	1	1	.03	.03	.15
F	Lappula occidentalis (a)	-	-	-	5	-	-	.01	-
F	Microsteris gracilis (a)	-	-	-	6	-	-	.01	-
F	Phlox hoodii	a71	ab108	c145	bc110	bc124	3.79	1.88	2.45
F	Phlox longifolia	a16	a6	b56	b64	c104	.28	.24	.62
F	Ranunculus testiculatus (a)	-	-	a8	a17	b39	.02	.03	.08

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Senecio integerrimus	-	-	-	1	-	-	.00	-
F	Senecio multilobatus	-	-	-	-	2	-	-	.03
F	Trifolium sp.	5	7	-	1	-	-	.00	-
F	Unknown forb-perennial	-	2	-	-	-	-	-	-
Total for Annual Forbs		0	0	27	202	254	0.07	0.55	0.96
Total for Perennial Forbs		152	197	232	206	292	4.44	2.65	4.12
Total for Forbs		152	197	259	408	546	4.51	3.20	5.08

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

BROWSE TRENDS --
Management unit 04 , Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	88	84	84	14.79	18.32	10.03
B	Atriplex gardneri falcata	7	14	13	.53	.09	.37
B	Ceratoides lanata	8	8	8	.21	-	.30
B	Chrysothamnus viscidiflorus stenophyllus	82	83	83	5.54	4.51	5.53
B	Opuntia sp.	13	4	9	.21	.53	.53
B	Tetradymia canescens	1	2	2	-	.15	.15
Total for Browse		199	195	199	21.29	23.60	16.92

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 14

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	10.73
Atriplex gardneri falcata	.15
Ceratoides lanata	.11
Chrysothamnus viscidiflorus stenophyllus	5.40
Opuntia sp.	-
Tetradymia canescens	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 14

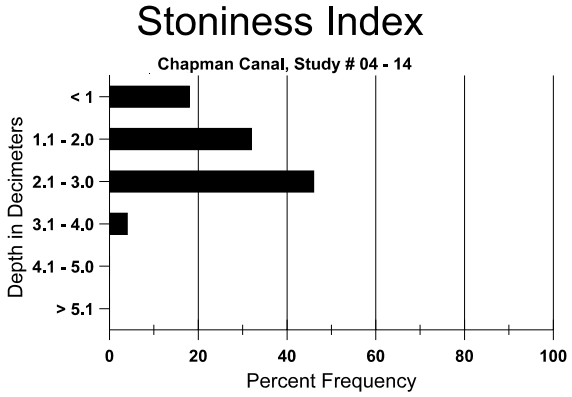
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.1	-

BASIC COVER --
Management unit 04 , Study no: 14

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.00	8.50	28.93	38.24	40.44
Rock	0	.25	.07	.06	.00
Pavement	0	.75	.63	1.22	.79
Litter	43.25	31.00	27.83	31.87	25.71
Cryptogams	10.00	18.25	12.77	21.15	12.23
Bare Ground	44.75	41.25	40.43	31.89	32.98

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 14, Chapman Canal

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.7	61.0 (9.4)	8.0	44.8	26.0	29.3	1.9	5.5	67.2	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 14

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Rabbit	9	28	38	-	-
Grouse	-	-	1	-	8.7 groups/acre
Elk	5	2	7	5 (13)	15 (38)
Deer	24	25	53	30 (74)	126 (311)
Cattle	1	-	2	5 (13)	3 (7)
Antelope	-	-	3	-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
84	**6799**	933	1466	2133	3200	-	29	60	47	.88	18	13/19
90	**6866**	-	2133	1800	2933	-	50	16	43	1	4	15/18
96	**3700**	20	60	2480	1160	760	32	2	31	9	9	18/34
01	**4040**	-	60	2940	1040	760	43	3	26	3	3	19/33
06	**3500**	140	60	340	3100	740	3	.57	89	64	93	16/29
Atriplex canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	22/36
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Atriplex gardneri falcata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**600**	-	-	600	-	-	0	0	-	-	0	4/9
01	**840**	-	440	400	-	-	2	0	-	-	0	3/7
06	**840**	-	340	500	-	-	10	0	-	-	0	3/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ceratoides lanata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**300**	60	80	220	-	-	13	0	-	-	0	5/7
01	**240**	-	20	220	-	-	17	17	-	-	0	6/10
06	**240**	-	-	240	-	-	33	67	-	-	0	5/8
Chrysothamnus viscidiflorus stenophyllus												
84	**4199**	-	733	3133	333	-	6	0	8	-	0	10/11
90	**4599**	-	866	2533	1200	-	43	4	26	-	3	5/7
96	**4260**	-	60	3200	1000	40	.93	0	23	2	4	10/17
01	**4240**	-	20	3100	1120	20	.94	0	26	4	4	8/15
06	**4180**	-	180	3360	640	-	3	1	15	1	11	9/14
Opuntia sp.												
84	**266**	-	-	266	-	-	0	0	0	-	0	4/9
90	**466**	-	333	133	-	-	0	0	0	-	29	5/3
96	**480**	-	-	440	40	-	0	0	8	-	0	4/15
01	**80**	-	-	60	20	-	0	0	25	-	0	3/11
06	**200**	-	40	140	20	-	0	0	10	-	0	4/9
Tetradymia canescens												
84	**133**	-	-	133	-	-	100	0	0	-	0	7/14
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**20**	-	-	-	20	-	0	0	100	100	100	8/7
01	**40**	-	-	40	-	-	0	0	0	-	0	7/10
06	**40**	-	-	40	-	-	0	50	0	-	50	8/21

Trend Study 4-15-06

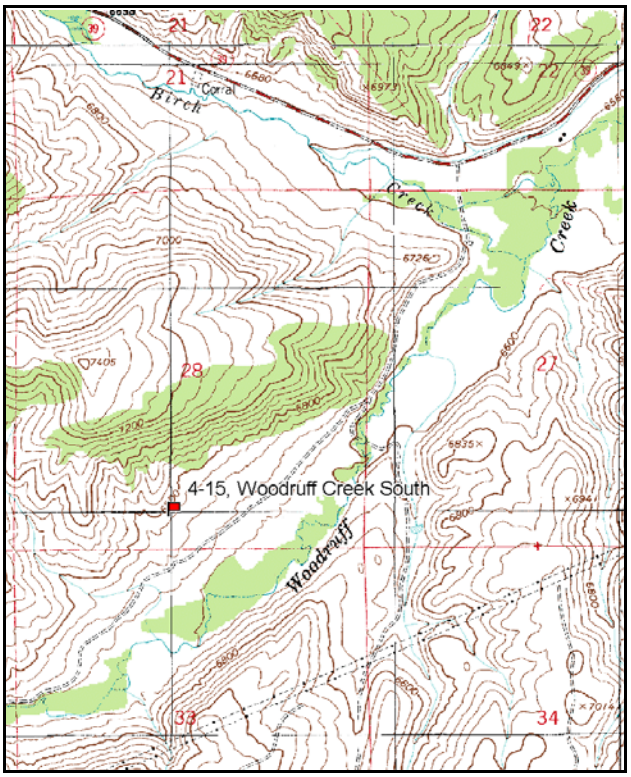
Study site name: Woodruff Creek South . Vegetation type: Big Sagebrush .

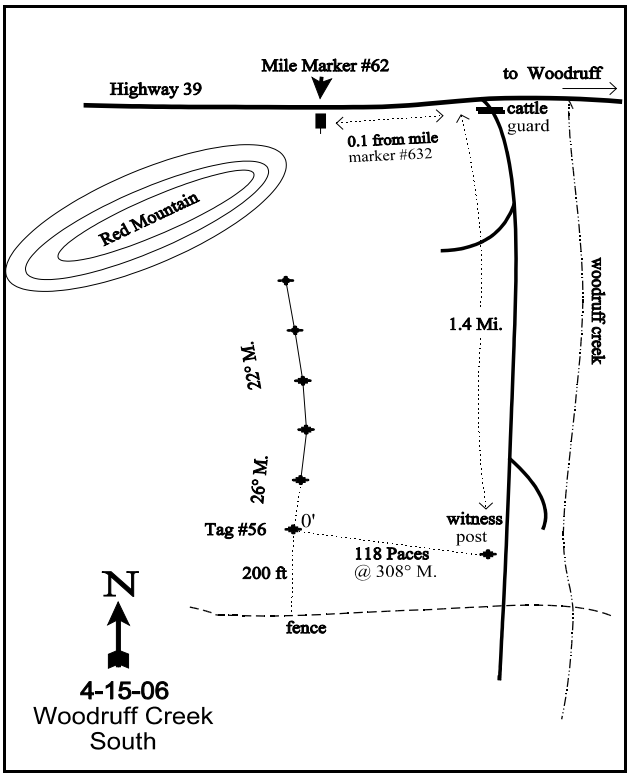
Compass bearing: frequency baseline 26 degrees magnetic.

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

LOCATION DESCRIPTION

Travel east on highway 39 and turn right (south) 0.1 miles past mile marker #62. Travel west for 1.4 miles to a witness post on the right hand side of the road. From the witness post, walk 118 paces at 308 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline stake is marked with a browse tag #56. There is a fence 200 feet to the west from the 0-foot baseline stake. The baseline runs in a direction of 26 degrees magnetic. The baseline doglegs at the 300-foot baseline stake and runs in a direction of 22 degrees magnetic.





Map Name: Meachum Ridge

Diagrammatic Sketch

Township 9N , Range 6E , Section 28

UTM NAD 27, UTM 12T 4591981 N 476988 E

DISCUSSION

Woodruff Creek South - Trend Study No. 4-15

Study Information

This study was established in 1996 downstream from Woodruff Reservoir and about one-third of a mile north of Woodruff Creek. It samples a Wyoming big sagebrush site with a juniper overstory (elevation: 6,800 feet, slope: 16%, aspect: east). The area is typically heavily used in winter by deer. Five winter killed deer were found in 1996. Deer pellet groups were fairly abundant in 1996, with a quadrat frequency of 28%. Cattle had utilized the site prior to the 1996 reading. Deer pellet group quadrat frequency was also moderately high in 2001, at 34%. The pellet group transect in 2001 estimated 31 deer days use/acre (76 ddu/ha) and 34 cow days use/acre (84 cdu/ha). All deer pellet groups appeared to be from winter use while cattle pats were from the previous fall. The 2006 pellet group quadrat frequency was 4% for deer. The pellet group transect estimate in 2006 was 18 deer and 36 cow days use/acre (45 ddu/ha and 88 cdu/ha).

Soil

The soil is in the Cutoff series, which is moderately deep, well drained, moderately permeable, and formed in residuum and colluvium derived from sandstone and conglomerate (USDA-NRCS 2006). The effective rooting depth is estimated at a little over 12 inches and the soil texture is a sandy clay loam with a neutral soil reaction (pH of 6.8). At about 6 inches in depth, a layer of larger gravel can be detected. The soil doesn't have much structure and was dry down to about 18 inches in 1996. Unprotected bare ground is not abundant due to the adequate herbaceous ground cover. Unfortunately, most of that cover comes from cheatgrass. Some erosion is occurring in the form of flow patterns, rills, pedestalling, and an active gully near the end of the baseline, but has not been excessive. The soil erosion condition class was determined as slight in 2001 and 2006.

Browse

The Wyoming big sagebrush is moderately abundant with an estimated density of 3,300 plants/acre in 1996, 5,480 plants/acre in 2001, and 4,700 plants/acre in 2006. Most of the sagebrush sampled in 1996 was losing its leaves due the excessively dry conditions. Data from the Woodruff weather station indicates that only 62% of the normal precipitation was collected from April-Sept of 1996 (Utah climate summaries 2006). Seed production appeared good with mostly light utilization. Seedlings were abundant and 18% of the population was classified as young. Decadent plants accounted for 33% of the population. In 2001, utilization was still light to moderate, vigor good, and percent decadence declined from 33% to 23%. Young plants were numerous and accounted for 29% of the population. In 2006, decadence decreased to 19%, use was light, and plants classified as dying increased to 11% of the population. The decrease in density was due to a loss in young; the combined densities of mature and decadent plants only decreased 2% from 2001 to 2006.

Other shrubs include narrowleaf low rabbitbrush, prickly pear, and gray horsebrush. A few snowberry and winterfat plants were also observed, but not sampled. Juniper trees are scattered through the area and most of the mature trees are highlined. There are quite a few young trees in the 3 to 4 foot class. Point-quarter data estimated 85 juniper trees/acre with an average diameter of 4 inches in 1996. During the 2001 reading, 94 trees/acre were estimated with an average diameter of 7 inches. In 2006, 117 trees/acre were estimated with an average diameter of 5 inches. Overhead canopy cover averaged 11% in 1996 and 2001, but increased to 16% in 2006.

Herbaceous Understory

The herbaceous understory consists of patches of thick cheatgrass. In other areas where cheatgrass is not as abundant, Sandberg bluegrass, western and bluebunch wheatgrass are common. Indian ricegrass is also fairly abundant. Several other perennial grasses are found in small numbers. Cheatgrass provided 16% cover in 1996, only 2% in 2001, and 8% in 2006. The decrease in cheatgrass was due to the dry conditions of 2000 and 2001 and rebounded some with the improved precipitation in 2004 and 2005 (Utah climate summaries 2006).

Sandberg bluegrass, western wheatgrass, and bluebunch wheatgrass have provided 8-9% combined cover since 1996. Forbs are very sparse, and have produced less than 1% cover since 1996.

2001 TREND ASSESSMENT

Trend for Wyoming big sagebrush is up. Density has increased 40%, utilization continues to be light to moderate, vigor is good, and percent decadence has declined to 23%. Reproduction is also excellent with abundant seedlings and young. The only other common shrub is stickyleaf low rabbitbrush, which has remained relatively stable in density. The grass trend is slightly up. The nested frequency of perennial grasses increased 18%. The nested frequencies of western wheatgrass and needle-and-thread grass increased significantly, but the nested freqeuncies of bluebunch wheatgrass, mutton bluegrass, and Indian ricegrass decreased significantly. These changes in grass abundance are likely caused by overgrazing in late spring. The nested frequency of cheatgrass decreased significantly. The forb trend is stable. The nested frequency and composition of forbs changed little. The Desirable Compents Index score was fair in 1996 due to moderate browse cover, moderate perennial grass cover, and moderate annual grass cover. In 2001, the DCI score improved to good due to an improved young density, increased in perennial grass cover, and decreased annual grass cover.

1996 winter range condition (DC Index) - fair (38) Lower potential scale
2001 winter range condition (DC Index) - good (61) Lower potential scale
browse - up (+2) grass - slightly up (+1) forb - stable(0)

2006 TREND ASSESSMENT

The browse trend is stable. The total density of Wyoming big sagebrush decreased 14% due to a 700 plants/acre decrease in young. The density of mature and decadent individuals did not change. The population continues to have a large density of young (19% of the population) and seedlings. Use was light and decadence decreased to 19% of the population. However, plants with poor vigor increased to 19% of the population and plants classified as dying increased to 11% of the population. The grass trend is slightly down. The nested frequency of perennial grasses decreased 13%; due mainly to a significant decrease in the nested frequency of Sandberg bluegrass. The forb trend is stable. The nested frequency of perennial forbs changed little and did not improve much in composition. The DCI score remained good.

winter range condition (DC Index) - good (51) Lower potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 15

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron smithii	$_{a}$37	$_{b}$123	$_{b}$105	.29	2.29	2.81
G	Agropyron spicatum	$_{b}$52	$_{a}$2	$_{a}$13	1.37	.01	.34
G	Bromus tectorum (a)	$_{b}$354	$_{a}$232	$_{a}$253	15.76	1.60	7.67
G	Elymus cinereus	4	-	-	.06	-	-
G	Koeleria cristata	2	-	-	.00	-	-
G	Oryzopsis hymenoides	$_{b}$36	$_{a}$22	$_{a}$21	.81	.49	.50
G	Poa fendleriana	$_{b}$9	$_{a}$-	$_{a}$-	.22	-	-
G	Poa pratensis	1	-	2	.03	-	.03

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Poa secunda	$_{ab}$257	$_{b}$309	$_{a}$241	6.25	7.15	4.35
G	Sitanion hystrix	22	13	24	.23	.04	.31
G	Stipa comata	$_{a}$2	$_{b}$31	$_{b}$31	.03	1.09	.50
Total for Annual Grasses		354	232	253	15.76	1.60	7.67
Total for Perennial Grasses		422	500	437	9.30	11.10	8.85
Total for Grasses		776	732	690	25.07	12.71	16.53
F	Agoseris glauca	-	-	2	-	-	.00
F	Alyssum alyssoides (a)	-	-	2	-	-	.00
F	Antennaria rosea	-	5	4	-	.01	.18
F	Arabis drummondi	$_{b}$12	$_{a}$-	$_{a}$-	.03	.03	-
F	Astragalus beckwithii	2	-	3	.03	-	.03
F	Astragalus convallarius	$_{a}$2	$_{b}$15	$_{ab}$8	.01	.16	.10
F	Astragalus utahensis	5	5	-	.03	.06	-
F	Chenopodium album (a)	-	-	7	-	-	.04
F	Chaenactis douglasii	1	3	1	.00	.00	.03
F	Cryptantha sp.	$_{a}$-	$_{a}$-	$_{b}$13	.03	-	.22
F	Descurainia pinnata (a)	6	2	6	.04	.00	.07
F	Erigeron pumilus	-	1	4	-	.00	.03
F	Gilia sp. (a)	$_{a}$-	$_{a}$-	$_{b}$12	-	-	.05
F	Holosteum umbellatum (a)	-	-	1	-	-	.00
F	Lappula occidentalis (a)	-	7	5	-	.04	.03
F	Orobanche sp.	5	-	-	.01	-	-
F	Phlox hoodii	6	6	1	.04	.04	.03
F	Phlox longifolia	$_{a}$3	$_{a}$4	$_{b}$17	.00	.01	.14
F	Ranunculus testiculatus (a)	$_{a}$-	$_{a}$-	$_{b}$17	-	-	.05
F	Sisymbrium altissimum (a)	-	-	-	-	-	.00
F	Tragopogon dubius	-	3	-	-	.01	-
Total for Annual Forbs		6	9	50	0.04	0.04	0.25
Total for Perennial Forbs		36	42	53	0.20	0.32	0.78
Total for Forbs		42	51	103	0.24	0.37	1.04

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

BROWSE TRENDS --
Management unit 04 , Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata wyomingensis	83	86	85	10.83	11.01	12.12
B	Atriplex canescens	0	0	0	-	.03	-
B	Chrysothamnus viscidiflorus viscidiflorus	58	54	52	2.68	1.89	.91
B	Gutierrezia sarothrae	0	0	1	-	-	-
B	Juniperus osteosperma	7	8	8	6.98	8.26	10.63
B	Opuntia sp.	13	6	4	.16	.00	-
B	Tetradymia canescens	3	3	5	.01	-	-
Total for Browse		164	157	155	20.67	21.20	23.67

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 15

Species	Percent Cover	
	'01	'06
Artemisia tridentata wyomingensis	-	13.43
Chrysothamnus viscidiflorus viscidiflorus	-	2.38
Juniperus osteosperma	11.19	15.63
Opuntia sp.	-	.26

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 15

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.2	1.3

POINT-QUARTER TREE DATA --
Management unit 04 , Study no: 15

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	93	117

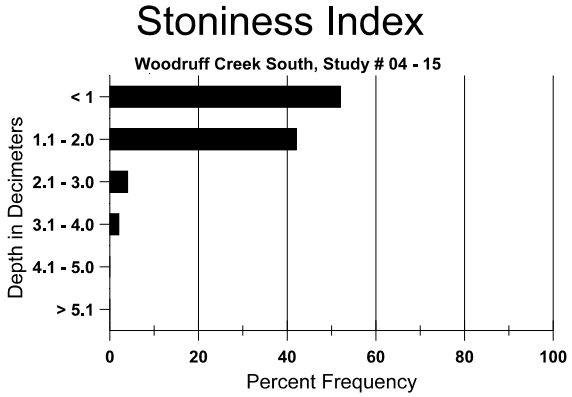
Average diameter (in)	
'01	'06
7.4	5.3

BASIC COVER --
Management unit 04 , Study no: 15

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	44.31	37.37	41.52
Rock	3.07	1.93	2.13
Pavement	10.89	13.43	17.09
Litter	46.23	47.56	42.37
Cryptogams	2.21	4.95	4.09
Bare Ground	7.96	14.96	13.99

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 15, Woodruff Creek South

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.3	61.0 (12.4)	6.8	53.7	19.3	27.0	2.8	20.9	204.8	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 15

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	13	25	32
Horse	1	-	-
Elk	7	1	2
Deer	28	34	4
Cattle	6	12	18

Days use per acre (ha)	
'01	'06
-	-
1 (3)	-
-	-
31 (76)	18 (45)
34 (84)	36 (88)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
96	**3300**	1100	600	1600	1100	840	19	.60	33	5	5	18/36
01	**5480**	360	1580	2660	1240	720	21	.72	23	.36	.36	17/28
06	**4700**	7760	880	2940	880	760	5	.42	19	11	19	18/27
Atriplex canescens												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	14/27
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Ceratoides lanata												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	9/16
Chrysothamnus viscidiflorus viscidiflorus												
96	**2540**	80	180	2220	140	20	0	0	6	2	2	13/20
01	**2340**	-	60	2020	260	-	0	0	11	3	3	10/15
06	**2180**	20	320	1800	60	-	2	0	3	-	0	10/16
Gutierrezia sarothrae												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	5/8
06	**20**	-	-	20	-	-	0	0	-	-	0	6/7
Juniperus osteosperma												
96	**140**	-	-	140	-	-	0	0	0	-	0	-/-
01	**180**	-	20	160	-	-	0	0	0	-	0	-/-
06	**180**	20	20	140	20	-	0	0	11	11	11	-/-
Opuntia sp.												
96	**420**	-	120	280	20	-	0	0	5	-	0	4/15
01	**300**	-	140	100	60	20	0	0	20	20	20	3/10
06	**120**	-	40	80	-	-	0	0	0	-	0	3/12
Purshia tridentata												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	9/29

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	19/18
Tetradymia canescens												
96	**80**	-	-	80	-	-	0	0	-	-	0	12/23
01	**80**	-	-	80	-	-	0	0	-	-	0	8/20
06	**140**	-	20	120	-	-	14	14	-	-	0	7/13

Trend Study 4-17-06

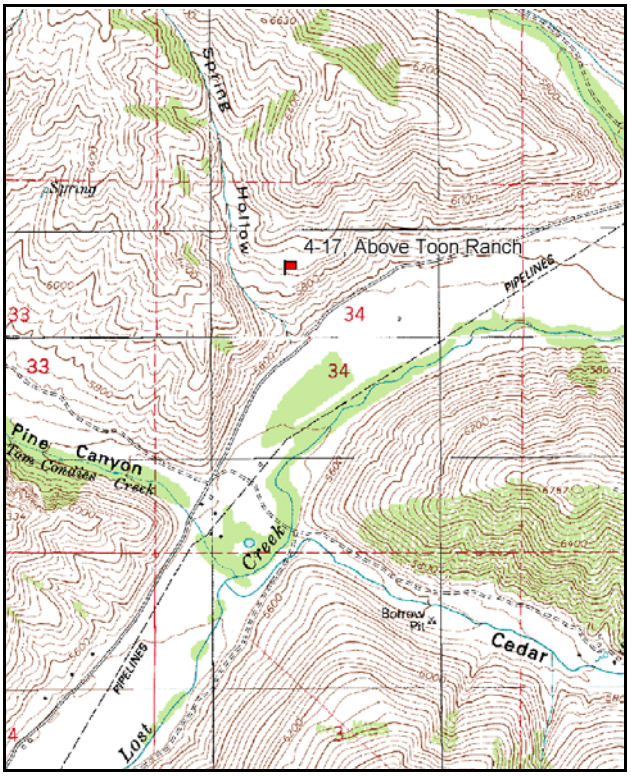
Study site name: Above Toon Ranch . Vegetation type: Big Sagebrush-Grass .

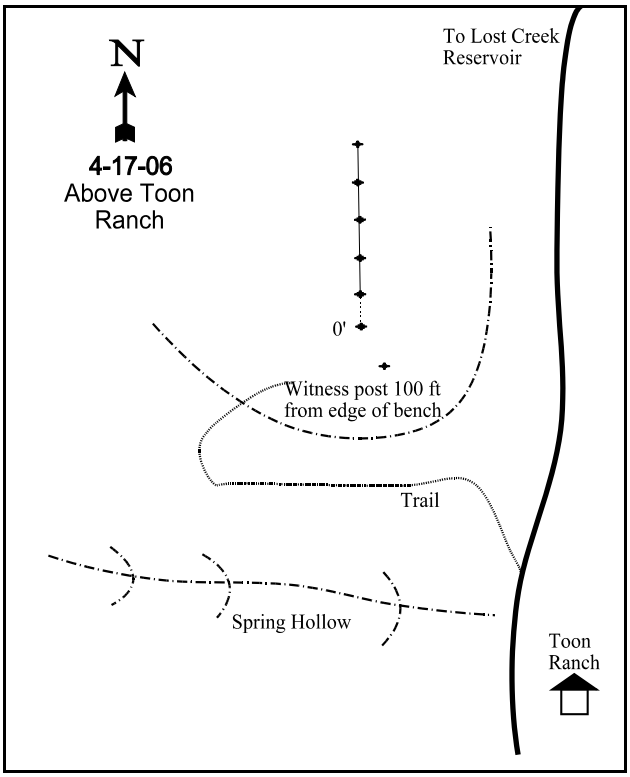
Compass bearing: frequency baseline 6 degrees magnetic.

Frequency belt placement: Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).
No rebar on lines 1, 2 & 4.

LOCATION DESCRIPTION

From Croyden drive up the main road towards Lost Creek Reservoir about 4 miles. Stop at Spring Hollow. Walk up the trail (up Spring Hollow) on the west side of the road until you reach the top of the bench. A witness post will be visible about 100 feet from the edge of the bench. From the witness post walk 100 feet to the north to the 0-foot baseline stake with browse tag #136. The baseline runs in a direction of 6 degrees magnetic.





Map Name: Lost Creek Dam

Diagrammatic Sketch

Township 5N , Range 4E , Section 34

UTM NAD 27, UTM 12T 4552803 N 459327 E

DISCUSSION

Above Toon Ranch - Trend Study No. 4-17

Study Information

This study was established in 1996 on a gently sloping bench above the Lost Creek Valley, where deer congregate during the winter (elevation: 5,800 feet, slope: 19%, aspect: south). The area is vegetated with a dense stand of mountain big sagebrush with an understory dominated by cheatgrass. It is isolated from the road and some of the sagebrush is tall enough to provide protective cover for deer. Deer pellet groups were abundant in 1996, with a quadrat frequency of 29%. Some elk and sheep sign were also found that year. In 2001, deer pellet quadrat frequency was 22%. A pellet group transect in 2001 estimated 70 deer days use/acre (173 ddu/ha). One elk pellet group was also sampled. The land owner grazes sheep during the fall and winter but no sheep sign was found in 2001. The 2006 deer pellet group quadrat frequency was 31%. The estimated pellet group transect data in 2006 was 52 deer, 11 elk, and 12 sheep days use/acre (127 ddu/ha, 26 edu/ha, and 30 sdu/ha). A deer was seen on the study area in 2006.

Soil

The soil is in the Isbell series, which consists of deep, well drained soils that formed in material weathered from calcareous sandstone and shale, They are formed on mountain slopes, alluvial fans, and stream terraces (USDA-NRCS 2006). The effective rooting depth was estimated at just a little over 11 inches due to a hard clay layer at approximately 10 inches. Soil texture is a loam with a slightly acidic soil reaction (pH of 6.5). There is little bare ground (relative cover has been below 5% all years) and, due to the abundance of cheatgrass, erosion is not a problem. The erosion condition class was stable in 2001 and 2006.

Browse

The area supports a dense stand of mature and vigorous mountain big sagebrush in association with some rabbitbrush. Sagebrush individuals appear to be hybrids of basin big sagebrush (*Artemisia tridentata tridentata*) and mountain big sagebrush (*Artemisia tridentata vaseyana*). Individual plants with more characteristics of mountain big sagebrush are more preferred and more heavily utilized. The density of sagebrush was estimated at nearly 2,880 plants/acre in 1996, 2,700 plants/acre in 2001, and 2,280 plants/acre in 2006. Mature plants are large, averaging between 3 and 3.5 feet in height. Canopy cover of sagebrush averaged 28% in 1996, 33% in 2001, and 27% in 2006. Utilization has been mostly light. Seedling and young densities have been adequate to maintain the population in the past, but the density of plants classified as dying was higher than that of young in 2006.

Stickyleaf low rabbitbrush has been the only other shrub sampled within density measurements. It has had a similar population density as sagebrush, but these shrubs are much smaller and have only provided 3% cover.

Herbaceous Understory

The herbaceous understory is dominated by cheatgrass, which provided 32% cover in 1996, 12% in 2001, and 17% in 2006. Dry conditions in 2000 and 2001 caused a decline in cheatgrass. Six species of perennial grasses have been sampled, 3 of which were sampled for the first time in 2006. Forbs are very diverse, yet the only abundant perennial species are western yarrow and American vetch. The majority of the other sampled forb species have been annuals.

2001 TREND ASSESSMENT

Trend for mountain big sagebrush is stable. Utilization is light, vigor good, and percent decadence moderately low. Canopy cover has increased slightly from 28% to 33%. Seedling and young recruitment appear to be adequate to maintain the stand. The grass trend is up. The nested frequency of perennial grasses increased 62%, due mainly to a significant increase in the nested frequency of Sandberg bluegrass. The nested frequency of cheatgrass also decreased significantly. The forb trend is slightly down. The nested frequency of annual forbs, most of which are weedy, increased. The nested frequency of perennial forbs did not change, but

composition is poor. The dominant perennial forbs are western yarrow and American vetch. Yarrow, which is an increaser species and is not preferred by elk and deer, increased significantly and American vetch, which is preferred by deer, decreased significantly. The Desirable Components Index score in 1996 was poor due to low perennial grass cover and high cheatgrass cover and despite high browse cover. The 2001 DCI score increased to fair due to decreased cheatgrass cover and increased perennial grass cover.

1996 winter range condition (DC Index) - poor (42) Mid-level potential scale
2001 winter range condition (DC Index) - fair (56) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is slightly down. The density of sagebrush decreased 16%, decadence increased to 34%, and the percentage of plants classified as dying surpassed that of young. The grass trend is slightly down. The nested frequency of perennial grasses decreased 10%. The nested frequency of cheatgrass did not change significantly, but cover was higher. The forb trend is slightly up. The nested frequency of perennial forbs increased 10% and the composition improved slightly. The nested frequencies of the desirable species pale agoseris and American vetch increased significantly. The nested frequency of the undesirable Pacific aster decreased significantly. The DCI score decreased to poor due to the increased in cheatgrass cover and the increase in sagebrush decadence.

winter range condition (DC Index) - poor (48) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 17

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	-	-	1	-	-	.00
G	Agropyron spicatum	33	40	23	.87	1.79	1.44
G	Bromus japonicus (a)	8	3	11	.04	.00	.07
G	Bromus tectorum (a)	$_{b}$452	$_{a}$369	$_{a}$389	31.50	11.57	17.39
G	Elymus cinereus	5	18	13	.82	1.60	.89
G	Melica bulbosa	-	-	5	-	-	.15
G	Poa pratensis	-	-	2	-	-	.03
G	Poa secunda	$_{a}$68	$_{b}$114	$_{ab}$111	1.46	2.60	4.55
Total for Annual Grasses		460	372	400	31.54	11.58	17.47
Total for Perennial Grasses		106	172	155	3.15	6.00	7.07
Total for Grasses		566	544	555	34.70	17.58	24.54
F	Achillea millefolium	$_{a}$100	$_{b}$139	$_{b}$159	4.02	6.30	9.32
F	Agoseris heterophylla (a)	$_{b}$22	$_{a}$7	$_{b}$28	.09	.01	.39
F	Alyssum alyssoides (a)	$_{a}$131	$_{a}$106	$_{b}$204	1.25	.74	1.78
F	Allium sp.	12	23	13	.03	.16	.06
F	Artemisia ludoviciana	1	6	2	.63	.03	.03

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Aster chilensis	$_{b}$77	$_{b}$63	$_{a}$12	.66	.94	.33
F	Aster sp.	-	-	4	-	-	.06
F	Castilleja linariaefolia	-	4	-	-	.03	-
F	Camelina microcarpa (a)	$_{b}$68	$_{a}$24	$_{a}$13	.26	.12	.04
F	Cirsium undulatum	$_{b}$12	$_{ab}$7	$_{a}$-	.03	.16	-
F	Collomia linearis (a)	$_{a}$12	$_{b}$54	$_{a}$23	.02	.26	.11
F	Collinsia parviflora (a)	$_{a}$24	$_{b}$90	$_{c}$129	.06	1.00	.70
F	Cryptantha sp.	$_{b}$14	$_{a}$-	$_{b}$14	.07	-	.19
F	Cymopterus sp.	-	-	1	-	-	.03
F	Descurainia pinnata (a)	6	2	-	.02	.01	-
F	Draba sp. (a)	$_{a}$18	$_{b}$55	$_{b}$63	.06	.24	.15
F	Erodium cicutarium (a)	-	-	3	-	-	.00
F	Galium sp.	5	13	-	.01	.09	-
F	Gayophytum ramosissimum(a)	-	-	10	-	-	.18
F	Holosteum umbellatum (a)	$_{a}$61	$_{b}$195	$_{a}$79	.33	2.66	.62
F	Lappula occidentalis (a)	5	7	6	.01	.19	.01
F	Lactuca serriola	1	-	2	.00	-	.01
F	Machaeranthera spp	4	-	-	.01	-	-
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$79	$_{b}$79	-	.82	.31
F	Polygonum douglasii (a)	9	9	4	.01	.01	.00
F	Ranunculus testiculatus (a)	-	5	2	-	.03	.00
F	Sisymbrium altissimum (a)	6	6	2	.02	.04	.00
F	Tragopogon dubius	-	2	-	-	.03	.03
F	Veronica biloba (a)	2	3	1	.03	.03	.03
F	Vicia americana	$_{b}$289	$_{a}$250	$_{b}$324	2.44	5.84	11.96
F	Viola sp.	-	-	5	-	-	.01
Total for Annual Forbs		364	642	646	2.18	6.20	4.36
Total for Perennial Forbs		515	507	536	7.93	13.61	22.06
Total for Forbs		879	1149	1182	10.11	19.82	26.42

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

BROWSE TRENDS --
Management unit 04 , Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	86	77	70	27.64	33.43	26.70
B	Chrysothamnus viscidiflorus viscidiflorus	69	53	54	3.37	2.83	3.36
Total for Browse		155	130	124	31.01	36.27	30.06

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 17

Species	Percent Cover '06
Artemisia tridentata vaseyana	29.01
Chrysothamnus viscidiflorus viscidiflorus	3.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 17

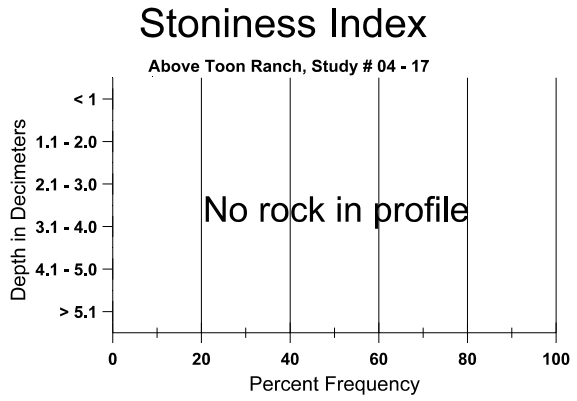
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.2	2.7

BASIC COVER --
Management unit 04 , Study no: 17

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	64.87	66.75	66.01
Rock	.22	.44	.97
Pavement	.20	.51	.67
Litter	75.83	57.01	47.29
Cryptogams	.52	.77	.06
Bare Ground	1.00	6.30	5.23

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 17, Above Toon Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.2	58.4 (12.7)	6.5	41.3	32.7	27.0	3.4	30.9	153.6	0.5



PELLET GROUP DATA --
Management unit 04 , Study no: 17

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	3	-	2
Rabbit	2	6	11
Elk	4	-	6
Deer	29	22	31
Cattle	-	3	-

Days use per acre (ha)	
'01	'06
-	12 (30)
-	-
1 (2)	11 (26)
70 (174)	52 (127)
-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
96	**2880**	40	200	2380	300	1040	6	0	10	3	10	34/52
01	**2700**	60	200	1940	560	360	7	0	21	1	2	41/53
06	**2280**	40	80	1420	780	700	18	7	34	7	10	36/48
Chrysothamnus nauseosus albicaulis												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	24/23
Chrysothamnus viscidiflorus viscidiflorus												
96	**3320**	20	320	2920	80	60	0	0	2	.60	.60	13/21
01	**2460**	-	280	2100	80	-	0	0	3	-	0	10/14
06	**2120**	-	200	1900	20	-	8	2	1	.94	.94	13/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	11/27
Tetradymia canescens												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	21/23

Trend Study 4-18-06

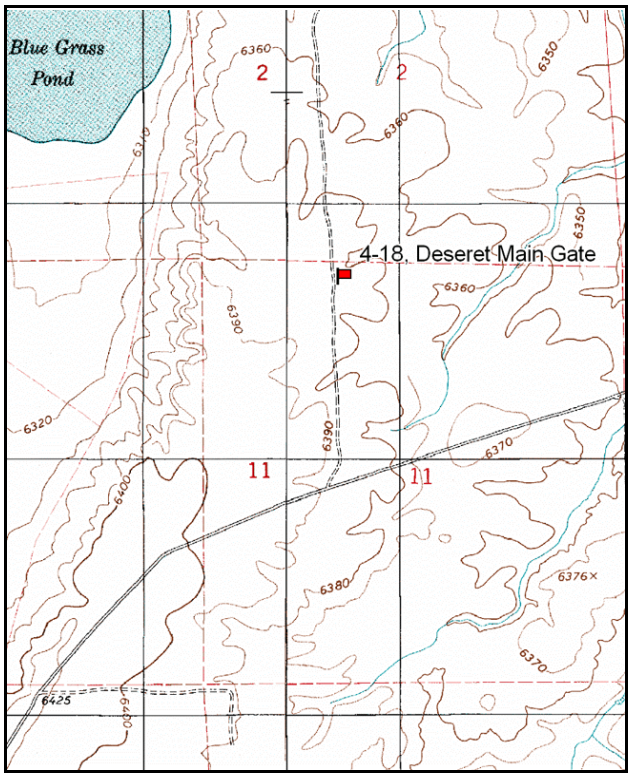
Study site name: Deseret Main Gate . Vegetation type: Big Sagebrush-Grass .

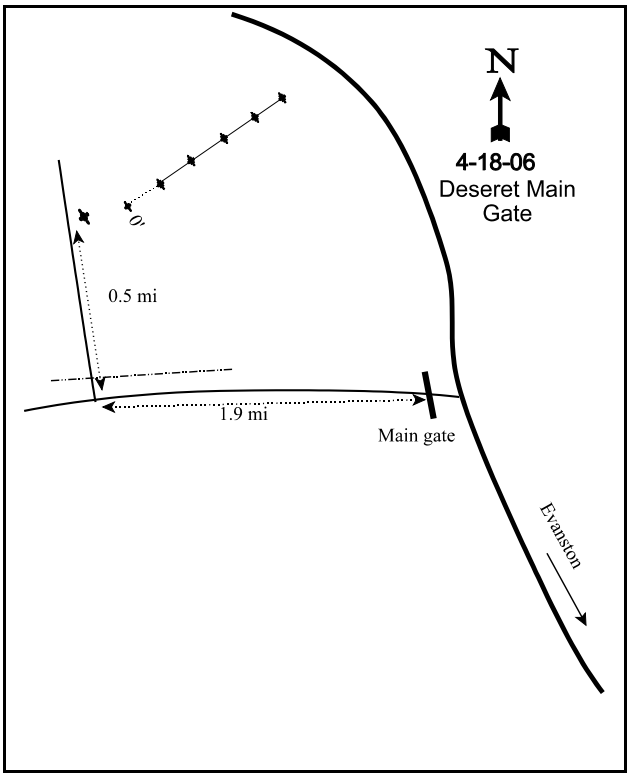
Compass bearing: frequency baseline 12 degrees magnetic.

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

LOCATION DESCRIPTION

From the Deseret Land & Livestock main gate on highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 1.9 miles. Turn right and go 0.5 miles north to a witness post on the east side of the road. The 0-foot stake is 9 paces at 48 degrees magnetic.





Map name: Neponset Reservoir NE Diagrammatic Sketch

Township 8N , Range 6E , Section 11 UTM NAD 27, UTM 12T 4588675 N 489762 E

DISCUSSION

Deseret Main Gate - Trend Study No. 4-18

Study Information

This study is located near the Deseret Land and Livestock ranch's east entrance, off of Highway 16 (elevation: 6,400 feet, slope: level, aspect: level). It was established in 1997 as part of a special study. This area is used by elk, mule deer, pronghorn, cattle, and sage grouse. The pellet group transect in 2001 estimated 19 elk days use/acre (48 edu/ha), 9 deer/pronghorn days use/acre (23/ha), and 53 cow days use/acre (131 cdu/ha). Two sage grouse pellet groups were also sampled. The 2006 pellet group transect data estimate was 62 elk, 11 deer/pronghorn, and 44 cow days use/acre (154 edu/ha, 28 d-adu/ha, and 109 cdu/ha). An estimated 52 sage grouse pellet groups/acre were also sampled. Elk pellets were from fall, winter, and spring. Pronghorn remains were identified near the exclosure.

Soil

The soil is in the Woodpass series, which consists of very deep, well drained soils that formed in alluvium derived mainly form sandstone and limestone and are found on alluvial fans and uplands (USDA-NRCS 2006). It is a loam texture and slightly acidic soil reaction (6.3 pH). The estimated effective rooting depth is over 14 inches. There is little rock or pavement on the soil surface or within the profile. Vegetation cover comes primarily from crested wheatgrass and Wyoming big sagebrush. Relative bare ground cover is fairly abundant (36% in 1996, 27% in 2001, and 30% in 2006), most of which is in the interspaces between crested wheatgrass and sagebrush. Erosion is minimal due to the gentle slope. Moderate pedestaling around sagebrush stems and crested wheatgrass clumps provide some evidence of past erosion. In 2001 and 2006, the erosion condition class assessments were stable.

Browse

The key browse species is Wyoming big sagebrush, which had an estimated density of 5,280 plants/acre in 1997, 5,780 plants/acre in 2001, and 3,900 plants/acre in 2006. Use on sagebrush was moderate to heavy in 1997, and light to moderate in 2001 and 2006. Decadence has increased from 27% of the population in 1997 to 43% in 2001, and to 45% in 2006. Plants classified as dying have increased from 10% of the population in 1997 to 11% in 2001, to 28% in 2006. Vigor was normal in the majority of the population in 1997 and 2001, but plants with poor vigor increased to 36% of the population in 2006. This increase in poor vigor in 2006 is likely due to an infestation of the sagebrush defoliator moth (*Aroga websterii*), which was identified on 10% of the sampled population. The study was sampled in August, after the web-like silk of the moth was gone and only defoliated plants remained. It can be assumed that many of the plants classified as dying were defoliated by the moth, but were not necessarily dying. Recruitment from young plants has been much lower than the percentage of plants classified as dying. Young plants made up 4% of the population in 1997, 8% in 2001, and 11% in 2006. This deficit in recruitment is playing a large role in the loss of sagebrush.

Herbaceous Understory

Crested wheatgrass is the dominant understory species, having contributed 12% cover in 1997, 18% in 2001, and 37% in 2006. Some utilization was noted on crested wheatgrass in 2001. Only two other grasses were sampled, Sandberg bluegrass and Indian ricegrass. Both species occur infrequently. Forbs are sparse and have provided less than 1% cover since 1997.

2001 TREND ASSESSMENT

Trend for browse is stable. The Wyoming big sagebrush population increased in percent decadence, but use decreased to a more moderate level and the percentage of plants displaying poor vigor remains about the same. The density of plants classified as dying is currently higher than the density of young in the population. This factor should be monitored closely for a possible decline in density in the future. The grass trend is slightly up. The nested frequency of perennial grasses increased 14%, some of which is due to a significant increase in Sandberg bluegrass. The forb trend is stable. The nested frequency of perennial forbs remained unchanged.

The Desirable Components Index score in 1997 was good due to moderate browse cover and good perennial grass cover. The 2001 DCI score remained good.

1997 winter range condition (DC Index) - good (50) Lower potential scale
2001 winter range condition (DC Index) - good (54) Lower potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is down. The density of Wyoming big sagebrush, the key browse species, declined 33%. The percentages of plants with poor vigor and plants classified as dying increased substantially. Most of the decline is the lack of recruitment to replace dying individuals, but the sagebrush defoliator moth is likely a cause of some of the increase in poor vigor. The grass trend is slightly up. The nested frequency of perennial grasses increased 15% and the nested frequency of Sandberg bluegrass increased significantly again. The forb trend is stable. The nested frequency of perennial forbs increased slightly since 1997, but the abundances remain low. Longleaf phlox, a species beneficial to sage grouse, increased significantly since 2001. Diversity is low, but has increased from 2 species in 1997 to 6 in 2006. The DCI score declined to fair to good due to decreased browse cover.

winter range condition (DC Index) - fair to good (47)Lower potential scale
browse - down (-2) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 18

Type	Species	Nested Frequency			Average Cover %		
		'97	'01	'06	'97	'01	'06
G	Agropyron cristatum	$_{a}$373	$_{ab}$403	$_{b}$417	11.72	18.31	37.15
G	Oryzopsis hymenoides	-	3	-	-	.03	-
G	Poa secunda	$_{a}$6	$_{b}$27	$_{c}$83	.03	.26	1.28
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		379	433	500	11.75	18.60	38.43
Total for Grasses		379	433	500	11.75	18.60	38.43
F	Alyssum alyssoides (a)	-	5	-	-	.03	-
F	Antennaria rosea	-	-	4	-	-	.06
F	Astragalus convallarius	-	11	2	-	.07	.01
F	Descurainia pinnata (a)	-	1	1	-	.00	.00
F	Phlox hoodii	$_{a}$10	$_{ab}$22	$_{b}$35	.05	.14	.34
F	Phlox longifolia	$_{b}$10	$_{a}$-	$_{b}$19	.10	-	.10
F	Trifolium sp.	-	2	1	-	.00	.00
Total for Annual Forbs		0	6	1	0	0.03	0.00
Total for Perennial Forbs		20	35	61	0.15	0.22	0.52
Total for Forbs		20	41	62	0.15	0.26	0.53

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

BROWSE TRENDS --
Management unit 04 , Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'97	'01	'06	'97	'01	'06
B	Artemisia tridentata wyomingensis	90	95	82	11.57	11.61	5.93
B	Atriplex gardneri falcata	3	9	9	.06	.31	.10
B	Ceratoides lanata	0	2	0	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	60	46	26	1.27	.57	.30
Total for Browse		153	152	117	12.91	12.50	6.33

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 18

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	4.28
Atriplex gardneri falcata	.20
Chrysothamnus viscidiflorus viscidiflorus	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 18

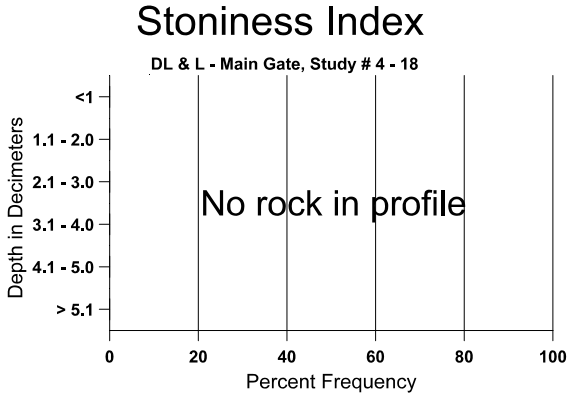
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	0.9	1.3

BASIC COVER --
Management unit 04 , Study no: 18

Cover Type	Average Cover %		
	'97	'01	'06
Vegetation	21.86	28.14	47.08
Rock	.64	.08	.38
Pavement	5.08	1.01	.69
Litter	22.24	47.11	33.21
Cryptogams	9.64	10.44	3.49
Bare Ground	33.04	32.00	36.12

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 18, Deseret Main Gate

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.6	69.6 (13.9)	6.3	48.0	28.1	23.9	1.5	22.1	185.6	0.4



PELLET GROUP DATA --
Management unit 04 , Study no: 18

Type	Quadrat Frequency			Days use per acre (ha)	
	'97	'01	'06	'01	'06
Rabbit	1	2	6	-	-
Grouse	1	-	1	17.4 groups/acre	52 groups/acre
Elk	24	5	57	19 (48)	62 (154)
Deer	22	8	1	9 (23)	11 (28)
Cattle	9	15	25	53 (131)	44 (109)
Antelope	-	-	1	-	-

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
97	**5280**	40	220	3660	1400	980	48	42	27	10	10	14/22
01	**5780**	60	480	2840	2460	1140	29	10	43	11	11	12/20
06	**3900**	80	400	1760	1740	1080	42	11	45	28	36	13/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Atriplex gardneri falcata												
97	**260**	-	40	220	-	-	0	0	-	-	0	4/5
01	**980**	-	320	660	-	-	0	0	-	-	0	3/4
06	**880**	-	280	600	-	-	30	11	-	-	0	5/9
Ceratoides lanata												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
97	**2720**	-	-	2720	-	-	0	0	0	-	0	6/8
01	**1820**	-	180	1400	240	-	0	0	13	-	0	4/6
06	**620**	-	220	320	80	40	13	16	13	3	13	5/7
Opuntia sp.												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	3/5

Trend Study 4-19-01

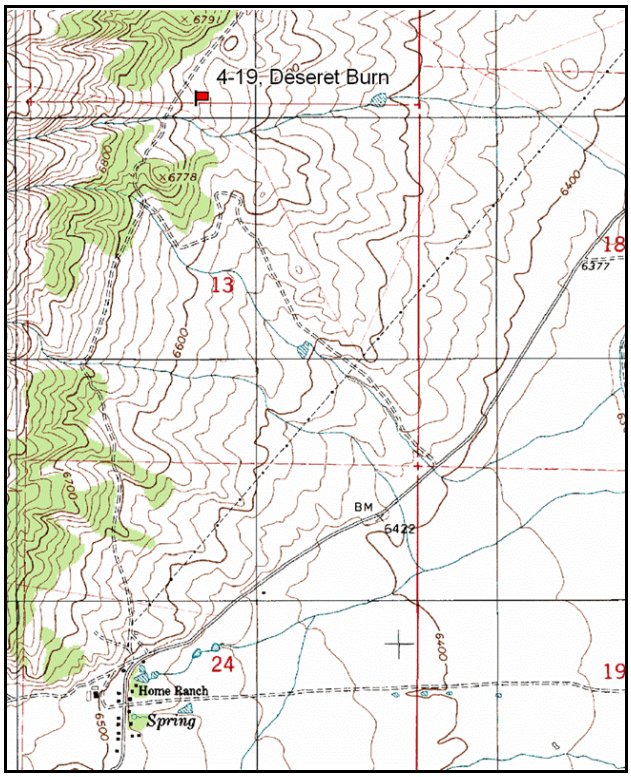
Study site name: Deseret Burn . Vegetation type: Burned and Seeded .

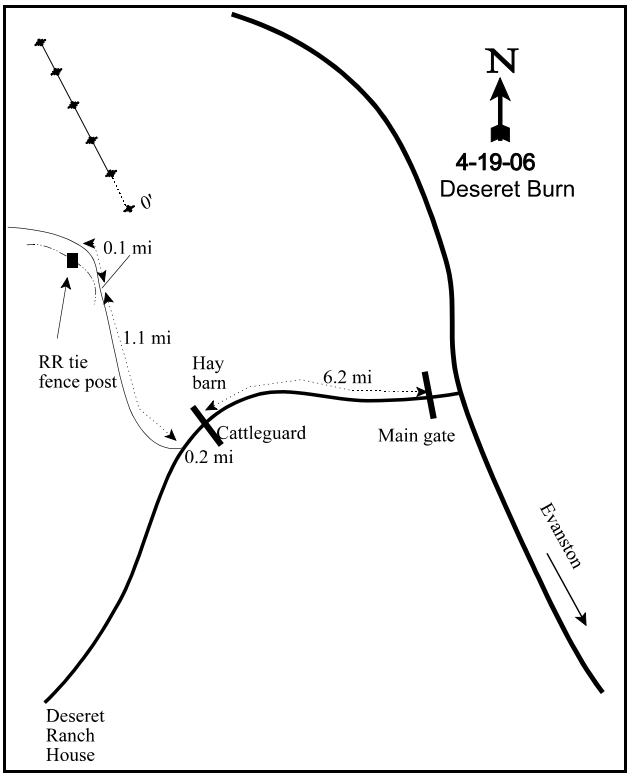
Compass bearing: frequency baseline 320 degrees magnetic.

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

LOCATION DESCRIPTION

From the Deseret Land & Livestock main gate on highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 6.2 miles to a cattleguard. Continue 0.2 miles and turn right onto a two track. Follow the two track for 1.2 miles staying left. The 0-foot stake is 16 paces at 54 degrees magnetic from a rail road tie in the fence line. The baseline runs at 320 degrees magnetic.





Map name: Neponset Reservoir NW

Diagrammatic Sketch

Township 8N , Range 6E , Section 13

UTM NAD 27, UTM 12T 45870412N 481752 E

DISCUSSION

Deseret Burn - Trend Study No. 4-19

Study Information

This study is located approximately 1.5 miles north of the Deseret Land and Livestock ranch house (elevation: 6,700 feet, slope: 12%, aspect: east). The area burned in 1996 and was aerially seeded and chained afterward. Shrubs were seeded either by a dribbler or planted from root stock. The study was established to monitor vegetation recovery following the treatment. There was very little wildlife use when it was established in 1997. Elk, deer, and cattle sign were present when the study was read in 2001. The pellet group transect in 2001 estimated 36 elk days use/acre (88 edu/ha), 4 deer days use/acre (10 ddu/ha), and 33 cow days use/acre (82 cdu/ha). The 2006 pellet group transect estimates were 64 elk, 3 deer, and 54 cow days use/acre (157 edu/ha, 7 ddu/ha, and 134 cdu/ha). Elk pellets were from winter, deer appeared to be from early summer, and cow from early summer. The area had been lightly grazed in 2006.

Soil

The soil is in the Duckree Gravelly Loam series, a category typified by very deep, well drained, moderately permeable soils, formed in alluvium and colluvium from quartzite, chert, and sandstone (USDA-NRCS 2006). The soil texture is sandy clay loam with a neutral soil reaction (6.7 pH). The effective rooting depth was estimated at just over 12 inches. Vegetation and litter cover were both very low in 1997, the first growing season following the seeding. Conversely, relative bare ground cover was high at 58%. In 2001, the vegetation had greatly increased, resulting in much better protective ground cover. Relative bare ground cover was only 19% in 2001 and 23% in 2006. The erosion condition class was stable in 2001 and 2006.

Browse

Even though there was a high effort to establish browse by seeding and planting bare-root stock, browse has remained sparse. Wyoming big sagebrush, fourwing saltbush, and low rabbitbrush have been sampled. Wyoming big sagebrush density was estimated at 60 plants/acre in 2001 and 2006. Fourwing saltbush density was estimated at 360 plants/acre in 1997, 100 plants/acre in 2001, and 60 plants/acre in 2006. Apparently, some of the young saltbush plants sampled in 1997 did not persist and some of the mature also died. Recruitment from young plants was only 20 plants/acre in 2001, but none were sampled in 2006. Low rabbitbrush density was estimated at 1,480 plants/acre in 1997, 1,600 plants/acre in 2001, and 1,400 plants/acre in 2006. This species appears to have a stable population with mostly mature plants.

Herbaceous Understory

The herbaceous understory is dominated by grasses. The most abundant perennial species include Sandberg bluegrass, crested wheatgrass, intermediate wheatgrass, and western wheatgrass. Less abundant species include needle-and-thread, sedge, and bluebunch wheatgrass. Perennial grass cover was 10% in 1997, 18% in 2001, and 28% in 2006. Sum of nested frequency for all perennial grasses increased by 27% in 2001 and again by 32% in 2006. Cheatgrass was the most abundant individual species in 2001, after significantly increasing in nested frequency. In 2006, cheatgrass nested frequency decreased significantly and provided less than 1% cover. Forbs have not been abundant. Seeded perennial forbs such as alfalfa and small burnet are rare. Small burnet, Lewis flax, and wild onion have significantly decreased since 1997 and were not sampled in 2006. With the exception of pale alyssum, annual forbs are infrequent as well. Forb diversity decreased from 14 species in 1997 and 2001 to 7 species in 2006.

2001 TREND ASSESSMENT

Trend for browse is slightly down. Fourwing saltbush density decreased and use increased. Most of the young plants sampled in 1997 apparently did not persist. Wyoming big sagebrush has an estimated density of 60 plants/acre, but recruitment is low. The grass trend is up. The nested frequency of perennial grasses increased 27%. Intermediate wheatgrass, western wheatgrass, and needle-and-thread grass all increased significantly. Unfortunately, cheatgrass also increased significantly. The forb trend is down. The nested

frequency of perennial forbs decreased 63%. Wild onion, Lewis flax, and small burnet all decreased significantly. The Desirable Components Index score in 1997 was poor to fair due to very low browse cover and despite good perennial grass cover and moderate perennial forb cover. The DCI score increased to fair in 2001 due to an increase in perennial grass cover.

1997 winter range condition (DC Index) - poor to fair (26) Lower potential scale
2001 winter range condition (DC Index) - fair (29) Lower potential scale
browse - slightly down (-1) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. The densities of the key browse species, Wyoming big sagebrush and fourwing saltbush, remained very low. The grass trend is up. The nested frequency of perennial grasses increased 32% and the nested frequencies of crested wheatgrass, western wheatgrass, and Sandberg bluegrass increased significantly. Cheatgrass nested frequency decreased significantly. The forb trend is slightly down. The nested frequency of perennial forbs decreased and the forb diversity was half that of 1996 and 2001. The DCI score remained fair.

winter range condition (DC Index) - fair (34)Lower potential scale
browse - stable (0) grass - up (+2) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 19

Type	Species	Nested Frequency			Average Cover %		
		'97	'01	'06	'97	'01	'06
G	Agropyron cristatum	a153	a148	b216	3.52	5.30	8.50
G	Agropyron intermedium	a93	b160	a113	1.70	4.90	4.03
G	Agropyron smithii	a47	b95	c134	1.10	2.47	2.14
G	Agropyron spicatum	b30	a1	a-	.51	.00	-
G	Bromus japonicus (a)	-	2	-	-	.00	-
G	Bromus tectorum (a)	a56	b295	a25	.65	6.25	.19
G	Carex sp.	22	25	6	.72	.51	.03
G	Elymus cinereus	-	1	-	-	.03	.03
G	Oryzopsis hymenoides	3	-	1	.15	-	.15
G	Poa fendleriana	6	-	-	.18	-	-
G	Poa secunda	a144	a175	b340	2.12	4.11	11.85
G	Sitanion hystrix	-	1	3	.00	.00	.00
G	Stipa comata	a7	b34	b31	.06	.31	1.20
Total for Annual Grasses		56	297	25	0.64	6.25	0.19
Total for Perennial Grasses		505	640	844	10.09	17.67	27.97
Total for Grasses		561	937	869	10.74	23.93	28.17

Type	Species	Nested Frequency			Average Cover %		
		'97	'01	'06	'97	'01	'06
F	Agoseris glauca	-	1	7	-	.00	.02
F	Alyssum alyssoides (a)	$_{a}$-	$_{c}$292	$_{b}$228	-	1.38	.84
F	Allium sp.	$_{b}$32	$_{a}$-	$_{a}$-	.11	-	-
F	Arabis sp.	3	-	-	.00	-	-
F	Astragalus sp.	2	3	-	.03	.01	.01
F	Balsamorhiza sagittata	2	1	1	.06	.33	.03
F	Chenopodium sp. (a)	-	-	-	.41	-	-
F	Crepis acuminata	-	2	-	-	.03	-
F	Cymopterus sp.	-	1	-	-	.00	-
F	Erigeron sp.	14	-	-	.24	-	-
F	Gayophytum ramosissimum(a)	$_{b}$76	$_{a}$-	$_{a}$-	1.69	-	-
F	Gilia sp. (a)	$_{b}$18	$_{b}$27	$_{a}$-	.26	.07	-
F	Lappula occidentalis (a)	$_{b}$14	$_{c}$72	$_{a}$-	.26	.18	-
F	Lactuca serriola	-	-	-	.06	-	-
F	Linum lewisii	$_{b}$13	$_{a}$-	$_{a}$-	.09	-	-
F	Medicago sativa	12	17	14	.24	.63	1.49
F	Phlox longifolia	$_{b}$54	$_{ab}$35	$_{a}$24	.21	.08	.13
F	Ranunculus testiculatus (a)	-	-	2	-	-	.00
F	Sanguisorba minor	$_{b}$65	$_{a}$4	$_{a}$-	1.84	.01	-
F	Sphaeralcea coccinea	2	3	4	.03	.15	.15
F	Tragopogon dubius	-	4	-	-	.03	-
F	Unknown forb-perennial	3	4	-	.03	.31	-
Total for Annual Forbs		108	391	230	2.63	1.64	0.84
Total for Perennial Forbs		202	75	50	2.97	1.61	1.84
Total for Forbs		310	466	280	5.60	3.25	2.68

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

BROWSE TRENDS --
Management unit 04 , Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'97	'01	'06	'97	'01	'06
B	Artemisia tridentata wyomingensis	0	3	3	-	.03	.18
B	Atriplex canescens	14	5	3	.04	.00	.15
B	Chrysothamnus viscidiflorus viscidiflorus	33	35	38	.83	1.58	2.30
B	Eriogonum microthecum	0	1	0	-	-	-
B	Opuntia sp.	2	3	3	-	.00	-
Total for Browse		49	47	47	0.87	1.62	2.63

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 19

Species	Percent Cover '06
Artemisia tridentata wyomingensis	.15
Atriplex canescens	.38
Chrysothamnus viscidiflorus viscidiflorus	2.61
Opuntia sp.	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 19

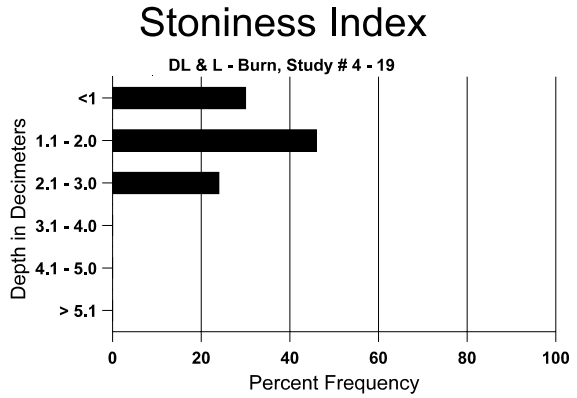
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	-	2.0
Atriplex canescens	4.0	9.0

BASIC COVER --
Management unit 04 , Study no: 19

Cover Type	Average Cover %		
	'97	'01	'06
Vegetation	16.43	38.72	41.27
Rock	3.81	1.23	1.19
Pavement	10.35	2.20	2.62
Litter	5.63	55.69	39.09
Cryptogams	.48	.30	.33
Bare Ground	51.37	23.37	25.48

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 19, Deseret Burn

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.4	74.8 (12.4)	6.7	49.6	19.5	30.9	2.7	27.7	249.6	0.8



PELLET GROUP DATA --
Management unit 04 , Study no: 19

Type	Quadrat Frequency		
	'97	'01	'06
Rabbit	-	5	29
Moose	-	-	2
Elk	-	14	44
Deer	-	5	5
Cattle	-	13	30

Days use per acre (ha)	
'01	'06
-	-
-	-
36 (88)	64 (157)
4 (10)	3 (7)
33 (82)	54 (134)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
97	**0**	-	-	-	-	100	0	0	-	-	0	-/-
01	**60**	-	20	40	-	180	0	0	-	-	0	8/9
06	**60**	-	-	60	-	-	0	100	-	-	0	11/17
Atriplex canescens												
97	**360**	20	180	180	-	40	0	0	-	-	0	23/23
01	**100**	20	20	80	-	-	60	0	-	-	0	19/18
06	**60**	-	-	60	-	20	33	0	-	-	0	32/41
Ceratoides lanata												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	9/11
Chrysothamnus viscidiflorus viscidiflorus												
97	**1480**	-	20	1440	20	-	0	0	1	1	1	12/17
01	**1600**	-	40	1160	400	20	0	0	25	3	3	10/18
06	**1400**	320	100	1180	120	-	16	10	9	-	3	11/22
Eriogonum microthecum												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
97	**40**	-	-	40	-	20	0	0	-	-	0	3/8
01	**100**	-	20	80	-	-	0	0	-	-	0	3/6
06	**80**	20	-	80	-	-	0	0	-	-	0	4/12
Tetradymia canescens												
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	25/22
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

SUMMARY

HERD UNIT 4 - Morgan - Rich

Thirteen trend studies were read in Unit 4 in 2006. Dry Hollow (4-16) was suspended in 2006 because access was restricted. Two roving studies established in 1997 on Deseret Land and Livestock property were added to the regular rotation in 2006. Seven of the studies sample mountain big sagebrush communities, 4 sample Wyoming big sagebrush communities, 1 samples a revegetated burn, and 1 samples a Gambel oak community.

Vegetative trends are dependent upon annual and spring precipitation patterns. Precipitation data from this herd unit was compiled from the Morgan, Woodruff, and Echo Dam weather stations (Figures 1 and 2). In 2001, 2002, and 2003, average precipitation values at the 3 weather stations were at or below drought level (75% of normal; Figure 1). Spring precipitation for the unit was below normal from 2000 to 2004 and below 75% of normal in 2001 and 2002 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. It is likely that declining browse trends are a product of the period of drought in 2001 and 2002 (Figure 3).

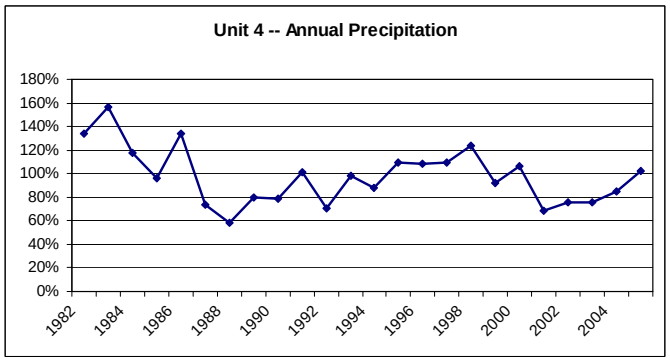


Figure 1. Annual precipitation for Unit 4. Precipitation data was collected in Morgan, Woodruff, and at Echo Dam (Utah climate summaries 2006).

The average browse trend for the unit has steadily decreased since 1984 (Figure 3). Between 2001 and 2006, both Wyoming big sagebrush and mountain big sagebrush density averages have decreased across the unit; Wyoming has declined by about 700 plants/acre and mountain by about 200 plants/acre on average (Figure 4). The unit average for Wyoming big sagebrush densities increased from 3,644 plants/acre in 1996 to 4,784 plants/acre in 2001, then decreased to 4,052 plants/acre in 2006. Mountain big sagebrush unit average density decreased from 2,088 plants/acre in 1996 to 1,740 plants/acre in 2001, down to 1,523 plants/acre in 2006. The average cover of both Wyoming and mountain big sagebrush decreased about 2% since 2001 (Figure 5). The percentage of plants classified as decadent also increased for both Wyoming and mountain big sagebrush populations since 2001 (Figure 6). On average, the number of plants classified as decadent increased nearly 14% in Wyoming big sagebrush and 8% in mountain big sagebrush. The browse trends of 5 study sites were either down or slightly down in 2006. Echo Canyon (4-2), Harris Canyon (4-6), and Deseret Main Gate (4-18) all had down browse trends. Shell Hollow (4-8), Chapman Canal (4-14), and Above Toon Ranch

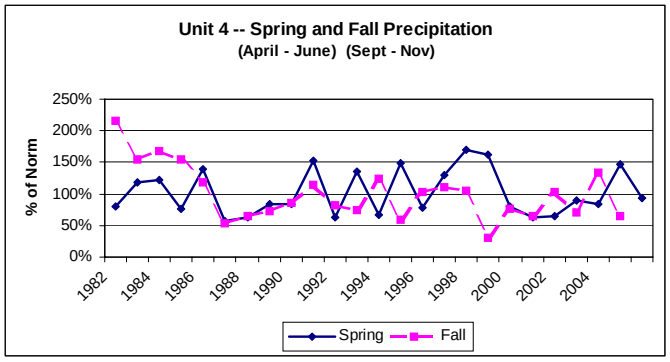


Figure 2. Spring and fall precipitation for Unit 4. Precipitation data was collected in Morgan, Woodruff, and at Echo Dam (Utah climate summaries 2006).

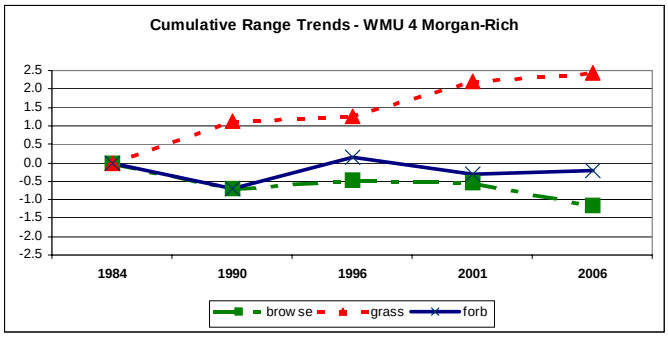


Figure 3. Cumulative Range Trends for unit 4, Morgan Rich.

(4-17) had slightly down browse trends. As mentioned above, the drought in 2001 and 2002 contributed to the declining browse trends, but part of the reason could be due to the increased infestation of the sagebrush defoliator moth (*Aroga websterii*) in this unit in 2006. Harris Canyon (4-6), Chapman Canal (4-14), and Deseret Main Gate (4-18) studies both showed defoliator moth infestation and all three showed downward browse trends. Ninety-three percent of the sagebrush individuals at the Chapman Canal study were classified with poor vigor, compared to 36% of Deseret Main Gate individuals and 9% of the Harris Canyon individuals. The moth was also present on some of the sagebrush at Shell Hollow (4-8), but none of the sampled individuals showed signs of infestation. It is possible that other sites were infested, but showed no signs of the moth at the time the studies were read.

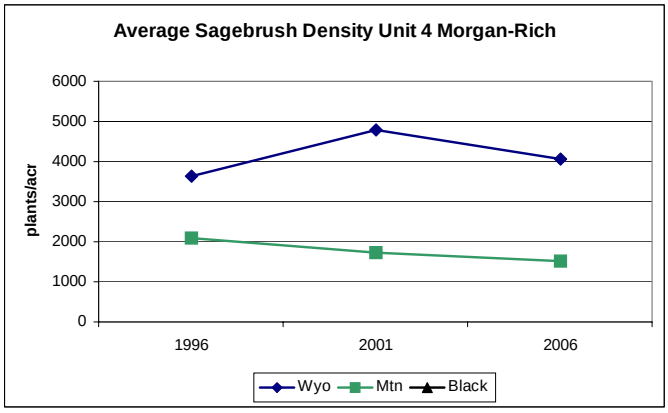


Figure 4. Average Wyoming and mountain big sagebrush densities in unit 4.

The herbaceous understory has improved unit wide from 2001 to 2006. The unit average of perennial grass cover has increased from 10% in 1996, to 15% in 2001, to 17% in 2006 (Figure 7). The nested frequency of perennial grasses has also increased steadily (Figure 8). The perennial forb cover unit average has increased about 2% since 1996 and the nested frequency has remained constant (Figures 7 and 8). The unit average of cheatgrass cover and nested frequency decreased from 1996 to 2001 and only returned partially (Figures 7 and 8). The bulbous bluegrass unit average cover and nested frequency show slight increases in since 1996 (Figures 7 and 8). Bulbous bluegrass has been sampled on 4 studies and has either increased or remained stable in cover and nested frequency on each. Studies with increasing bulbous bluegrass cover and nested frequencies appear to hinder cheatgrass growth. Stewart and Hull (1949) reported that bulbous bluegrass seed and bulbils distributed in established cheatgrass stands could reduce the cheatgrass.

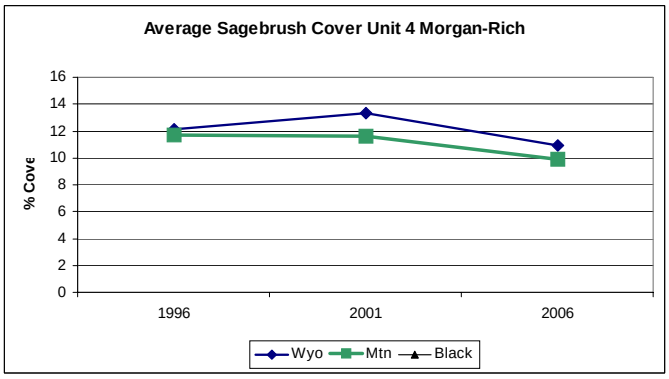


Figure 5. Average Wyoming and mountain big sagebrush cover in unit 4.

The unit-wide Desirable Components Index (DCI) scores have slightly decreased, although they have remained fair for the Mid-level potential (mountain big sagebrush and Gambel oak) studies and good for the Lower potential (Wyoming big sagebrush) studies (Figure 9). The 2006 DCI scores remained similar to those of 2001 despite the decrease in browse densities across the unit. This is because the DCI score only takes browse cover, decadence, and young into account; unlike browse densities, the unit average of sagebrush cover only decreased about 2% for mountain and Wyoming big sagebrush.

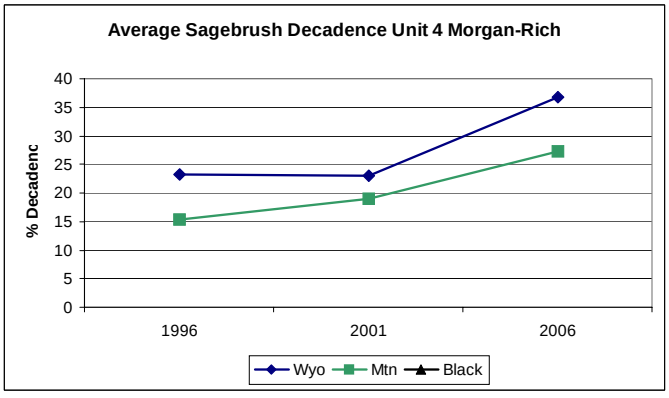


Figure 6. The average percentage of Wyoming and mountain big sagebrush decadence in unit 4.

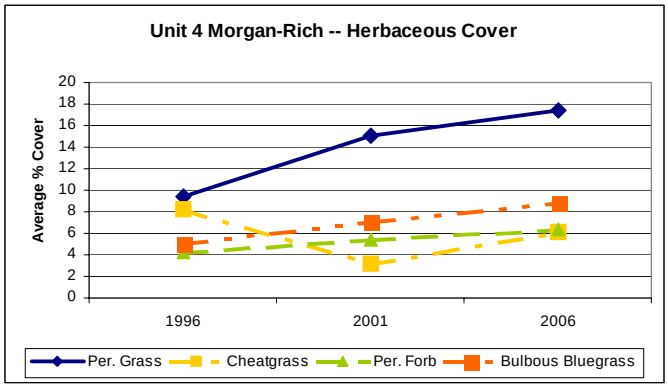


Figure 7. Unit 4 herbaceous understory cover averages.

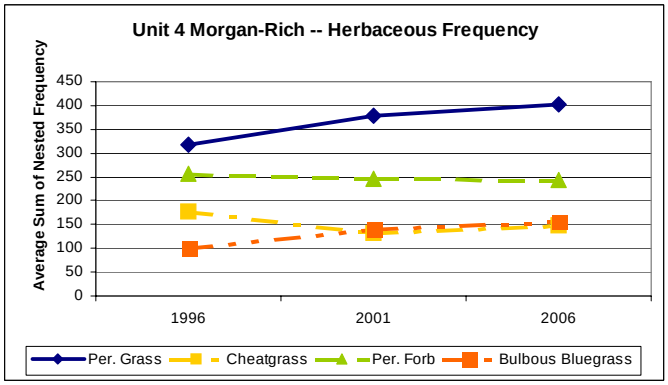


Figure 8. Unit 4 herbaceous understory nested frequency averages.

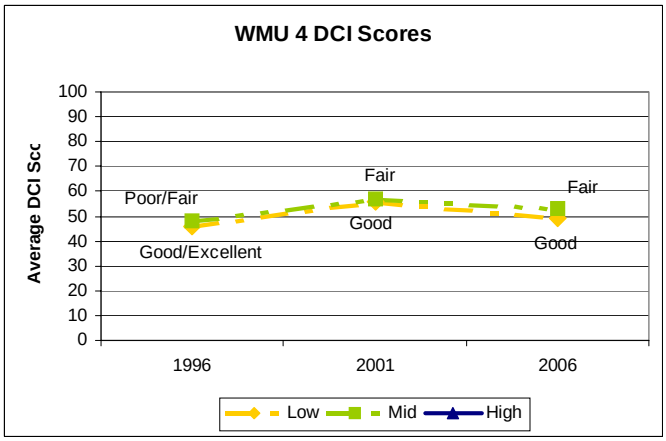
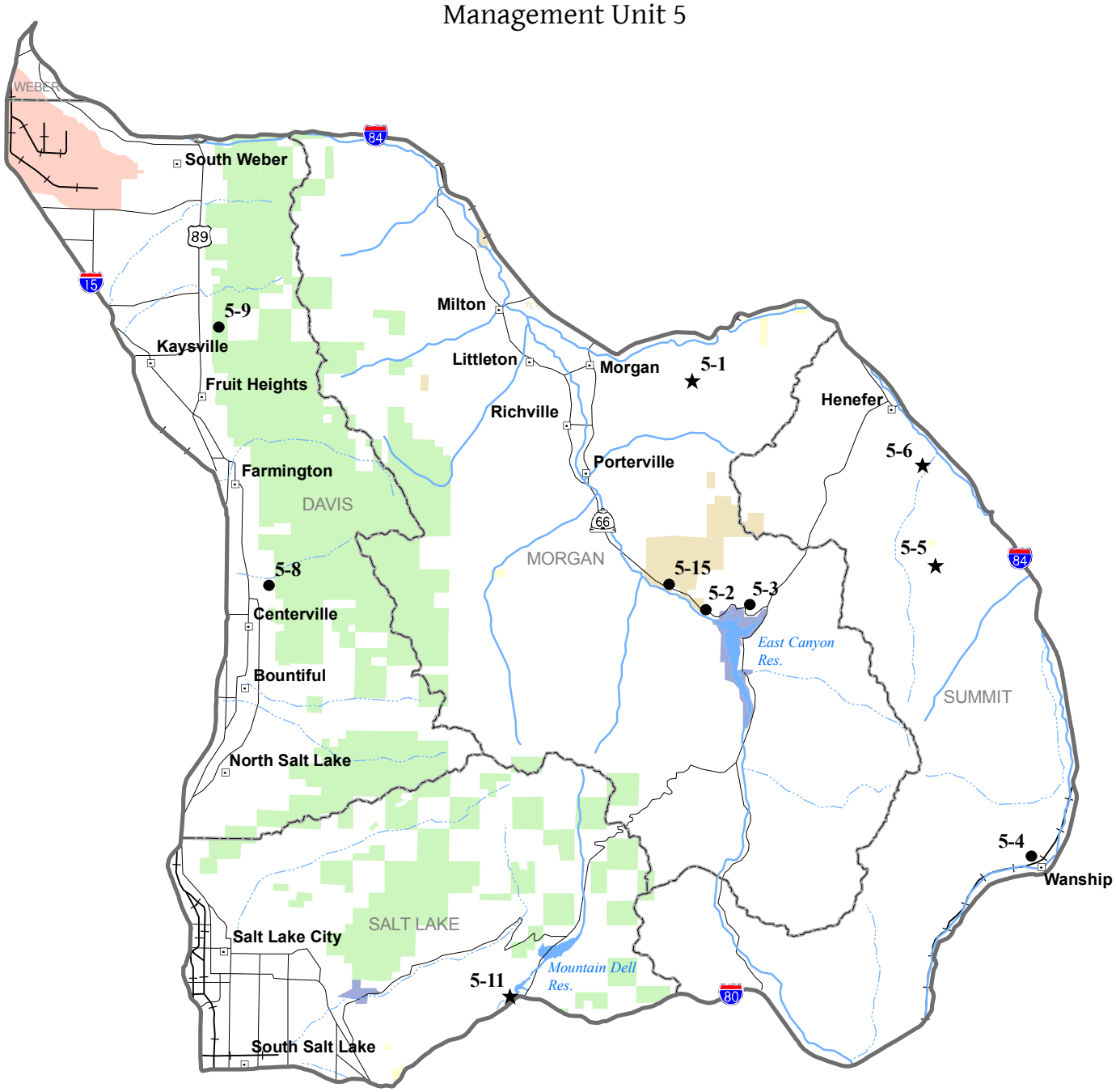


Figure 9. Unit 4 average Desirable Components Index (DCI) score by year. The DCI ratings are given for each site based on the 3 ecological potentials.

Management Unit 5

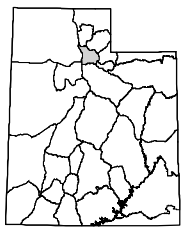


Transect location
Suspended site
Forest Service
BLM
Utah DWR
Private
Military
Utah State Park
Water body
Perennial stream
Intermittent stream
Road
County boundary
Railroad

N

Map Scale 1:305,000
(1 inch = 4.8 miles)

Unit Location



WILDLIFE MANAGEMENT UNIT - 5 - EAST CANYON

Boundary Description

Morgan, Summit, Salt Lake, and Davis counties - The boundary begins at the junction of I-80 and I-84 (Echo Junction); south and west on I-80 to Interstate 15; north on I-15 to I-84; east on I-84 to I-80.

Management Unit Description

The East Canyon deer herd unit is located mostly on the east side of the Wasatch Mountains. The topography varies across the unit from fairly deep canyons and steep slopes in the western portion to more gentle open slopes and fewer cliffs in the east. Most of the unit is drained by the Weber River. Several creeks along the north and east edges of the unit drain directly into the river. The East Canyon Creek flows into the Weber River. East Canyon Reservoir is located approximately in the center of the unit. The highest elevations are along the western boundary on peaks of the Wasatch Range which reach above 9,500 feet. The lowest point is 4,800 feet in the northwest corner where the Weber River flows out of the unit.

The upper limits of normal winter range are generally considered to be about 7,000 feet. Winter range is found in the major drainages and around East Canyon Reservoir. All of the valleys have been developed for agriculture and housing. The major canyons, Weber, East, and Main Canyons, contain housing developments and high-use roads. The northern, eastern, and southern boundaries are formed by Interstates 80 and 84. Other more narrow and higher elevation canyons have seasonal roads. The area is highly developed because a majority of the unit is private land. Approximately 83% of the deer winter range and 76% of the summer range is under private ownership. As of 2006, approximately 35% of the unit was winter range. Not only is the quantity of winter range limited, but the quality is compromised by development and roads. Many deer that summer on the unit migrate over to the Davis County side of the unit (Wasatch Face) to winter. Winter migration into the unit from other areas is minimal.

Most of the winter range is comprised of sagebrush range types. In the original inventory in 1972, King and Olson (1972) described almost three-quarters of the winter range as a mixture of black sagebrush on the ridge tops and big sagebrush down the slopes on the deeper soils. The sagebrush type has a good mix of browse species and can provide substantial forage for wintering deer. This browse type, which is 20% of the total range, is composed mainly of big sagebrush and Gambel oak. Other range types include agricultural lands and burns.

Recently, increased numbers of people and deer have lead to conflicts and degradation of the winter range. Heavy deer and livestock use has resulted in downward trends on much of the range. Soil erosion, removal of perennial herbaceous cover, and heavy use of browse species are the major problems. Highway mortality occurs, but is not as high here as on surrounding units. Harvesting depredating deer is difficult because of access restrictions to private land. Since a majority of the land is privately-owned, reducing the deer herd to within the carrying capacity of the winter range must be done with the cooperation and support of local interest groups.

Unit Management Objectives

The management objective is to maintain a target wintering deer herd of approximately 7,000 deer. The Davis and Salt Lake County portion of Unit 5 contains most of the public land in the unit. Winter ranges are adjacent to the heavily populated Wasatch Front and are becoming limited due to the impact of urban development. The herd composition goal for the East Canyon management unit is 25 bucks per 100 does and 65 fawns per 100 does (Hersey and McLaughlin 2005).

The management objective for elk is to maintain a winter herd size of 1,000. The objective for herd composition is to maintain ratio of 8 bulls per 100 cows. Fifty percent of the bulls are planned to be 2.5 years of age or older (1998 Utah Big Game Management Plan and personal communication with Craig

McLaughlin).

The East Canyon deer herd unit, like the neighboring Morgan-Rich unit, has several management concerns related to the high percentage of private ownership. The concerns listed in the 1984 trend study report (Giunta et al. 1986) continue to persist. These concerns relate to access, range management, rehabilitation, and development on the privately owned winter range. The DWR has purchased winter range in the Redrock Canyon area. The herd unit remains on the top of the priority list of units requiring winter habitat acquisition.

Trend Study Site Description

Ten trend studies were established in the East Canyon unit between 1983 and 1985. These 10 studies were reread in 1990. Eight of the 10 studies were read again in 1996 and a new study was established in Red Rock Canyon. During the 2001 season, 7 of the 11 trend studies were reread. In 2006, 6 of the 11 trend studies were reread. Individual study site descriptions, maps, and data tables are found below.

Trend Study 5-2-06

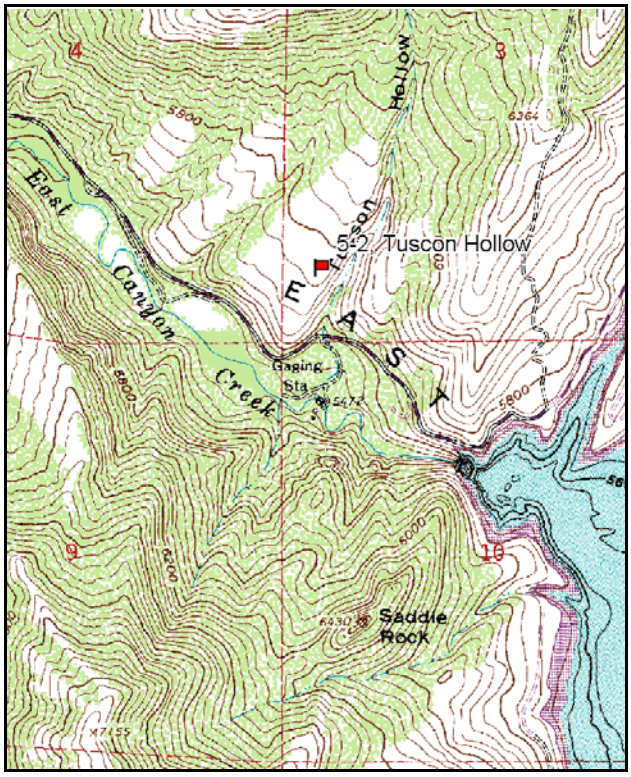
Study site name: Tucson Hollow . Vegetation type: Mountain Brush .

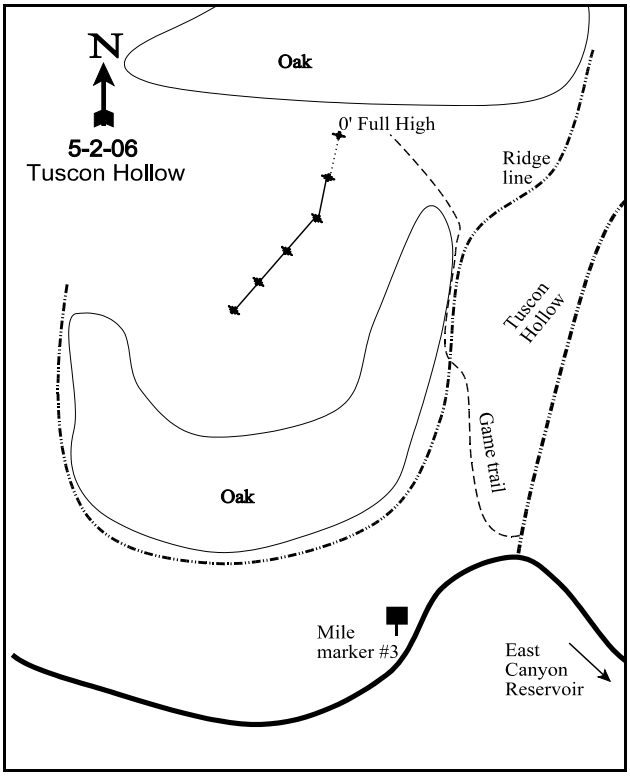
Compass bearing: frequency baseline 204 degrees magnetic.

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

LOCATION DESCRIPTION

From the dam at East Canyon Reservoir, proceed 0.2 miles northwest past Tucson Hollow, and stop near mile marker 3. Walk up the slope following a game trail (to the northeast) to the plateau. Walk through the oak stand bordering the ridge line continuing northeast to an opening in the oak. Look for a full high fence post on the north side of the opening. This full high fence post is the 0-foot stake. The baseline runs 208 degrees magnetic. At the 200-foot baseline stake the baseline doglegs and runs 229 degrees magnetic.





Map Name: East Canyon Reservoir

Diagrammatic Sketch

Township 2N , Range 3E , Section 3

UTM NAD 27, UTM 12T 4530600 N 448928 E

DISCUSSION

Tucson Hollow - Trend Study No. 5-2

Study Information

This study is located on a nearly level bench just northwest of East Canyon Reservoir (elevation: 5,800 feet, slope: 3%, aspect: south). It was originally placed in a nearby thick patch of Gambel oak brush. Because there was very little apparent utilization in the dense oak, the study was moved just south of the original study in 1996. The study now samples a big sagebrush/grass opening about 25 to 30 acres in size and is surrounded on 3 sides by oak clones. In 1990, three winter-killed deer and several antler drops were found in the immediate vicinity. Deer and elk pellet groups are scattered throughout the area. The quadrat frequency of deer pellet groups was 17% in 1996 and 2001, then had increased to 32% in 2006. In addition, the pellet group transect data from 2001 was an estimated 31 deer days use/acre (76 ddu/ha). In 2006, 24 elk (60 edu/ha) and 69 deer (170 ddu/ha) days use/acre were estimated. Most of the pellet groups were from spring use.

Soil

The soil is classified as a Manila Loam, a classification that occurs only on localized mountain slopes (USDA-NRCS 2006). The soil texture is a clay loam and is slightly acidic (6.5 pH). This soil has limited crop and pasture capability and is highly susceptible to erosion. It is moderately deep with a reddish-brown color. Few rocks were encountered in the soil profile and the effective rooting depth was estimated at nearly 13 inches. Water permeability is low and available water capacity is high (Carley et al. 1980). The site has a good vegetation and litter cover that precludes most erosion. The erosion condition class was determined as stable in 2001 and 2006.

Browse

The site supports a variety of browse species but sagebrush and stickyleaf low rabbitbrush have provided the majority of the browse cover. Sagebrush on the site displays characteristics of both basin big sagebrush (*Artemisia tridentata tridentata*) and mountain big sagebrush (*Artemisia tridentata vaseyana*). All sagebrush was classified as basin big sagebrush, which had an estimated density of 1,400 plants/acre in 1996, 1,220 in 2001, and 860 in 2006. Seventy-six percent of the plants were classified as mature with a decadency of 19% in 1996. In 2001, mature plants increased to 85% of the population with 15% decadency. In 2006, mature plants made up 72% and decadent individuals had increased to 23%. No seedlings were sampled in 1996 and 2001, but an estimated 140 seedlings/acre were sampled in 2006. The average height and crown measurements have increased continually since 1996. The average height was 26 inches with an average crown width of 35 inches in 1996 and has increased to 33 inches tall and 44 inches wide in 2006. Individuals classified as dying have remained less than 7% of the population. Use has been light, vigor good on most plants, and decadence remained low at 15%. The average leader growth in 2001 was 3.8 inches and 3.7 inches in 2006. Although the defoliator moth (*Aroga websterii*) was identified on the East Canyon Reservior study (5-3) less than 1.5 miles to the east, no evidence of the moth was identified on this study.

Stickyleaf low rabbitbrush density has remained stable since 1996. Previous to 2006, decadent individuals made up 5%, or less, of the total population. This increased to 26% in 2006. The shrub species with the highest density was Oregon grape with an estimated density of 18,740 plants/acre in 2001 and 16,360 plants/acre in 2006. The plants were very small, only 4 to 5 inches in height with a 6 inch crown. Antelope bitterbrush, Saskatoon serviceberry, and chokecherry are scattered throughout the site and exhibit moderate to heavy hedging. Bitterbrush has showed the heaviest use with most available plants exhibiting a clubbed growth form. It provided 4% cover in 1996 and 2001, and 2% in 2006. However, bitterbrush has occured at a relatively low density of approximately 200 plants/acre. The average leader growth of bitterbrush was 3.2 inches in 2001 and 2 inches in 2006. Other browse include a few white rubber rabbitbrush and snowberry.

Herbaceous Understory

The herbaceous understory is productive with high diversity. Cheatgrass and Japanese brome dominated the

understory in 1996, making up 81% of the grass cover and 54% of the total herbaceous cover. Due to the dry fall and spring conditions of 2001, cheatgrass and Japanese brome declined significantly in nested frequency. The percent cover of annual grasses dropped nearly seven-fold from 19% to 3% in 2001. In response to the decline in annual grasses in 2001, perennial grasses increased substantially. Perennial grass cover increased from 5% to 26% in 2001. In 2006, cheatgrass nested frequency increased significantly and cover increased from 2% to nearly 10%. Japanese brome did not increase or decline significantly in 2006. With the increase in cheatgrass, perennial grass cover and nested frequency decreased some in 2006. Bulbous bluegrass, an undesirable perennial grass, was sampled for the first time in 2001 at 1.5% cover. Bulbous bluegrass cover remained at under 2% cover in 2006. Common perennial species include Sandberg bluegrass, Kentucky bluegrass, bluebunch wheatgrass, and Great Basin wildrye.

Forbs are diverse with 26 species encountered in 1996 and 34 species in 2001 and 2006. Perennial forb cover was 9% in 1996, 25% in 2001, and 21% in 2006. Some of the larger forbs include silvery lupine, balsamroot, oneflower helianthella, yellow salsify, and Pacific aster. Other forbs are in relatively low numbers and contribute little to overall herbaceous understory cover.

2001 TREND ASSESSMENT

The trend for browse is stable for basin big sagebrush. Sagebrush density decreased from 1,400 plants/acre in 1996 to 1,220 plants/acre. The majority of this loss was in the decadent and young individuals. The density of mature individuals remained stable. Bitterbrush also remained stable. No young and seedlings were sampled this year and only branches growing out of the reach of big game produced any flowers this year. The grass trend is up. The nested frequencies of Japanese brome and cheatgrass decreased significantly from 1996 to 2001. The combined cover of Japanese brome and cheatgrass decreased from 19% to 3%. The decrease in annual grasses allowed the perennial grasses to increase. The nested frequencies of most perennial grasses increased significantly and perennial grass cover increased from 5% in 1996 to 20% in 2001. Bulbous bluegrass, an undesirable perennial grass, was sampled for the first time this year. It provided 1.5% cover. The trend for forbs is up. The perennial forb nested frequency increased over two-fold and perennial forb cover increased from 9% to 25%. Important perennial forb species like yarrow, silvery lupine, arrowleaf balsamroot, yellow salsify, and American vetch increased in cover and nested frequency. Annual forbs also increased, but not significanly. The Desirable Components Index score inproved from very poor in 1996 to fair due to large increases in perennial grass cover and decreases in annual grass cover.

1996 winter range condition (DC Index) - very poor (29) Mid-level potential scale
2001 winter range condition (DC Index) - fair (62) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - up (+2)

2006 TREND ASSESSMENT

The browse trend is down. The basin big sagebrush density decreased 30% from 2001 to 2006. The majority of the loss was in the mature age class of the population, which decreased 40% from 1,040 plants/acre to 620 plants/acre. The percentage of decadent individuals increased slightly, but mainly because the population of mature individuals decreased. Antelope bitterbrush density increased, but there are only a small number of individuals in the community. The grass trend is down. The nested frequency of perennial grasses decreased 21%, all of which were desirable species. The percent cover of perennial grasses decreased from 26% to 16%. The nested frequency and percent cover of bulbous bluegrass remained similar to 2001 estimates. The nested frequency of cheatgrass increased significantly and percent cover increased from 2% to 10%. Japanese brome cover and nested frequency values remained similar to those in 2001. The forb trend is down. The nested frequency of perennial forbs decreased 35% from 2001 to 2006 while the nested frequency of annual forbs increased substantially. The percent cover of perennial species decreased slightly from 25% to 21% and the percent cover of annual forbs also decreased slightly (from 5% to 3%). The Desirable Components Index score is fair due to moderate browse cover, fair browse decadence, and excellent perennial grass cover.

winter range condition (DC Index) - fair (59) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 2

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a-	a4	b19	-	.03	.04
G	Agropyron intermedium	-	3	-	-	.06	-
G	Agropyron spicatum	33	33	32	1.09	1.66	2.26
G	Bromus japonicus (a)	b344	a114	a150	14.94	.69	.65
G	Bromus tectorum (a)	b216	a136	c334	4.38	2.17	9.53
G	Elymus cinereus	2	1	8	.01	.63	.53
G	Melica bulbosa	a-	a5	b21	-	.15	.38
G	Poa bulbosa	a-	b41	b49	-	1.50	1.64
G	Poa pratensis	a19	b71	a25	.25	2.20	.58
G	Poa secunda	a141	c315	b220	3.16	19.95	10.71
Total for Annual Grasses		560	250	484	19.32	2.86	10.19
Total for Perennial Grasses		195	473	374	4.51	26.21	16.17
Total for Grasses		755	723	858	23.84	29.07	26.36
F	Achillea millefolium	49	61	69	1.00	1.93	3.67
F	Agoseris glauca	a-	b16	b19	-	.08	.15
F	Alyssum alyssoides (a)	a17	b65	b57	.08	.73	.15
F	Allium sp.	a-	c137	b33	-	1.44	.10
F	Artemisia ludoviciana	-	1	-	-	.03	-
F	Aster chilensis	a27	b50	a30	2.05	1.79	.79
F	Astragalus convallarius	3	15	10	.05	.25	.11
F	Balsamorhiza macrophylla	11	14	13	.91	2.16	2.37
F	Balsamorhiza sagittata	-	5	4	-	.81	.54
F	Camelina microcarpa (a)	a3	b17	ab13	.01	.13	.03
F	Cirsium undulatum	b24	a4	a3	.33	.07	.03
F	Collomia grandiflora (a)	5	6	9	.00	.03	.04
F	Comandra pallida	17	24	22	.21	.42	.43
F	Collinsia parviflora (a)	a-	c117	b53	-	1.07	.24
F	Crepis acuminata	6	14	1	.06	.57	.24
F	Cynoglossum officinale	4	4	3	.21	.15	.03
F	Descurainia pinnata (a)	b28	a-	a-	.59	-	-
F	Draba sp. (a)	a2	a10	b46	.00	.04	.09
F	Epilobium brachycarpum (a)	a-	a3	b108	-	.01	.68

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Erodium cicutarium (a)	-	5	11	-	.15	.16
F	Galium aparine (a)	$_{a}$23	$_{a}$29	$_{b}$59	.17	.61	.47
F	Gayophytum ramosissimum(a)	$_{b}$57	$_{a}$-	$_{a}$-	.55	-	-
F	Helianthella uniflora	12	19	28	1.76	1.92	6.05
F	Heterotheca villosa	-	5	-	-	1.58	-
F	Holosteum umbellatum (a)	$_{a}$18	$_{a}$25	$_{b}$56	.40	.66	.15
F	Lappula occidentalis (a)	$_{a}$5	$_{b}$48	$_{b}$34	.15	.14	.08
F	Lactuca serriola	$_{b}$29	$_{b}$22	$_{a}$4	.13	.76	.03
F	Lithospermum ruderale	-	-	-	.03	-	-
F	Lomatium sp.	8	-	-	.04	-	-
F	Lupinus argenteus	28	37	41	1.93	3.34	2.73
F	Machaeranthera canescens	$_{b}$12	$_{a}$-	$_{a}$-	.05	-	-
F	Melilotus officinalis	-	-	1	-	-	.15
F	Microsteris gracilis (a)	$_{a}$-	$_{a}$-	$_{b}$39	-	-	.08
F	Nemophila breviflora (a)	-	-	8	-	-	.06
F	Phlox longifolia	$_{a}$-	$_{b}$22	$_{a}$-	-	.09	-
F	Polygonum douglasii (a)	$_{b}$51	$_{a}$6	$_{b}$49	.19	.01	.11
F	Ranunculus testiculatus (a)	$_{a}$-	$_{a}$7	$_{b}$21	-	.01	.09
F	Senecio integerrimus	-	2	1	-	.03	.05
F	Sisymbrium altissimum (a)	$_{a}$13	$_{b}$33	$_{a}$12	.27	1.25	.25
F	Taraxacum officinale	$_{a}$-	$_{b}$12	$_{b}$6	-	.16	.25
F	Tragopogon dubius	$_{a}$41	$_{b}$153	$_{a}$31	.55	4.56	.21
F	Vicia americana	$_{a}$21	$_{b}$117	$_{c}$155	.10	2.57	3.14
Total for Annual Forbs		222	371	575	2.45	4.88	2.73
Total for Perennial Forbs		292	734	474	9.46	24.78	21.12
Total for Forbs		514	1105	1049	11.92	29.66	23.85

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

BROWSE TRENDS --
Management unit 05 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	2	3	2	.18	.00	.15
B	Artemisia tridentata tridentata	46	39	35	6.76	7.79	9.46
B	Chrysothamnus nauseosus albicaulis	2	0	2	.38	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	43	45	43	6.92	8.61	6.84
B	Gutierrezia sarothrae	0	1	1	-	.03	-
B	Mahonia repens	41	42	49	2.50	1.93	3.28
B	Purshia tridentata	8	6	7	4.13	3.76	2.48
B	Symphoricarpos oreophilus	6	4	6	1.06	.91	1.75
Total for Browse		148	140	145	21.95	23.06	23.97

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 2

Species	Percent Cover
	'06
Amelanchier alnifolia	.11
Artemisia tridentata tridentata	10.44
Chrysothamnus nauseosus albicaulis	.33
Chrysothamnus viscidiflorus viscidiflorus	8.83
Mahonia repens	3.08
Purshia tridentata	4.83
Symphoricarpos oreophilus	1.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 2

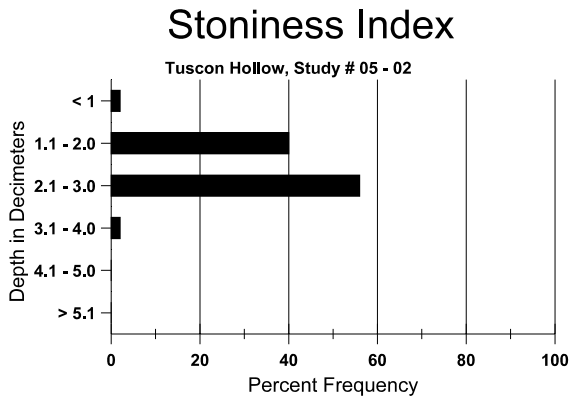
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata tridentata	3.8	3.7
Purshia tridentata	3.2	2.0

BASIC COVER --
Management unit 05 , Study no: 2

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	57.73	72.55	68.09
Rock	1.45	1.56	1.25
Pavement	.71	.32	.44
Litter	68.56	52.19	47.06
Cryptogams	.01	0	.22
Bare Ground	3.37	3.33	3.50

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 02, Tucson Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.5	66.8 (14.7)	6.5	33.9	37.1	29.0	4.2	29.8	304.0	0.6



PELLET GROUP DATA --
Management unit 05 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	6	1	7
Elk	5	1	-
Deer	17	17	32
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
-	24 (60)
31 (76)	69 (170)
-	-

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**40**	-	-	40	-	-	50	50	-	-	0	27/29
01	**60**	-	20	40	-	-	0	67	-	-	0	34/28
06	**40**	-	-	40	-	-	50	50	-	-	0	34/33
Artemisia tridentata tridentata												
96	**1400**	-	80	1060	260	860	31	0	19	7	9	26/35
01	**1220**	-	-	1040	180	400	5	0	15	7	8	31/38
06	**860**	140	40	620	200	480	42	12	23	5	5	33/44
Chrysothamnus nauseosus albicaulis												
96	**60**	-	20	40	-	-	0	0	-	-	33	53/68
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**60**	-	20	40	-	-	0	0	-	-	0	33/41
Chrysothamnus viscidiflorus viscidiflorus												
96	**1620**	-	20	1560	40	-	1	0	2	-	0	20/37
01	**1740**	-	20	1640	80	20	0	0	5	-	0	21/33
06	**1540**	-	60	1080	400	40	4	0	26	5	5	20/31
Gutierrezia sarothrae												
96	**0**	-	-	-	-	-	0	0	-	-	0	12/9
01	**60**	-	-	60	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	14/25
Mahonia repens												
96	**8680**	80	1360	7320	-	-	0	0	-	-	0	5/6
01	**18740**	-	680	18060	-	-	0	0	-	-	0	4/5
06	**16360**	-	420	15940	-	-	0	0	-	-	0	4/5
Prunus virginiana												
96	**0**	-	-	-	-	-	0	0	-	-	0	21/15
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
96	**200**	-	-	200	-	-	0	100	0	-	0	38/63
01	**180**	-	-	80	100	-	11	89	56	22	22	30/66
06	**260**	-	60	160	40	40	0	46	15	8	8	34/60

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Quercus gambelii												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	77/57
Sambucus cerulea												
96	**0**	-	-	-	-	-	0	0	-	-	0	93/81
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
96	**240**	-	40	200	-	-	0	17	0	-	0	21/30
01	**140**	-	-	140	-	-	0	0	0	-	0	24/41
06	**160**	-	20	120	20	-	0	0	13	13	13	23/42

Trend Study 5-3-01

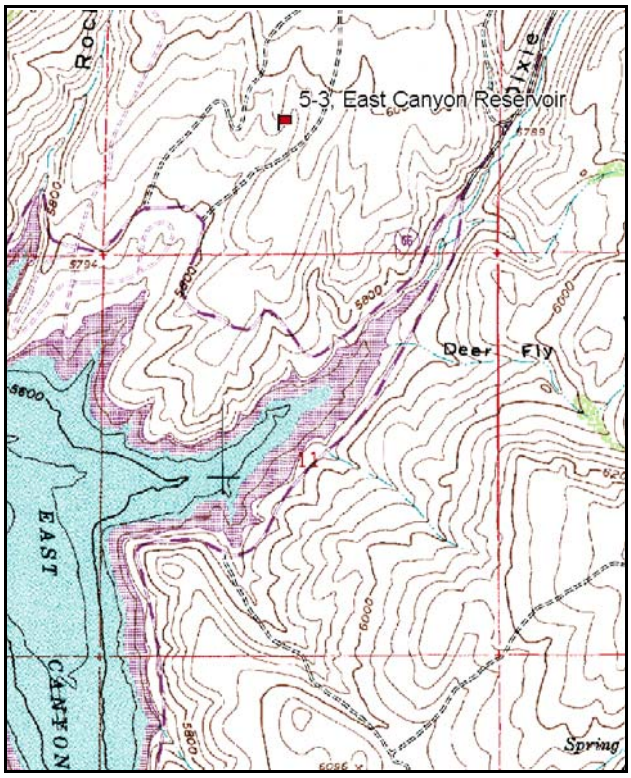
Study site name: East Canyon Reservoir . Vegetation type: Big Sagebrush .

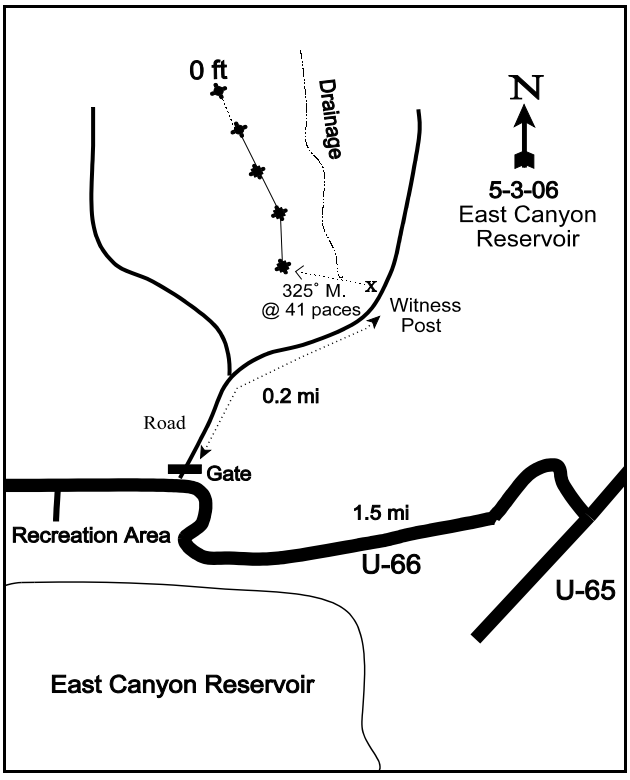
Compass bearing: frequency baseline 186 degrees magnetic.

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

LOCATION DESCRIPTION

Begin to note mileage at the junction of U-65 and U-66. Proceed towards Porterville on U-66 1.15 miles to a gate on the right. There should be a picnic/campground area on left side of road. Proceed through gate on foot (gate locked), travel 0.2 miles to the witness post on the left hand side of the road. From the witness post the 400-foot baseline stake is 41 paces at 325 degrees magnetic. The 0-foot baseline stake is 400 feet to the northwest. The 0-foot stake of the baseline is marked by browse tab #7968. The baseline runs 186 degrees. The baseline doglegs at the 300-foot baseline stake and runs 232 degrees magnetic.





Map Name: East Canyon Reservoir Diagrammatic Sketch

Township 2N , Range 3E , Section 2 UTM NAD 27, UTM 12T 4530848 N 451110 E

DISCUSSION

East Canyon Reservoir - Trend Study No. 5-3

Study Information

This study is located immediately north of East Canyon Reservoir (elevation: 5,900 feet, slope: 20-30%, aspect: southeast). The vegetation type is mountain big sagebrush-grass with a substantial amount of antelope bitterbrush. Deer pellet groups were abundant in 1996. Three winter-killed deer were noted in 1990 and deer antler sheds were also noted in 2006. Based on a pellet group transect read in 2001, there were an estimated 79 deer days use/acre (195 ddu/ha). Sheep sign was estimated at 15 days use/acre (38 sdu/ha) and a flock of sheep was on site one week prior to the 2001 reading on June 20. Sage grouse scat was also encountered within the pellet group transect. In 2006, estimated pellet groups were 38 elk, 36 deer, and 1 cow days use/acre (93 edu/ha, 89 ddu/ha, and 2 cdu/ha). Both deer and elk pellets were from winter and spring.

Soil

The soil classification for this site is similar to that described for Tucson Hollow. Manila Loam is a soil with excellent potential for growth and forage production. It has a rather high potential for erosion and subsurface slippage. Although only slowly permeable to water, the Manila loam soil volume shrinks and swells greatly in response to setting or drying (Carley et al. 1980). The soil has a loam texture and is slightly acidic (6.3 pH). The effective rooting depth was estimated at 11 inches. Litter and vegetation cover are abundant and provide sufficient protective ground cover to prevent most erosion. The erosion condition class was determined as stable in 2001 and 2006.

Browse

Mountain big sagebrush and antelope bitterbrush are the key browse species. Since 1996, mountain big sagebrush has been lightly to moderately hedged with good vigor and lower percent decadency than reported in 1984 and 1990. In 2006, sagebrush vigor was very poor and approximately 46% of the population had been infested with the sagebrush defoliator moth (*Aroga websterii*) or were classified as dying. Decadence had also increased to 56% of the population in 2006 (21% in 1996 and 23% in 2001). Sagebrush density remained relatively stable from 1984 to 1996, averaging about 1,800 plants/acre. In 2001, the population density decreased to 1,580 plants/acre, then decreased again to 1,040 plants/acre in 2006. The decrease in density and increase in decadence in 2006 are likely products of the defoliator moth infestation. Reproduction has been marginal with few seedlings encountered in 1996 and none sampled in 2001. Young plants accounted for 15% of the population in 1996, 6% in 2001, and 2% in 2006. The poor recruitment could be due to the dense cheatgrass and bulbous bluegrass cover. Average sagebrush leader growth was 1.3 inches in 2001 and 2.2 inches in 2006.

Antelope bitterbrush has a low density of about 100 plants/acre. Due to their low densities and high preference, use has been heavy during all sampling periods. Recruitment is also poor with no seedlings or young plants encountered in 1996 or 2001. The average bitterbrush leader growth was 1.9 inches in 2001 and 1.5 inches in 2006. Oregon grape was encountered for the first time in 1996. This is due to the greatly increased sample size used which more accurately reflects browse densities. Other browse species occurring in low densities include prickly pear cactus, white rubber rabbitbrush, stickyleaf low rabbitbrush, Saskatoon serviceberry, and Wood's rose.

Herbaceous Understory

The herbaceous understory is abundant and diverse. However, the composition is dominated by weedy species like cheatgrass, Japanese brome, and bulbous bluegrass. Annual grass nested frequencies and cover values have been decreasing while the nested frequency of bulbous bluegrass has increased. Annual grass cover has decreased from 8% in 1996, to 4% in 2001, to 2% in 2006. Bulbous bluegrass has increased from 8% cover in 1996, to 27% in 2001, to 29% in 2006. Other perennial grass species include Great Basin wildrye, Sandberg bluegrass, intermediate wheatgrass, and Kentucky bluegrass. Great Basin wildrye, intermediate wheatgrass, and bluebunch wheatgrass are the only perennial grass species with substantial cover values. Great Basin

wildrye cover has been 3% since 1996, bluebunch cover has fluctuated around 2%, and intermediate cover has slowly increased to 2% by 2006.

Forbs are very diverse with few species commonly occurring. Many species are small annuals that add very little to the herbaceous cover. Forb composition includes few desirable species, certainly far less than what this site is capable of. Perennial forb cover decreased from 13% in 1996 to 3% in 2001, then to 4% in 2006. The nested frequency of perennial forbs has also decreased consistently since 1996. This decrease coincides with the increase in invasive grass species.

1990 TREND ASSESSMENT

Compared to the heavily hedged, poor condition of the key browse species noticed in 1984, there have been no significant changes in the density of big sagebrush or bitterbrush. Although the percentage of decadent plants, especially sagebrush, is still high, it is lower than in 1984. Bitterbrush retains a heavily hedged growth form, while the sagebrush has a more moderately browsed growth form. Young plants make up a small percentage of both populations. Distribution of perennial grasses was very patchy in 1984. Although annual species remain prevalent, the frequency of perennial grasses, mostly Sandberg bluegrass, have increased. Bulbous bluegrass was sampled for the first time and provided nearly one-third of all perennial grass nested frequency. The grass trend is slightly up. The forb trend is slightly up. The nested frequency of perennial forbs increased 11% from 1984 to 1990. There is thick vegetation and litter cover provided by the herbaceous understory. Soil erosion is minimal.

browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

1996 TREND ASSESSMENT

The density of the key browse species, mountain big sagebrush and antelope bitterbrush, have stayed relatively stable over the years. Decadence has decreased since 1990, but this may be due to the change in sample methods and increase in sample size beginning in 1992. The browse trend is stable. The grass trend is stable. The sum of the nested frequency of perennial grasses increased, but the majority of the increase was a significant increase in bulbous bluegrass. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 36%. Cheatgrass and bulbous bluegrass are the dominant herbaceous species at this time. With the change in sampling methods in 1992, it is difficult to estimate the abundance of annual grasses on the site in 1990, but the nested frequency of cheatgrass was quite high in 1996. The forb trend is slightly up. The sum of the nested frequency of perennial forbs increased 54% from 1990 to 1996, but part of this increase is due to the increased sample size in 1996. The Desirable Components Index score is fair due to good browse cover, fair browse decadence, moderate perennial grass cover, and moderate annual grass cover.

winter range condition (DC Index) - fair (53) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly up (+1)

2001 TREND ASSESSMENT

Trend for browse is slightly down. The density of the key species, mountain big sagebrush, decreased by 17% in 2001. The number of individuals decreased in the young, mature, and decadent age classes. Use is similar and vigor is normal on most plants. Recruitment is poor, but percent decadence remained moderate. The small population of bitterbrush also decreased slightly and decadence increased. The grass trend is up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 33%. The nested frequncy of annual grasses decreased 40%. Unfortunately, the nested frequency of bluebunch wheatgrass decreased significantly. The bulbous bluegrass nested frequency increased 79%. It appears as though the bulbous bluegrass is out-competing the annual grasses. Japanese brome did not change significantly. The only perennial grass that significantly increased in nested frequency was Kentucky bluegrass, which is an increaser with grazing. The forb trend is down. The nested frequency of perennial forbs decreased by 47% and annual forb nested frequency increased by 91%. Several perennial species showed a significant decrease in nested frequency. The Desirable Components Index score increased due to the increase in browse cover, the increase

in perennial grass cover, and the decrease in annual grass cover.

winter range condition (DC Index) - fair (58) Mid-level potential scale
browse - slightly down (-1) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is down. The key browse species, mountain big sagebrush, density decreased by 34%. The majority of the loss was in the mature age class. A large number of mature individuals had shifted from the mature age class to the decadent class. Decadence was estimated at 56% and plants classified as dying made up 38% of the population. The defoliator moth caused the plants to appear to be dying. Plants classified as infested or dying made up 46% of the population. More individuals were classified as dying or infested than classified as mature and healthy. The small number of bitterbrush individuals were mostly of good vigor, but heavily hedged. The grass trend is stable. The sum of the nested frequency of perennial grasses changed little. The nested frequency and cover of bulbous bluegrass increased slightly and cheatgrass nested frequency also increased slightly. The forb trend is down. The sum of the nested frequency of perennial forbs decreased by 37% and the nested frequency of annual forbs increased 59%. The Desirable Components Index score decreased due to the decrease in browse cover and increase in browse decadence.

winter range condition (DC Index) - poor (44) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron intermedium	$_{a}$7	$_{a}$10	$_{a}$9	$_{ab}$22	$_{b}$33	.18	.91	2.11
G	Agropyron smithii	-	-	-	4	2	-	.53	.03
G	Agropyron spicatum	$_{a}$3	$_{ab}$18	$_{b}$48	$_{a}$21	$_{ab}$24	2.04	.34	1.75
G	Bromus japonicus (a)	-	-	41	62	45	.39	.32	.26
G	Bromus tectorum (a)	-	-	$_{b}$283	$_{a}$135	$_{a}$177	7.92	3.98	2.29
G	Carex sp.	-	-	3	7	7	.03	.03	.06
G	Elymus cinereus	$_{a}$-	$_{a}$-	$_{b}$29	$_{b}$24	$_{b}$24	2.53	3.04	2.55
G	Poa bulbosa	$_{a}$-	$_{b}$41	$_{c}$149	$_{d}$267	$_{d}$292	7.90	26.96	28.90
G	Poa pratensis	$_{ab}$19	$_{a}$3	$_{a}$6	$_{b}$50	$_{ab}$19	.04	2.20	.36
G	Poa secunda	$_{a}$21	$_{bc}$59	$_{ab}$27	$_{abc}$34	$_{c}$56	.58	.79	.96
G	Vulpia octoflora (a)	-	-	6	1	-	.53	.00	-
Total for Annual Grasses		0	0	330	198	222	8.84	4.31	2.56
Total for Perennial Grasses		50	131	271	429	457	13.33	34.84	36.75
Total for Grasses		50	131	601	627	679	22.17	39.16	39.32

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Achillea millefolium	$_{a}$26	$_{ab}$35	$_{c}$62	$_{bc}$53	$_{a}$24	1.19	.86	1.14
F	Agoseris glauca	-	-	-	1	3	-	.00	.00
F	Alyssum alyssoides (a)	-	-	4	7	12	.01	.04	.03
F	Allium sp.	-	-	1	3	1	.00	.00	.00
F	Arabis sp.	-	-	4	-	-	.03	-	-
F	Artemisia ludoviciana	$_{b}$51	$_{b}$45	$_{a}$17	$_{ab}$26	$_{ab}$26	.51	.73	1.97
F	Aster chilensis	$_{a}$38	$_{a}$36	$_{b}$89	$_{b}$89	$_{a}$10	3.00	.69	.07
F	Astragalus sp.	$_{ab}$5	$_{a}$-	$_{b}$12	$_{a}$-	$_{ab}$6	.52	-	.01
F	Cirsium undulatum	$_{abc}$17	$_{bc}$27	$_{c}$41	$_{ab}$9	$_{a}$7	1.10	.10	.07
F	Collomia linearis (a)	-	-	$_{a}$12	$_{b}$30	$_{a}$14	.03	.10	.04
F	Collinsia parviflora (a)	-	-	$_{a}$3	$_{b}$21	$_{b}$39	.00	.08	.08
F	Cruciferae	-	4	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	6	3	-	.04	.00
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$54	$_{c}$84	-	.15	.17
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{a}$8	$_{b}$57	-	.01	.17
F	Erodium cicutarium (a)	-	-	$_{a}$22	$_{a}$33	$_{b}$55	.16	.80	.27
F	Erigeron pumilus	$_{b}$54	$_{b}$51	$_{c}$125	$_{a}$2	$_{a}$22	3.91	.00	.25
F	Gayophytum ramosissimum(a)	-	-	$_{b}$43	$_{a}$-	$_{a}$-	.15	-	-
F	Haplopappus acaulis	-	-	1	-	-	.00	-	-
F	Hedysarum boreale	-	-	2	1	-	.15	.00	.03
F	Holosteum umbellatum (a)	-	-	$_{a}$9	$_{b}$78	$_{b}$93	.02	.31	.43
F	Lappula occidentalis (a)	-	-	$_{a}$6	$_{a}$-	$_{b}$18	.03	-	.06
F	Lactuca serriola	-	1	1	-	4	.00	-	.01
F	Lithospermum ruderale	$_{b}$24	$_{b}$31	$_{b}$16	$_{a}$1	$_{a}$2	1.06	.00	.03
F	Lomatium sp.	-	-	2	4	1	.00	.01	.00
F	Lupinus argenteus	$_{a}$-	$_{a}$-	$_{b}$11	$_{b}$22	$_{ab}$8	.10	.35	.02
F	Machaeranthera canescens	-	-	-	-	1	-	-	.00
F	Microsteris gracilis (a)	-	-	-	2	1	-	.00	.00
F	Oenothera caespitosa	3	2	3	2	-	.15	.00	-
F	Polygonum douglasii (a)	-	-	$_{b}$35	$_{a}$14	$_{ab}$27	.08	.03	.06
F	Ranunculus testiculatus (a)	-	-	-	3	3	-	.00	.00
F	Sphaeralcea grossulariifolia	-	-	-	-	-	-	-	.00
F	Sphaeralcea munroana	16	13	15	9	7	.55	.05	.26
F	Taraxacum officinale	-	-	2	-	3	.00	-	.00
F	Tragopogon dubius	$_{ab}$19	$_{ab}$18	$_{b}$19	$_{a}$4	$_{a}$1	.25	.01	.00
F	Viguiera multiflora	$_{a}$-	$_{b}$17	$_{ab}$7	$_{ab}$1	$_{b}$16	.04	.00	.26

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Zigadenus paniculatus	-	-	-	2	3	-	.04	.01
Total for Annual Forbs		0	0	134	256	406	0.50	1.59	1.36
Total for Perennial Forbs		253	280	430	229	145	12.63	2.88	4.21
Total for Forbs		253	280	564	485	551	13.13	4.47	5.57

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

BROWSE TRENDS --
Management unit 05 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	64	53	41	14.37	18.14	13.68
B	Chrysothamnus nauseosus albicaulis	1	1	0	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	12	13	13	.33	.18	.18
B	Leptodactylon pungens	0	0	0	-	-	.03
B	Mahonia repens	22	21	24	.83	.45	.60
B	Opuntia sp.	6	5	2	.03	-	.03
B	Purshia tridentata	4	5	4	2.40	1.94	1.06
Total for Browse		109	98	84	17.98	20.71	15.60

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 3

Species	Percent Cover '06
Artemisia tridentata vaseyana	20.38
Chrysothamnus viscidiflorus viscidiflorus	.73
Mahonia repens	.80
Opuntia sp.	.03
Purshia tridentata	1.01

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 3

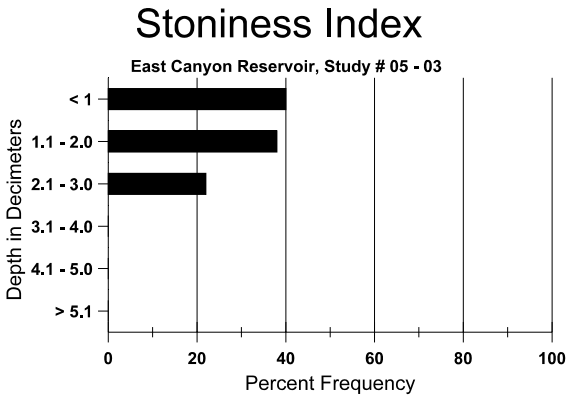
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.3	2.2
Purshia tridentata	1.9	1.5

BASIC COVER --
Management unit 05 , Study no: 3

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.50	6.00	50.76	60.62	61.56
Rock	5.25	6.75	5.53	3.97	3.74
Pavement	.50	2.00	1.27	1.48	.67
Litter	79.50	71.00	61.27	49.72	45.27
Cryptogams	.50	0	.13	.95	.73
Bare Ground	10.75	14.25	4.19	8.60	3.04

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 03, East Canyon Reservoir

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.8	69.2 (11.4)	6.3	48.7	28.0	23.3	2.4	20.6	163.2	0.4



PELLET GROUP DATA --
Management unit 05 , Study no: 3

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	4	-
Rabbit	-	-	10
Grouse	-	1	-
Elk	5	-	4
Deer	32	26	38
Cow	-	-	-

Days use per acre (ha)	
'01	'06
15 (38)	-
-	-
2 (17) groups/acre	-
-	38 (93)
79 (195)	36 (89)
1 (2)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	37/60
01	**0**	-	-	-	-	-	0	0	-	-	0	51/55
06	**0**	-	-	-	-	-	0	0	-	-	0	32/44
Artemisia tridentata vaseyana												
84	**1998**	-	66	566	1366	-	42	58	68	2	3	25/24
90	**1732**	400	66	533	1133	-	44	25	65	9	15	29/38
96	**1900**	20	280	1220	400	660	32	2	21	4	8	30/45
01	**1580**	-	100	1120	360	460	23	3	23	6	6	32/47
06	**1040**	-	20	440	580	640	31	0	56	38	46	32/52
Chrysothamnus nauseosus albicaulis												
84	**33**	-	-	-	33	-	0	100	100	-	0	-/-
90	**33**	-	-	33	-	-	100	0	0	-	0	26/28
96	**20**	-	-	20	-	-	0	0	0	-	0	-/-
01	**20**	-	-	20	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	31/46

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
84	**33**	-	-	-	33	-	0	0	100	-	100	-/-
90	**33**	-	-	33	-	-	100	0	0	-	100	14/15
96	**320**	-	20	300	-	-	0	0	0	-	6	15/27
01	**320**	-	-	300	20	-	0	0	6	-	0	12/17
06	**340**	-	-	340	-	-	0	0	0	-	0	13/22
Mahonia repens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**2960**	40	640	2320	-	-	0	0	-	-	0	5/6
01	**4460**	-	620	3840	-	20	0	0	-	-	0	3/4
06	**4480**	100	720	3760	-	-	0	0	-	-	0	3/4
Opuntia sp.												
84	**66**	-	-	66	-	-	0	0	0	-	0	10/13
90	**66**	-	-	-	66	-	0	0	100	-	0	-/-
96	**380**	-	120	260	-	40	0	0	0	-	5	5/15
01	**180**	-	20	160	-	-	0	0	0	-	0	5/14
06	**80**	-	-	80	-	-	0	0	0	-	0	6/14
Purshia tridentata												
84	**199**	-	-	66	133	-	17	83	67	-	0	20/9
90	**266**	-	100	100	66	-	25	75	25	-	0	35/47
96	**120**	-	-	120	-	-	0	100	0	-	0	35/80
01	**100**	-	-	80	20	20	20	80	20	-	0	33/61
06	**80**	20	-	60	20	20	0	100	25	25	25	32/61
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	24/17
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	12/7

Trend Study 5-4-06

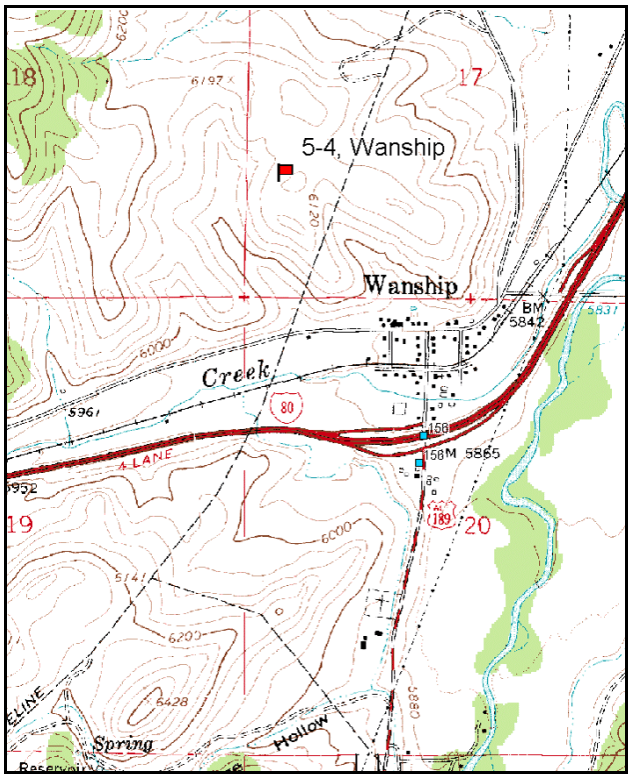
Study site name: Wanship . Vegetation type: Forage Kochia .

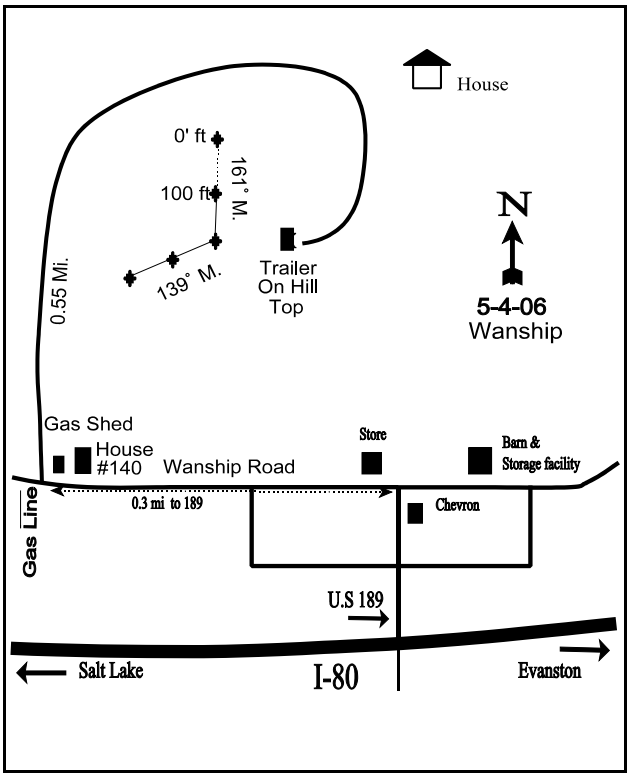
Compass bearing: frequency baseline 161 degrees magnetic.

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

LOCATION DESCRIPTION

From the I-80 overpass in Wanship (Exit 155), proceed north on 189 to the "T" junction in town with Buck's Chevron on the right. Turn left and go 0.3 miles. Turn right here and go up the draw 0.55 miles to a house on top of the hill. The owner of this home would like to be contacted when the site is read. From the fork in the road take a bearing of 220 degrees magnetic and walk 36 paces to the baseline. The 0-foot stake of the baseline is marked by browse tag #7955. The baseline runs 161 degrees magnetic. The baseline doglegs at the 200-foot baseline stake and runs 193 degrees magnetic.





Map Name: Wanship

Diagrammatic Sketch

Township 1N , Range 5E , Section 17

UTM NAD 27, UTM 12T 4518294 N 465163 E

DISCUSSION

Wanship - Trend Study No. 5-4

Study Information

This study samples an important winter range north of Wanship and west of the Weber River that is privately owned (elevation: 6,200 feet, slope: 3%, aspect: southwest). The site was established in 1984. A wildfire burned the entire area sometime after the 1990 reading and eliminated most of the browse, which was dominated by mountain big sagebrush. Deer use during the winter of 1983-84 was light because of deep crusted snow and deer were supplementary fed a pelleted ration alfalfa at feeding stations located along the frontage road near Wanship. There were numerous deer pellet groups encountered in 1996, indicating that deer still use the area. Quadrat frequency of deer pellet groups was moderately high at 36%. Some livestock sign was also apparent but likely from the previous fall. Gopher activity was noted. Pellet group transect data in 2001 was estimated at 67 deer, 24 elk, and 13 cow days use/acre (165 ddu/ha, 60 edu/ha, and 32 cdu/ha). In 2001, pellet quadrat frequency of deer was 34%, similar to 1996. The land owner said that there were nearly 50 deer wintering in the area and he counted over 100 elk on the ridge just west of the site during the 2000/2001 winter. He also said that cattle heavily graze the area later in the summer. In 2006, 14 elk and 96 deer days use/acre (35 edu/ha and 236 ddu/ha) were estimated from the pellet group transect data. In 2006, the deer pellet quadrat frequency had increased to 43%.

Soil

The soil is fairly deep but rocky on the surface. The soil series classification is Ayoub (USDA-NRCS, 2006). The effective rooting depth was estimated at only 9 inches, but it is likely deeper because mountain big sagebrush is present. The soil texture is a loam with a neutral pH of 6.6. The color is a dark reddish-gray, which is apparently derived from a basalt parent material. There is not much bare ground due to the abundant vegetation and litter cover. Erosion is minimal because of the gentle terrain and soil permeability. The soil erosion condition class was determined as stable in 2001 and 2006.

Browse

The key browse species are mountain big sagebrush and forage kochia. Sagebrush density was over 3,000 plants/acre in 1984 and 1990. A fire burned the site sometime after the 1990 reading and eliminated most of the sagebrush. It is unclear whether the burn was seeded with sagebrush or if it was seeded naturally. In 1996, the density of sagebrush was estimated at 2,880 plants/acre, 98% of which were young. The sagebrush use was light in 1996. Sagebrush density remained similar in 2001 at 2,500 plants/acre, but had decreased to 2,160 plants/acre in 2006. The majority of the population (94% in 2001 and 82% in 2006) has been made up of mature individuals. Vigor has been good and decadence low since the fire. In 2001 and 2006, use was moderate to high. Mature plants have been slowly increasing in height from 9 inches in 1996 to 12 inches in 2006. The average sagebrush leader growth in 2001 was 1.9 inches and 1.4 inches in 2006.

Forage kochia was seeded after the fire and has established well. The estimated density was 11,980 plants/acre in 1996, 11,500 plants/acre in 2001, and 5,980 plants/acre in 2006. All of the losses in density were in the mature and young age classes. It is likely that the forage kochia is either self-thinning or being out-competed by other species better adapted to the higher precipitation levels. Forage kochia is best adapted to areas receiving 6-16 inches of precipitation annually (Jensen et al. 2001). This study site is located in a region which receives an average annual precipitation of 16-18 inches (USDA et al. 1999). Mature plants measured 7 inches in height and 11 inches in width on average in 1996 and had changed little by 2006. Utilization was mostly light in 1996, but increased to light-moderate in 2001 and 2006. Antelope bitterbrush density was low in the past and all individuals were eliminated by the fire. Some white rubber rabbitbrush and stickyleaf low rabbitbrush have resprouted, but are not abundant. Other species encountered include Saskatoon serviceberry, broom snakeweed, pricklypear cactus, and gray horsebrush.

Herbaceous Understory

The seeded grasses established extremely well after the fire. These species included crested wheatgrass,

intermediate wheatgrass, and orchard grass. Crested wheatgrass has steadily, and significantly, increased every year in nested frequency. Crested wheatgrass cover has increased steadily to 21% in 2006. Perennial grass cover was 10% in 1996, 26% in 2001, and 31% in 2006. Native grasses, bluebunch wheatgrass and Sandberg bluegrass, persisted after the fire. Bluebunch wheatgrass has declined since the 1996 sampling, likely due to competition with seeded species. Sandberg bluegrass has increased since the fire and has sustained 6% cover. Other grasses include sheep fescue, bulbous bluegrass, and bottlebrush squirreltail. Cheatgrass was abundant in 1996, but declined significantly in nested frequency and cover in 2001 and remained low in 2006. Cheatgrass cover was 10% in 1996, decreased to less than 1% in 2001 and has remained unchanged.

Forbs are diverse but perennial species are deficient. Seeded Alfalfa and small burnet occur only occasionally, but were very robust and vigorous in 1996. Alfalfa was sampled in 1996 and 2001, but no small burnet was sampled after 1996. Alfalfa was not sampled in 2006, although some robust plants were present in the study area. Many small annual forbs have been sampled. Bur buttercup, pale alyssum, draba, and holosteum are the most abundant forb species.

1990 TREND ASSESSMENT

The browse trend is slightly down. The increased decadence and poor vigor of mountain big sagebrush and bitterbrush indicate a declining vegetation trend for this heavily utilized winter range. Virtually all the bitterbrush and 25% of the sagebrush have a heavily hedged growth form. Vigor is poor on many of the shrubs. There is limited reproduction. The grass trend is up with a 56% increase in the nested frequency of perennial grasses. There are large bare areas in the understory but less cheatgrass than observed on similar sites. The frequency of bluebunch wheatgrass is almost unchanged. The ground cover indicates a decrease in the amount of litter cover and an increase in bare soil. The nested frequency of perennial forbs decreased slightly.

browse - slightly down (-1) grass - up (+2) forb - slightly down (-1)

1996 TREND ASSESSMENT

The fire that burned this site was beneficial to the mountain big sagebrush population. Decadence has decreased with nearly the same density as reported in the past. It is unclear at this point if the mountain big sagebrush was seeded or came from the existing seed bank. Most of the population (98%) was classified as young and vigor is excellent. Forage kochia is the most abundant browse species, with some moderate use. Increaser or invader browse species are in low abundance and do not appear to be expanding at this time. The browse trend is up. The grass trend is down. After the fire, the existing perennial grass species have decreased in nested frequency. Crested wheatgrass and intermediate wheatgrass, both of which compete well with cheatgrass, have established from the post-fire treatment. Had these two seeded species not established, the decrease in perennial grass nested frequency would have been greater. Cheatgrass nested frequency and cover are quite high, athough there are no 1990 annual grass data with which to compare. The forb trend is up. The sum of the nested frequency of perennial forbs increased substantially, half of which were seeded species. The sum of the nested frequency of annual forbs is very high, much of which is burr buttercup. The Desirable Components Index score is good due to moderate browse cover, low decadence, and excellent recruitment.

winter range condition (DC Index) - good (65) Mid-level potential scale
browse - up (+2) grass - down (-2) forb - up (+2)

2001 TREND ASSESSMENT

The trend for browse is slightly down. Mountain big sagebrush density decreased 13% since 1996, although most (94%) plants were mature. The density of young individuals was very low. Use was moderate to heavy but plants were vigorous and there were no decadent individuals. The dominant browse is still forage kochia, which provided 54% of the shrub cover and a stable density of 11,500 plants/acre. Use is heavier than in 1996, but vigor is normal. The grass trend is up. The sum of the nested frequency of perennial grasses

increased 96% and cheatgrass nested frequency decreased significantly. Sandberg bluegrass, crested wheatgrass, and intermediate wheatgrass nested frequencies all increased significantly. The forb trend is down. The sum of the nested frequency of perennial forbs decreased 33%. Small burnet was not sampled at all, spring parsley nested frequency decreased significantly, and alfalfa nested frequency decreased slightly. The nested frequency of annual forbs changed little. The Desirable Components Index score decreased to good to fair because of a decrease in browse cover and recruitment.

winter range condition (DC Index) - fair to good (64) Mid-level potential scale
browse - slightly down (-1) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased by 14% and decadence increased from 0% to 8%. Very few young and seedlings were sampled. The forage kochia density decreased drastically, little more than half the number of the individuals sampled in 2001 were sampled in 2006. This decrease was mainly in the young and mature populations. Despite the large number of density losses, vigor remained excellent. The grass trend is stable. The sum of the nested frequency of perennial grass changed little and the nested frequency of cheatgrass increased slightly, but not significantly. The forb trend is stable. The nested frequencies of perennial and annual forbs changed little. The Desirable Components Index score decreased slightly to fair because of a decrease in browse cover, an increase in decadence, and a decrease in perennial forb cover.

winter range condition (DC Index) - fair (58) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	a-	a-	b103	c192	d232	5.33	16.42	20.63
G	Agropyron dasystachyum	-	-	-	3	-	-	.03	-
G	Agropyron intermedium	a-	a-	b24	c79	c85	1.51	3.19	3.20
G	Agropyron spicatum	ab25	b27	b35	ab12	a10	1.13	.81	.68
G	Bromus tectorum (a)	-	-	b315	a55	a81	6.34	.28	.23
G	Dactylis glomerata	a-	a-	b11	a1	a3	.21	.03	.03
G	Festuca ovina	-	-	2	-	-	.00	-	-
G	Poa bulbosa	a-	a-	a1	a4	19	.03	.01	.22
G	Poa secunda	b187	d307	a92	c235	bc218	2.00	5.69	5.72
G	Sitanion hystrix	b15	b21	a1	a1	a-	.00	.01	-
Total for Annual Grasses		0	0	315	55	81	6.34	0.28	0.23
Total for Perennial Grasses		227	355	269	527	567	10.24	26.19	30.50
Total for Grasses		227	355	584	582	648	16.58	26.47	30.73

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Allium acuminatum	$_{b}$18	$_{ab}$5	$_{a}$-	$_{b}$16	$_{c}$40	-	.03	.20
F	Alyssum alyssoides (a)	-	-	$_{c}$188	$_{b}$141	$_{a}$91	1.45	.63	.21
F	Antennaria rosea	6	5	-	-	-	-	-	-
F	Arabis sp.	-	3	-	-	2	-	-	.03
F	Astragalus cibarius	-	-	1	3	8	.00	.18	.11
F	Astragalus convallarius	-	-	-	4	-	-	.01	-
F	Astragalus utahensis	7	1	11	-	-	.21	-	-
F	Cirsium sp.	-	-	3	-	-	.00	-	-
F	Collomia linearis (a)	-	-	1	2	-	.00	.00	-
F	Comandra pallida	-	-	-	4	-	-	.03	-
F	Collinsia parviflora (a)	-	-	$_{a}$3	$_{b}$76	$_{c}$130	.01	.32	.48
F	Crepis acuminata	-	2	-	1	-	-	.15	-
F	Cryptantha sp.	6	-	-	-	-	-	-	-
F	Cymopterus longipes	$_{a}$-	$_{a}$10	$_{c}$54	$_{b}$32	$_{ab}$28	.49	.21	.25
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$105	$_{c}$168	-	.41	.79
F	Epilobium brachycarpum (a)	-	-	-	2	6	-	.00	.01
F	Erodium cicutarium (a)	-	-	-	1	-	-	.03	-
F	Erigeron pumilus	2	3	1	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	$_{b}$14	$_{a}$-	$_{a}$4	.03	-	.03
F	Holosteum umbellatum (a)	-	-	$_{b}$213	$_{b}$185	$_{a}$136	1.45	.76	.53
F	Lupinus argenteus	-	-	-	5	-	-	.18	-
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{b}$18	$_{ab}$10	$_{a}$-	.82	.95	.44
F	Microsteris gracilis (a)	-	-	-	3	7	-	.03	.01
F	Penstemon sp.	3	-	-	-	-	-	-	-
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{b}$25	$_{ab}$10	$_{ab}$9	.29	.07	.01
F	Polygonum douglasii (a)	-	-	3	-	1	.00	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{b}$263	$_{a}$217	$_{b}$264	2.44	2.87	2.50
F	Sanguisorba minor	$_{a}$-	$_{a}$-	$_{b}$16	$_{a}$-	$_{a}$-	1.29	-	-
F	Schoencrambe linifolia	-	-	3	1	-	.03	.00	-
F	Sisymbrium altissimum (a)	-	-	1	-	-	.03	-	-
F	Tragopogon dubius	4	-	3	5	-	.03	.03	-
Total for Annual Forbs		0	0	686	732	807	5.44	5.07	4.59
Total for Perennial Forbs		46	29	135	91	87	3.20	1.86	1.05
Total for Forbs		46	29	821	823	894	8.65	6.94	5.64

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

BROWSE TRENDS --
Management unit 05 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	58	52	49	1.08	2.00	2.19
B	Chrysothamnus nauseosus albicaulis	3	3	1	-	.03	-
B	Chrysothamnus viscidiflorus viscidiflorus	27	27	32	2.05	1.51	1.23
B	Gutierrezia sarothrae	1	3	1	-	.15	-
B	Kochia prostrata	95	95	79	7.61	4.27	1.92
B	Opuntia sp.	3	3	3	.15	-	.41
B	Tetradymia canescens	1	1	2	-	-	-
Total for Browse		188	184	167	10.89	7.97	5.76

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 4

Species	Percent Cover '06
Artemisia tridentata vaseyana	2.70
Chrysothamnus viscidiflorus viscidiflorus	1.08
Kochia prostrata	2.33
Opuntia sp.	.16
Tetradymia canescens	.28

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 4

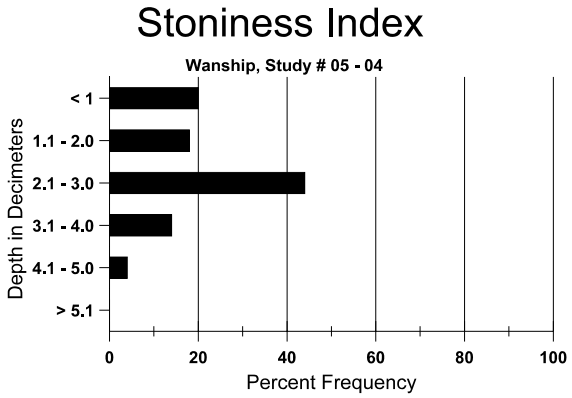
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.9	1.4

BASIC COVER --
Management unit 05 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	15.75	37.70	44.98	38.54
Rock	9.00	9.00	11.57	9.17	10.86
Pavement	16.25	14.75	3.39	2.23	5.23
Litter	64.00	41.00	44.87	27.26	36.85
Cryptogams	.25	5.25	.47	.86	1.64
Bare Ground	7.50	14.25	11.60	24.70	21.86

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 04, Wanship

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.2	78.0 (8.3)	6.6	44.9	28.7	23.4	2.7	15.4	185.6	0.5



PELLET GROUP DATA --
Management unit 05 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	2	-	-
Rabbit	10	-	8
Elk	3	9	22
Deer	36	34	43
Cattle	1	1	2

Days use per acre (ha)	
'01	'06
-	-
-	-
24 (60)	14 (35)
67 (165)	96 (236)
13 (32)	-

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	24/28
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	23/28
Artemisia tridentata vaseyana												
84	**3532**	833	300	1466	1766	-	36	61	50	5	10	33/43
90	**3066**	133	233	933	1900	-	53	25	62	10	25	26/36
96	**2880**	40	2820	60	-	560	0	0	0	-	0	9/9
01	**2500**	-	140	2360	-	-	38	55	0	-	2	11/13
06	**2160**	-	200	1780	180	100	33	28	8	3	3	12/17
Chrysothamnus nauseosus albicaulis												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	-	60	-	-	0	0	0	-	0	13/14
01	**60**	-	-	40	20	-	33	0	33	-	0	21/17
06	**20**	-	-	20	-	20	0	0	0	-	0	21/26
Chrysothamnus viscidiflorus viscidiflorus												
84	**599**	-	333	266	-	-	0	0	0	-	0	13/12
90	**1065**	-	33	766	266	-	16	3	25	6	63	11/12
96	**820**	-	-	820	-	20	0	0	0	-	0	12/22
01	**720**	-	40	560	120	20	3	0	17	3	3	12/22
06	**800**	-	60	640	100	-	3	3	13	5	5	12/17
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**20**	-	-	20	-	-	0	0	0	-	0	8/11
01	**100**	-	-	80	20	20	0	0	20	20	20	7/11
06	**40**	-	20	20	-	-	0	0	0	-	0	5/6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Kochia prostrata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**11980**	40	3300	8640	40	-	9	0	0	-	.16	7/11
01	**11500**	60	1760	9700	40	20	56	10	0	-	0	6/9
06	**5980**	780	960	5000	20	40	31	19	0	.33	.33	7/9
Opuntia sp.												
84	**33**	-	33	-	-	-	0	0	0	-	0	-/-
90	**365**	-	66	166	133	-	0	0	36	22	36	3/10
96	**120**	-	40	80	-	-	0	0	0	-	0	4/8
01	**80**	-	20	60	-	-	0	0	0	-	0	5/11
06	**100**	-	20	80	-	-	0	0	0	-	0	5/15
Purshia tridentata												
84	**133**	-	-	133	-	-	0	100	0	-	0	29/40
90	**33**	-	-	-	33	-	0	100	100	61	100	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	11/18
01	**20**	-	-	20	-	-	0	0	-	-	0	12/34
06	**40**	-	-	40	-	-	0	0	-	-	0	17/18

Trend Study 5-8-06

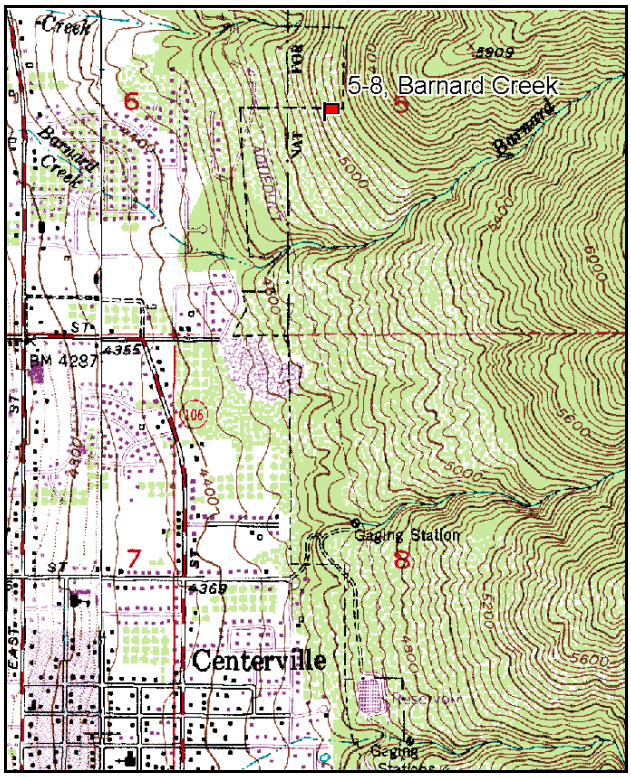
Study site name: Barnard Creek . Vegetation type: Bitterbrush .

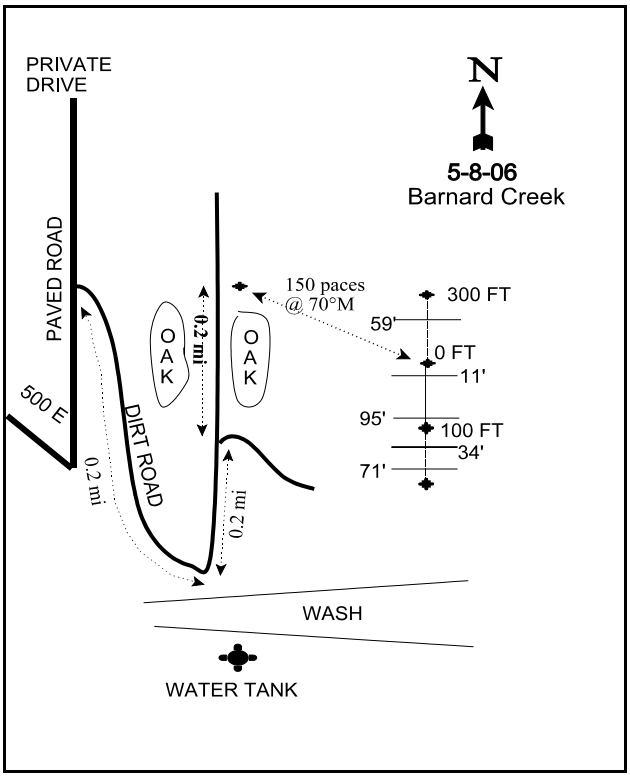
Compass bearing: frequency baseline 166 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).
No rebar on belts 4 and 5

LOCATION DESCRIPTION

From U-106 in Centerville (400 East) take Barnard Street (1200 North) east to Oak Ridge Drive. Turn left on Oak Ridge to 500 East and stop. Take a bearing of 53 degrees magnetic from the northwest corner of this intersection to locate the transect up the first hill below a band of oak and boulders. Continue along Oak Ridge Drive for 0.2 miles, take a hairpin turn to the right and go 0.2 miles along the Weber Basin Pipeline to a fork in the road. Take the left fork and go 0.2 miles around a bend to a fork. Continue left on a two track 0.2 miles to a witness post on the right just after a patch of oak. The transect is 150 paces up the slope at a bearing of 70 degrees magnetic. The 0-foot baseline has browse tag #58 attached. The baseline runs 166 degrees magnetic. The 300 foot line runs off the 0-foot baseline stake at a bearing of 360 degrees magnetic.





Map Name: Bountiful Peak

Diagrammatic Sketch

Township 2N , Range 1E , Section 5

UTM NAD 27, UTM 12T 4531803 N 427123 E

DISCUSSION

Barnard Creek - Trend Study No. 5-8

Study Information

This study is located within an isolated bitterbrush population on critical deer winter range on the Wasatch Face above Centerville (elevation: 5,000 feet, slope: 52%, aspect: west). The transect is about 1,000 feet from the nearest residence. The transect is located on private land near the National Forest Service boundary. Deer use is heavy and the range has shown some signs of intense utilization during past readings. Some elk also appear to winter on this slope. In 2001, the pellet group transect estimates were 46 deer and 5 elk days use/acre (114 ddu/ha and 12 edu/ha). In 2006, the pellet group transect estimate was 27 deer days use/acre (68 ddu/ha).

Soil

The soil is part of the Kilburn-Francis series complex which consists of very deep, somewhat excessively drained, moderately rapidly permeable soils formed in alluvium, colluvium, and eolian sands derived from gneiss, schist, granite, and quarzite (USDA-NRCS, 2006). It is gravely with an effective rooting depth of over 33 inches. A deep layer of litter and organic matter has built up under the shrubs. The soil is a neutral (7.0 pH) sandy loam. Phosphorus levels were low at 5.7 ppm, values below 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). The soil is easily disturbed and the erosion potential is high. Vegetation and litter cover are high and help limit most erosion. The erosion condition class was determined as stable in 2001 and 2006. There is easy access for ORVs and their frequent use has led to increased erosion and possibly harassment of wintering big game animals.

Browse

Antelope bitterbrush and mountain big sagebrush are the key browse species. Bitterbrush is the dominant browse species, and has provided the majority of browse cover since 1996. Bitterbrush densities were 600 plants/acre in 1996, 1,220 plants/acre in 2001, and 920 plants/acre in 2006. The bitterbrush plants are large and vigorous with an average height of nearly 4 feet and a crown of about 6 feet. The annual leader growth averaged 2.3 inches in 2001 and 4.6 inches in 2006. These plants were heavily hedged in 1985 and have shown moderate hedging since. No young or seedlings have been sampled since 1990. It is possible that the population is being sustained by layering.

Mountain big sagebrush provides less browse cover than bitterbrush. Sagebrush densities have remained fairly stable at 680 plants/acre in 1996 and 780 plants/acre in 2001 and 2006. Use has been light and vigor has been good. The average leader growth was 2.8 inches in 2001 and 2.3 inches in 2006. Sagebrush decadence has been moderate to low since 1996. However, reproduction has been poor since 1990 and the density of young individuals has slowly decreased to none. The sagebrush seedlings appear to be having difficulty establishing in the high density cheatgrass.

Herbaceous Understory

The study area is completely dominated by cheatgrass, which provided 37% cover in 1996, 31% in 2001, and 34% in 2005. This very high cheatgrass cover creates a substantial fire hazard and could potentially prevent the establishment of young browse individuals (Hall et al. 1999). The nested frequency of perennial grasses is low and they have provided less than 3% cover since 1996. Perennial grasses include bluebunch wheatgrass, purple threeawn, Sandberg bluegrass, and sand dropseed.

A variety of forbs have been sampled on the study, but are not abundant. Perennial forb cover has fluctuated from 5-6% in 1996 and 2001 to 3% in 2006. Annual forb cover has never been above 3%. Common species include pale alyssum, storksbill, hairy goldaster, Douglas knotweed, and Louisiana sage. The state listed noxious weed, dyer's woad, was first sampled in 1996 and has increased in nested frequency since. Dalmation toadflax, a noxious weed in Wasatch County, was also first sampled in 1996 and was sampled every year since.

1990 TREND ASSESSMENT

The mountain big sagebrush and bitterbrush populations appear relatively stable. An increased density of the moderately hedged, vigorous bitterbrush was measured, including several young plants. Mountain big sagebrush has declined in density, but 54% of the population were classified as young plants. The increase in bitterbrush counters the loss in sagebrush. The understory is dominated by cheatgrass and storksbill. Perennial grasses and forbs remain uncommon or scarce and perennial forbs have decreased.

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

1996 TREND ASSESSMENT

The key browse species are antelope bitterbrush, which makes up 83% of the browse cover, and mountain big sagebrush, which contributes 16% of the browse cover. Bitterbrush utilization is light to moderate with apparently good vigor. There were no seedlings or young found but percent decadence is low at only 3%. The browse trend is stable. The grass trend is stable. Cheatgrass is the dominant grass and perennial grass abundance is similar to that of 1990. The forb trend is slightly down. The nested frequency of perennial forbs is relatively unchanged. Annual forb nested frequency increased, but none of the species were especially competitive and weedy. Unfortunately, Dyer's Woad, a state listed noxious weed, was sampled on the study for the first time. The Desirable Components Index score is very poor due to high annual grass cover, presence of a noxious weed, and little perennial grass cover.

winter range condition (DC Index) - very poor (28) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2001 TREND ASSESSMENT

The trend for the key browse species, antelope bitterbrush and mountain big sagebrush, is up. The density of bitterbrush increased 51%, nearly all of which was in the mature population. Utilization was moderate to heavy, but vigor is normal and percent decadence low. Sagebrush density increased 13% and decadence was moderate. Use was light and vigor good. The grass trend is up. The nested frequency of perennial grasses increased substantially. As well, the nested frequency of cheatgrass decreased significantly. The forb trend is slightly down. The nested frequency of perennial forbs increased by 58% and cover increased slightly, but about one-third of that increase was an increase in Dyer's Woad. The nested frequency of annual forbs increased substantially as well. Most of the annual increase was due to a significant increase in storksbill. The Desirable Components Index score improved to poor due to an increase in browse cover.

winter range condition (DC Index) - poor (35) Mid-level potential scale
browse - up (+2) grass - up (+2) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is slightly down. The antelope bitterbrush density decreased by 25%, the percentage of decadent individuals increased slightly, and the number of individuals classified as dying increased slightly. However, the mountain big sagebrush, also an import browse species, density remained unchanged and decadence decreased substantially. Sagebrush vigor improved and the number of plants classified as dying decreased. The grass trend is stable. Very little change in the nested frequency of perennial and annual grasses occurred. The forb trend is down. The nested frequency of perennial forbs decreased by 30% and cover also decreased. The nested frequency of annual forbs decreased substantially as well. The nested frequency of Dyer's Woad also increased slightly. The Desirable Components Index score declined to very poor due to a decrease in perennial forb cover.

winter range condition (DC Index) - very poor (31) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	a8	a3	ab15	ab14	b23	.67	.90	1.18
G	Aristida purpurea	-	2	5	9	2	.09	.36	.30
G	Bromus tectorum (a)	-	-	b392	a378	a373	36.54	30.96	34.23
G	Festuca myuros (a)	-	-	-	5	5	-	.03	.31
G	Poa bulbosa	ab3	a-	a-	c18	bc16	-	.20	.43
G	Poa fendleriana	3	3	-	-	3	-	-	.00
G	Poa secunda	a-	a-	b12	bc32	c30	.10	.66	.51
G	Secale cereale (a)	-	-	a-	a-	b17	-	-	.54
G	Sporobolus cryptandrus	a-	ab12	ab4	b8	b13	.30	.27	.42
G	Stipa comata	-	2	-	-	-	-	-	-
Total for Annual Grasses		0	0	392	383	395	36.54	30.99	35.09
Total for Perennial Grasses		14	22	36	81	87	1.16	2.40	2.86
Total for Grasses		14	22	428	464	482	37.70	33.39	37.95
F	Agoseris glauca	-	-	-	1	-	-	.03	-
F	Alyssum alyssoides (a)	-	-	b29	a8	a3	.10	.06	.03
F	Allium sp.	a11	a-	a2	b52	a18	.00	.38	.07
F	Ambrosia psilostachya	-	-	9	1	-	.27	.00	-
F	Artemisia ludoviciana	b49	a21	a11	a11	a14	.36	.33	.50
F	Aster chilensis	c63	a-	a-	b8	a-	-	.03	-
F	Chenopodium album (a)	-	6	-	-	-	-	-	-
F	Comandra pallida	-	-	-	-	2	-	-	.00
F	Cynoglossum officinale	-	-	3	-	3	.00	-	.01
F	Descurainia pinnata (a)	-	-	-	2	1	-	.01	.00
F	Draba sp. (a)	-	-	a-	c59	b25	-	.26	.13
F	Epilobium brachycarpum (a)	b24	a-	a4	a11	a5	.01	.12	.01
F	Erodium cicutarium (a)	b18	a-	a-	c79	a-	-	1.77	-
F	Erigeron sp.	5	3	-	-	-	-	-	.00
F	Eriogonum umbellatum	-	-	-	-	1	-	-	.03
F	Euphorbia sp.	-	-	3	1	-	.00	.00	-
F	Gilia sp. (a)	-	-	-	5	-	-	.03	-
F	Helianthus annuus (a)	-	6	-	7	-	-	.02	-
F	Heterotheca villosa	ab40	b46	ab38	ab38	a21	3.22	3.36	1.21
F	Holosteum umbellatum (a)	-	-	a-	b18	b24	-	.41	.06
F	Isatis tinctoria	a-	a-	b9	c31	c41	.31	1.13	.78
F	Lactuca serriola	b-	c28	b2	b-	b3	.00	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'85	'90	'96	'01	'06	'96	'01	'06
F	Linaria dalmatica	-	-	1	6	3	.15	.36	.13
F	Machaeranthera canescens	-	-	1	-	2	.00	-	.00
F	Phlox longifolia	-	-	-	4	-	-	.01	-
F	Polygonum douglasii (a)	-	-	$_{b}$28	$_{a}$-	$_{a}$-	.14	-	-
F	Portulaca oleracea (a)	-	3	-	-	-	-	-	-
F	Salsola iberica (a)	-	8	-	2	-	-	.03	-
F	Tragopogon dubius	$_{a}$-	$_{a}$1	$_{b}$17	$_{a}$2	$_{a}$-	.17	.06	-
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
F	Verbascum blattaria	-	-	2	-	-	.00	-	-
Total for Annual Forbs		42	23	61	191	58	0.26	2.74	0.23
Total for Perennial Forbs		171	99	98	155	108	4.52	5.72	2.75
Total for Forbs		213	122	159	346	166	4.79	8.46	3.00

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

BROWSE TRENDS --
Management unit 05 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	25	27	28	2.73	5.09	9.18
B	Gutierrezia sarothrae	8	2	2	.06	-	.38
B	Opuntia sp.	2	2	1	-	-	-
B	Purshia tridentata	27	36	30	14.06	16.55	17.37
Total for Browse		62	67	61	16.86	21.65	26.93

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 8

Species	Percent Cover '06
Artemisia tridentata vaseyana	11.68
Purshia tridentata	27.93

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 8

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.8	2.3
Purshia tridentata	4.4	4.6

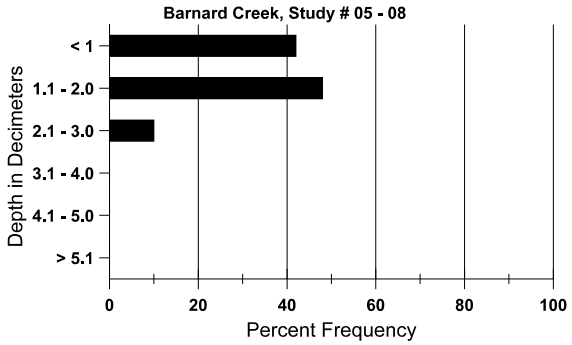
BASIC COVER --
Management unit 05 , Study no: 8

Cover Type	Average Cover %				
	'85	'90	'96	'01	'06
Vegetation	7.25	4.75	55.25	60.27	65.84
Rock	5.00	6.50	5.85	5.56	4.69
Pavement	12.50	13.25	3.92	4.43	3.58
Litter	38.00	61.25	55.74	48.18	53.77
Cryptogams	0	0	.12	.06	.04
Bare Ground	37.25	14.25	.56	6.14	1.91

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 08, Barnard Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
33.5	53.0 (18.1)	7.0	60.9	19.1	20.0	1.1	5.7	118.4	0.3

Stoniness Index



PELLET GROUP DATA --
Management unit 05 , Study no: 8

Type	Quadrat Frequency		
	'96	'01	'06
Elk	-	-	-
Rabbit	-	-	1
Deer	20	19	14

Days use per acre (ha)	
'01	'06
5 (12)	-
-	-
46 (114)	27 (68)

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
85	**1332**	200	66	1066	200	-	65	10	15	-	10	26/40
90	**865**	-	466	133	266	-	23	0	31	-	0	13/22
96	**680**	-	20	540	120	440	18	0	18	3	3	19/35
01	**780**	-	20	580	180	500	0	0	23	3	3	27/40
06	**780**	-	-	760	20	660	21	0	3	-	0	28/49
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**200**	-	60	140	-	-	0	0	-	-	0	13/19
01	**80**	-	-	80	-	20	0	0	-	-	0	11/14
06	**40**	-	-	40	-	-	0	0	-	-	0	12/19
Opuntia sp.												
85	**66**	-	-	66	-	-	0	0	-	-	0	7/17
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	6/12
01	**40**	-	-	40	-	-	0	0	-	-	0	10/17
06	**20**	-	-	20	-	-	0	0	-	-	0	9/23
Purshia tridentata												
85	**66**	-	-	66	-	-	0	100	0	-	0	36/51
90	**399**	-	66	333	-	-	50	0	0	-	0	50/66
96	**600**	-	-	580	20	40	70	0	3	-	0	43/73
01	**1220**	-	-	1180	40	80	56	21	3	-	0	40/67
06	**920**	-	-	860	60	40	37	26	7	7	7	41/72

Trend Study 5-9-06

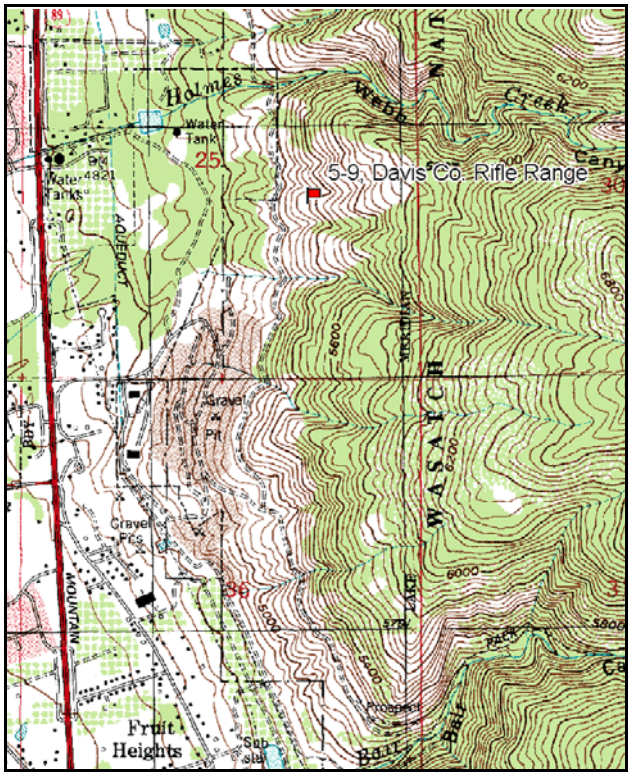
Study site name: Davis Co. Rifle Range . Vegetation type: Bitterbrush .

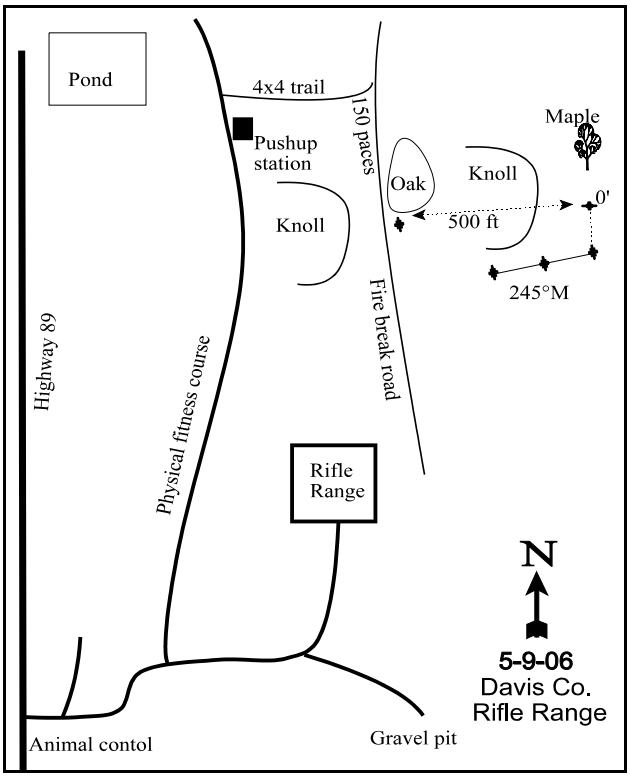
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

Take Highway 89 into Davis County. Turn east up the road toward the Animal Control and the Davis County Rifle Range. Go east past the Animal Control Center to a dirt road marked "Par Course". Follow this road 0.45 miles north to a well-developed trial going east. Walk up the trail to a fire break road, the follow the fire break road south 150 paces to a rebar witness post 10 feet south of an oak clone. From the witness post, head due east 500 feet up a bare ridge, then across to a lone maple. A rebar tagged #7081 marks the 0-foot baseline. The baseline doglegs west (245 degrees magnetic) after 100 feet.





Map Name: Kaysville

Diagrammatic Sketch

Township 4N , Range 1W , Section 25

UTM NAD 27, UTM 12T 4544690 N 424627 E

DISCUSSION

Davis County Rifle Range - Trend Study No. 5-9

Study Information

This trend study is located on a slope above gravel pits and the Davis County Rifle range east of Kaysville (elevation: 5,400 feet, slope: 40%, aspect: west). Like other Forest Service land along the Wasatch Front, livestock grazing has been discontinued in order to protect the watershed. Although there are many roads, the distance to housing developments is greater here than other studies along the Wasatch Front. Therefore, human pressure is relatively low. Deer pellet groups were very abundant in 1985 and 1990. A pellet group transect read on the site estimated 67 deer use days/acre (165 ddu/ha) in 2001 and 34 deer days use/acre (84 ddu/ha) in 2006. Most of the deer pellet groups appear to be from late winter use with some from early spring. Some coyote scat was identified on site but not encountered within the pellet group transect.

Soil

The soil is in the highly erosion-susceptible Ridd series (USDA 1968). It is underlain by bedrock at a depth of 25 to 40 inches. The effective rooting depth was estimated at 37 inches in 2001. The soil is a rocky sandy loam with a majority of the surface protected by vegetation, litter, and a buildup of organic matter. Some erosion has been apparent in the form of pedestalling around shrubs, flow patterns, rills, and some localized soil movement. The erosion condition class was determined as slight in 2001 and stable in 2006.

Browse

Antelope bitterbrush and mountain big sagebrush are the key browse species at this study. Antelope bitterbrush provides the majority of browse cover. Bitterbrush density was 760 plants/acre in 2001 and 1,140 plants/acre in 2006. Decadent individuals made up only 8% of the population in 2001 and 14% in 2006. It is highly preferred and displayed heavy hedging in 1985, but use has been moderate to light since. The plants are large and vigorous and there was adequate recruitment in 1985 and 1990, but few seedlings and young were encountered in 2001 or 2006. This is not as critical for the persistence of bitterbrush because, unlike sagebrush, it is a fairly long-lived shrub.

Mountain big sagebrush has provided only a small part of the overall browse component. Sagebrush density was 1,060 plants/acre in 2001 and 980 plants/acre in 2006. The population was moderate to heavily browsed in 1985, but has been lightly browsed since. Decadent individuals made up 6% of the overall population in 2001 and 10% in 2006. The individuals classified as dying made up 2% of the population in 2001 and 4% in 2006. The average annual leader growth of sagebrush was 2.3 inches in 2001 and 2.5 inches in 2006. The only other browse species sampled include small numbers of Wyeth eriogonum, broom snakeweed, and prickly pear cactus.

Herbaceous Understory

The herbaceous understory is dominated by cheatgrass, which provided 15% cover in 2001 and 2006. In 2006, Japanese brome was first sampled with 2% cover. The low value perennial, bulbous bluegrass is also abundant. It produced 14% cover in 2001 and 15% in 2006. Preferred perennial grasses occur in low numbers; mutton bluegrass and bluebunch wheatgrass are the most common.

Forbs are diverse and moderately abundant, although the composition is poor with many annual species. The most abundant annual is storksbill. The only common perennial is yellow salsify. Utilization of all herbaceous species is generally light. Dalmation toadflax, a noxious weed in Wasatch County, was sampled in 2001 and 2006. Dyer's woad was identified in 2006, although not sampled in quadrats.

1990 TREND ASSESSMENT

The data show a large decline in browse density. Mountain big sagebrush has decreased in density by 30%. However, vigor is fair and use has been lighter on the mature plants. Young plants of sagebrush and bitterbrush were sampled. Bitterbrush is more heavily hedged and it has decreased in density by 44%. There

is competition in the understory from the abundant cheatgrass and small bluegrasses. Perennial grasses, excluding bulbous bluegrass, decreased in nested frequency by 32%. As in 1985, yellow salsify is the domintant perennial forb, although it decreased significantly in nested frequency. The sum of the nested frequency of perennial forbs decreased 72%.

browse - down (-2) grass - down (-2) forb - down (-2)

2001 TREND ASSESSMENT

The trend for browse is stable. Sagebrush has increased slightly in density and displays a decline in percent decadence. Reproduction is poor but young plants currently account for 8% of the population. Bitterbrush remains at a similar density. Utilization remains moderate to heavy but vigor is good and decadence has declined to only 8%. Recruitment is poor with no young plants sampled. Dry conditions combined with competition from the weedy understory are likely having a negative effect of seedling establishment. These changes in density for this shrub are likely due to the much larger sample size used beginning in 1992, which better estimates shrub populations with clumped and/or discontinuous distributions. The grass trend is down. The existing perennial grasses decreased in nested frequency by 26%, mainly because Sandberg bluegrass decreased significantly in nested frequency. Bulbous bluegrass nested frequency increased significantly. Cheatgrass nested frequency and cover are both high. The forb trend is slightly up with a slight increase in the nested frequency and quadrat frequency of perennial forbs. The lack of annual forb data in 1990 makes determining annual forb changes impossible. The Desirable Components Index score was poor due to high annual grass cover.

winter range condition (DC Index) - poor (43) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is up. The density of bitterbrush increased 33% and the density of sagebrush decreased 8%. The loss of sagebrush individuals is much less than the gain of bitterbrush. In the case of both sagebrush and bitterbrush, the percentage of decadent individuals increased, but so did the percentage of young individuals. The grass trend is stable. Cheatgrass nested frequency increased significantly, but nested frequency of perennial grasses increased 14%. The forb trend is up. The nested frequency and cover of perennial forbs increased two-fold. Annual forb nested frequency also increased nearly 2-fold, but most of which were small annuals which compete little with perennial species. The Desirable Components Index score improved to fair because of a very large increase in perennial forbs.

winter range condition (DC Index) - fair (57) Mid-level potential scale
browse - up (+2) grass - stable (0) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 9

Type	Species	Nested Frequency				Average Cover %	
		'85	'90	'01	'06	'01	'06
G	Agropyron spicatum	28	38	27	18	1.51	1.82
G	Bromus brizaeformis (a)	-	-	$_{b}$25	$_{a}$-	.12	-
G	Bromus japonicus (a)	-	-	$_{a}$-	$_{b}$90	-	2.08
G	Bromus tectorum (a)	-	-	$_{a}$293	$_{b}$333	15.16	15.33
G	Carex sp.	-	-	3	-	.03	-
G	Festuca myuros (a)	-	-	6	-	.03	-
G	Poa bulbosa	$_{a}$58	$_{b}$136	$_{c}$222	$_{c}$217	13.56	14.86
G	Poa secunda	$_{c}$202	$_{b}$118	$_{a}$84	$_{ab}$112	2.18	7.88
Total for Annual Grasses		0	0	324	423	15.32	17.41
Total for Perennial Grasses		288	292	336	347	17.30	24.57
Total for Grasses		288	292	660	770	32.62	41.99
F	Agoseris glauca	$_{b}$25	$_{a}$-	$_{a}$3	$_{a}$3	.00	.03
F	Alyssum alyssoides (a)	-	-	$_{a}$47	$_{b}$120	.11	.66
F	Allium sp.	$_{c}$35	$_{a}$-	$_{ab}$11	$_{b}$17	.05	.04
F	Arenaria sp.	-	-	-	1	-	.03
F	Artemisia ludoviciana	-	-	-	-	-	.03
F	Astragalus sp.	5	-	-	2	-	.15
F	Calochortus nuttallii	-	-	-	2	-	.00
F	Cirsium sp.	-	-	-	6	-	.03
F	Cirsium undulatum	3	5	10	14	.36	.78
F	Collomia linearis (a)	-	-	1	5	.00	.02
F	Crepis acuminata	$_{ab}$10	$_{a}$2	$_{ab}$8	$_{b}$24	.15	.58
F	Cymopterus longipes	33	16	16	38	.15	1.04
F	Draba sp. (a)	-	-	$_{a}$-	$_{b}$130	-	1.83
F	Epilobium brachycarpum (a)	$_{c}$112	$_{a}$-	$_{b}$12	$_{b}$14	.02	.19
F	Erodium cicutarium (a)	$_{b}$10	$_{a}$-	$_{c}$194	$_{c}$184	7.44	1.31
F	Erigeron sp.	3	-	-	-	-	-
F	Galium sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$22	-	.34
F	Hackelia patens	-	-	3	3	.03	.00
F	Holosteum umbellatum (a)	-	-	$_{a}$60	$_{b}$142	.17	.89
F	Lactuca serriola	-	-	-	2	-	.03
F	Linaria dalmatica	-	-	3	3	.03	.00
F	Lithospermum ruderale	-	-	-	3	-	.15
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$14	-	.03
F	Montia perfoliata (a)	-	-	$_{a}$-	$_{b}$20	-	.90

Type	Species	Nested Frequency				Average Cover %	
		'85	'90	'01	'06	'01	'06
F	Penstemon comarrhenus	-	-	-	1	-	.00
F	Plectritus macrocera (a)	-	-	$_{a}$-	$_{b}$21	-	.35
F	Polygonum douglasii (a)	-	-	7	-	.01	-
F	Tragopogon dubius	$_{b}$146	$_{a}$51	$_{a}$44	$_{a}$36	.75	.60
F	Unknown forb-perennial	3	-	-	-	-	-
Total for Annual Forbs		122	0	321	650	7.76	6.20
Total for Perennial Forbs		263	74	98	177	1.55	3.87
Total for Forbs		385	74	419	827	9.31	10.07

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

BROWSE TRENDS --
Management unit 05 , Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'01	'06	'01	'06
B	Artemisia tridentata vaseyana	33	30	6.01	9.42
B	Eriogonum heracleoides	7	5	.79	.76
B	Gutierrezia sarothrae	14	2	1.24	.30
B	Opuntia polyacantha	2	1	.00	-
B	Purshia tridentata	26	35	16.82	18.39
B	Quercus gambelii	0	1	.03	-
Total for Browse		82	74	24.90	28.88

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 9

Species	Percent Cover '06
Artemisia tridentata vaseyana	10.41
Eriogonum heracleoides	.53
Purshia tridentata	25.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 9

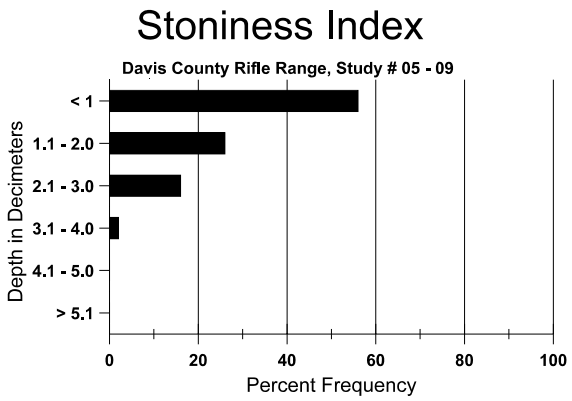
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.3	2.5
Purshia tridentata	2.1	1.2

BASIC COVER --
Management unit 05 , Study no: 9

Cover Type	Average Cover %			
	'85	'90	'01	'06
Vegetation	9.50	4.75	63.66	70.40
Rock	3.25	1.75	2.98	4.31
Pavement	11.75	12.00	8.18	10.81
Litter	53.50	73.25	53.75	26.29
Cryptogams	0	.50	.00	.41
Bare Ground	22.00	7.75	4.78	3.13

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 09, Davis County Rifle Range

Effective rooting depth (in)	Temp °F (depth)	PH				%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
37.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



PELLET GROUP DATA --
Management unit 05 , Study no: 9

Type	Quadrat Frequency	
	'01	'06
Rabbit	4	2
Deer	13	13

Days use per acre (ha)	
'01	'06
-	-
67 (165)	34 (84)

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
85	**1132**	-	200	466	466	-	41	24	41	-	18	24/26
90	**798**	66	266	266	266	-	0	0	33	-	0	16/26
01	**1060**	-	80	920	60	380	8	0	6	2	2	21/33
06	**980**	100	100	780	100	160	10	0	10	4	4	25/40
Eriogonum heracleoides												
85	**266**	-	133	133	-	-	0	0	-	-	0	10/13
90	**266**	-	66	200	-	-	0	0	-	-	0	7/17
01	**180**	-	-	180	-	-	0	0	-	-	0	8/16
06	**120**	-	20	100	-	-	67	0	-	-	0	12/30
Gutierrezia sarothrae												
85	**2132**	66	733	1333	66	-	0	0	3	-	3	11/13
90	**1466**	666	733	733	-	-	0	0	0	-	0	12/20
01	**440**	-	-	380	60	580	5	0	14	5	5	13/19
06	**80**	-	-	80	-	20	0	0	0	-	0	9/13
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	11/23
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia polyacantha												
85	**200**	-	-	200	-	-	0	0	-	-	0	8/10
90	**133**	-	-	133	-	-	0	0	-	-	0	7/10
01	**60**	-	-	60	-	-	0	0	-	-	0	9/19
06	**20**	-	-	20	-	-	0	0	-	-	0	7/23
Purshia tridentata												
85	**1533**	-	333	1000	200	-	13	83	13	-	13	43/24
90	**866**	-	333	400	133	-	38	15	15	-	0	45/43
01	**760**	-	-	700	60	20	47	13	8	-	0	41/84
06	**1140**	-	40	940	160	-	49	16	14	4	4	30/63
Quercus gambelii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	36/37
06	**80**	-	-	80	-	20	0	0	-	-	0	22/25

Trend Study 5-15-06

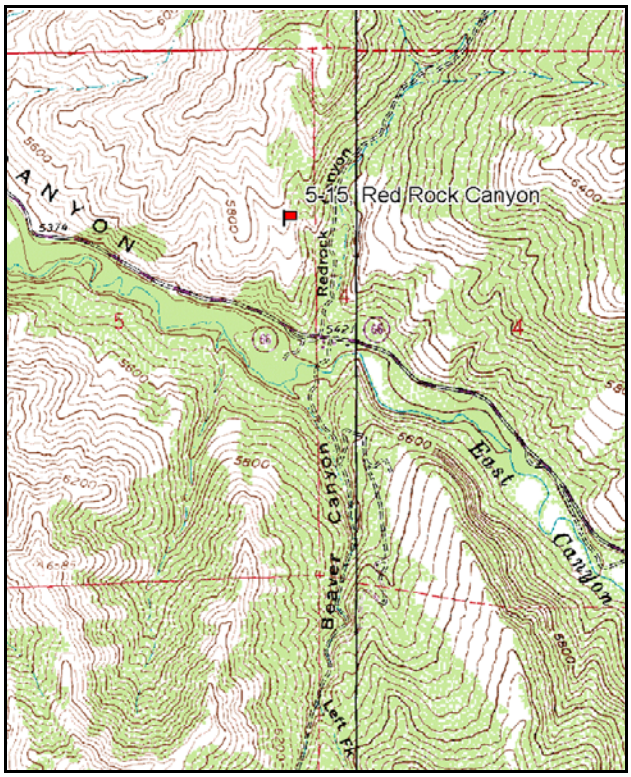
Study site name: Red Rock Canyon . Vegetation type: Burned and Seeded .

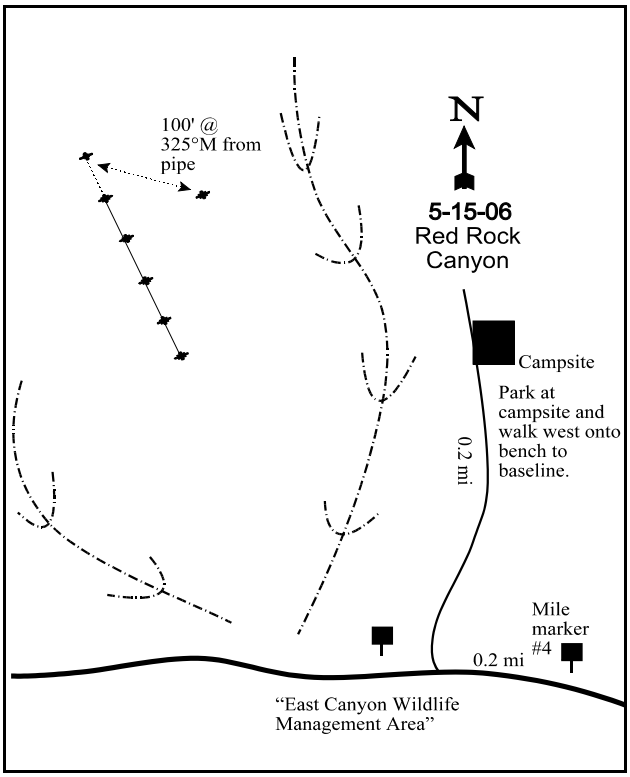
Compass bearing: frequency baseline 155 degrees magnetic.

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

LOCATION DESCRIPTION

Travel east for 0.2 miles past mile marker # 4 on highway 66 heading towards Porterville and turn right (sign says East Canyon Wildlife Management Area). Travel north for 0.2 miles to a campsite. Park at the campsite and walk up on the bench due west to a pipe posted in the ground. From the pipe the 0-foot baseline stake is 100 feet at 325 degrees magnetic. The 0-foot baseline stake is marked by a browse tag # 52. The baseline runs 155 degrees magnetic.





Map Name: Porterville

Diagrammatic Sketch

Township 2N , Range 3E , Section 5

UTM NAD 27, UTM 12T 4531873 N 447100 E

DISCUSSION

Red Rock Canyon - Trend Study No. 5-15

Study Information

This trend study was established in 1996 on a small bench north of East Canyon (elevation: 5,800 feet, slope: 10%, aspect: southeast). The site burned and was seeded in 1992 with a combination of forbs and grasses. The area is considered winter range, although it also receives year round use. Big game use was low in 1996, but a pellet group transect read in 2001, estimated 50 deer days use/acre (124 ddu/ha). Several deer pellet groups were recent and there were a few bedding areas encountered. In 2006, pellet group data estimates were 27 elk, 40 deer, and 42 cow days use/acre (68 edu/ha, 98 ddu/ha, 104 cdu/ha). Two deer carcasses were identified in 2006.

Soil

The soil is moderately deep with an effective rooting depth of over 13 inches. It is classified as Hoskin (USDA-NRCS, 2006) and has a clay loam to sandy clay loam texture with a neutral soil reaction (7.2 pH). There is very little rock in the soil profile or on the soil surface. Percent bare soil is also low with the majority of the bare soil caused by gopher activity. Vegetation and litter cover are high with no erosion apparent. The soil condition class measurement was stable in 2001 and 2006.

Browse

Browse species have not been abundant since the fire. The only common species include resprouting stickyleaf low rabbitbrush and some broom snakeweed. Mountain big sagebrush has had a stable density of approximately 250 plants/acre. Other browse species include white rubber rabbitbrush, stickyleaf low rabbitbrush, and mountain snowberry.

Herbaceous Understory

The herbaceous understory is abundant and diverse. Seeded grasses established well after the fire. Crested wheatgrass has increased in quadrat frequency from 55% of the quadrats in 1996 to 73% in 2006. Other perennial grass species include Kentucky bluegrass, bluebunch wheatgrass, orchard grass, mountain rye, Sandberg bluegrass, thickspike wheatgrass, and Great Basin wildrye. Bulbous bluegrass was sampled in 2001 for the first time and provided 5% cover. It increased to 7% in 2006. Japanese brome dominated the herbaceous understory in 1996, with 21% cover. Cheatgrass was also present in 1996, but not as prominent. Dry conditions and competition with seeded perennials has caused Japanese brome to decline significantly in nested frequency. The nested frequency for cheatgrass has increased and cover has fluctuated. The average cover of annual grasses has dropped from 24% in 1996 to 5% in 2001 and 2006. The cover of perennial grasses more than doubled from 1996 to 2001, but decreased slightly in 2006.

Forbs are also abundant and several useful species are found on the site. In 1996 and 2001, yellow salsify was the dominant forb, but decreased significantly in 2006. The seeded alfalfa and small burnet were also abundant in 1996, but had begun to decrease by 2006. Overall, seeded forbs established well. Perennial forb cover was 11% in 1996, 21% in 2001, and 8% in 2006. The nested frequency of perennial forbs increased in 2001 and decreased in 2006. Some utilization was noted on alfalfa and yellow salsify. Annual species included autumn willow weed, Douglas knotweed, tumble mustard, and pale alyssum.

2001 TREND ASSESSMENT

The trend for the key browse species is stable. Mountain big sagebrush density was estimated at only 220 plants/acre, but they are all vigorous. The density of increasers, broom snakeweed and stickyleaf low rabbitbrush, have declined. The grass trend is up. The nested frequency of perennial grasses increased two-fold and the nested frequency of annual grasses decreased substantially. The nested frequency of Japanese brome decreased significantly and cheatgrass changed little. Bulbous bluegrass was sampled for the first time in 2001. The forb trend is slightly up. The nested frequency of perennial forbs increased 10% and the cover of perennial forbs increased from 11% to 21%. However, the nested frequency of annual forbs doubled, which

could increase competition with the establishment of perennial species. The 2001 Desirable Components Index score was poor due to the lack of browse cover.

1996 winter range condition (DC Index) - very poor (17) Mid-level potential scale
2001 winter range condition (DC Index) - poor (37) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is stable. The density of mountain big sagebrush changed little. The individuals sampled were all in the mature age class, as opposed to mainly young in 2001 and 1996. The grass trend is stable. The nested frequency of annual grasses decreased and the nested frequency of perennial grasses changed little. The nested frequency of bulbous bluegrass increased, but not significantly. The forb trend is down. The nested frequency of annual forbs increased by 69% and the nested frequency of perennial forbs decreased by 24%. The nested frequency of the desirable perennial forbs perennial blue flax, alfalfa, yellow salsify, and American vetch all decreased significantly. The Desirable Components Index score was poor due to the continued lack of browse cover.

winter range condition (DC Index) - poor (37) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 05 , Study no: 15

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{a}$180	$_{a}$183	$_{b}$228	9.30	12.78	12.04
G	Agropyron dasystachyum	$_{ab}$6	$_{a}$1	$_{b}$17	.06	.03	.11
G	Agropyron intermedium	-	2	1	-	.03	.15
G	Agropyron spicatum	$_{ab}$27	$_{b}$34	$_{a}$15	.66	2.72	.80
G	Bromus brizaeformis (a)	$_{a}$-	$_{b}$10	$_{a}$3	-	.22	.01
G	Bromus carinatus	$_{a}$-	$_{b}$22	$_{b}$17	-	1.25	.59
G	Bromus japonicus (a)	$_{c}$394	$_{b}$256	$_{a}$156	21.03	3.12	.96
G	Bromus tectorum (a)	$_{a}$121	$_{a}$138	$_{b}$191	3.38	1.42	4.00
G	Dactylis glomerata	$_{b}$18	$_{ab}$7	$_{a}$1	.16	.22	.03
G	Elymus cinereus	2	7	10	.85	.81	.30
G	Phleum pratense	-	3	-	-	.00	-
G	Poa bulbosa	$_{a}$-	$_{b}$146	$_{b}$180	-	5.17	7.27
G	Poa pratensis	$_{ab}$51	$_{b}$63	$_{a}$18	1.11	1.50	.08
G	Poa secunda	$_{a}$9	$_{b}$197	$_{b}$216	.05	5.60	5.70
G	Secale montanum	$_{b}$14	$_{a}$-	$_{a}$1	.40	.00	.03
Total for Annual Grasses		515	404	350	24.41	4.76	4.97
Total for Perennial Grasses		307	665	704	12.61	30.14	27.12
Total for Grasses		822	1069	1054	37.02	34.91	32.09

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Achillea millefolium	27	39	42	.23	.67	1.40
F	Agoseris glauca	17	32	40	.10	.45	.38
F	Alyssum alyssoides (a)	$_{a}$11	$_{b}$116	$_{b}$102	.03	1.15	.25
F	Allium sp.	$_{a}$-	$_{b}$89	$_{c}$162	-	.35	.79
F	Aster sp.	-	3	-	-	.00	-
F	Camelina microcarpa (a)	$_{a}$-	$_{b}$21	$_{b}$21	-	.21	.05
F	Chaenactis douglasii	-	3	-	-	.00	-
F	Cirsium undulatum	$_{b}$39	$_{ab}$21	$_{a}$11	.66	.76	.08
F	Collomia grandiflora (a)	1	1	7	.00	.00	.01
F	Collomia linearis (a)	13	18	2	.03	.06	.00
F	Comandra pallida	$_{b}$19	$_{ab}$13	$_{a}$3	.08	.10	.00
F	Collinsia parviflora (a)	$_{a}$-	$_{b}$69	$_{b}$41	-	.35	.09
F	Descurainia pinnata (a)	-	5	3	-	.01	.00
F	Draba sp. (a)	$_{a}$-	$_{b}$19	$_{b}$24	-	.08	.05
F	Epilobium brachycarpum (a)	$_{b}$122	$_{a}$13	$_{c}$257	1.10	.10	1.10
F	Erodium cicutarium (a)	$_{a}$8	$_{b}$77	$_{c}$147	.09	1.26	.93
F	Erigeron pumilus	1	-	-	.00	-	-
F	Galium aparine (a)	1	5	-	.00	.03	-
F	Gayophytum ramosissimum(a)	-	-	3	-	-	.00
F	Gilia sp. (a)	-	3	-	-	.00	-
F	Grindelia squarrosa	2	-	15	.03	-	.24
F	Helianthus annuus (a)	$_{a}$3	$_{a}$-	$_{b}$21	.03	-	.09
F	Holosteum umbellatum (a)	$_{a}$-	$_{b}$37	$_{c}$67	-	.13	.15
F	Lappula occidentalis (a)	$_{a}$-	$_{b}$32	$_{a}$7	-	.14	.01
F	Lactuca serriola	$_{c}$154	$_{a}$6	$_{b}$36	1.77	.18	.33
F	Linum lewisii	$_{b}$99	$_{b}$98	$_{a}$32	1.39	.71	.18
F	Machaeranthera canescens	$_{a}$4	$_{a}$-	$_{b}$16	.18	-	.04
F	Melilotus officinalis	$_{ab}$11	$_{a}$7	$_{b}$20	.48	.09	.93
F	Medicago sativa	$_{ab}$48	$_{b}$60	$_{a}$32	1.71	6.19	1.58
F	Microsteris gracilis (a)	$_{a}$-	$_{a}$1	$_{b}$19	-	.00	.06
F	Onobrychis viciaefolia	-	-	-	-	.03	-
F	Phlox longifolia	2	9	-	.00	.01	-
F	Polygonum douglasii (a)	$_{c}$50	$_{a}$3	$_{b}$30	.19	.01	.05
F	Ranunculus testiculatus (a)	-	-	4	-	-	.00
F	Sanguisorba minor	$_{b}$32	$_{a}$16	$_{a}$6	.60	.17	.24
F	Sisymbrium altissimum (a)	16	35	15	.25	.61	.10

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Taraxacum officinale	$_{a}$-	$_{b}$9	$_{ab}$1	-	.19	.06
F	Tragopogon dubius	$_{b}$190	$_{b}$191	$_{a}$76	3.86	8.22	.90
F	Vicia americana	$_{a}$11	$_{c}$124	$_{b}$53	.07	2.45	.46
Total for Annual Forbs		225	455	770	1.74	4.18	3.01
Total for Perennial Forbs		656	720	545	11.20	20.64	7.65
Total for Forbs		881	1175	1315	12.95	24.83	10.67

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

BROWSE TRENDS --
Management unit 05 , Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	10	9	12	.10	.15	.44
B	Chrysothamnus nauseosus albicaulis	1	3	3	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	51	44	41	7.43	4.78	5.36
B	Gutierrezia sarothrae	22	11	0	1.45	.65	-
B	Purshia tridentata	0	0	0	.00	-	-
B	Symphoricarpos oreophilus	3	4	3	.38	.15	.15
Total for Browse		87	71	59	9.37	5.74	5.96

CANOPY COVER, LINE INTERCEPT --
Management unit 05 , Study no: 15

Species	Percent Cover '06
Artemisia tridentata vaseyana	1.98
Chrysothamnus nauseosus albicaulis	.43
Chrysothamnus viscidiflorus viscidiflorus	9.19
Symphoricarpos oreophilus	.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 05 , Study no: 15

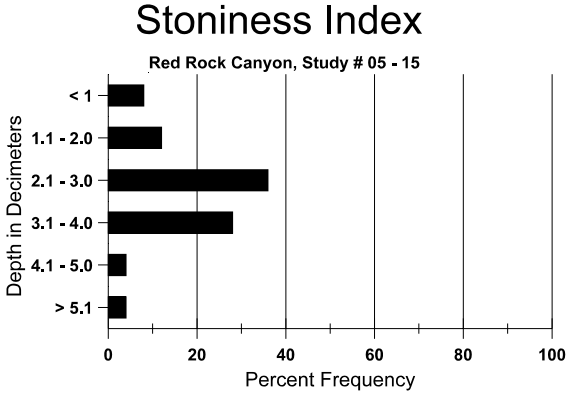
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	-	3.1

BASIC COVER --
Management unit 05 , Study no: 15

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	63.68	64.11	53.64
Rock	.35	.51	.64
Pavement	.20	2.60	2.07
Litter	79.98	49.67	38.51
Cryptogams	.04	.08	.06
Bare Ground	3.74	4.70	17.82

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 15, Red Rock Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.5	66.2 (16.4)	7.2	44.6	25.4	30.0	3.3	41.4	291.2	0.6



PELLET GROUP DATA --
Management unit 05 , Study no: 15

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	6
Elk	1	-	5
Deer	5	11	42
Cattle	-	-	30

Days use per acre (ha)	
'01	'06
-	-
-	27 (68)
50 (124)	40 (98)
-	42 (104)

BROWSE CHARACTERISTICS --
Management unit 05 , Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	25/31
Artemisia tridentata vaseyana												
96	**220**	80	220	-	-	20	0	0	-	-	0	17/9
01	**220**	-	140	80	-	20	0	0	-	-	0	18/25
06	**280**	-	-	280	-	-	21	36	-	-	0	22/22
Chrysothamnus nauseosus albicaulis												
96	**20**	-	-	20	-	-	0	0	-	-	0	25/25
01	**60**	-	60	-	-	-	0	0	-	-	0	9/31
06	**60**	-	-	60	-	-	0	0	-	-	0	27/39
Chrysothamnus viscidiflorus viscidiflorus												
96	**2200**	-	160	2020	20	-	0	0	1	-	0	17/28
01	**1360**	-	20	1180	160	40	0	0	12	-	0	15/25
06	**1220**	-	-	1200	20	20	0	0	2	-	0	19/30
Gutierrezia sarothrae												
96	**1580**	-	560	1020	-	-	0	0	0	-	0	11/10
01	**580**	-	-	540	40	20	0	0	7	-	0	8/10
06	**0**	-	-	-	-	-	0	0	0	-	0	9/7
Purshia tridentata												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	17/28
Symphoricarpos oreophilus												
96	**80**	-	40	40	-	20	0	0	-	-	0	23/32
01	**80**	-	40	40	-	-	25	0	-	-	0	13/21
06	**60**	-	20	40	-	-	0	0	-	-	0	19/31

SUMMARY

WILDLIFE MANAGEMENT UNIT 5 - EAST CANYON

Six trend studies were read in 2006. Greary Hollow (5-1) was suspended in 2006 due to low animal use in previous years. The key browse species on all sites were mountain big sagebrush, antelope bitterbrush, or a mountain big sagebrush/basin big sagebrush hybrid. The soil trends were mostly stable in 2006, with the exception of Red Rock Canyon which was slightly down.

Vegetative trends are dependent upon annual and spring precipitation patterns. Precipitation data from this herd unit was compiled from the Morgan, Bountiful, and Wanship Dam weather stations (Figures 1 and 2). Although the precipitation data is not complete, it appears that spring precipitation in 2000, 2001, and 2002 was below 75% of normal (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of perennial native grasses and forbs. The declining browse trends, discussed further below (Figure 3), are quite possibly caused by this low precipitation between 2000 and 2002. This drought is also the likely cause of declining perennial forbs and grasses.

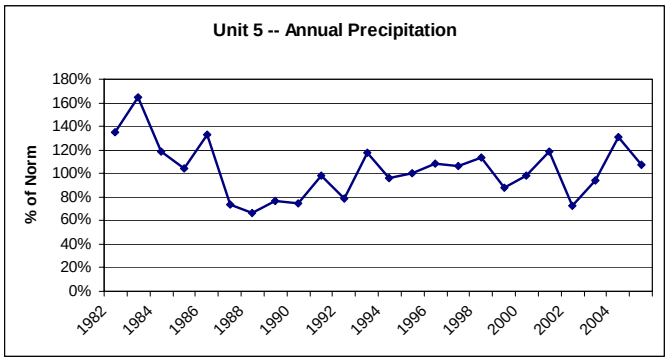


Figure 1. Annual precipitation in unit 5. Precipitation data was collected in Morgan, Bountiful, and at Wanship dam.

The average browse trends for the unit decreased from 2001 to 2006 (Figure 3). Browse trends were down for Tuscon Hollow and East Canyon Reservior, and slightly down for Wanship and Barnard Creek. The average sagebrush density has declined steadily since 1996 (Figure 4). Average sagebrush density decreased from 1,416 plants/acre in 1996 to 1, 227 in 2001, to 1,017 in 2006. Every site, with the exception of 2 sites with small sagebrush populations (Barnard Creek and Red Rock Canyon), have decreased in sagebrush density since 1996. The two sites which have not decreased are low-density sites where bitterbrush is the dominant browse species or burned. The sagebrush decadence increased from an average of 12% of the population in 1996 and 2001 to 17% (Figure 5). Despite the decreases in sagebrush numbers and slight increase in decadence, average sagebrush cover increased from 5% to 7% (Figure 6). Some of the loss of sagebrush is due to an infestation of the sagebrush defoliator moth (*Aroga websterii*) in the herd unit. The only study where the moth was identified was East Canyon Reservior; it was estimated that 46% of the population showed signs of infestation. It is possible that other sites were infested, but showed no signs of the moth at the time the study was read.

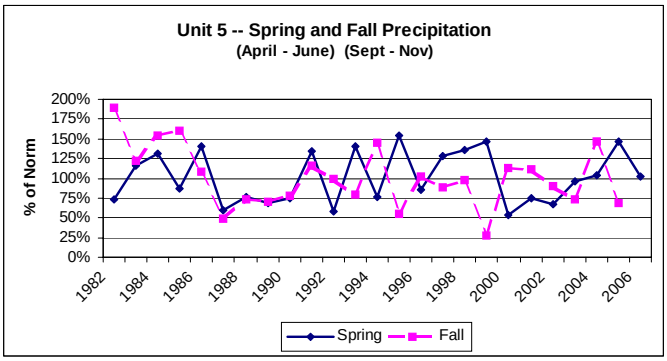


Figure 2. Spring and fall precipitation in unit 5. Precipitation data was collected in Morgan, Bountiful, and at Waship dam.

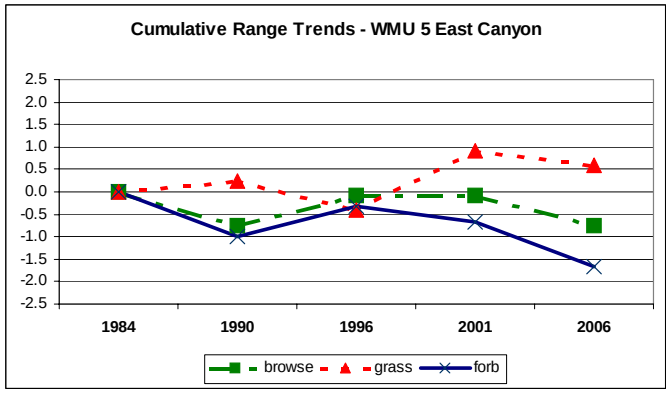


Figure 3. Cumulative Range Trends for unit 5, East Canyon.

The overall herbaceous understory has improved slightly since 1996 due to an increase in perennial grasses since 1996. A large part of the improvement is due to seeded grasses after the fires at the Wanship and Red Rock Canyon sites. The average grass trends have decreased since 2001 (Figure 3). Grass trends were down at only Tuscon Holow. The

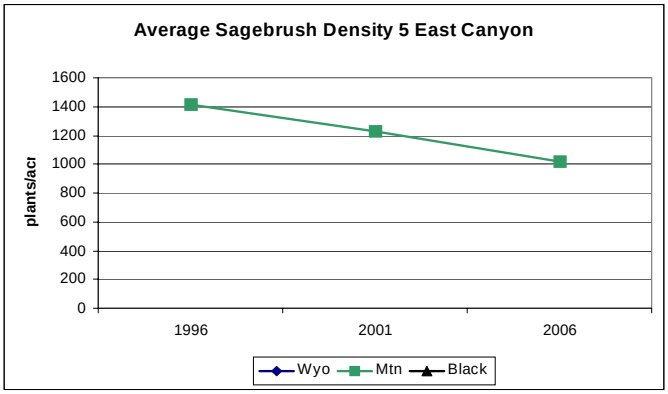


Figure 4. Average Sagebrush Density for unit 5.

average bulbous bluegrass cover for the unit increased from 1% in 1996 to 9% in 2006 and cheatgrass cover remained relatively unchanged. At some sites, it appears that the bulbous bluegrass displaced cheatgrass and Japanese brome. It is quite possible that part of the decline in sagebrush is due to inability of sagebrush seedlings to establish in the thick grass cover. The average cheatgrass cover and nested frequency has remained fairly unchanged since 2001 (Figures 7 and 8). Since 2001, cheatgrass cover increased at 3 sites, remained unchanged at 2 sites and decreased at 1 site. Japanese brome has been sampled on 4 of the 6 studies since 1996, at 3 of which the Japanese brome provided at least 2% cover.

In 2001, perennial grasses increased substantially in cover and nested frequency and changed little by 2006 (Figures 7 and 8). Two of the six studies, Wanship and Redrock Canyon, had been burned previous to 1996, so a large part of the increase was due to establishment of grasses on the burns. Tuscon Hollow, however, was not recovering from fire, but showed a large increase in perennial grasses.

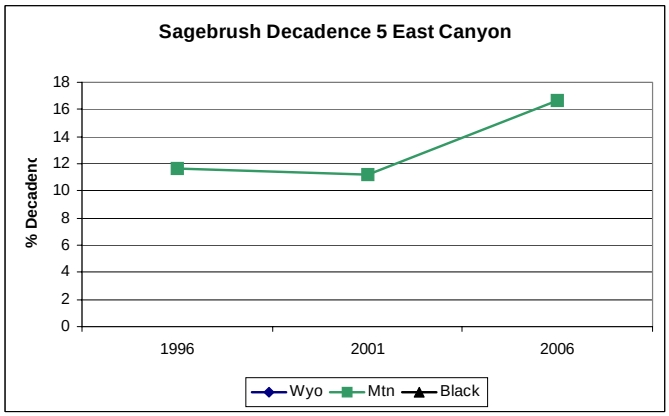


Figure 5. Sagebrush decadence in unit 5.

The average forb trends in the unit decreased from 1996 to 2006, although the average nested frequency and cover changed little (Figures 3, 7, and 8). Forb trends were down at East Canyon Reservoir, Barnard Creek, and Red Rock Canyon and slightly down at Tuscon Hollow. Part of this decrease in trends is due to a decline in desirable forb species, especially on the sites that were burned and seeded, and part is due to an increase in annual forb species. The establishment of noxious weeds also decreased the trends. The noxious weed, dyer's woad, was present at the Davis County Rifle Range and Barnard Creek sites in 2006. It was not sampled in quadrats at the Davis County Rifle Range, but was identified within the study area. The dyer's woad at Barnard Creek was first sampled in quadrats in 1996, and has continually increased with each sample.

The unit-wide Desirable Components Index score averages increased from poor to fair from 1996 to 2001, then declined to poor again in 2006. The poor DCI scores in 2006 are mainly due to increases in sagebrush decadence and decreases in perennial forb cover.

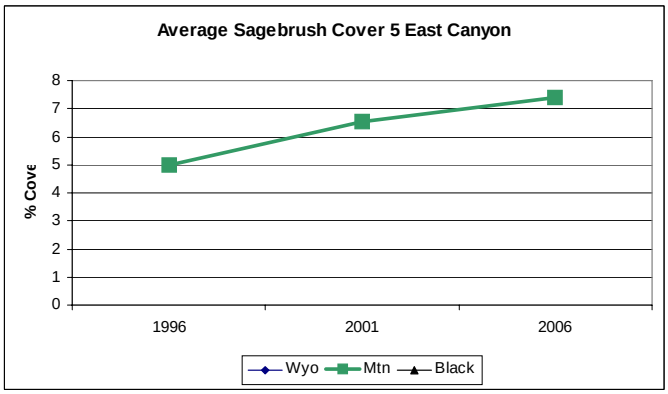


Figure 6. Average sagebrush cover for unit 5.

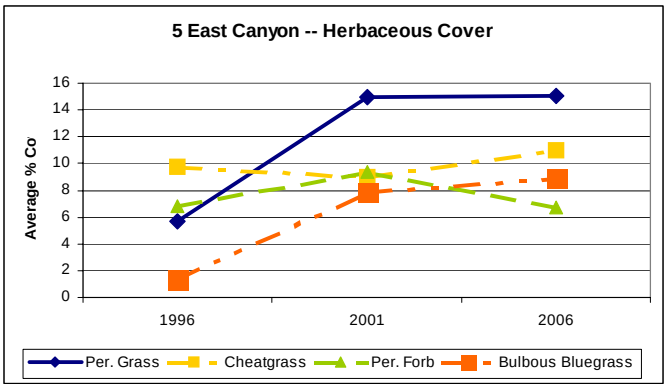


Figure 7. Unit 5 herbaceous cover.

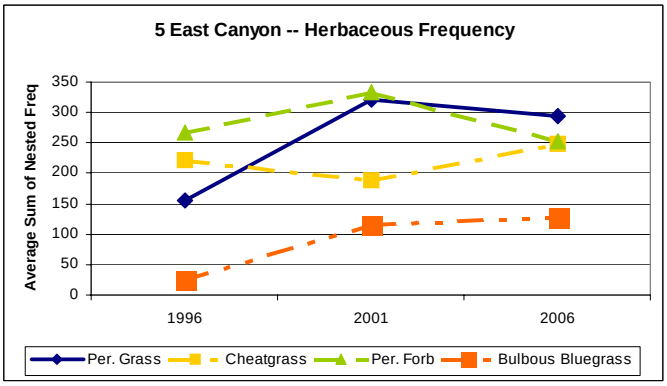


Figure 8. Unit 5 herbaceous nested frequency.

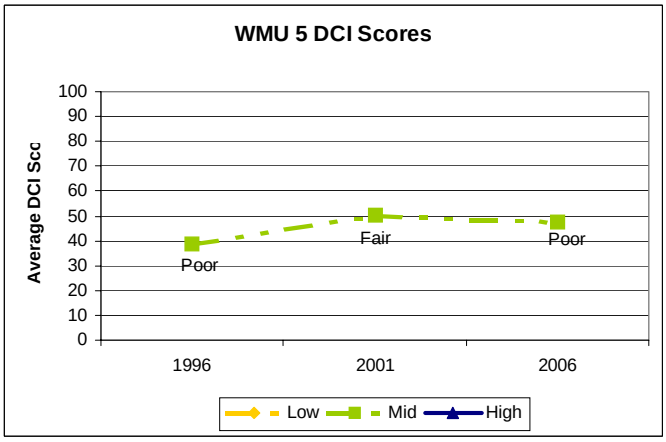
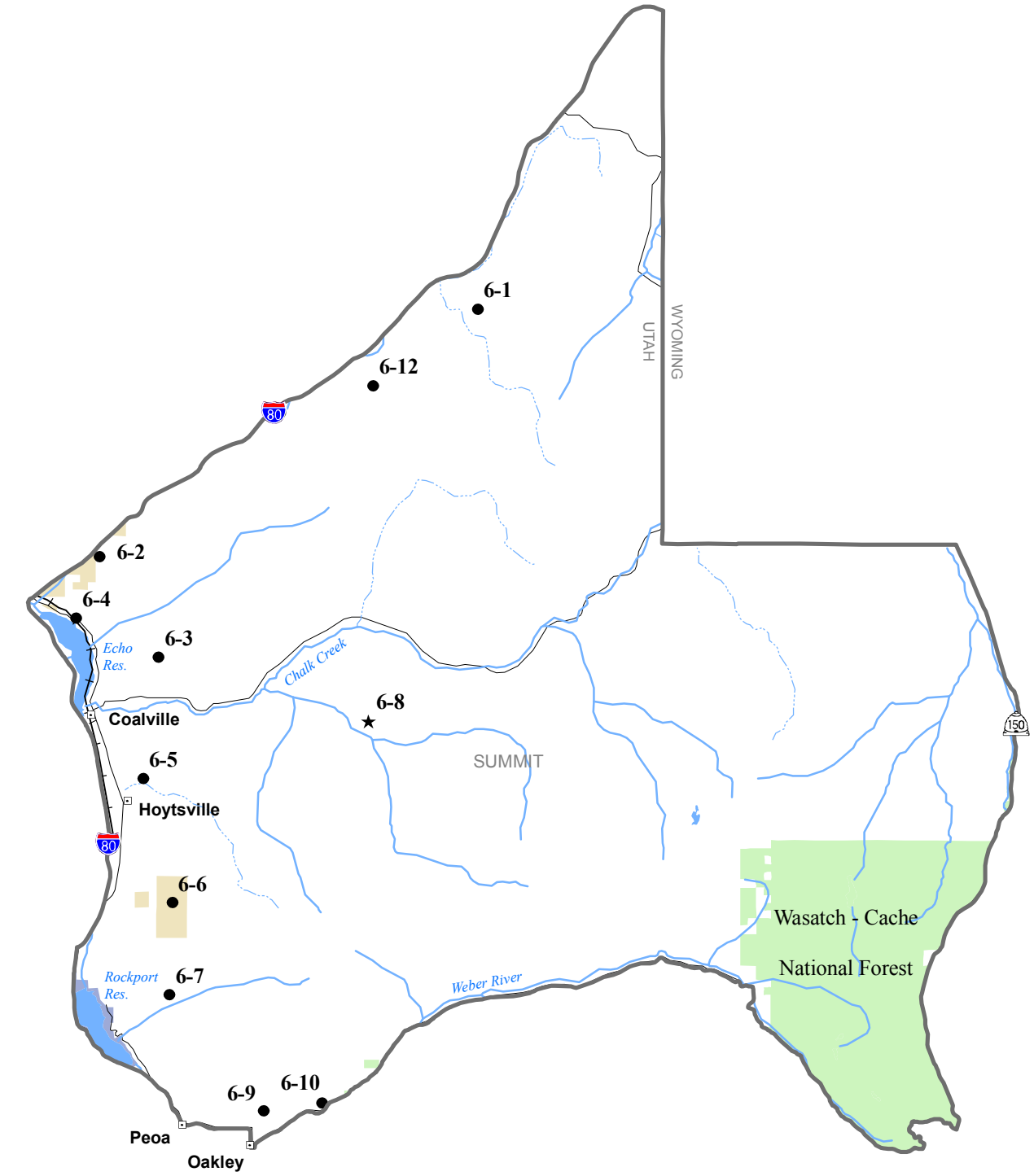
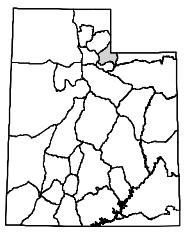


Figure 9. Unit 5 average Desirable Components Index scores by year. The Desirable Components Index ratings are divided into 3 categories based on different ecological potentials, which include: Low, Mid-level, and High.

Management Unit 6



Unit Location



Transect location
Suspended site
Forest Service
Utah DWR
Utah State Park
Private
Water body
Perennial stream
Intermittent stream
Road
Railroad

N

Map Scale 1:320,000
(1 inch = 5.1 miles)

WILDLIFE MANAGEMENT UNIT 6 - CHALK CREEK

Boundary Description

Summit and **Duchesne** counties - Boundary begins at the junction of Interstates 84 and 80 near Echo; then northeast on I-80 to the Utah-Wyoming state line; south and east along this state line to Highway SR-150; south on SR-150 to Pass Lake and the Weber River Trail; west on this trail to Holiday Park and the Weber River road; west on this road to Highway SR-32; north and west on SR-32 to I-80 and Wanship; north on I-80 to I-84 near Echo.

Management Unit Description

An estimated 395,397 total acres (summer and winter ranges combined) of mule deer range are within management unit 6, 90% of which is on private land. An estimated 435,170 total acres of elk range are within the unit, 91% of which is on private land. Widespread private ownership leads to numerous management complications. Unregulated development and loss of habitat are some of the biggest problems. The discovery, development, and removal of oil throughout the unit, especially the Chalk Creek area, has led to increased road and housing developments. Agricultural projects on critical winter range also continue to increase depredation problems and further decrease the available big game range. Because of the preponderance of private land and the establishment of hunting clubs, access is severely restricted for trophy hunting on large areas. Private landowners are also less likely to undertake extensive rehabilitation projects to improve the value of the remaining range. More than any other unit in the state, this unit has a large acreage of land in need of acquisition for wildlife management purposes. Unfortunately, the high cost of the land would probably prevent the acquisition of this critical range.

The topography of the unit is influenced mainly by the Uinta mountains to the east, with their drainages flowing through long, gradual slopes down into the Weber River Valley. Other major drainages include Crandall Canyon, Chalk Creek, Echo Canyon, Hixon Canyon, Pecks Canyon, and Grass Creek. The southern exposures of these canyons are especially important winter ranges. The rest of the winter range is found in the low rolling foothills of the western and central areas of the unit. The upper limits of the winter range vary between approximately 6,800 and 7,200 feet (Giunta 1979).

Towns located in the valley along the Weber River include: Oakley, Peoa, Wanship, Hoytsville, and Coalville. Echo and Rockport Reservoirs, located on the west side of the unit on the Weber River, are both significant barriers to big game movement. Additionally, I-80 through Echo Canyon discourages big game movement and many deer deaths occur there during winter and spring.

In the 1977 range inventory, the winter range was classified into 12 distinct vegetation types (Giunta 1979). Of these, seven of the larger, more important types were sampled. The sagebrush-grass and oakbrush types were the most prevalent. The sagebrush-grass type is quite variable with basin big sagebrush, mountain big sagebrush, and Wyoming big sagebrush all occurring within the unit. The sagebrush-grass type is found on a variety of exposures, slopes, and elevations. In the 1977 inventory, it occupied 36% of the normal winter range and produced 33% of the total production. It was even more important on severe winter range, having occupied 43% of the available range. The oakbrush type, which covered 32% of the winter range, is the most productive type, but is largely unavailable in severe winters. This type intergrades with the sagebrush-grass and other types. Other important types are juniper, especially important for thermal cover, and mountain brush. Air dry production from the 1977 range inventory report are as follows: Aspen, 435 lbs/acre; juniper, 240 lbs/acre; sagebrush-grass, 383 lbs/acre; mountain brush, 510 lbs/acre; oakbrush, 580 lbs/acre; grassland, 285 lbs/acre.

Fires in recent years have destroyed large tracts of important range. Because of this habitat loss, increasing numbers of mule deer, elk, and moose tend to concentrate in the lower areas on agricultural land and at mouths of canyons, especially during severe winters.

Big Game Management Objectives

Management options are rather limited because of the prevalence of private land on both winter and summer ranges. The herd unit management plan in 1983 (Kearl 1983) stated a harvest objective of 2,500 to 3,000 bucks per year and outlined various management programs and numerous problems with possible solutions. In the 1998 management plan, annual buck harvest was expected to be about 1,600 under normal conditions, with a target population of 11,500 (9,500 in 2005) wintering animals (Hodson et al. 2000; Hersey and McLaughlin 2005). This is significantly lower than the 1983 plan. It is more practical to look at the regression of buck harvests since 1950 to get a better understanding of the overall trend. The analysis demonstrates an increased buck harvest since 1950, even with the great deal of variation for buck harvest, which began with 2,031 and increased to 2,323 in 1990. This variation can be further depicted by some low harvests in the 1950's, 60's, and 70's of around 900, and high harvests of over 3,000 in the mid-50's and early-80's. Management of the deer herd is further complicated by the presence of other big game species, migrations, excessive road kills on I-80, and many hunting restrictions. Elk management objectives in 1998 called for a target winter herd size of 1,900 animals, a postseason bull to cow ratio of 8:100, with at least 4 bulls being 2½ years or older. These objectives had not changed by 2006.

The composition of the herbaceous understory is poor in many areas due to an abundance of cheatgrass and other annual species. Understories that are dominated by annual species can prohibit sagebrush seedling establishment, especially during Utah's hot, dry summers. Another serious concern is the rapidly increasing loss of critical wintering habitat to urbanization. A DWR program to acquire additional land, and/or conservation easements, and landowner cooperation are necessary to help perpetuate the big game herds on this unit.

Range Trend Studies

A total of 12 trend studies are located in management unit 6. All of the studies established in 1984 were located on important big game winter ranges. Six of the 19 line-intercept transects established in 1977 were in areas considered important for continued monitoring. These transects were reread and replaced with new interagency trend studies. In addition, 1 new study was established in 1990, and another in 1996. All of the transects in this unit are located on private land, except the Hixon Canyon and Echo Canyon Rest Area studies, which are located on DWR property. All of the trend studies that were established in 1984 were reread in 1990. Project personnel attempted to reread all of the trend studies in both 1996 and 2001, but a few of the studies were not read due to difficulty getting permission and/or access to privately owned lands. In 1990, Upper Chalk Creek (6-11) was suspended and has not been reread. Spring Hollow Burn (6-3) was not read in 1996 and Hixon Canyon (6-6) and South Fork Chalk Creek (6-8) were not read in 2001. In 2006, 10 studies were reread; South Fork Chalk Creek (6-8) was not reread due to the lack of access on private land.

Trend Study 6-1-06

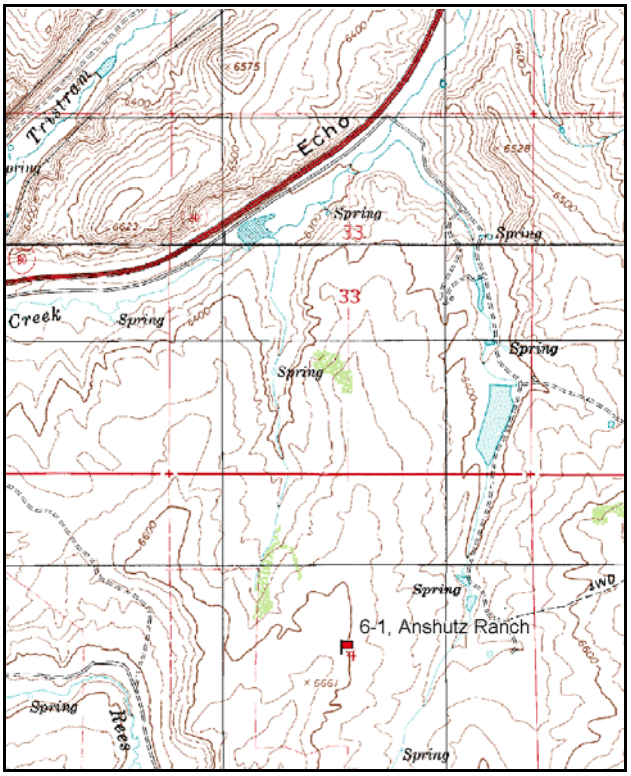
Study site name: Anshutz Ranch . Vegetation type: Low Sagebrush .

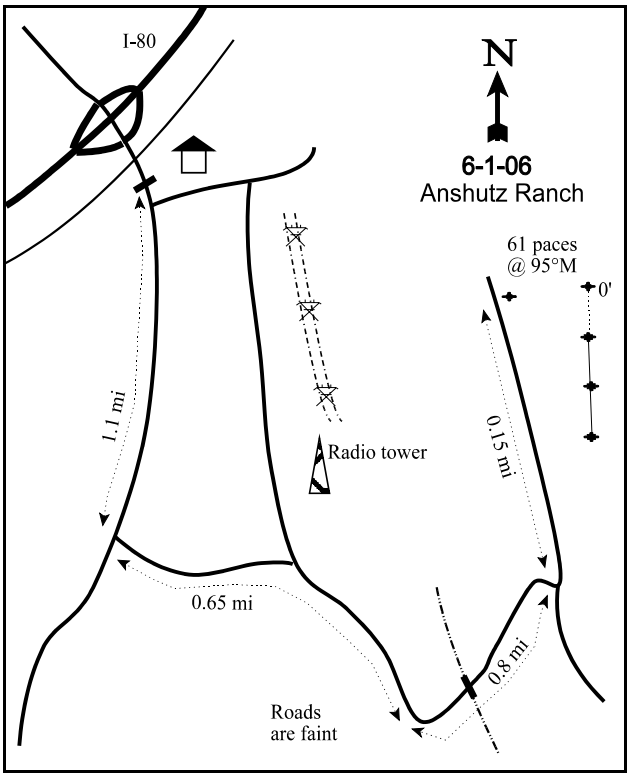
Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to Anshutz Ranch headquarters. From the security guard house proceed 1.1 miles and turn left. Proceed 0.65 miles (passing ranch lumber and equipment yard and a gate)to a faint road to the left. Turn left, proceed 0.8 miles (go through gate) to a crossroad on a small ridge. Turn left(road not on quad and quite faint) and proceed 0.15 miles to a green steel stake on the right(east)side of the road. From stake, walk 51 paces at 95 degrees magnetic to the 0-foot of the baseline marked by browse tag #7949.





Map Name: Castle Rock

Diagrammatic Sketch

Township 4N , Range 7E , Section 4

UTM NAD 27, UTM 12T 4550593 N 486531 E

DISCUSSION

Anshutz Ranch - Trend Study No. 6-1

Study Information

This trend study is located southeast of the Anshutz Ranch headquarters (elevation: 6,600 feet, slope: 6%, aspect: northeast). Big game use of the area is light to moderate and comes chiefly from elk. The area is also important for sage grouse. The land is part of the Ensign Ranch and is utilized by sheep, cattle, and horses. A number of range types are closely intermixed. In swales, grass and/or basin big sagebrush is often dominant. On gentle slopes and flat areas are mixed communities of basin big sagebrush and low sagebrush with occational Wyoming big sagebrush and mountain big sagebrush. On the more well-drained ridgetops, low sagebrush is dominant. Scattered around the area is an abundance of stickyleaf low rabbitbrush and broom snakeweed, which are dominant in a few patches. The entire area is very open with little protective cover and gently rolling topography. The actual study area vegetation consists of a mixture of basin big sagebrush and low sagebrush. Pellet group transect data in 2001 estimated 3 deer, 48 elk, and 4 cow days use/acre (8 ddu/ha, 117 edu/ha, and 9 cdu/ha). Horse and sage grouse droppings were also sampled. The pellet group data estimates in 2006 were 13 deer, 38 elk, 4 cow, 1 sheep, and 1 horse days use/acre (31 ddu/ha, 93 edu/ha, 9cdu/ha, 3 sdu/ha, and 1 hdu/ha). Deer pellets were from winter, elk pellets from spring or early summer, and sheep were from winter or fall. Thirty-five sage grouse pellet groups/acre were sampled as well. A sheep carcass was identified in 2006.

Soil

The soil is in the Richsum-Heiners series complex, which are shallow to very deep, well drained, moderately permeable soils on high tablelands, low mountains, and valley sides. They formed in residuum, slope alluvium, and valley side alluvium derived from shale, sandstone, and conglomerate (USDA-NRCS 2006). The effective rooting depth is nearly 14 inches. The soil is classified as a clay loam, with a slightly alkaline soil reaction (7.6 pH). Percent organic matter is moderate at 2.9%. Phosphorus concentration is 5.9 ppm; values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). The soil has some variable-sized rock interspersed throughout the profile. Surface rock and pavement provided 3% combined average cover in 1996, 2001, and 2006. Protective cover provided by vegetation, litter, and cryptogams is abundant. Relative bare ground cover was 13% in 1996, 17% in 2001, and 24% in 2006. Some localized soil movement is apparent. The erosion condition class rating was stable in 2006.

Browse

Browse composition is dominated by low sagebrush (*Artemisia arbuscula*), which has provided 21-22% cover since 1996. Low sagebrush density was estimated at 8,040 plants/acre in 1996, 9,580 plants/acre in 2001, and 8,280 plants/acre in 2006. Young plants made up 5% of the population in 1996, 2% in 2001, and 3% in 2006. Decadent individuals made up 13% of the population in 1996, 22% in 2001, and 10% in 2006, which is much lower than in 1984 and 1990. Plants classified as dying made up 3% of the population in 1996, 10% in 2001, and 7% in 2006. Utilization has consistently been light to moderate, with the exception of moderate in 1984. Vigor has been generally good in all sampling years. Poor vigor has ranged from 4% in 1996 to 13% in 1990. In 2006, 200 plants/acre were classified as being infested with insects and an additional 160 plants/acre were classified as having other indications of poor vigor. It was not recorded that the sagebrush defoliator moth (*Aroga websterii*) was identified on the study, but with the widespread infestation in other areas of the northern region, it is quite possible that the moth was the cause of the infestation at this location. Annual leader growth averaged less than 1 inch in 2001 and 2006, but seed production was abundant.

Basin big sagebrush (*Artemisia tridentata tridentata*), which occurs mostly in the swales where soils are deeper, has provided 7% cover since 1996. Density estimates have varied from 2,200 plants/acre in 1996 and 2006 to 3,120 plants/acre in 2001. Density estimates in 1984 and 1990 were overestimated due to the small sample sized used during those readings. The larger sample used starting in 1996 provides more accurate density estimates for shrubs that have clumped and/or discontinuous population distributions. From 1984 to

1996, use was light to moderate and percent decadence ranged from 20-28%. Vigor was generally good, except in 1996, when plants with poor vigor made up 20% of the population. In 2001 and 2006, utilization was light and decadence was moderately high. Vigor was good in 2001, but nearly 20% of the population was classified as having poor vigor in 2006. Some of this is due to insect infestation on approximately 140 plants/acre in 2006, which could be sagebrush defoliator moth infestation. The young made up 8% of the population in 1996, 4% in 2001, and 3% in 2006. Annual leader growth averaged just over 1 inch in 2001 and just under 1 inch in 2006.

Gray horsebrush and winterfat have been sampled in low densities. Broom snakeweed and stickyleaf low rabbitbrush have also been sampled. They appeared to be increasing in earlier readings (1984 and 1990), but population density estimates have been much lower since the increased sample size in 1996.

Herbaceous Understory

The herbaceous understory is fairly diverse, but not overly abundant. Composition has been quite variable with perennials showing increased nested frequency values from 1984 to 1996. However, in 2001 the sum of nested frequency for all perennial herbaceous species decreased by 29% and cover decreased by half. These decreases, at least in part, are due to the extremely dry conditions during the spring and summer of 2001 (Utah climate summaries 2006). Thickspike wheatgrass and Sandberg bluegrass have been the dominant perennial grasses since 2001. Bottlebrush squirreltail was abundant in 1984 and 1990, but has steadily decreased since. Annual grasses are present, but not very abundant. In 2001, some utilization on grasses by cattle was noted, especially on plants within the shrub interspaces. Little change in grasses occurred by 2006. Forbs were depleted in 2001 due to the drought. Perennial forbs not only recovered by 2006, but provided the highest nested frequency and cover values of all readings. Desert phlox, longleaf phlox, and silky milkvetch have been the most abundant perennials.

1990 TREND ASSESSMENT

Big game use is not concentrated on this large expanse of sagebrush range. Big sagebrush displays light to moderate hedging and low sagebrush are lightly used. There is a high percentage of decadence in the low sagebrush population, but a large number of young sagebrush were also sampled. Total sagebrush canopy cover is 26%, with equal percentages for both species. Density slightly deceased, while 55% of the population continues to be decadent. Broom snakeweed did not increase. Nested frequency of both Sandberg bluegrass and bottlebrush squirreltail increased significantly, while no species decreased. Utilization of grasses has been light this year, but overall there is limited herbaceous forage available. Perennial forb abundance doubled, but most are low growing species.

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

1996 TREND ASSESSMENT

Big game use continues to be light for both elk and deer. The browse trend is stable. The density of low sagebrush has not changed, but that of basin big sagebrush decreased substantially. This change in density of basin is likely due to the increased sample size starting this year. Decadence of low sagebrush decreased substantially. The grass trend is stable. The nested frequency of perennial grasses is unchanged. Bottlebrush squirreltail nested frequency decreased significantly, but is the only species which showed a significant change. The forb trend is slightly down. The nested frequency of perennial forbs decreased 25%, but much of the decrease is likely due to the change in placement of quadrats with the change in sampling procedures. The Desirable Components Index score is good due to excellent browse cover, good perennial grass cover, and good perennial forb cover.

winter range condition (DC Index) - good (71) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is slightly up. Low sagebrush and basin big sagebrush both increased in density; low sagebrush increased 16% and basin increased 29%. Decadence also increased in each population, as did the percentage of plants classified as dying. The number of young in the population for both species is low as well. The grass trend is slightly down. The nested frequency of perennial grasses decreased 20%, but the nested frequency of cheatgrass decreased significantly as well. The only perennial grass which decreased significantly was bottlebrush squirreltail. The forb trend is down. The nested frequency of perennial forbs decreased 44%, due to a significant decrease in longleaf phlox, which is very beneficial to sage grouse hens (Barnett and Crawford 1994). The DCI score decreased to fair due to decreased perennial grass and forb cover and increased browse decadence.

winter range condition (DC Index) - fair (54) Mid-level potential scale
browse - slightly up (+1) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. The density of low sagebrush decreased 14% and the density of basin big sagebrush decreased 29%. Sagebrush cover and decadence for each species did not change. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The nested frequency of cheatgrass remained low. The forb trend is up. The nested frequency of perennial forbs increased, mainly due to significant increases in rose pussytoes and silky milkvetch, which provide forage for sage grouse (Barnett and Crawford 1994). The DCI score increased to good due to improved decadence, increased perennial grass cover, and increased perennial forb cover.

winter range condition (DC Index) - good (74) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 1

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{a}$72	$_{ab}$71	$_{a}$72	$_{bc}$111	$_{c}$157	1.80	.76	4.19
G	Agropyron spicatum	$_{a}$4	$_{a}$12	$_{c}$98	$_{ab}$27	$_{b}$43	2.77	.38	1.10
G	Bromus japonicus (a)	-	-	2	3	-	.03	.03	-
G	Bromus tectorum (a)	-	-	$_{b}$78	$_{a}$25	$_{a}$17	2.00	.09	.08
G	Carex sp.	-	-	-	2	-	-	.03	-
G	Oryzopsis hymenoides	3	-	8	-	5	.09	-	.06
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{ab}$26	$_{b}$33	$_{a}$6	.42	.53	.04
G	Poa pratensis	$_{a}$3	$_{ab}$8	$_{b}$27	$_{ab}$11	$_{ab}$11	.75	.10	.24
G	Poa secunda	$_{a}$76	$_{d}$230	$_{bc}$154	$_{c}$182	$_{ab}$108	2.01	2.61	2.14
G	Sitanion hystrix	$_{b}$118	$_{c}$162	$_{b}$127	$_{a}$32	$_{a}$50	2.63	.46	.92
G	Stipa comata	$_{ab}$17	$_{a}$9	$_{ab}$14	$_{ab}$14	$_{b}$19	.25	.59	.63
G	Stipa lettermani	$_{a}$5	$_{ab}$23	$_{a}$10	$_{ab}$19	$_{b}$39	.35	.16	1.53
Total for Annual Grasses		0	0	80	28	17	2.03	0.12	0.08
Total for Perennial Grasses		298	515	536	431	438	11.11	5.64	10.88
Total for Grasses		298	515	616	459	455	13.15	5.76	10.97
F	Achillea millefolium	4	13	7	8	7	.07	.21	.33
F	Agoseris glauca	4	3	-	6	3	-	.03	.01
F	Allium acuminatum	$_{b}$44	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$7	-	-	.01
F	Alyssum alyssoides (a)	-	-	$_{a}$-	$_{ab}$7	$_{b}$13	-	.02	.06
F	Antennaria rosea	$_{ab}$35	$_{c}$82	$_{a}$10	$_{a}$16	$_{b}$37	.27	.10	.61
F	Arabis sp.	$_{a}$-	$_{b}$22	$_{b}$9	$_{a}$-	$_{b}$17	.02	-	.08
F	Astragalus cibarius	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$104	-	-	1.13
F	Astragalus convallarius	11	5	7	18	9	.12	.19	.05
F	Astragalus utahensis	-	-	-	3	1	-	.03	.00
F	Castilleja linariaefolia	-	-	-	-	-	-	-	.00
F	Calochortus nuttallii	8	2	-	-	5	-	-	.01
F	Cirsium undulatum	$_{a}$15	$_{b}$40	$_{a}$12	$_{a}$6	$_{a}$4	.13	.12	.07
F	Collomia linearis (a)	-	-	$_{a}$-	$_{b}$24	$_{a}$4	-	.05	.01
F	Comandra pallida	-	-	-	-	2	-	-	.15
F	Collinsia parviflora (a)	-	-	$_{b}$43	$_{a}$13	$_{a}$3	.14	.03	.00
F	Cordylanthus ramosus (a)	-	-	$_{a}$-	$_{b}$43	$_{a}$-	-	1.39	-
F	Epilobium brachycarpum (a)	-	-	-	3	-	-	.01	-
F	Erigeron pumilus	$_{ab}$47	$_{b}$74	$_{a}$31	$_{a}$16	$_{a}$15	.22	.12	.18
F	Eriogonum umbellatum	-	1	3	5	3	.06	.21	.18
F	Gayophytum ramosissimum(a)	-	-	-	4	-	-	.01	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Holosteum umbellatum (a)	-	-	$_{b}$18	$_{a}$-	$_{a}$-	.03	-	-
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{a}$3	$_{ab}$7	$_{b}$16	.03	.04	.13
F	Lomatium sp.	-	-	-	-	3	-	-	.01
F	Machaeranthera canescens	$_{a}$-	$_{b}$9	$_{a}$-	$_{a}$-	$_{a}$-	-	.00	-
F	Microsteris gracilis (a)	-	-	-	-	11	-	-	.04
F	Phlox austromontana	$_{a}$-	$_{a}$2	$_{b}$60	$_{b}$46	$_{b}$63	1.36	.85	1.50
F	Phlox longifolia	$_{a}$40	$_{b}$164	$_{b}$158	$_{a}$39	$_{b}$134	1.16	.20	.58
F	Polygonum douglasii (a)	-	-	$_{c}$85	$_{b}$27	$_{a}$-	1.08	.08	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$14	$_{a}$5	$_{b}$51	.03	.01	.17
F	Senecio multilobatus	-	-	-	2	-	-	.00	-
F	Sphaeralcea coccinea	1	2	-	-	-	-	-	-
F	Taraxacum officinale	$_{a}$-	$_{b}$9	$_{b}$8	$_{ab}$5	$_{ab}$2	.05	.01	.00
F	Tragopogon dubius	$_{a}$-	$_{a}$-	$_{b}$11	$_{ab}$3	$_{a}$-	.02	.00	-
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	160	126	82	1.29	1.61	0.30
Total for Perennial Forbs		212	428	319	180	432	3.54	2.16	5.10
Total for Forbs		212	428	479	306	514	4.84	3.77	5.40

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

BROWSE TRENDS --
Management unit 06 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia arbuscula	90	86	86	22.02	20.63	21.67
B	Artemisia tridentata tridentata	53	61	51	7.44	6.64	7.19
B	Ceratoides lanata	3	4	3	-	.01	-
B	Chrysothamnus viscidiflorus viscidiflorus	94	89	83	5.53	4.28	4.36
B	Gutierrezia sarothrae	18	28	31	.28	1.20	1.05
B	Tetradymia canescens	9	8	10	.03	.03	.21
Total for Browse		267	276	264	35.31	32.81	34.50

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 1

Species	Percent Cover '06
Artemisia arbuscula	27.14
Artemisia tridentata tridentata	11.60
Chrysothamnus viscidiflorus viscidiflorus	6.23
Gutierrezia sarothrae	1.04

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 1

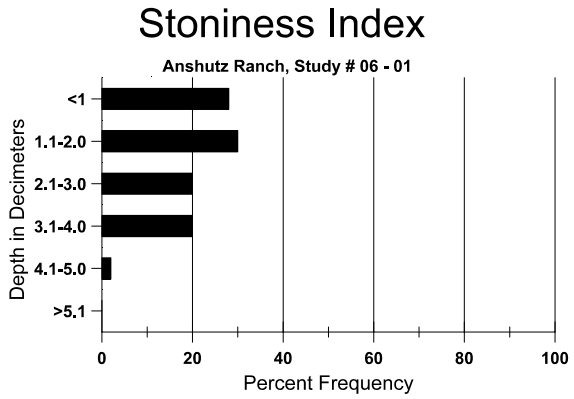
Species	Average leader growth (in) '06
Artemisia arbuscula	0.7
Artemisia tridentata tridentata	0.9

BASIC COVER --
Management unit 06 , Study no: 1

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	12.25	49.98	45.91	45.28
Rock	2.25	1.25	1.98	1.67	1.35
Pavement	0	2.00	1.36	1.81	2.29
Litter	71.25	60.25	55.00	46.81	40.79
Cryptogams	.50	.50	.77	6.75	2.26
Bare Ground	23.75	23.75	16.36	20.99	28.38

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 01, Anshutz Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.9	63.3 (14.9)	7.6	40.7	26.0	33.3	2.9	5.9	83.2	0.8



PELLET GROUP DATA --
Management unit 06 , Study no: 1

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	-	1
Rabbit	11	7	18
Horse	-	2	1
Grouse	-	1	1
Elk	8	7	9
Deer	6	2	1
Cattle	1	-	2

Days use per acre (ha)	
'01	'06
-	1 (3)
-	-
6 (16)	1 (1)
8.7 (21) groups/acre	35 (86) groups/acre
48 (117)	38 (93)
3 (8)	13 (31)
4 (9)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia arbuscula												
84	**7866**	-	200	3733	3933	-	84	3	50	-	5	12/17
90	**8532**	533	866	3000	4666	-	.78	0	55	4	13	9/15
96	**8040**	40	420	6580	1040	340	18	1	13	3	4	9/20
01	**9580**	80	200	7260	2120	240	22	0	22	10	10	10/20
06	**8280**	500	260	7180	840	240	1	0	10	7	9	11/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
84	**8599**	2466	4666	2200	1733	-	38	3	20	-	2	27/35
90	**6466**	400	3266	1400	1800	-	21	2	28	.92	5	28/29
96	**2200**	-	180	1560	460	460	49	5	21	.90	20	29/34
01	**3120**	-	140	1880	1100	480	6	0	35	4	4	29/38
06	**2200**	20	60	1440	700	300	9	0	32	17	19	31/35
Ceratoides lanata												
84	**66**	-	-	66	-	-	0	0	0	-	0	7/3
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	20	40	-	-	33	0	0	-	0	7/8
01	**140**	-	-	120	20	-	43	0	14	14	14	6/9
06	**60**	-	20	40	-	-	33	67	0	-	0	5/5
Chrysothamnus viscidiflorus viscidiflorus												
84	**16132**	-	-	7666	8466	-	0	0	52	-	2	9/11
90	**15066**	-	1800	5266	8000	-	2	0	53	6	28	9/13
96	**8100**	180	1940	6120	40	-	.98	0	0	-	.24	8/12
01	**7340**	40	60	6760	520	20	0	0	7	1	1	7/11
06	**6620**	40	380	6020	220	-	0	0	3	.90	.90	8/13
Gutierrezia sarothrae												
84	**9000**	-	-	8200	800	-	0	0	9	-	0	7/6
90	**8466**	66	1000	6666	800	-	0	0	9	.47	2	5/7
96	**900**	-	80	820	-	-	0	0	0	-	0	5/6
01	**1620**	-	20	1600	-	-	4	0	0	-	0	6/11
06	**1200**	-	120	1080	-	-	0	0	0	-	0	6/9
Tetradymia canescens												
84	**132**	-	66	66	-	-	0	0	0	-	0	8/3
90	**66**	-	-	66	-	-	100	0	0	-	0	4/5
96	**240**	-	60	160	20	-	8	33	8	-	0	7/13
01	**180**	-	-	120	60	-	0	0	33	11	11	6/12
06	**280**	-	20	240	20	-	0	0	7	7	7	8/12

Trend Study 6-2-06

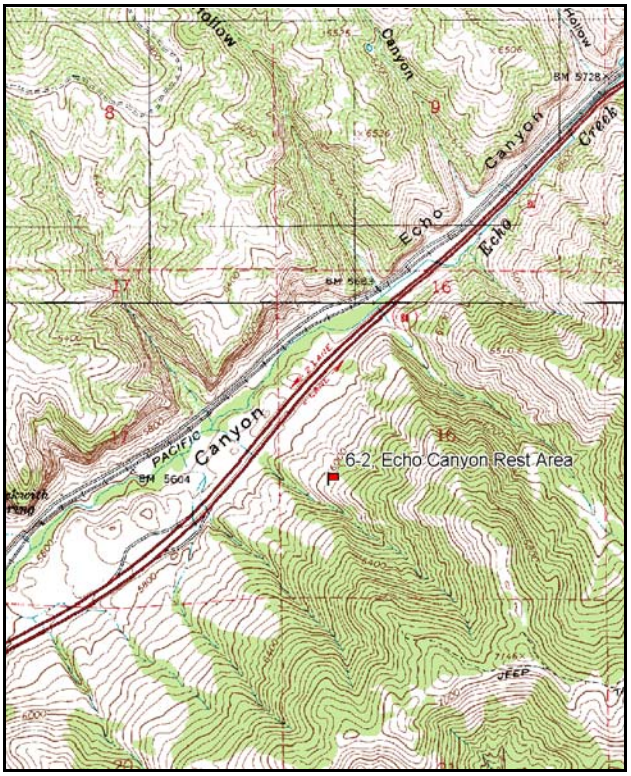
Study site name: Echo Canyon Rest Area . Vegetation type: Mountain Brush .

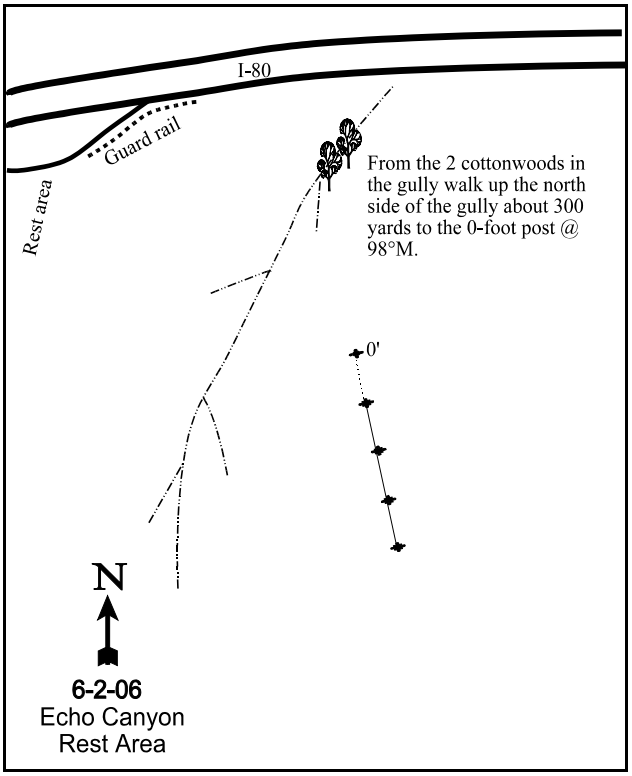
Compass bearing: frequency baseline 80 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards). From the end of the guard-rail, proceed on an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand or north side of the canyon. The 0-foot stake of the baseline consists of a green steel fencepost, 12"-18" high, and is marked with browse tag #7950.





Map Name: Coalville Diagrammatic Sketch

Township 3N , Range 5E , Section 16 UTM NAD 27, UTM 12T 4537730 N 466866 E

DISCUSSION

Echo Canyon Rest Area - Trend Study 6-2

Study Information

This study replaced a line-intercept transect established in 1977 which sampled a similar true mountain mahogany community. In 1984, a new study was established slightly up slope using the newer sampling methods, but was on a steep rocky south-facing slope (70%) with very little big game use. The current study was reestablished a second time in 1996, when the study methods were refined once again, on a ridge that is up slope and to the north of the 1984 study (elevation: 6,000 feet, slope: 32%, aspect: west). A fire burned the study area in 1999. In 1996 (pre-burn), the pellet group quadrat frequency showed moderately high use for deer, light use for elk, and occasional use by moose. Pellet group quadrat frequency for deer decreased from 38% in 1996 to 12% 2001 and no elk or moose pellet groups were sampled. The pellet group transect data in 2001 estimated 26 deer days use/acre (64 ddu/ha) and 7 elk days use/acre (18 edu/ha). In 2006, the pellet group quadrat frequency was 28% for deer and 18% for elk. The 2006 pellet group transect data estimated 27 deer, 36 elk, and 1 moose days use/acre (68 ddu/ha, 89 edu/ha, and 1 mdu/ha). Most pellets were from winter, but some were from spring.

Soil

The soil is in the Horrocks-Cutoff series complex, which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quarzite, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is a sandy clay loam with a neutral reaction (pH of 6.7). Soils have an effective rooting depth estimated at almost 15 inches. Surface rock and pavement are not particularly abundant, yet the soil profile is moderately stony throughout. Erosion is not excessive on this moderately steep ridge because of the abundant vegetation and litter cover and a fairly low percentage of bare ground cover. The relative bare ground cover was 6% in 1996, 12% in 2001, and 14% in 2006. The erosion condition class score was slight in 2001 and stable in 2006.

Browse

The browse community has been diverse, both before and after the burn. Prior to the fire, the key browse consisted mostly of mountain big sagebrush, true mountain mahogany, bitterbrush, and serviceberry. Two other species that are usually not considered key browse, snowberry and Gambel oak, were also present and had displayed some use. Mountain big sagebrush was the most abundant browse in 1996, with an estimated density of 2,440 plants/acre. Plants classified with poor vigor was also high in 1996. After the fire, the sagebrush density was 80 plants/acre in 2001 and 160 plants/acre in 2006, most of which were young in 2001 and mature in 2006.

Antelope bitterbrush, Saskatoon serviceberry, and true mountain mahogany shrubs were sampled at relatively low densities previous to the fire. In 1996, serviceberry density was 120 plants/acre, mahogany was 420 plants/acre, and bitterbrush was only 60 plants/acre. After the fire in 2001, it was noted that these key browse species were resprouting, primarily mountain mahogany and serviceberry. A lot of the mahogany and serviceberry were classified as decadent in 2001, but decadence may have been overestimated because of the burned growth form and many of the resprouting individuals appeared young. Serviceberry density was 200 plants/acre in 2001 and 440 plants/acre in 2006. Use on serviceberry was heavy in 1996, light in 2001, and light-moderate in 2006. Mahogany density was 300 plants/acre in 2001 and 180 plants/acre in 2006. Use on mahogany was light in 2001, but heavy in 2006. Bitterbrush density was only 40 plants/acre in 2001 and 2006. Use was moderate in 1996, light in 2001, and heavy in 2006.

Gambel oak density increased from 760 stems/acre in 1996 to 2,040 stems/acre in 2001 and 2,880 stems/acre in 2006. Oak cover remained unchanged after the fire, although stems were more abundant. This species is a vigorous sprouter following fire. Stickyleaf low rabbitbrush has maintained a stable population since 1996.

Herbaceous Understory

The herbaceous understory is an important component to this winter range; it provided 27% cover in 1996, 51% in 2001, and 36% in 2006. A composition change occurred between 1996 and 2001 due to the fire. In 1996, 88% of the herbaceous cover was made up of grasses. In 2001, grasses provided only 47% of the herbaceous cover and forbs provided 53% of the cover. The increase in forbs was due primarily to two perennial species, yarrow and American vetch, and several annual species (pale alyssum, littleflower collinsia, holosteum, and bur buttercup). In 2006, grasses made up 73% of the herbaceous cover, most of which were perennials. Sandberg bluegrass and bluebunch wheatgrass made up 85% of the grass cover in 1996, but both significantly decreased in nested frequency in 2001. Bluebunch increased significantly again in 2006, but Sandberg's bluegrass did not. Cheatgrass provided 3% cover in 1996, increased to 8% in 2001, then decreased to 5% in 2006. Annual forb nested frequency increased ten-fold in 2001 and remained high in 2006. Annual species often increase following disturbances.

2001 TREND ASSESSMENT

Due to the change in the study location in 1996, the summaries for 1984 to 1996 have been omitted because they do not compare with the new location.

Trend for browse is down. The decline in trend is cause by the decline in sagebrush density and increased decadence of other browse species after the fire. Mountain big sagebrush density declined by 97% in 2001, with only 80 young plants/acre sampled. Mountain big sagebrush provided 44% of the browse cover in 1996 and 0% in 2001. True mountain mahogany density decreased as well, but many of the plants are sprouting. Serviceberry and bitterbrush were infrequent prior to the fire, and have remained so. Gambel oak density increased from an estimated 760 stems/acre to over 2,000 stems/acre in 2001, which should help prevent erosion. The grass trend is down. The nested frequency of perennial grasses decreased 35% which was due to significant decreases in bluebunch wheatgrass and Sandberg bluegrass. The nested frequency of annual forbs increased 35%, although the nested frequency of cheatgrass did not increase significantly. The forb trend is up. The nested frequency of perennial forbs increased more than two-fold and several species increased significantly. The nested frequency of annual forbs also increased, nearly ten-fold. The Desirable Components Index score in 1996 was good due to excellent browse cover, excellent perennial grass cover, moderate perennial forb cover, and moderate decadence. In 2001, the DCI had decreased to fair because of the loss of browse cover.

1996 winter range condition (DC Index) - good (78) High potential scale
2001 winter range condition (DC Index) - fair (64) High potential scale
browse - down (-2) grass - down (-2) forb - up (+2)

2006 TREND ASSESSMENT

The browse trend is stable. The density of serviceberry increased slightly; mahogany, sagebrush, and bitterbrush densities remained stable. The density of Gamble oak increased, but did not appear to have been utilized. The grass trend is up. The nested frequency of perennial grasses increased 37% (excluding bulbous bluegrass) due to a significant increase in bluebunch wheatgrass. The nested frequency of cheatgrass increased significantly, however. The forb trend is stable. The nested frequency of perennial forbs decreased, but most of the decreases were due to significant decreases in weedy or increaser species. The DCI score remained fair in 2006.

winter range condition (DC Index) - fair (63) High potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 2

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{b}$176	$_{a}$104	$_{b}$186	6.88	6.83	11.74
G	Bromus brizaeformis (a)	-	-	1	-	-	.00
G	Bromus carinatus	-	2	2	-	.15	.03
G	Bromus japonicus (a)	-	-	1	-	-	.00
G	Bromus tectorum (a)	$_{a}$166	$_{a}$214	$_{b}$310	3.30	7.93	4.98
G	Carex sp.	-	-	1	-	.00	.03
G	Festuca myuros (a)	-	2	-	-	.00	-
G	Festuca ovina	5	-	-	.03	-	-
G	Koeleria cristata	3	1	2	.03	.00	.03
G	Oryzopsis hymenoides	-	-	1	.00	-	.15
G	Poa bulbosa	-	-	4	-	-	.01
G	Poa fendleriana	$_{a}$7	$_{ab}$14	$_{b}$28	.18	.57	1.11
G	Poa secunda	$_{b}$318	$_{a}$194	$_{a}$224	13.49	8.03	8.32
G	Sitanion hystrix	-	-	3	-	-	.03
Total for Annual Grasses		166	216	312	3.30	7.94	4.99
Total for Perennial Grasses		509	315	451	20.62	15.60	21.48
Total for Grasses		675	531	763	23.93	23.54	26.47
F	Achillea millefolium	$_{c}$117	$_{b}$176	$_{a}$48	1.82	10.21	1.58
F	Agoseris glauca	$_{a}$-	$_{a}$2	$_{b}$18	-	.00	.04
F	Alyssum alyssoides (a)	$_{a}$28	$_{b}$104	$_{c}$200	.11	3.04	.83
F	Allium sp.	$_{a}$4	$_{c}$86	$_{b}$63	.03	.51	.49
F	Ambrosia psilostachya	-	1	1	-	.15	.15
F	Antennaria rosea	1	1	3	.03	.03	.15
F	Arabis sp.	1	8	2	.00	.04	.01
F	Astragalus cibarius	$_{a}$-	$_{b}$14	$_{ab}$6	-	.37	.18
F	Astragalus convallarius	4	6	1	.03	.16	.00
F	Aster sp.	3	-	4	.03	.03	.06
F	Castilleja linariaefolia	3	1	-	.03	.03	-
F	Calochortus nuttallii	$_{a}$-	$_{ab}$3	$_{b}$18	-	.01	.06
F	Cirsium undulatum	$_{a}$14	$_{b}$36	$_{a}$12	.11	.79	.23
F	Collomia linearis (a)	1	7	10	.00	.02	.02
F	Comandra pallida	3	-	-	.00	-	-
F	Collinsia parviflora (a)	$_{a}$12	$_{c}$188	$_{b}$111	.03	3.34	.40
F	Crepis acuminata	3	9	14	.00	.10	.10
F	Descurainia pinnata (a)	$_{a}$-	$_{b}$38	$_{a}$1	-	.21	.00

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Draba verna (a)	$_{a}$-	$_{b}$64	$_{b}$44	-	.20	.15
F	Epilobium brachycarpum (a)	$_{a}$-	$_{b}$96	$_{c}$109	-	.46	.89
F	Erodium cicutarium (a)	-	-	5	-	-	.03
F	Erigeron pumilus	$_{b}$30	$_{b}$28	$_{a}$7	.65	.32	.04
F	Gayophytum ramosissimum(a)	3	3	2	.00	.00	.01
F	Hackelia patens	3	-	-	.03	.15	.03
F	Hedysarum boreale	-	-	2	-	-	.00
F	Helianthella uniflora	-	-	-	-	.00	-
F	Holosteum umbellatum (a)	$_{a}$6	$_{b}$95	$_{b}$85	.01	1.18	.27
F	Lactuca serriola	-	1	-	-	.00	-
F	Lomatium triternatum	$_{a}$-	$_{ab}$4	$_{b}$13	-	.01	.10
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$15	$_{c}$57	-	.08	.78
F	Penstemon sp.	1	-	4	.00	-	.00
F	Phlox longifolia	6	3	-	.02	.03	-
F	Polygonum douglasii (a)	$_{a}$6	$_{a}$2	$_{b}$39	.01	.00	.11
F	Ranunculus testiculatus (a)	$_{a}$9	$_{b}$83	$_{c}$139	.02	1.31	1.19
F	Schoencrambe linifolia	$_{a}$-	$_{b}$22	$_{a}$4	-	.53	.04
F	Senecio integerrimus	-	2	-	-	.00	-
F	Sisymbrium altissimum (a)	$_{a}$-	$_{b}$13	$_{a}$-	-	.22	-
F	Sphaeralcea coccinea	-	-	1	-	-	.15
F	Tragopogon dubius	-	-	3	-	-	.03
F	Verbascum thapsus	$_{a}$-	$_{b}$18	$_{a}$1	-	.11	.03
F	Vicia americana	$_{a}$37	$_{b}$140	$_{b}$129	.28	2.97	1.40
F	Zigadenus paniculatus	-	1	2	-	.03	.03
Total for Annual Forbs		65	708	802	0.21	10.13	4.72
Total for Perennial Forbs		230	562	356	3.11	16.64	4.96
Total for Forbs		295	1270	1158	3.33	26.77	9.68

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

BROWSE TRENDS --
Management unit 06 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	6	10	10	.07	.63	.93
B	Artemisia tridentata vaseyana	75	3	7	12.75	-	.38
B	Cercocarpus montanus	18	11	8	3.73	.97	.71
B	Chrysothamnus nauseosus albicaulis	0	2	1	-	-	.15
B	Chrysothamnus viscidiflorus viscidiflorus	55	52	56	3.87	5.69	6.55
B	Gutierrezia sarothrae	4	3	7	.06	.18	-
B	Opuntia sp.	1	1	1	-	-	-
B	Purshia tridentata	2	2	2	1.00	1.25	1.70
B	Quercus gambelii	6	9	9	2.57	2.22	2.13
B	Symphoricarpos oreophilus	32	32	33	4.96	4.35	5.69
Total for Browse		199	125	134	29.04	15.31	18.27

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 2

Species	Percent Cover '06
Amelanchier alnifolia	.36
Artemisia tridentata vaseyana	.33
Cercocarpus montanus	1.13
Chrysothamnus nauseosus albicaulis	.23
Chrysothamnus viscidiflorus viscidiflorus	11.14
Gutierrezia sarothrae	.10
Purshia tridentata	1.14
Quercus gambelii	4.23
Symphoricarpos oreophilus	9.61

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 2

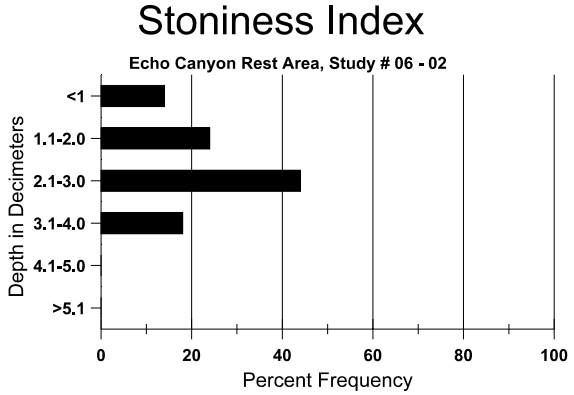
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	1.8	3.5
Artemisia tridentata vaseyana	-	3.6
Cercocarpus montanus	2.4	3.3

BASIC COVER --
Management unit 06 , Study no: 2

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	51.15	61.48	50.06
Rock	1.75	2.42	3.21
Pavement	2.69	3.64	5.06
Litter	55.56	36.42	38.07
Cryptogams	6.57	1.93	2.82
Bare Ground	7.26	14.42	16.09

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 02, Echo Canyon Rest Area

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.9	65.2 (19.7)	6.7	44.7	22.0	33.3	2.9	14.4	92.8	0.4



PELLET GROUP DATA --
Management unit 06 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	3	4	28
Moose	1	-	-
Elk	6	-	18
Deer	38	12	28

Days use per acre (ha)	
'01	'06
-	-
-	1 (1)
7 (18)	36 (89)
26 (64)	27 (68)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**120**	20	60	60	-	-	0	67	0	-	17	34/36
01	**200**	-	80	60	60	20	10	0	30	-	0	24/31
06	**440**	120	160	260	20	20	9	36	5	-	0	24/33
Artemisia tridentata vaseyana												
96	**2440**	-	120	1360	960	740	61	26	39	3	37	22/37
01	**80**	-	80	-	-	860	0	0	0	-	0	21/35
06	**160**	-	20	140	-	340	25	13	0	-	0	21/23
Cercocarpus montanus												
96	**420**	-	60	360	-	-	52	33	0	-	0	49/47
01	**300**	-	40	100	160	60	0	0	53	-	0	25/31
06	**180**	-	-	100	80	-	11	89	44	33	33	23/27
Chrysothamnus nauseosus albicaulis												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**40**	-	40	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	21/34
Chrysothamnus viscidiflorus viscidiflorus												
96	**2400**	-	80	2260	60	-	0	0	3	-	4	15/21
01	**2320**	-	180	2140	-	-	0	0	0	-	0	14/22
06	**2460**	60	220	1980	260	60	0	0	11	2	2	17/27
Gutierrezia sarothrae												
96	**120**	-	-	120	-	-	0	0	0	-	0	7/8
01	**80**	-	20	60	-	-	0	0	0	-	0	8/16
06	**160**	-	20	120	20	-	0	0	13	-	0	8/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
96	**40**	-	-	40	-	-	0	0	-	-	0	6/26
01	**20**	-	-	20	-	-	0	0	-	-	0	4/9
06	**20**	-	-	20	-	-	0	0	-	-	0	6/12
Purshia tridentata												
96	**60**	-	-	60	-	-	0	33	0	-	0	34/64
01	**40**	-	-	20	20	40	0	0	50	-	0	12/37
06	**40**	-	-	40	-	-	0	100	0	-	0	16/51
Quercus gambelii												
96	**760**	80	460	260	40	-	8	0	5	-	0	16/29
01	**2040**	-	2040	-	-	120	0	0	0	-	0	33/18
06	**2880**	-	240	2560	80	-	0	0	3	-	0	36/27
Symphoricarpos oreophilus												
96	**1280**	-	340	920	20	-	34	13	2	-	5	22/43
01	**680**	-	60	600	20	-	0	0	3	-	0	20/47
06	**1240**	-	140	1100	-	20	3	0	0	-	0	22/46

Trend Study 6-3-06

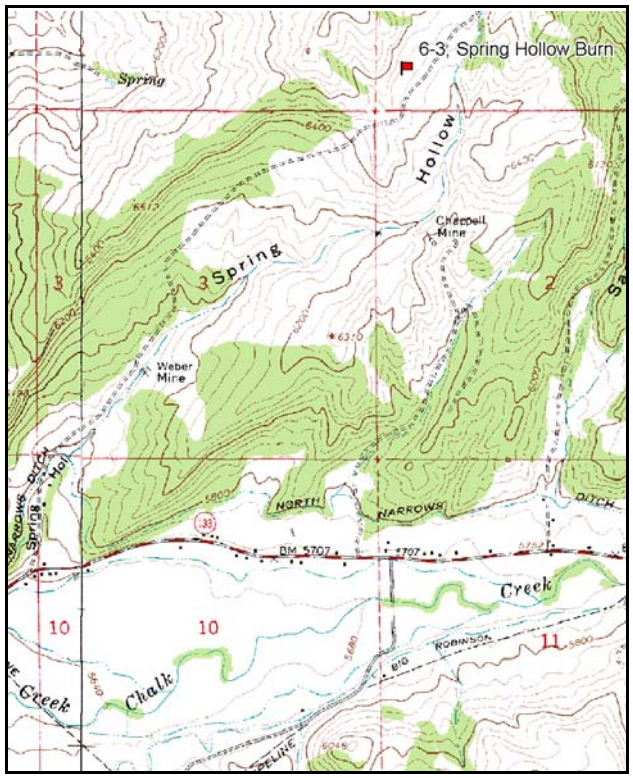
Study site name: Spring Hollow Burn . Vegetation type: Big Sagebrush-Grass .

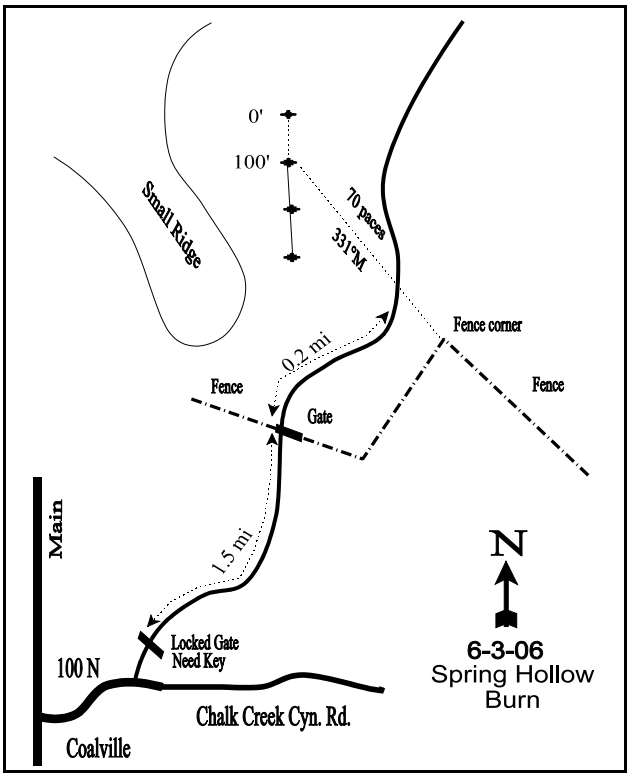
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 100 North and Main in Coalville, travel east 1.3 miles to Spring Hollow Road. Turn left (northeast) and proceed 0.2 mile to a locked gate. Proceed through gate, and continue 1.5 miles to a gate. Continue 0.2 miles to a fence line corner on the right. From corner post, walk 70 paces at 331 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7974.





Map Name: Turner Hollow

Diagrammatic Sketch

Township 3N , Range 5E , Section 35

UTM NAD 27, UTM 12T 4532493 N 469930 E

DISCUSSION

Spring Hollow Burn - Trend Study No. 6-3

Study Information

This study is located near an old line-intercept study on an old burn in the upper part of Spring Hollow (elevation: 6,500 feet, slope: 20%, aspect: southeast). The area was dominated by sagebrush-grass and juniper-pinyon communities. After the burn, the area was seeded with perennial grasses, mostly crested and intermediate wheatgrass. It is privately-owned and grazed by a variety of domestic animals in addition to winter use by deer and elk. During heavy winters, it may not be as critical for wildlife due to the lack of browse. In 1984, deer pellet groups occurred frequently, and 3 deer and 1 elk antler sheds were found. The study was not read in 1996 because access to the private property was not obtained. However, permission was obtained to monitor the study in 2001 and 2006. In 2001, the pellet group transect data estimated 9 elk days use/acre (21 edu/ha), 6 deer days use/acre (15 ddu/ha), and 21 cow days use/acre (52 cdu/ha). Livestock were also observed nearby in 2001. The 2006 pellet group data estimates were 17 elk, 13 deer, and 14 cow days use/acre (41 edu/ha, 33 ddu/ha, and 34 cdu/ha). A deer carcass was identified in 2006. Deer and elk pellets were from winter and spring use and cattle pats were from the previous summer.

Soil

The soil is in the Ant Flat series, which are very deep, well drained, slowly permeable soils on terraces and mountain slopes. They formed in colluvium, residuum, and alluvium from calcareous sandstone and some quartzite, conglomerate, limestone, and shale (USDA-NRCS 2006). The soil texture is a clay loam with a slightly acidic soil reaction (6.5 pH). Soil depth is quite shallow with an estimated effective rooting depth of less than 9 inches. Organic matter is relatively high at 4.6%. Erosion is minimal due to the abundance of herbaceous vegetation cover, litter cover, and low percent bare ground. Relative bare ground cover was 11% in 2001 and 10% in 2006. The erosion condition class assessment determined soils as stable in 2001 and 2006.

Browse

Browse is very limited on the site. It provided only 2% cover in 2001 and 3% in 2006. Mountain big sagebrush and serviceberry are the most abundant preferred species. In 1984, sagebrush density was 966 plants/acre, but had decreased to 699 plants/acre in 1990. No serviceberry plants were sampled in 1984 or 1990. Both species have had densities estimated at 40 plants/acre or less since 2001 and both have also showed moderate to heavy use since 2001. Population densities decreased from 1990 to 2001 due to the increase in sample area, which better estimates clumped and/or discontinuous distributions. The sagebrush and serviceberry populations will remain small due to high resource competition with the dense crested wheatgrass. The sagebrush defoliator moth (*Aroga websterii*) was identified on a few sagebrush plants in 2006, but was not sampled in the density measurements. Broom snakeweed is the most abundant species with an estimated density of 4,100 plants/acre in 2001 and 3,480 plants/acre in 2006.

Herbaceous Understory

The herbaceous understory is dominated by crested wheatgrass and Sandberg bluegrass. Crested wheatgrass displayed moderate to heavy utilization in 2001 and light in 2006. It was reported in 1990 that grasses appeared less vigorous than normal because of grazing effects and damage by ants and aphids. Grass cover was 36% in 2001 and 28% in 2006. Forbs provided 7% cover in 2001 and 13% in 2006. Perennial species increased in sum of nested frequency between 1990 and 2001, partially because of the change in sample area. Annual forbs, which were not sampled in 1984 or 1990, were quite abundant in 2001 and 2006.

1990 TREND ASSESSMENT

There was a significant increase in percent decadence in this low density, heavily used big sagebrush population. Sagebrush density decreased 28% from 1984 to 1990. The site has an incredible infestation of ants and aphids on the sagebrush. In spite of these factors, the sagebrush display fair growth and seed production. No seedlings were found. Any openings in the dense crested wheatgrass stand that would allow

young sagebrush to become established are crowded with snakeweed seedlings and young. The dense stand of small crested wheatgrass plants had increased in nested frequency values. It shows 40-60% utilization, and cattle are still in the area utilizing the fall green-up.

browse - down (-2) grass - up (+2) forb - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is stable, although browse is limited with only 20 sagebrush and 40 serviceberry plants/acre. Due to the lack of dead sagebrush plants, the large decrease in sagebrush density since 1990 is due to the increased sample size used in 2001, which more accurately estimates browse populations that have clumped and/or discontinuous distributions. Sagebrush is very patchy throughout the area. Recruitment by residual plants seems unlikely in the future due to competition with understory of crested wheatgrass. Broom snakeweed has a much lower density compared to 1984 and 1990 estimates. The population appears stable with an age class consisting of 94% mature plants. The grass trend is slightly up. The nested frequency of perennial grasses increased 11%, due to significant increases in the nested frequencies of thickspike and bluebunch wheatgrass. The forb trend is slightly up. The nested frequency of perennial forbs increased substantially and many new species were sampled for the first time in this reading. The Desirable Components Index score is poor due to the very low browse cover.

winter range condition (DC Index) - poor (41) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is stable. The density and use of the key browse species changed little. The density of broom snakeweed decreased 15%. The grass trend is down. The nested frequency of perennial grasses (excluding bulbous bluegrass) decreased 27%, due to significant decreases in the nested frequencies of thickspike wheatgrass, bluebunch wheatgrass, prairie junegrass, and Sandberg bluegrass. Cheatgrass was sampled for the first time at this study in 2006. The forb trend is slightly up. The nested frequency of perennial forbs increased 11%, some of which are desirable species. The DCI score remained poor.

winter range condition (DC Index) - poor (41) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 3

Type	Species	Nested Frequency				Average Cover %	
		'84	'90	'01	'06	'01	'06
G	Agropyron cristatum	$_{a}$312	$_{b}$348	$_{b}$323	$_{ab}$317	27.98	24.37
G	Agropyron dasystachyum	$_{ab}$10	$_{a}$-	$_{b}$11	$_{a}$-	.67	-
G	Agropyron intermedium	$_{a}$-	$_{b}$9	$_{ab}$5	$_{b}$13	.04	.42
G	Agropyron spicatum	$_{a}$5	$_{a}$7	$_{b}$46	$_{a}$24	2.08	1.18
G	Bromus tectorum (a)	-	-	-	3	-	.00
G	Elymus cinereus	-	-	3	-	.03	-
G	Koeleria cristata	$_{a}$14	$_{a}$2	$_{b}$44	$_{a}$12	.59	.10
G	Poa bulbosa	-	-	9	4	.12	.03

Type	Species	Nested Frequency				Average Cover %	
		'84	'90	'01	'06	'01	'06
G	Poa fendleriana	-	5	-	-	-	-
G	Poa pratensis	1	-	8	10	.07	.09
G	Poa secunda	$_{a}$77	$_{b}$214	$_{b}$205	$_{a}$92	4.55	1.52
G	Stipa sp.	-	3	-	-	-	-
Total for Annual Grasses		0	0	0	3	0	0.00
Total for Perennial Grasses		419	588	654	472	36.16	27.73
Total for Grasses		419	588	654	475	36.16	27.73
F	Achillea millefolium	$_{a}$3	$_{a}$4	$_{b}$20	$_{ab}$7	.11	.21
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$12	$_{c}$96	.04	.36
F	Alyssum alyssoides (a)	-	-	42	58	.25	.16
F	Allium sp.	$_{a}$-	$_{a}$-	$_{c}$54	$_{b}$12	.18	.03
F	Antennaria rosea	-	-	2	3	.03	.03
F	Arabis sp.	-	4	-	-	-	-
F	Artemisia ludoviciana	4	8	8	5	.06	.21
F	Aster chilensis	$_{a}$7	$_{a}$8	$_{b}$60	$_{b}$61	1.82	2.24
F	Astragalus cibarius	$_{a}$-	$_{a}$-	$_{b}$59	$_{c}$138	.39	3.90
F	Astragalus convallarius	-	-	2	-	.03	-
F	Calochortus nuttallii	$_{a}$-	$_{a}$-	$_{ab}$3	$_{b}$9	.01	.05
F	Cirsium undulatum	5	3	4	3	.06	.06
F	Collomia linearis (a)	-	-	$_{a}$34	$_{b}$68	.08	.22
F	Collinsia parviflora (a)	-	-	98	80	.33	.21
F	Crepis acuminata	-	-	-	1	-	.00
F	Cryptantha sp.	-	-	-	4	-	.01
F	Descurainia pinnata (a)	-	-	6	-	.01	-
F	Draba sp. (a)	-	-	$_{b}$85	$_{a}$33	.18	.10
F	Epilobium brachycarpum (a)	-	-	$_{a}$85	$_{b}$221	.46	2.70
F	Erodium cicutarium (a)	-	-	3	7	.01	.01
F	Erigeron divergens	$_{c}$124	$_{b}$56	$_{b}$46	$_{a}$6	.65	.09
F	Holosteum umbellatum (a)	-	-	31	38	.09	.10
F	Lappula occidentalis (a)	-	-	9	8	.04	.04
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{a}$8	$_{b}$23	.04	.09
F	Lithospermum ruderale	$_{b}$45	$_{b}$42	$_{a}$8	$_{a}$1	.49	.33
F	Lupinus argenteus	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$14	.06	.36
F	Microsteris gracilis (a)	-	-	27	44	.11	.10
F	Oenothera pallida	$_{b}$40	$_{b}$32	$_{a}$14	$_{ab}$21	.23	.29
F	Phlox longifolia	-	-	7	-	.01	-

Type	Species	Nested Frequency				Average Cover %	
		'84	'90	'01	'06	'01	'06
F	Polygonum douglasii (a)	-	-	34	46	.07	.11
F	Ranunculus testiculatus (a)	-	-	$_{a}$46	$_{b}$82	.15	.30
F	Senecio integerrimus	-	-	2	-	.01	-
F	Sphaeralcea coccinea	$_{a}$-	$_{ab}$4	$_{ab}$4	$_{b}$8	.02	.07
F	Tragopogon dubius	$_{a}$8	$_{a}$12	$_{b}$56	$_{a}$11	.42	.19
F	Viguiera multiflora	-	1	-	-	-	-
F	Zigadenus paniculatus	$_{a}$-	$_{a}$-	$_{b}$13	$_{a}$4	.19	.06
Total for Annual Forbs		0	0	500	685	1.80	4.09
Total for Perennial Forbs		236	174	384	427	4.89	8.63
Total for Forbs		236	174	884	1112	6.70	12.72

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

BROWSE TRENDS --
Management unit 06 , Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'01	'06	'01	'06
B	Amelanchier alnifolia	2	2	.03	.15
B	Artemisia tridentata vaseyana	1	1	.63	.38
B	Chrysothamnus viscidiflorus viscidiflorus	8	7	.18	.03
B	Gutierrezia sarothrae	63	37	1.19	2.45
B	Leptodactylon pungens	1	0	-	-
B	Opuntia sp.	3	4	-	-
B	Symphoricarpos oreophilus	1	2	-	-
Total for Browse		79	53	2.03	3.01

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 3

Species	Percent Cover '06
Amelanchier alnifolia	.20
Chrysothamnus viscidiflorus viscidiflorus	.71
Gutierrezia sarothrae	3.11
Opuntia sp.	.03
Symphoricarpos oreophilus	.13

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 3

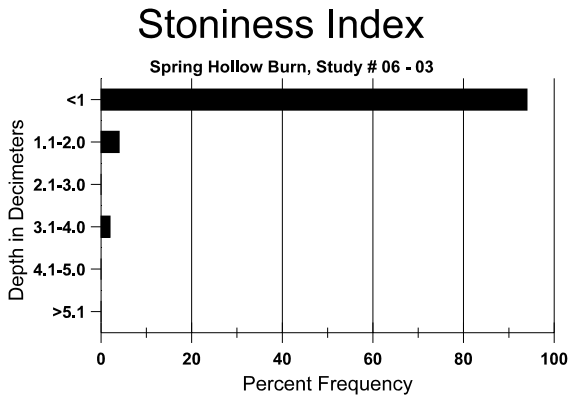
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	2.3	1.9

BASIC COVER --
Management unit 06 , Study no: 3

Cover Type	Average Cover %			
	'84	'90	'01	'06
Vegetation	3.50	15.50	49.49	45.59
Rock	7.00	3.25	3.73	5.75
Pavement	11.50	15.75	6.90	10.15
Litter	49.50	43.25	43.11	43.63
Cryptogams	11.25	2.00	.07	0
Bare Ground	17.25	20.25	13.19	11.42

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 03, Spring Hollow Burn

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
8.6	66.0 (12.0)	6.5	30.9	38.4	30.6	4.6	25.8	384.0	0.9



PELLET GROUP DATA --
Management unit 06 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'01	'06	'01	'06
Rabbit	10	10	-	-
Horse	1	-	-	-
Elk	5	4	9 (22)	17 (41)
Deer	2	11	6 (15)	13 (33)
Cattle	16	6	21 (52)	14 (34)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**40**	-	-	-	40	-	50	50	100	-	0	21/23
06	**40**	-	-	20	20	-	50	0	50	-	0	25/25
Artemisia tridentata vaseyana												
84	**966**	66	66	700	200	-	59	34	21	-	0	17/23
90	**699**	-	-	366	333	-	62	38	48	-	5	23/36
01	**20**	-	-	20	-	-	100	0	0	-	0	22/34
06	**20**	-	-	-	20	-	100	0	100	-	100	22/38
Chrysothamnus nauseosus albicaulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	24/28
Chrysothamnus viscidiflorus viscidiflorus												
84	**66**	-	-	33	33	-	0	0	50	-	50	11/17
90	**333**	-	100	33	200	-	10	0	60	12	20	12/11
01	**320**	-	-	320	-	-	0	0	0	-	0	9/13
06	**180**	-	40	140	-	20	11	11	0	-	0	12/24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**20333**	1433	4133	16200	-	-	0	0	0	-	0	7/6
90	**16999**	966	8000	8133	866	-	.78	0	5	.47	3	7/7
01	**4100**	-	220	3860	20	-	0	0	0	.48	.48	7/8
06	**3480**	-	120	3220	140	200	10	5	4	2	3	8/10
Leptodactylon pungens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**60**	-	-	60	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**399**	-	33	366	-	-	0	0	0	-	0	3/3
90	**299**	66	200	66	33	-	0	0	11	-	11	5/10
01	**60**	-	-	60	-	-	0	0	0	-	0	4/9
06	**80**	-	20	60	-	-	0	0	0	-	0	6/21
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**33**	-	-	-	33	-	0	0	100	-	0	-/-
01	**20**	-	-	20	-	-	0	0	0	-	0	15/23
06	**40**	-	-	40	-	-	0	0	0	-	0	23/53

Trend Study 6-4-06

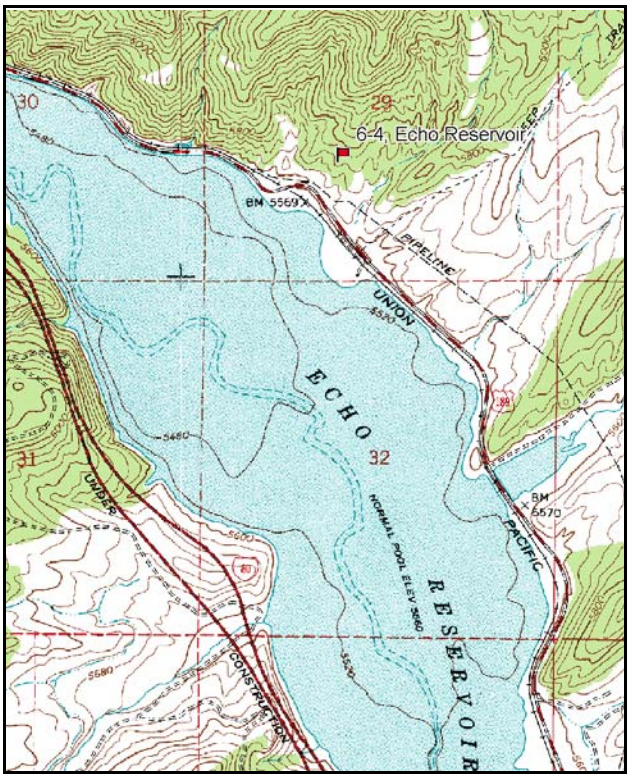
Study site name: Echo Reservoir . Vegetation type: Juniper .

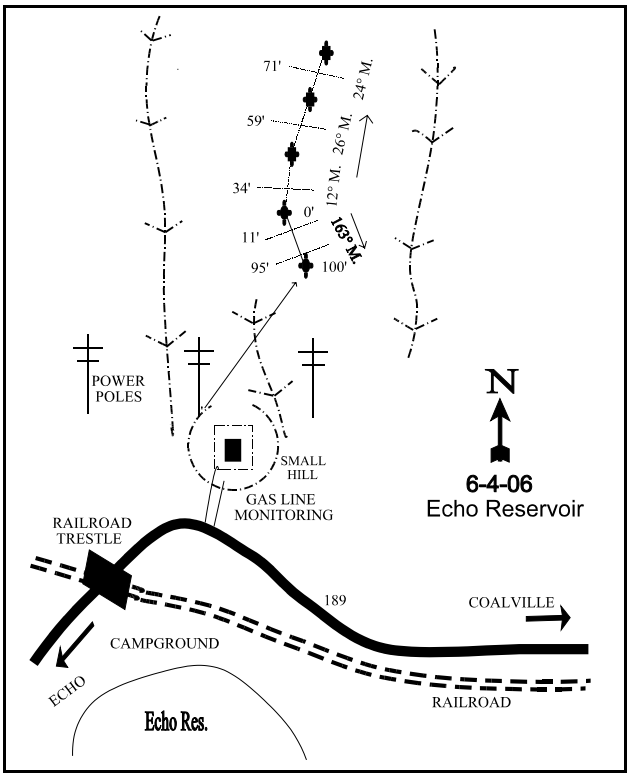
Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

From the east end of Echo Dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the station, walk up the narrow ridge north of the power pole approximately 70 paces at 45 degrees true to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7970. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs in a direction of 34 degrees magnetic. Line 3 runs in a direction of 26 degrees magnetic. Line 4 runs in a direction of 24 degrees magnetic.





Map Name: Coalville

Diagrammatic Sketch

Township 3N , Range 5E , Section 29

UTM NAD 27, UTM 12T 4534516 N 465647 E

DISCUSSION

Echo Reservoir - Trend Study No. 6-4

Study Information

The study samples a Utah juniper community located immediately east of Echo Reservoir near Coalville (elevation: 5,700 feet, slope: 15-25%, aspect: southwest). This area is critically important to wintering deer, and to a lesser extent elk. Much of the surrounding area, including the high ridge to the north and the bench lands adjacent to Grass Creek, were consumed by fire prior to 1977. The old line-intercept transect, as well as the range trend study, both lie entirely within unburned juniper. Big game use has been moderate to heavy. Deer use was heavy prior to 1977. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use was intense. The heavy use has resulted in the elimination of the already low abundance browse forage. The only browse species is Utah juniper, but it was intensely highlined in the past, and provides only limited forage. Further evidence of heavy deer use was the more than 50 winter-killed carcasses from the critical winter of 1983-84 observed near the old line-intercept transect. The pellet group transect data in 2001 estimated 63 deer days use/acre (155 ddu/ha), 8 elk days use/acre (20 edu/ha), and 4 cow days use/acre (9 cdu/ha). In 2001, 3 deer carcasses were also observed. In 2006, 46 deer and 19 elk days use/acre (112 ddu/ha and 48 edu/ha) were estimated. Most pellets were from winter.

Soil

The soil is in the Jana-Richsum-Rock outcrop series complex, which consists of shallow to very deep, well drained, moderately permeable soils that formed in slope alluvium, colluvium, and residuum on mountain slopes, valley sides, low mountains, and high tablelands. They were derived from conglomerate, sandstone, and shale (USDA-NRCS 2006). The effective rooting depth was estimated at just over 12 inches. The soil is clay loam in texture with a moderately alkaline soil reaction (7.9 pH). On the more gentle slopes, soil depth is moderate. On the steeper slopes, soil depth is more shallow and the erosion rate is more rapid. Relative bare ground cover in 1996 was 21%, 24% in 2001, and 36% in 2006. Most of the bare soil lies in the interspaces between juniper trees. On more gentle slopes, there is good litter cover under tree crowns and fair grass cover in the tree interspaces. The erosion condition class measurement was moderate in 2001and slight in 2006.

Browse

Browse composition consists of a variety of scattered shrubs, of which only mountain big sagebrush and Saskatoon serviceberry are palatable. The remaining species are less preferred and generally classifieded as increasers or invaders. The most abundant are stickyleaf low rabbitbrush and broom snakeweed. Big sagebrush and serviceberry have not been sampled since 1996 in neither density nor height/crown measurements. Utah juniper is highlined, but not as extensively as in the winters of 1982-84. It has shown significant recovery, yet is still a limited source of low quality browse. Point-centered quarter data taken in 2001 and 2006 estimated about 80 juniper trees/acre. Line intercept cover has averaged 16% since 2001.

Herbaceous Understory

Grasses are moderately abundant. Cheatgrass was the dominant grass in 1996 with 15%, but significantly declined in nested frequency and cover in 2001 due to the drought conditions of 2000 and 2001. Cheatgrass nested frequency changed little by 2006. Perennial grass cover nearly doubled in 2001. Indian ricegrass, Sandberg bluegrass, and needle-and-thread all significantly increased in nested frequency in 2001, while bluebunch wheatgrass significantly decreased in nested frequency. In 2006, the nested frequency of perennial grasses decreased, mainly due to significant decreases in the nested frequencies of Sandberg bluegrass and needle-and-thread. Forbs have been relatively insignificant during all years it has been sampled, having contributed only 2% cover in 2001 and about 5% in 1996 and 2006.

1990 TREND ASSESSMENT

The browse trend is down. The estimated 101 juniper trees/acre are mostly mature, severely highlined trees. Saskatoon serviceberry density decreased from 866 to 0 plants/acre in 1990. Low rabbitbrush provides most

of the browse forage. Prickly pear cactus and broom snakeweed are the only browse species that increased in density. The perennial grass component has improved since 1984. There is a good stand of bluebunch wheatgrass, Indian ricegrass, and needle-and-thread. The nested frequency of Sandberg bluegrass increased significantly.

browse - down (-2) grass - up (+2) forb - down (-2)

1996 TREND ASSESSMENT

The browse trend is stable. The density of preferred browse species continues to be lacking. The grass trend is slightly down. The nested frequency of perennial grasses decreased 16%, due mainly to significant decreases in the nested frequencies of Indian ricegrass and Sandberg bluegrass. Cheatgrass cover is quite high. The forb trend is slightly up, due mainly to a significant increase in the nested frequency of Utah milkvetch. The Desirable Components Index score is very poor due to no browse cover, only moderate perennial grass cover, moderate cheatgrass cover, and only moderate perennial forb cover.

winter range condition (DC Index) - very poor (11) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

2001 TREND ASSESSMENT

Trend for browse remains stable. Palatable browse remains in very low abundance. Juniper is the dominant browse. The less palatable species, low rabbitbrush, prickly pear, and snakeweed, are the most abundant shrubs. The grass trend is up. The nested frequency of perennial grasses increased 23%. The nested frequency of Indian ricegrass and Sandberg bluegrass increased significantly and cheatgrass decreased significantly. The forb trend is stable. The nested frequency and composition of perennial forbs changed little. The DCI score remained very poor, although the annual grass cover decreased and perennial grass cover increased.

winter range condition (DC Index) - very poor (31) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is stable. Preferred browse species are still lacking. The grass trend is down. The nested frequency of perennial grasses decreased 21%. The nested frequencies of Sandberg bluegrass and needle-and-thread decreased significantly. Cheatgrass nested frequency is unchanged. The forb trend is slightly down. The nested frequency of perennial forbs decreased slightly. The DCI score remained very poor.

winter range condition (DC Index) - very poor (27) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{ab}$13	$_{ab}$21	$_{a}$7	$_{a}$6	$_{b}$27	.18	.15	.56
G	Agropyron spicatum	$_{a}$81	$_{bc}$130	$_{d}$177	$_{ab}$109	$_{cd}$166	5.22	4.59	8.24
G	Bromus brizaeformis (a)	-	-	7	-	-	.02	-	-
G	Bromus japonicus (a)	-	-	-	2	-	-	.00	-
G	Bromus tectorum (a)	-	-	$_{b}$323	$_{a}$152	$_{a}$138	15.37	1.27	1.90
G	Oryzopsis hymenoides	$_{b}$71	$_{b}$79	$_{a}$26	$_{b}$70	$_{b}$60	.43	3.11	2.12
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{b}$18	$_{a}$-	$_{a}$1	.13	-	.03
G	Poa pratensis	-	-	2	5	3	.00	.30	.03
G	Poa secunda	$_{a}$10	$_{c}$143	$_{b}$63	$_{c}$150	$_{b}$71	.93	2.65	1.13
G	Sitanion hystrix	-	-	1	3	-	.03	.00	.00
G	Sporobolus cryptandrus	2	1	-	-	-	-	-	-
G	Stipa comata	$_{ab}$32	$_{b}$47	$_{b}$61	$_{b}$92	$_{a}$15	1.87	5.07	.73
Total for Annual Grasses		0	0	330	154	138	15.39	1.28	1.90
Total for Perennial Grasses		209	421	355	435	343	8.81	15.89	12.86
Total for Grasses		209	421	685	589	481	24.20	17.17	14.77
F	Agoseris glauca	-	1	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	$_{b}$291	$_{a}$264	$_{b}$307	2.98	1.28	3.78
F	Allium sp.	-	-	-	4	4	-	.01	.01
F	Antennaria rosea	$_{b}$24	$_{b}$20	$_{a}$-	$_{a}$3	$_{ab}$7	-	.00	.09
F	Artemisia ludoviciana	-	-	-	-	3	-	-	.15
F	Astragalus cibarius	-	-	-	3	1	-	.00	.03
F	Astragalus utahensis	$_{b}$79	$_{a}$17	$_{b}$68	$_{a}$38	$_{a}$23	1.45	.29	.23
F	Camelina microcarpa (a)	-	-	-	1	4	-	.00	.02
F	Calochortus nuttallii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$1	-	.01	.00
F	Cirsium undulatum	8	2	3	-	-	.03	-	-
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Collinsia parviflora (a)	-	-	-	8	19	-	.04	.06
F	Cordylanthus ramosus (a)	-	-	-	1	-	-	.00	-
F	Crepis acuminata	-	-	1	-	-	.00	-	-
F	Cryptantha sp.	-	-	10	-	5	.06	-	.06
F	Cymopterus sp.	-	-	2	9	5	.01	.02	.06
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$1	$_{b}$17	-	.00	.03
F	Draba sp. (a)	-	-	$_{a}$-	$_{a}$2	$_{b}$33	-	.00	.08
F	Epilobium brachycarpum (a)	-	-	-	4	-	-	.03	-
F	Eriogonum brevicaule	6	2	5	-	-	.09	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Erigeron pumilus	$_{a}$-	$_{ab}$5	$_{a}$-	$_{b}$12	$_{ab}$9	-	.08	.33
F	Galium aparine (a)	-	-	-	2	-	-	.00	-
F	Hackelia patens	-	-	4	-	-	.01	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$1	$_{ab}$6	$_{b}$14	.00	.02	.17
F	Lactuca serriola	-	-	-	-	2	-	-	.00
F	Lesquerella sp.	-	-	-	3	-	-	.00	-
F	Machaeranthera grindelioides	-	-	-	5	-	-	.03	-
F	Penstemon humilis	1	-	-	-	-	-	-	-
F	Phlox austromontana	22	21	12	8	7	.12	.19	.24
F	Phlox hoodii	-	-	-	-	1	-	-	.03
F	Phlox longifolia	-	1	-	-	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{a}$5	$_{b}$17	-	.01	.07
F	Sphaeralcea coccinea	30	29	24	19	16	.49	.31	.30
F	Townsendia sp.	-	-	-	5	-	-	.01	-
F	Tragopogon dubius	$_{b}$15	$_{a}$1	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
F	Vicia americana	-	-	-	3	-	-	.01	-
Total for Annual Forbs		0	0	292	297	411	2.98	1.43	4.22
Total for Perennial Forbs		185	99	130	122	84	2.30	1.00	1.56
Total for Forbs		185	99	422	419	495	5.29	2.43	5.79

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

BROWSE TRENDS --
Management unit 06 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Chrysothamnus nauseosus albicaulis	2	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	36	27	18	1.18	.72	.18
B	Gutierrezia sarothrae	36	33	7	1.12	.90	.49
B	Juniperus osteosperma	3	2	1	7.92	5.48	1.89
B	Opuntia sp.	36	41	39	1.15	.90	1.62
B	Pinus edulis	0	0	1	-	-	-
B	Tetradymia canescens	1	3	2	-	.03	-
Total for Browse		114	107	69	11.39	8.03	4.19

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 4

Species	Percent Cover	
	'01	'06
Chrysothamnus viscidiflorus viscidiflorus	-	.01
Gutierrezia sarothrae	-	.30
Juniperus osteosperma	17.60	15.28
Opuntia sp.	-	1.35

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 4

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	80	79

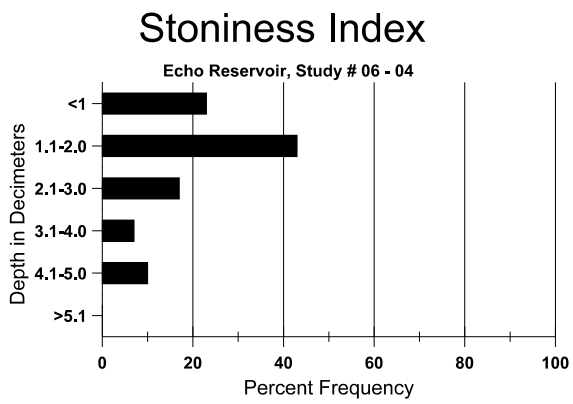
Average diameter (in)	
'01	'06
12.6	8.7

BASIC COVER --
Management unit 06 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	6.50	7.25	37.54	31.35	25.73
Rock	1.25	1.50	2.04	1.21	2.53
Pavement	2.25	4.50	6.47	6.97	10.48
Litter	61.00	46.50	37.07	31.57	22.95
Cryptogams	.75	7.75	6.51	16.85	11.54
Bare Ground	28.25	32.50	23.30	27.64	40.34

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 04, Echo Reservoir

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.3	75.6 (12.1)	7.9	44.7	24.0	31.3	2.1	4.3	38.4	0.5



PELLET GROUP DATA --
Management unit 06 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	19	35
Elk	5	2	16
Deer	31	36	43
Cattle	1	3	-

Days use per acre (ha)	
'01	'06
-	-
8 (20)	19 (48)
63 (155)	46 (112)
-	-

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**866**	-	66	400	400	-	8	92	46	-	0	42/14
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata vaseyana												
84	**66**	-	-	-	66	-	50	50	100	-	50	-/-
90	**33**	-	-	-	33	-	100	0	100	61	100	-/-
96	**0**	-	-	-	-	260	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	20	0	0	0	-	0	-/-
Chrysothamnus nauseosus albicaulis												
84	**33**	-	-	33	-	-	0	100	0	-	0	19/18
90	**33**	-	-	-	33	-	0	100	100	-	100	-/-
96	**40**	-	-	-	40	-	0	50	100	50	50	27/40
01	**20**	-	-	-	20	-	0	0	100	-	0	21/20
06	**20**	-	-	-	20	-	0	0	100	100	100	26/27
Chrysothamnus viscidiflorus viscidiflorus												
84	**5132**	-	66	2066	3000	-	14	0	58	-	0	12/18
90	**2332**	-	66	1733	533	-	9	11	23	2	69	10/14
96	**1940**	20	560	1340	40	-	1	0	2	-	0	8/14
01	**1200**	-	100	840	260	-	2	0	22	3	3	6/10
06	**580**	-	180	360	40	-	14	0	7	3	3	7/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**1432**	-	66	1333	33	-	0	0	2	-	0	13/14
90	**2366**	566	1200	1033	133	-	0	0	6	.84	10	8/7
96	**1900**	700	580	1280	40	-	0	0	2	2	2	8/10
01	**2380**	-	40	2140	200	-	0	0	8	3	4	6/8
06	**280**	-	100	140	40	-	0	0	14	14	14	6/7
Juniperus osteosperma												
84	**66**	-	33	33	-	-	0	50	-	-	50	69/47
90	**33**	33	33	-	-	-	100	0	-	-	0	-/-
96	**60**	-	-	60	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	50	0	-	-	0	-/-
06	**20**	20	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**999**	-	366	633	-	-	0	0	0	-	0	6/16
90	**1199**	-	333	833	33	-	0	0	3	-	22	4/16
96	**1300**	40	260	980	60	120	0	0	5	3	6	5/18
01	**1680**	40	120	1520	40	120	1	0	2	1	2	5/10
06	**1800**	40	120	1260	420	-	0	1	23	6	7	5/13
Pinus edulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**1266**	-	333	800	133	-	32	0	11	-	0	27/25
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Tetradymia canescens												
84	**66**	-	-	-	66	-	100	0	100	-	0	-/-
90	**66**	-	-	-	66	-	100	0	100	-	50	-/-
96	**40**	-	-	40	-	-	0	0	0	-	0	8/16
01	**100**	-	-	20	80	-	20	0	80	-	0	12/24
06	**40**	-	-	40	-	-	50	0	0	-	0	8/14

Trend Study 6-5-06

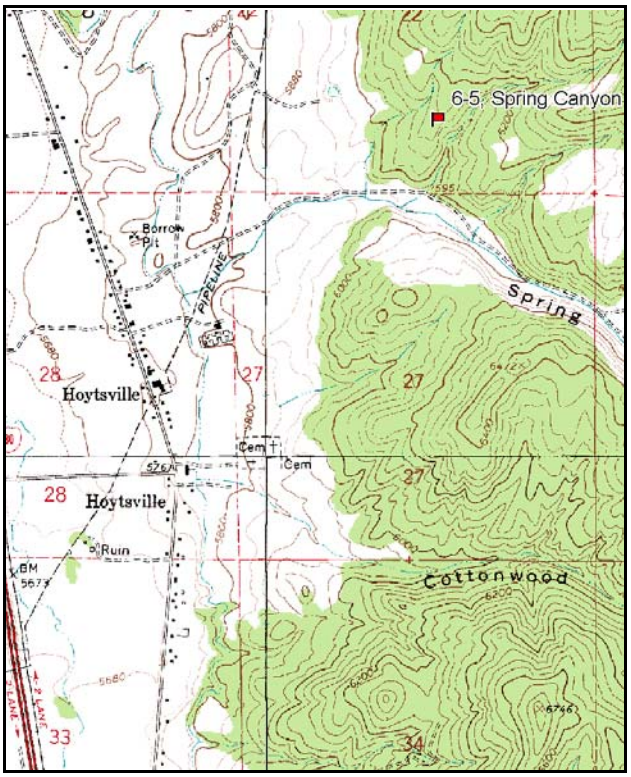
Study site name: Spring Canyon . Vegetation type: Juniper .

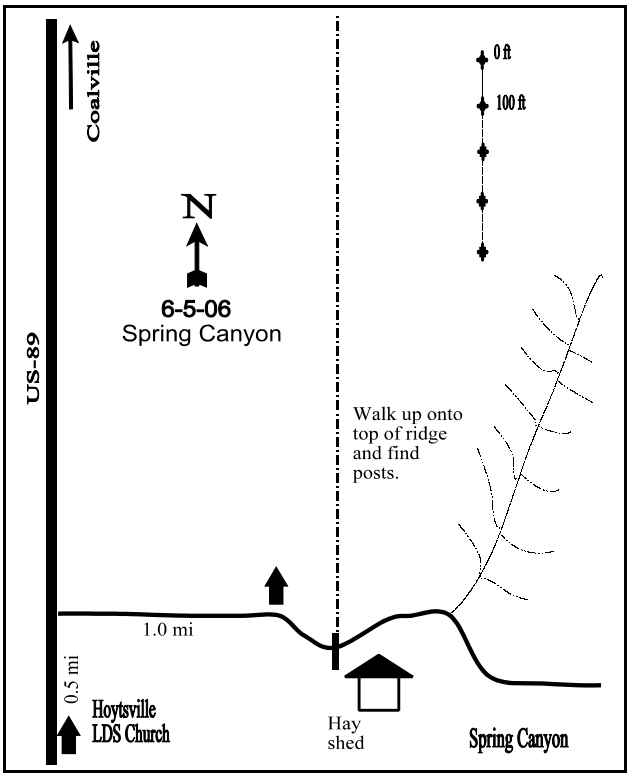
Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the LDS Church in Hoytsville, travel north 0.5 miles on old U.S. 189. At 0.5 miles note a dirt road to the right with a sign "Echo-Chalk Creek Range Owners Protective Association" and turn right (east). Proceed 1.0 miles to a gate and a sharp bend to the right (south). The site is on the ridge on the left side of the gate as you enter the property. Walk to the north side of the road to a north/south running fence. From here walk north along the fence to the 40th metal fence post. From post #40 walk 35 paces at 73 degrees true to the 400-foot baseline stake. The 0-foot stake is marked with browse tag #7953.





Map Name: Turner Hollow

Diagrammatic Sketch

Township 2N , Range 5E , Section 22

UTM NAD 27, UTM 12T 4526183 N 469139 E

DISCUSSION

Spring Canyon - Trend Study No. 6-5

Study Information

This study is located on a juniper covered ridge immediately east of Hoytsville and north of the mouth of Spring Canyon (elevation: 6,120, slope: 15%, aspect: south). The area is critical deer winter range, primarily used by deer for thermal cover, and is dominated by Utah juniper and little else. The juniper type is very uniform and characterized by a moderately dense stand of even-aged trees. Animal use by sheep, deer, and elk has been heavy. Domestic sheep were present in late August of 1984 when the study was established. Deer pellet groups have been high every year sampled. Nine winter-killed deer were observed in the immediate vicinity in 1984. Browsing has been extremely heavy, to the point of browsing wood on the sparse preferred browse species. The pellet group transect in 2001 estimated 58 deer days use/acre (144 ddu/ha) and less than 1 cow day use/acre (2 cdu/ha). A fawn was spotted approaching the study area in 2006. The 2006 pellet group data estimated 88 deer, 3 elk, and 2 cow days use/acre (218 ddu/ha, 8 edu/ha, and 4 cdu/ha). Most deer and elk pellets were from winter and spring; cattle pats were from the previous summer. Numerous game trails traverse the study and head toward the alfalfa fields below.

Soil

The soil is in the Jana-Richsum-Rock outcrop series complex, which consists of shallow to very deep, well drained, moderately permeable soils that formed in slope alluvium, colluvium, and residuum on mountain slopes, valley sides, low mountains, and high tablelands. They were derived from conglomerate, sandstone, and shale (USDA-NRCS 2006). The soils texture is clay loam and soil reaction is neutral (7.3 pH). The soil surface is rocky and the profile is moderately stony. The effective rooting depth was estimated at just over 12 inches in 1996. The erosion hazard is moderately high because of poor understory cover. In 2001, the level of erosion ranged from slight to moderate. Relative bare ground cover has been around 30% since 1996. The erosion condition class rating was moderate in 2006.

Browse

Other than juniper, shrubs and trees are rare. Browse species consists basically of broom snakeweed, prickly pear cactus, and a few snowberry. Utah juniper is the dominant species, which provides little forage and prevents the growth of other species. Nearly all of the juniper trees have received use over the years, evidenced by highlining. Juniper canopy cover was estimated at 37% in 2001 and 45% in 2006. The point quarter juniper density estimates were 189 trees/acre in 2001 and 155 trees/acre in 2006.

Herbaceous Understory

The herbaceous understory is sparse and provides little ground cover and forage. Native perennial grasses are somewhat abundant in the more open areas, but are infrequent where the juniper overstory is dense. Bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, squirreltail, and needle-and-thread have all been sampled. Perennial grasses provided only 5% cover in 2001 and 3% in 2006. Cheatgrass is also present, but provided only 3% cover in 1996 and less than 1% cover in 2001 and 2006. Forbs consist mostly of annual and/or low-growing perennials that provide very little cover or forage. Bur buttercup has increased significantly in nested frequency every year since 1996. Due to the vegetation characteristics, this site is really only useful as thermal cover and as a travel corridor for wildlife.

1990 TREND ASSESSMENT

This juniper range type is representative of a majority of winter range in the area above Hoytsville. There is very little browse forage available. The steeper slopes and west exposures support a variety of browse species, but all occur in low densities, are heavily hedged, and mostly decadent. All juniper trees are highlined. Notably, bluebunch wheatgrass decreased in nested frequency while Indian ricegrass frequency was almost unchanged. These plants show evidence of recent grazing.

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

1996 TREND ASSESSMENT
The browse trend remains stable, with no preferred browse sampled. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The forb trend is stable. The nested frequency of perennial forbs changed little. The Desirable Components Index score is very poor due to no preferred browse cover, low perennial grass cover, and low perennial forb cover.

winter range condition (DC Index) - very poor (6) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT
Trend for browse remains stable. As in previous readings, palatable, preferred browse forage is nearly nonexistent. The grass trend is stable. The nested frequency of perennial grasses is unchanged. Cheatgrass nested frequency decreased significantly. The forb trend is stable. The nested frequency of perennial forbs did not change. The DCI score remained very poor.

winter range condition (DC Index) - very poor (12) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2006 TREND ASSESSMENT
The browse trend is stable, with no preferred browse species sampled. The grass trend is slightly up. The nested frequency of perennial grasses is unchanged, but the nested frequency of cheatgrass decreased significantly again in 2006. Unfortunately, the nested frequency of needle-and-thread decreased significantly. The forb trend is stable. The nested frequency of perennial forbs is unchanged. The DCI score remained very poor.

winter range condition (DC Index) - very poor (10) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	$_{b}$59	$_{a}$32	$_{ab}$44	$_{ab}$53	$_{b}$60	.59	1.43	.96
G	Bromus tectorum (a)	-	-	$_{c}$129	$_{b}$103	$_{a}$75	2.82	.42	.63
G	Oryzopsis hymenoides	68	66	78	85	91	1.08	1.62	1.40
G	Poa bulbosa	-	-	-	-	3	-	-	.00
G	Poa pratensis	3	-	-	-	-	-	-	-
G	Poa secunda	$_{a}$13	$_{c}$56	$_{abc}$47	$_{bc}$54	$_{ab}$38	.48	.96	.51
G	Sitanion hystrix	$_{a}$1	$_{c}$34	$_{bc}$22	$_{abc}$23	$_{ab}$18	.28	.51	.40
G	Stipa comata	$_{bc}$13	$_{c}$27	$_{bc}$29	$_{b}$9	$_{a}$-	.30	.34	-
Total for Annual Grasses		0	0	129	103	75	2.82	0.42	0.62
Total for Perennial Grasses		157	215	220	224	210	2.75	4.86	3.28
Total for Grasses		157	215	349	327	285	5.58	5.28	3.92

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Agoseris glauca	-	-	-	-	2	-	-	.00
F	Alyssum alyssoides (a)	-	-	239	262	253	1.10	1.05	.74
F	Antennaria rosea	$_{a}$-	$_{ab}$6	$_{ab}$1	$_{ab}$7	$_{b}$10	.00	.04	.02
F	Arabis sp.	-	3	5	-	-	.01	-	-
F	Astragalus convallarius	4	-	-	-	2	-	-	.00
F	Astragalus utahensis	1	-	2	1	-	.03	.03	-
F	Camelina microcarpa (a)	-	-	5	2	4	.01	.00	.03
F	Chaenactis douglasii	2	-	-	-	-	-	-	-
F	Cirsium undulatum	2	-	1	-	-	.03	-	-
F	Collinsia parviflora (a)	-	-	2	3	-	.01	.00	-
F	Cryptantha sp.	30	13	21	16	20	.25	.45	.39
F	Cymopterus longipes	-	2	5	3	2	.02	.01	.03
F	Descurainia pinnata (a)	-	-	-	2	-	-	.00	-
F	Eriogonum umbellatum	7	2	-	-	-	-	-	-
F	Hackelia patens	$_{a}$-	$_{b}$11	$_{ab}$7	$_{ab}$6	$_{ab}$4	.04	.04	.21
F	Hedysarum boreale	$_{b}$8	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Holosteum umbellatum (a)	-	-	-	-	3	-	-	.00
F	Machaeranthera grindelioides	-	-	2	1	1	.01	.00	.00
F	Microsteris gracilis (a)	-	-	-	12	8	-	.05	.01
F	Penstemon humilis	1	5	3	5	1	.03	.01	.00
F	Penstemon sp.	$_{b}$17	$_{a}$-	$_{a}$3	$_{a}$1	$_{a}$-	.03	.00	-
F	Phlox austromontana	27	20	39	37	27	.66	.82	1.08
F	Phlox longifolia	-	-	5	11	6	.01	.02	.01
F	Ranunculus testiculatus (a)	-	-	$_{a}$86	$_{b}$166	$_{c}$228	.27	.97	1.77
F	Senecio multilobatus	-	-	2	-	-	.00	-	-
F	Sisymbrium altissimum (a)	-	-	1	-	-	.00	-	-
Total for Annual Forbs		0	0	333	447	496	1.39	2.09	2.56
Total for Perennial Forbs		99	62	96	88	75	1.16	1.43	1.78
Total for Forbs		99	62	429	535	571	2.56	3.53	4.35

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

BROWSE TRENDS --
Management unit 06 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	0	1	0	-	-	-
B	Gutierrezia sarothrae	6	7	0	.20	.03	-
B	Juniperus osteosperma	12	12	13	16.73	8.39	7.87
B	Opuntia sp.	8	11	14	.22	.05	.45
B	Symphoricarpos oreophilus	1	0	0	-	-	-
Total for Browse		27	31	27	17.15	8.47	8.32

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 5

Species	Percent Cover	
	'01	'06
Juniperus osteosperma	36.79	44.86
Opuntia sp.	-	.23

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 5

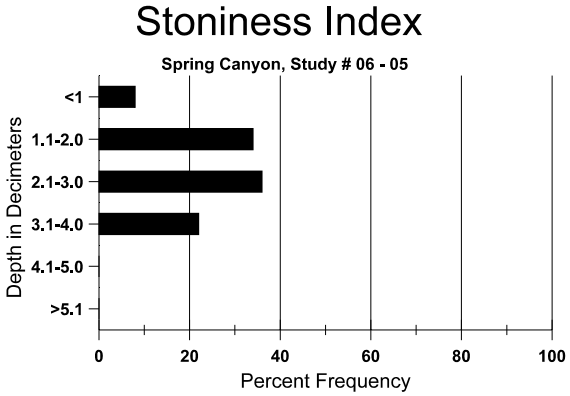
Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	189	155	20.2	9.9

BASIC COVER --
Management unit 06 , Study no: 5

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	.50	1.00	25.55	18.48	16.60
Rock	1.75	6.25	2.94	2.79	2.20
Pavement	9.25	12.50	3.84	5.47	7.21
Litter	56.25	48.50	40.31	40.42	45.65
Cryptogams	2.75	5.25	3.52	14.18	9.54
Bare Ground	29.50	26.50	28.08	31.93	36.15

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 05, Spring Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.1	70.2 (11.9)	7.3	32.6	30.7	36.7	2.9	3.8	38.4	0.6



PELLET GROUP DATA --
Management unit 06 , Study no: 5

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	2	-	-
Rabbit	12	37	51
Elk	1	1	2
Deer	44	22	23
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
-	-
-	3 (8)
58 (144)	88 (218)
1 (2)	2 (4)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**33**	-	33	-	-	-	100	0	-	-	100	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	62/56

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	20	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
84	**66**	-	33	-	33	-	50	0	50	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	6/11
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**240**	20	40	200	-	-	0	0	0	-	0	7/8
01	**400**	-	300	80	20	60	0	0	5	5	5	5/4
06	**0**	-	-	-	-	-	0	0	0	-	0	6/6
Juniperus osteosperma												
84	**366**	-	66	300	-	-	36	36	0	-	0	67/157
90	**299**	-	33	266	-	-	0	33	0	-	0	186/153
96	**260**	-	40	220	-	20	0	0	0	-	0	-/-
01	**280**	20	20	220	40	-	0	0	14	14	14	-/-
06	**520**	20	20	480	20	40	0	31	4	-	0	-/-
Opuntia sp.												
84	**66**	-	33	33	-	-	0	0	0	-	0	7/14
90	**165**	-	66	66	33	-	0	0	20	-	20	5/10
96	**280**	-	20	160	100	40	0	0	36	-	29	5/12
01	**260**	20	60	180	20	-	0	0	8	-	0	4/10
06	**380**	-	80	260	40	20	0	0	11	11	11	5/17
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	0	-	-	0	7/12
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 6-6-06

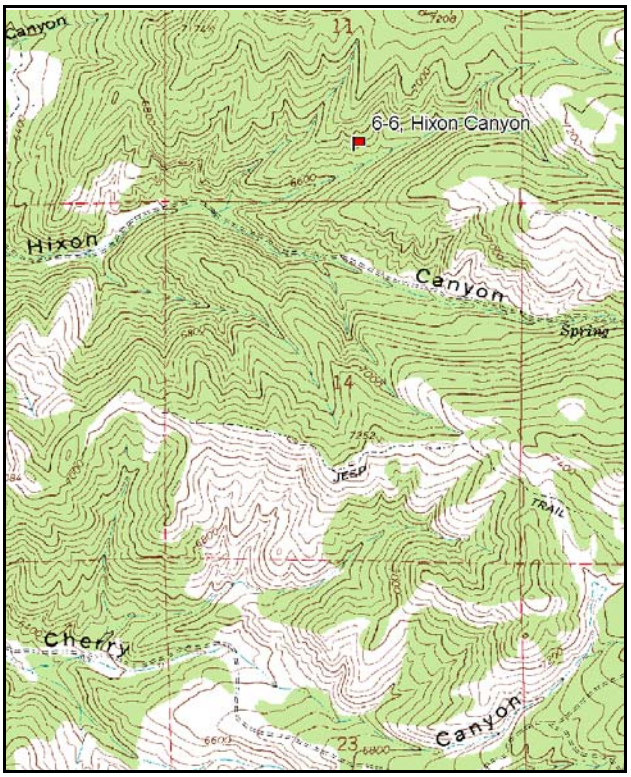
Study site name: Hixon Canyon . Vegetation type: True Mountain Mahogany .

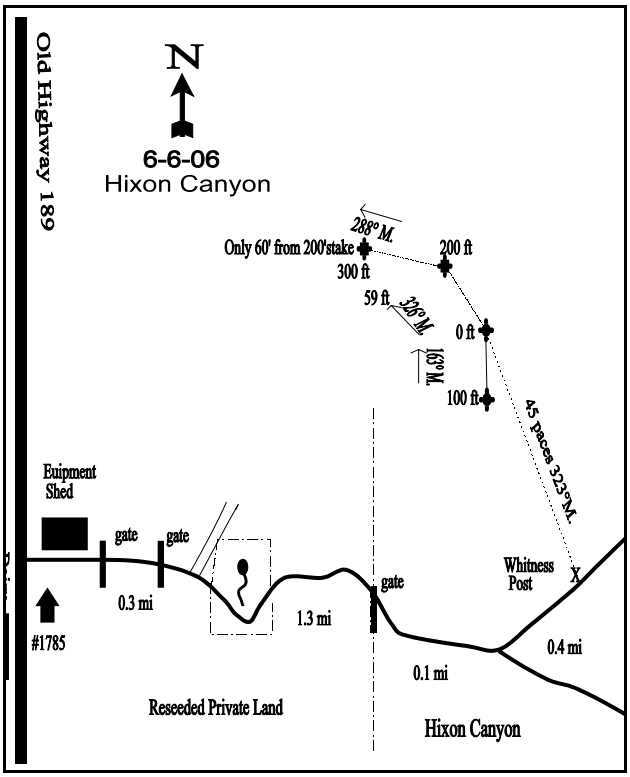
Compass bearing: frequency baseline 146 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 76ft), line 3 (59ft).

LOCATION DESCRIPTION

From 1875 Old Highway 189, travel east up Hixon Canyon on a dirt road through a gate and proceed 0.3 miles to another gate. Turn right and proceed 1.3 miles to a fence with a gate. Continue 0.1 miles and turn left at the fork. This road is only shown as an intermittent stream on 1967 quad map. Proceed 0.40 miles to a white topped green steel fence post stake in a rockpile. From the rockpile, walk 45 paces at 323 degrees magnetic to the 0-foot stake of the baseline marked by browse tab #7966. The baseline runs 146 degrees. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 326 degrees magnetic. Line 3 runs 288 degrees magnetic.





Map Name: Crandall Canyon

Diagrammatic Sketch

Township 1N , Range 5E , Section 11

UTM NAD 27, UTM 12T 4519983 N 470604 E

DISCUSSION

Hixon Canyon - Trend Study No. 6-6

Study Information

This study was established in 1984 in the upper reaches of Hixon Canyon (elevation: 6,700 feet, slope: 30-40%, aspect: south). It samples a mixed mountain brush type on moderately steep terrain in critical deer winter range. Access to the study through private land was not obtained in 2001, so it was not sampled. Pellet group frequency for deer in 1996 indicated moderate use; elk pellet groups indicated light use. Domestic sheep and cattle also utilize the area. The 2006 pellet group transect data estimates were 7 elk, 3 deer, and 1 cow days use/acre (18 edu/ha, 7 ddu/ha, and 2 cdu/ha). Most pellets were sampled on the ridge.

Soil

The soil is in the Heiners-Fewkes-Hades series complex, which consists of shallow to very deep, well drained moderately slowly permeable soils that formed in slope residuum, colluvium, till, and alluvium derived from quartzite, sandstone, conglomerate, and shale. They are found on mountain slopes, hills, structural benches, and fan remnants (USDA-NRCS 2006). It is red in color and appears to be highly erodible. Most surface rock and herbaceous plants are pedestalled. The soil texture is a sandy clay loam with a soil reaction that is moderately alkaline (7.9 pH). The effective rooting depth is 12 inches. Relative bare ground cover was 39% in 1984, 31% in 1990, only 16% in 1996, and 35% in 2006. Consequently, the erosion condition class was critical in 2006. This was due to the steep slope, heavy surface rock movement, flow patterns covering 10-25% of the surface area, rills 1.5 to 3 inches deep, gullies with 10-50% of the channel bed actively eroding, and soil deposits around obstacles 0.2-0.4 inches deep.

Browse

This area, like many mountain brush types, has a plant composition that is quite variable between the microsites sampled. On much of the area, the preferred browse species (true mountain mahogany and mountain big sagebrush) and juniper are the dominant species of the community. True mountain mahogany provided 3% cover in 1996 and 4% in 2006. Mahogany density has been around 300 plants/acre since 1996, with around 20% of the population classified as decadent. Mountain big sagebrush provided less than 1% cover in 1996 and 2% in 2006. Sagebrush density has been around 250 plants/acre since 1996, with 62% of population classified as decadent in 1996 and 42% in 2006. Both of the preferred key browse species, as well as the less abundant Saskatoon serviceberry and mountain snowberry, have sustained heavy use.

Juniper line intercept cover was 23% in 2006. The juniper tree density was 78 trees/acre in 1990. The juniper point-centered-quarter density estimate was 80 trees/acre with an average diameter of 15 inches in 2006.

Herbaceous Understory

The herbaceous understory contributes little quality forage. Plant distribution is random and greatly effected by soil erosion. Many of the shrub interspaces are bare soil and rock. The most numerous perennial species are Sandberg bluegrass, bluebunch wheatgrass, and Indian ricegrass, which are important forage species. All showed past evidence of utilization. The forb component is dominated by annuals with a moderate diversity of perennials.

1990 TREND ASSESSMENT

The key browse species are highly decadent and heavily used. There is some mountain mahogany recruitment with the young age class, accounting for 13% of the population. The low density sagebrush population has an average cover of only 2%. Undesirable woody species make up the vast majority of the browse composition. Broom snakeweed density has increased by 31%. Juniper has an estimated density of 78 trees/acre. Indian ricegrass shows an increase in nested frequency with moderate utilization.

browse - down (-2) grass - up (+2) forb - slightly up (+1)

1996 TREND ASSESSMENT

Decadence for sagebrush is high at 62%. Mahogany is showing some improvement with only about 20% decadence, but mahogany density is down to 300 plants/acre. The only real positive aspect is that the population of broom snakeweed has decreased by 97%. The decrease in mahogany and snakeweed are likely a product of the increased sample size in 1996, which better estimates patchy distributions of plants. The grass trend is stable. The nested frequency of perennial grasses decreased slightly, but this is likely a cause of an increased sampled area. The forb trend is slightly down. The nested frequency of perennial forbs decreased, some of which was caused by the change in sample area. The Desirable Components Index score is very poor due to the low browse cover.

winter range condition (DC Index) - very poor (11) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2006 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush and mahogany changed little. Sagebrush decadence improved, but continues to be high. The grass trend is up. The nested frequency of perennial grasses, excluding bulbous bluegrass, increased 35%. The nested frequency of Sandberg bluegrass increased significantly and that of cheatgrass decreased significantly. The forb trend is stable. The nested frequency of perennial forbs is unchanged. The DCI score remained very poor.

winter range condition (DC Index) - very poor (32) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 6

Type	Species	Nested Frequency				Average Cover %	
		'84	'90	'96	'06	'96	'06
G	Agropyron dasystachyum	-	-	3	-	.03	-
G	Agropyron spicatum	$_{ab}$29	$_{a}$27	$_{c}$64	$_{bc}$50	1.64	2.49
G	Bromus tectorum (a)	-	-	$_{b}$269	$_{a}$155	6.09	2.27
G	Elymus cinereus	-	-	6	7	.53	1.25
G	Oryzopsis hymenoides	$_{bc}$86	$_{c}$116	$_{a}$29	$_{ab}$63	1.04	4.21
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{a}$3	$_{b}$16	.00	.25
G	Poa fendleriana	-	-	1	2	.15	.15
G	Poa pratensis	-	-	-	1	-	.03
G	Poa secunda	$_{a}$18	$_{b}$58	$_{b}$69	$_{c}$109	1.97	3.03
Total for Annual Grasses		0	0	269	155	6.09	2.27
Total for Perennial Grasses		133	201	175	248	5.38	11.43
Total for Grasses		133	201	444	403	11.48	13.71

Type	Species	Nested Frequency				Average Cover %	
		'84	'90	'96	'06	'96	'06
F	Alyssum alyssoides (a)	-	-	$_{b}$252	$_{a}$83	2.32	.18
F	Arabis sp.	-	-	-	1	-	.00
F	Artemisia ludoviciana	$_{c}$21	$_{bc}$17	$_{a}$-	$_{ab}$1	.03	.00
F	Camelina microcarpa (a)	-	-	1	-	.00	-
F	Calochortus nuttallii	-	5	-	-	-	-
F	Chenopodium album (a)	-	-	1	-	.00	-
F	Chaenactis douglasii	$_{a}$9	$_{b}$53	$_{a}$3	$_{a}$9	.01	.05
F	Cirsium undulatum	$_{ab}$9	$_{b}$17	$_{a}$5	$_{ab}$3	.04	.01
F	Comandra pallida	$_{ab}$6	$_{a}$1	$_{b}$11	$_{ab}$5	.07	.06
F	Collinsia parviflora (a)	-	-	-	6	-	.02
F	Cryptantha sp.	6	16	8	2	.02	.15
F	Cynoglossum officinale	1	-	-	-	-	-
F	Erigeron pumilus	-	-	8	5	.01	.03
F	Eriogonum racemosum	-	-	-	1	-	.03
F	Hackelia patens	6	12	11	3	.02	.15
F	Hedysarum boreale	-	-	-	1	-	.15
F	Holosteum umbellatum (a)	-	-	1	6	.00	.01
F	Lesquerella sp.	-	-	-	6	-	.03
F	Lomatium sp.	-	-	-	2	-	.03
F	Machaeranthera canescens	1	2	-	-	-	-
F	Microsteris gracilis (a)	-	-	-	3	-	.00
F	Oenothera caespitosa	$_{ab}$8	$_{b}$13	$_{a}$-	$_{a}$-	-	-
F	Phlox austromontana	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$7	.00	.44
F	Phlox longifolia	-	2	-	2	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{a}$13	$_{b}$35	.02	.07
F	Tragopogon dubius	2	1	-	-	-	-
F	Veronica biloba (a)	-	-	-	4	-	.01
Total for Annual Forbs		0	0	268	137	2.35	0.31
Total for Perennial Forbs		69	139	48	48	0.22	1.16
Total for Forbs		69	139	316	185	2.57	1.47

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

BROWSE TRENDS --
Management unit 06 , Study no: 6

Type	Species	Strip Frequency '96	Strip Frequency '06	Average Cover % '96	Average Cover % '06
B	Amelanchier alnifolia	2	1	.03	-
B	Artemisia tridentata vaseyana	10	11	.25	1.67
B	Cercocarpus montanus	15	13	2.93	3.74
B	Chrysothamnus viscidiflorus viscidiflorus	3	2	.03	.15
B	Gutierrezia sarothrae	11	8	.32	.18
B	Juniperus osteosperma	8	3	7.08	11.42
B	Opuntia sp.	19	23	.16	.89
B	Quercus gambelii	2	1	1.63	1.00
B	Symphoricarpos oreophilus	1	3	.18	.00
Total for Browse		71	65	12.62	19.08

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 6

Species	Percent Cover '06
Artemisia tridentata vaseyana	1.11
Cercocarpus montanus	3.16
Juniperus osteosperma	23.43
Opuntia sp.	.76
Quercus gambelii	1.11
Symphoricarpos oreophilus	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 6

Species	Average leader growth (in) '06
Artemisia tridentata vaseyana	1.7
Cercocarpus montanus	3.1

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 6

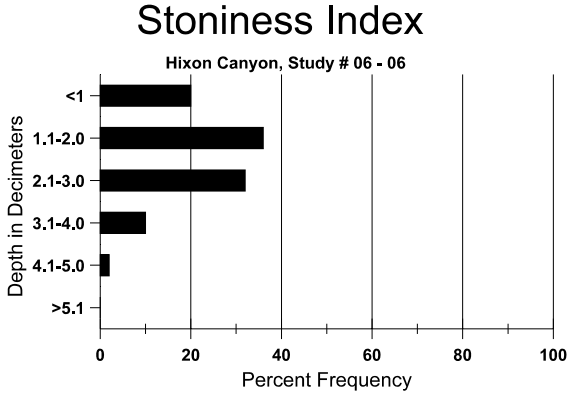
Species	Trees per Acre '06	Average diameter (in) '06
Juniperus osteosperma	80	15

BASIC COVER --
Management unit 06 , Study no: 6

Cover Type	Average Cover % '84	'90	'96	'06
Vegetation	2.75	7.00	28.37	32.02
Rock	21.00	23.00	15.63	15.44
Pavement	4.00	18.25	10.17	8.48
Litter	33.25	20.50	39.14	22.73
Cryptogams	0	0	.09	1.28
Bare Ground	39.00	31.25	17.65	43.99

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 06, Hixon Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.3	66.3 (12.4)	7.9	46.9	25.1	28.0	1.7	9.7	19.2	0.5



PELLET GROUP DATA --
Management unit 06 , Study no: 6

Type	Quadrat Frequency '96	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	18	8	-
Elk	3	3	7 (18)
Deer	17	-	3 (7)
Cattle	1	-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**99**	-	-	66	33	-	0	100	33	-	0	30/30
90	**66**	-	-	66	-	-	0	100	0	-	0	39/31
96	**40**	-	-	20	20	-	50	0	50	-	0	24/24
06	**20**	-	-	20	-	-	0	100	0	-	0	23/31
Artemisia tridentata vaseyana												
84	**766**	-	-	233	533	-	9	91	70	5	9	21/28
90	**166**	33	33	33	100	-	20	20	60	24	40	14/43
96	**260**	-	-	100	160	320	54	8	62	15	15	18/32
06	**240**	-	-	140	100	220	0	0	42	25	25	19/34
Cercocarpus montanus												
84	**499**	-	33	-	466	-	0	93	93	-	0	-/-
90	**498**	-	66	66	366	-	7	93	73	20	60	22/31
96	**300**	-	60	180	60	120	20	73	20	7	7	23/34
06	**260**	80	20	180	60	20	0	100	23	-	0	28/43
Chrysothamnus viscidiflorus viscidiflorus												
84	**299**	-	-	233	66	-	0	56	22	-	0	20/18
90	**366**	-	-	333	33	-	0	0	9	-	45	19/27
96	**60**	-	-	60	-	-	0	0	0	-	0	11/19
06	**40**	20	-	-	40	-	0	0	100	50	50	18/30
Gutierrezia sarothrae												
84	**15333**	-	3233	12100	-	-	0	0	0	-	0	9/9
90	**22332**	366	14833	7233	266	-	.14	0	1	.35	.74	9/10
96	**740**	-	280	460	-	-	0	0	0	-	0	7/13
06	**260**	-	-	220	40	-	0	0	15	15	15	10/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
84	**133**	-	-	133	-	-	0	0	-	-	0	60/48
90	**100**	-	-	100	-	-	0	0	-	-	0	71/56
96	**160**	-	-	160	-	20	0	25	-	-	0	-/-
06	**60**	20	-	60	-	-	0	0	-	-	0	-/-
Mahonia repens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	2/4
Opuntia sp.												
84	**633**	-	133	500	-	-	0	0	0	-	0	6/7
90	**499**	33	233	233	33	-	0	0	7	-	13	4/8
96	**560**	-	20	540	-	60	4	0	0	-	11	6/16
06	**800**	-	40	640	120	-	0	0	15	5	5	4/13
Quercus gambelii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**140**	-	-	140	-	-	0	0	-	-	0	-/-
06	**140**	-	-	140	-	-	0	0	-	-	0	42/28
Symphoricarpos oreophilus												
84	**66**	-	-	33	33	-	50	50	50	-	0	19/17
90	**266**	-	-	233	33	-	0	0	12	-	100	23/24
96	**20**	20	20	-	-	-	0	0	0	-	0	17/37
06	**60**	-	20	20	20	-	0	0	33	-	0	22/33

Trend Study 6-7-06

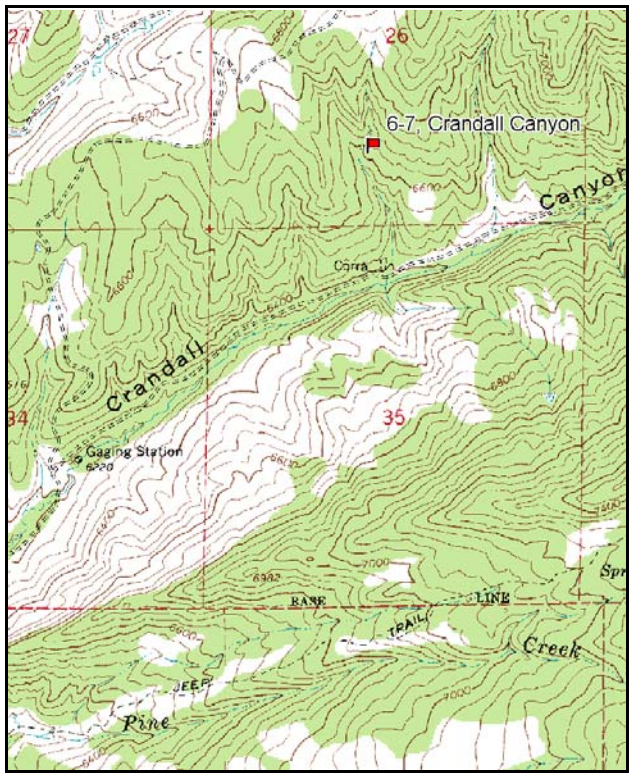
Study site name: Crandall Canyon . Vegetation type: Mountain Brush .

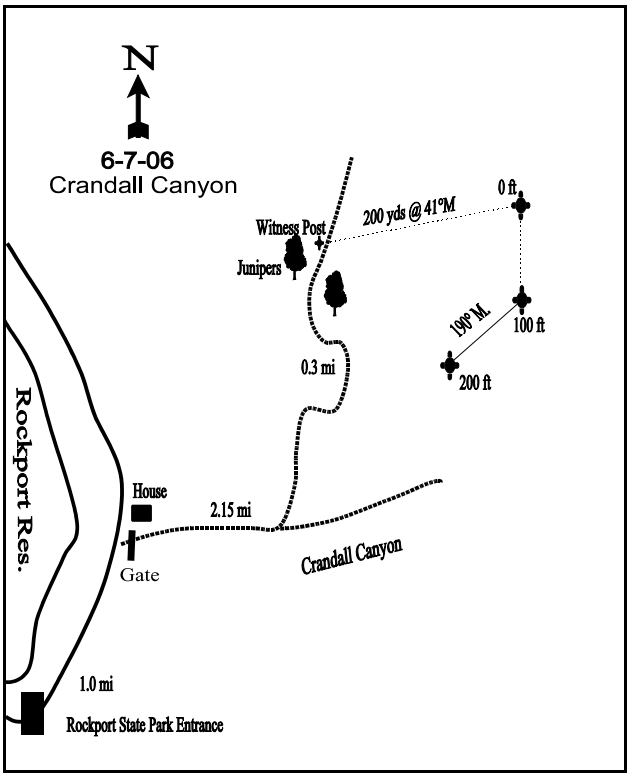
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: Line 1 (11, 31, & 71ft), line 2 (59 & 95ft).

LOCATION DESCRIPTION

From the guard house at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up though the gate and up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.3 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left hand side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7956. The 200-foot baseline doglegs and runs 190 degrees magnetic.





Map Name: Crandall Canyon

Diagrammatic Sketch

Township 1N , Range 5E , Section 26

UTM NAD 27, UTM 12T 4514925 N 470499 E

DISCUSSION

Crandall Canyon - Trend Study No. 6-7

Study Information

This study is located on critical deer and elk winter range east of Rockport Lake (elevation: 6,600 feet, slope: 28%, aspect: southwest). The plant community is best described as mixed mountain brush with patches of mountain big sagebrush-grass and Gambel oak. The result is a mosaic vegetation pattern that provides excellent big game habitat. Crandall Canyon is privately owned and is grazed by sheep and cattle. Big game use is heavy and animals are usually seen here at all times of the year. All types of vegetation have been impacted by grazing or browsing since the establishment of this study. The pellet group transect in 2001 estimated 50 deer days use/acre (122 ddu/ha), 2 elk days use/acre (5 edu/ha), and 7 cow days use/acre (16 cdu/ha). The 2006 pellet group data estimates were only 15 deer and 1 elk days use/acre (36 ddu/ha and 3 edu/ha).

Soil

The soil is in the Yeates Hollow-Henefer series complex, which consists of deep to very deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium, and residuum from conglomerate, sandstone, and quartzite. They are found on fan remnants, hills, mountain toeslopes, and mountain slopes (USDA-NRCS 2006). The soil texture is classified as sandy clay loam and the soil reaction is moderately alkaline (8.0 pH). Phosphorus is low at 5.1 ppm; values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). The soil profile is moderately rocky throughout. Some erosion is apparent with pedestalling around some of the plants. The relative bare ground cover was 27% in 1996, 36% in 2001, and 38% in 2006. The erosion condition class assessment estimated slight soil erosion in 2001 and moderate erosion in 2006. Gullies are evident, but many of them show signs of healing. Most of the area has been utilized heavily enough to adversely effect plant and litter cover, especially when associated with periods of drought. Sheet and gully erosion have been high in the past, but appear to have been stabilizing in recent years.

Browse

The majority of the vegetation is composed of a diverse mixture of mountain brush species. Twelve species have been sampled. The abundant species are true mountain mahogany, mountain snowberry, Gambel oak, serviceberry, mountain big sagebrush, and bitterbrush. The estimated density of two species, serviceberry and mountain big sagebrush, decreased substantially after the 1990 sampling. Both of these species have discontinuous, clumped distributions, and much of the change in density is due to the larger sample size implemented during 1996 reading. Sagebrush density has decreased from 340 plants/acre in 1996 to 200 plants/acre in 2006 and serviceberry has decreased from 580 plants/acre in 1996 to 320 plants/acre in 2006. In 1990, percent decadence and poor vigor were high in the populations of serviceberry, mountain big sagebrush, mountain mahogany, and snowberry. Beginning in 1996, percent decadence and vigor have shown considerable improvement for all of these species. The key browse species receive moderate to heavy use and have stable populations. In 2001 and 2006, the highest use was observed on mountain mahogany, but mahogany densities have remained relatively stable. Mahogany densities have remained between 1,060 and 1,200 plants/acre since 1996. Consistent heavy browsing on mahogany has resulted in a population of short-statured plants. Pocket gopher and badger diggings around plants were noted in the past. A moderate rust infestation on serviceberry plants has also been sampled in past readings, which does not usually kill plants, but can effect vigor.

Juniper has been invading the study area. Juniper line intercept cover has increased from 7% in 2001 to 13% in 2006. Juniper density estimated from the point-centered-quarter method was 40 trees/acre in 2006.

Herbaceous Understory

The herbaceous understory is quite sparse for a mountain brush community. Forbs are insignificant and only

provided 2-3% average cover from 1996 to 2006. Grasses have contributed an average of 11% cover in 1996 and 2001, and 17% cover in 2006. Thickspike wheatgrass, bluebunch wheatgrass, and Indian ricegrass are the most abundant perennial grasses. Two annuals, cheatgrass and Japanese brome, are present, but not abundant. Both of these annual bromes have remained at low nested frequencies since 1996.

1990 TREND ASSESSMENT

The mixed mountain brush community on this privately-owned winter range still provides good big game habitat, although conditions have deteriorated for some species. Photo-point comparisons depict a loss of sagebrush cover and production. Sagebrush density is slightly higher, however. Sagebrush canopy cover averages only 5%. True mountain mahogany density decreased and a loss of mature plants occurred, resulting in 88% decadence. Vigor is poor on these heavily hedged shrubs. Oakbrush, low rabbitbrush, and snakeweed increased in several, but not all measured parameters. Thickspike wheatgrass nested frequency increased significantly. The nested frequency of Indian ricegrass is unchanged, while that of bluebunch wheatgrass was significantly lower. Forbs are relatively insignificant.

browse - stable (0) grass - stable (0) forb - stable (0)

1996 TREND ASSESSMENT

Since the drought from 1987 to 1990, there have been some signs of recovery. The browse trend is stable. Browse densities for sagebrush and serviceberry have decreased because of the change in sample size and location in 1996. Mountain mahogany density remained unchanged. Decadence and the percentage of plants classified as dying has decreased for all key browse species. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The forb trend is stable. The nested frequency of perennial forbs increased, but some of the increase is due to a change in sample area and none of the species increases are beneficial to big game. The Desirable Components Index score is fair due to low preferred browse cover, low browse decadence, good perennial grass cover, and moderate perennial forb cover.

winter range condition (DC Index) - fair (60) High potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

Trend for browse is stable. The preferrred species remained at stable densities. Percent decadence increased in mountain big sagebrush and mountain mahogany, but current levels are within acceptable limits for these species. Use remains moderate to heavy on true mountain mahogany, serviceberry, and mountain big sagebrush. Recruitment from young plants is low for big sagebrush and mahogany, but moderately high for serviceberry. The grass trend is slightly down. The nested frequency of perennial grasses decreased 16%, but the nested frequencies of individuals species did not change. The forb trend is stable. The nested frequency of perennial forbs is unchanged and forb composition did not change. The DCI score declined to poor due to decreases in browse cover and percent young and an increase in decadence.

winter range condition (DC Index) - poor (51) High potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is slightly down. The densities of serviceberry, sagebrush, and mahogany all decreased slightly. Mahogany cover decreased slightly and the strip frequency of serviceberry and sagebrush decreased. Juniper line intercept cover nearly doubled. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The nested frequency of thickspike wheatgrass increased significantly and the nested frequency of bluebunch wheatgrass decreased significantly. The forb trend is stable. The nested frequency of perennial forbs decreased, but forb composition remained poor for big game forage. The DCI score returned to fair due to a decrease in decadence and an increase in perennial grass cover.

winter range condition (DC Index) - fair (60) High potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a26	c268	b126	b100	c219	3.48	2.92	9.85
G	Agropyron spicatum	b244	a21	b147	b133	a44	4.57	5.35	2.71
G	Bromus japonicus (a)	-	-	a-	ab10	b19	-	.04	.09
G	Bromus tectorum (a)	-	-	b57	b40	a20	.22	.15	.05
G	Carex sp.	b19	ab12	ab8	ab6	a1	.16	.08	.03
G	Elymus cinereus	-	-	-	1	-	-	.03	-
G	Oryzopsis hymenoides	53	53	72	49	55	1.62	1.81	3.05
G	Poa pratensis	-	-	1	5	3	.00	.06	.03
G	Poa secunda	4	6	20	13	17	.18	.03	.09
G	Sitanion hystrix	-	3	4	3	-	.00	.03	-
G	Stipa comata	a1	ab10	ab8	b15	b12	.45	.64	1.08
Total for Annual Grasses		0	0	57	50	39	0.21	0.20	0.14
Total for Perennial Grasses		347	373	386	325	351	10.48	10.97	16.87
Total for Grasses		347	373	443	375	390	10.70	11.17	17.01
F	Achillea millefolium	-	-	4	1	-	.03	.03	-
F	Agoseris glauca	-	-	-	-	3	-	-	.00
F	Alyssum alyssoides (a)	-	-	b215	ab182	a177	1.00	.84	.43
F	Arabis sp.	-	-	-	1	-	-	.00	-
F	Aster chilensis	a-	a-	b32	b36	b14	.52	.48	.11
F	Astragalus convallarius	-	-	-	-	1	-	-	.03
F	Astragalus sp.	-	3	-	-	-	-	-	-
F	Balsamorhiza sagittata	3	3	5	2	-	.06	.03	.03
F	Camelina microcarpa (a)	-	-	a-	a1	b29	-	.00	.06
F	Calochortus nuttallii	-	-	-	5	-	-	.18	-
F	Chaenactis douglasii	4	11	13	5	1	.08	.04	.00
F	Cirsium sp.	-	-	-	-	1	-	-	.03
F	Cirsium undulatum	9	5	22	27	16	.63	.90	.61
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Comandra pallida	28	12	28	25	23	.19	.22	.14
F	Cryptantha sp.	a19	b34	a22	ab30	a12	.27	.50	.37
F	Descurainia pinnata (a)	-	-	1	-	1	.00	-	.00
F	Epilobium brachycarpum (a)	-	-	1	-	1	.00	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Eriogonum umbellatum	-	3	-	-	3	-	-	.03
F	Hackelia patens	$_{c}$32	$_{ab}$10	$_{bc}$21	$_{ab}$8	$_{a}$4	.20	.04	.18
F	Lactuca serriola	-	-	1	-	-	.00	-	-
F	Oenothera caespitosa	-	-	-	1	-	-	.03	-
F	Penstemon humilis	11	6	9	15	10	.09	.18	.07
F	Phlox longifolia	-	-	-	-	1	-	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{b}$14	$_{a}$-	-	.02	-
F	Smilacina racemosa amplexicaulis	$_{a}$-	$_{a}$-	$_{b}$6	$_{a}$3	$_{a}$-	.07	.03	-
F	Tragopogon dubius	2	-	4	-	6	.06	-	.06
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	217	200	208	1.01	0.88	0.50
Total for Perennial Forbs		111	87	167	159	95	2.24	2.71	1.68
Total for Forbs		111	87	384	359	303	3.25	3.59	2.19

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

BROWSE TRENDS --
Management unit 06 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	22	25	16	1.68	1.17	2.56
B	Artemisia tridentata vaseyana	13	11	8	.94	.56	.63
B	Cercocarpus montanus	38	38	40	5.02	4.66	2.92
B	Chrysothamnus viscidiflorus viscidiflorus	20	23	19	.74	1.50	1.55
B	Gutierrezia sarothrae	82	77	36	4.02	3.67	.44
B	Juniperus osteosperma	2	6	7	2.39	3.37	5.87
B	Opuntia sp.	10	7	11	.51	.45	.18
B	Purshia tridentata	1	1	1	.63	.38	.38
B	Quercus gambelii	6	8	9	2.65	1.66	2.16
B	Rosa woodsii	0	1	0	.15	-	-
B	Symphoricarpos oreophilus	19	19	21	2.75	3.59	1.97
B	Tetradymia canescens	4	3	0	.18	.38	-
Total for Browse		217	219	168	21.69	21.43	18.69

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 7

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	3.48
Artemisia tridentata vaseyana	-	.30
Cercocarpus montanus	-	2.59
Chrysothamnus viscidiflorus viscidiflorus	-	1.01
Gutierrezia sarothrae	-	.98
Juniperus osteosperma	6.80	13.14
Opuntia sp.	-	.08
Purshia tridentata	-	1.01
Quercus gambelii	3.40	4.31
Symphoricarpos oreophilus	-	3.45

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 7

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	2.7
Artemisia tridentata vaseyana	-	2.2
Cercocarpus montanus	1.9	2.3

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 7

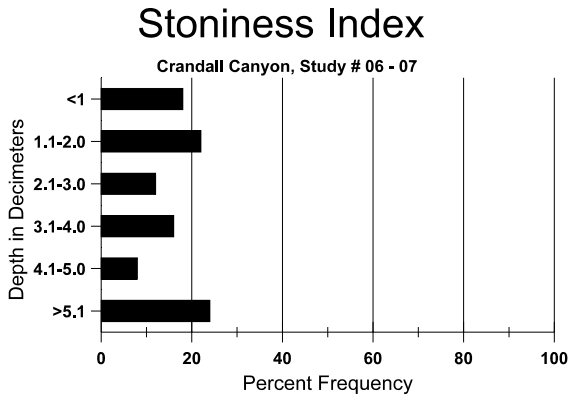
Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	-	40	-	8.5

BASIC COVER --
Management unit 06 , Study no: 7

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	4.50	9.50	34.75	37.41	38.00
Rock	2.75	4.75	3.69	3.95	4.17
Pavement	11.25	7.25	5.34	4.38	4.35
Litter	46.50	37.00	38.81	26.92	26.64
Cryptogams	.25	0	.03	0	0
Bare Ground	34.75	41.50	31.27	41.62	45.29

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 07, Crandall Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.8	68.0 (14.8)	8.0	58.7	12.0	29.3	1.7	5.1	32.0	0.5



PELLET GROUP DATA --
Management unit 06 , Study no: 7

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	11	3
Elk	5	2	2
Deer	15	22	7
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
2 (5)	1 (3)
50 (122)	15 (36)
7 (16)	-

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**1133**	-	533	-	600	-	24	18	53	9	29	-/-
96	**580**	20	120	400	60	40	21	21	10	-	14	21/22
01	**640**	-	160	400	80	-	28	34	13	6	9	22/27
06	**320**	-	80	200	40	20	19	44	13	-	19	25/30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
84	**866**	-	66	400	400	-	62	31	46	-	0	20/23
90	**1133**	66	-	333	800	-	12	59	71	7	41	19/23
96	**340**	-	80	240	20	140	24	41	6	-	0	14/25
01	**280**	-	20	180	80	40	36	43	29	-	0	16/26
06	**200**	60	-	160	40	100	50	20	20	20	20	23/31
Cercocarpus montanus												
84	**1333**	-	133	600	600	-	15	85	45	-	0	17/18
90	**1065**	-	66	66	933	-	13	81	88	8	31	6/10
96	**1120**	20	220	860	40	40	27	43	4	-	2	21/29
01	**1200**	-	40	940	220	20	7	80	18	13	13	26/35
06	**1060**	-	100	740	220	60	9	66	21	4	6	20/34
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**6266**	-	1400	3133	1733	-	16	0	28	4	43	9/7
96	**1020**	-	20	960	40	-	2	2	4	-	0	10/12
01	**1640**	-	60	1580	-	20	0	0	0	-	0	8/11
06	**1120**	-	100	1000	20	-	5	0	2	-	0	9/16
Gutierrezia sarothrae												
84	**4599**	-	-	4466	133	-	1	0	3	-	0	11/13
90	**7999**	2333	2866	4333	800	-	0	0	10	.50	3	8/7
96	**7640**	620	820	6820	-	-	0	0	0	-	0	9/11
01	**10680**	20	180	9760	740	520	0	0	7	4	4	6/8
06	**1360**	40	220	1120	20	-	0	0	1	-	0	7/10
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	40	-	-	20	0	0	-	-	0	-/-
01	**120**	-	-	120	-	-	0	0	-	-	0	-/-
06	**140**	-	20	120	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**399**	-	133	200	66	-	0	0	17	-	0	10/7
90	**199**	-	66	133	-	-	0	0	0	-	0	6/6
96	**380**	-	60	320	-	-	0	0	0	-	0	5/15
01	**300**	20	-	180	120	-	0	0	40	27	27	4/9
06	**440**	-	60	380	-	20	0	0	0	-	0	4/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	20	20	-	50	0	50	-	0	-/-
01	**60**	-	-	60	-	-	0	0	0	-	0	14/51
06	**20**	-	-	20	-	-	100	0	0	-	0	12/54
Quercus gambelii												
84	**1999**	-	733	1266	-	-	27	47	0	-	0	30/19
90	**4400**	666	3200	-	1200	-	26	6	27	.45	18	-/-
96	**720**	60	120	600	-	-	0	0	0	-	0	28/18
01	**1320**	-	340	980	-	80	0	0	0	-	0	47/24
06	**1460**	-	340	1120	-	40	0	0	0	-	0	40/19
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	16/10
01	**40**	-	-	40	-	-	0	0	-	-	0	9/6
06	**0**	-	-	-	-	-	0	0	-	-	0	19/12
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**866**	-	133	-	733	-	54	8	85	18	62	-/-
96	**940**	20	340	520	80	20	32	2	9	2	2	16/26
01	**560**	-	120	440	-	-	0	0	0	-	0	18/29
06	**1000**	-	80	640	280	-	0	4	28	14	16	16/22
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**200**	-	20	180	-	-	90	0	-	-	0	15/18
01	**100**	-	20	80	-	-	0	0	-	-	0	10/15
06	**0**	-	-	-	-	-	0	0	-	-	0	6/15

Trend Study 6-9-06

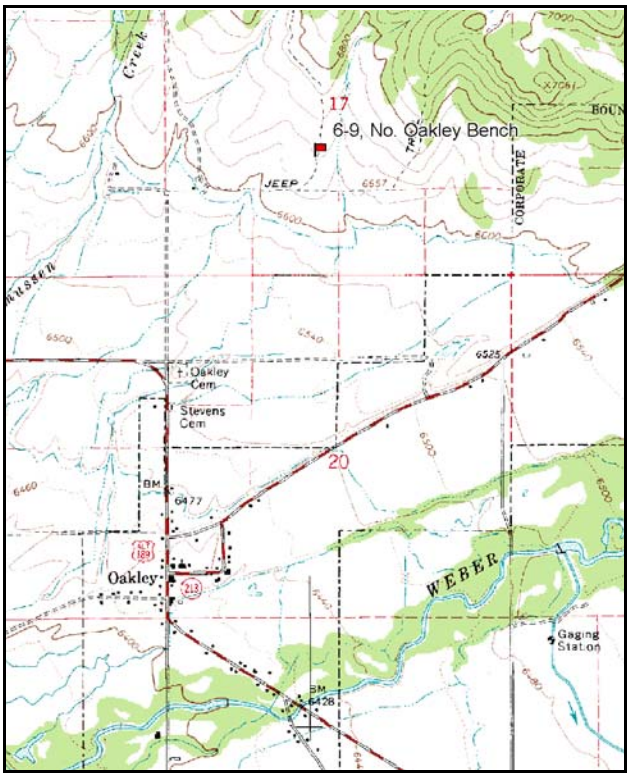
Study site name: North Oakley Bench . Vegetation type: Mountain brush .

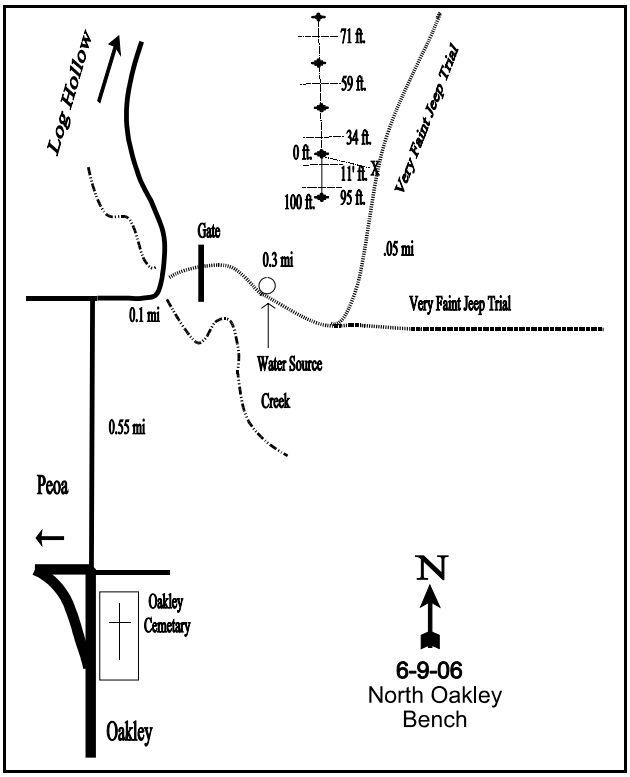
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the Oakley cemetery, just north of Oakley, proceed north 0.55 miles to an intersection and turn right. Proceed east 0.1 miles to a gate, pass through gate (private land; key needed) with creek on immediate right. Continue on a faint road for 0.3 miles to a fork. Turn left and proceed 0.05 miles to a witness post. From the witness post walk 7 paces at 248 degrees magnetic to the 0-foot baseline stake. The first 100 feet of the baseline runs 180 degrees magnetic. The remaining 300 feet run off the 0-foot baseline stake at 343 degrees magnetic.





Map Name: Kamas

Diagrammatic Sketch

Township 1S , Range 6E , Section 17

UTM NAD 27, UTM 12T 4508895 N 475394 E

DISCUSSION

North Oakley Bench - Trend Study No. 6-9

Study Information

This study lies on a relatively uniform mountain big sagebrush-grass/mountain brush community north of Oakley (elevation: 6,700 feet, slope: 8%, aspect: south). Due to its location, this area has a high potential for residential home development. There is very little useful escape or thermal cover in the immediate area. It is on privately owned land that is managed by the Oakley Cattlemen's Association, which means that the winter range is also used by domestic livestock most of the year. It is very representative of the south-facing slopes north of Oakley. Based on the pellet group frequencies and forage utilization, the level of use from both game and livestock varies from moderate to heavy. Pellet group quadrat frequency data has indicated light to moderate use by deer, elk, and cattle. The pellet group transect data in 2001 estimated 29 elk days use/acre (73 edu/ha), 19 deer days use/acre (48 ddu/ha), and 22 cow days use/acre (54 cdu/ha). Cattle were on the study when it was monitored in 2001. The 2006 pellet group data estimates were 59 elk, 46 deer, 13 cow, 2 sheep, and 3 horse days use/acre (146 edu/ha, 112 ddu/ha, 32 cdu/ha, 5 sdu/ha, and 7 hdu/ha). A moose pellet group was identified in 2006, but not sampled within the pellet group transect. Ants were extremely abundant in 2001 and 2006.

Soil

The soil is in the Ayoub series, which consists of moderately deep, well drained, moderately slowly permeable soils that formed in colluvium and residuum from andesite. They are found on mountain slopes and foothills (USDA-NRCS 2006). The effective rooting depth was estimated at nearly 10 inches with a clay loam soil texture and a neutral soil reaction (7.0 pH). During the height of the 1987-1990 drought, some trampling damage and soil compaction were evident from livestock, but have been less evident as vegetation recovered. Protective ground cover is adequate to prevent most soil loss. Erosion is minimal, primarily because of the gentle terrain and high cover contributed by the herbaceous understory. The soil erosion condition class assessment completed in 2001 and 2006 determined the soil to be stable.

Browse

The preferred browse species are mountain big sagebrush, serviceberry, and antelope bitterbrush. The most abundant key browse is mountain big sagebrush, which provided 6% cover in 1996 and 2006 and 9% in 2001. When the study was established in 1984, mountain big sagebrush was decadent in appearance and heavily browsed. Sagebrush is in much poorer condition at this location than over most of the surrounding area. Use on big sagebrush has been moderate to heavy in all years. Sagebrush density has consistently decreased from 2,180 plants/acre in 1996 to 1,180 plants/acre in 2006 and decadence has increased from 9% of the population in 1996 to 47% in 2006. Plants classified as dying has increased from none in 1996 to 8% of the population in 2001 and 27% in 2006. This increase in dying and decadent individuals in 2006 is likely due to an infestation of the sagebrush defoliator moth (*Aroga websterii*), which caused defoliation and drying of leaves on approximately 540 plants/acre. The high decadence and percent dying classifications are likely a product of defoliated sagebrush plants. Young plants made up 17% of the population in 1996 and 2006 and 11% in 2001. Until 2006, recruitment from young individuals was higher than that of dying individuals.

Snowberry, serviceberry, and bitterbrush have combined to provide about one-third of the browse cover. Serviceberry and bitterbrush have showed moderate to heavy use, good vigor, and low decadence since 1996. Snowberry displayed moderate to heavy use in 1996, but light use in 2001 and 2006. Vigor has been normal and decadence low. Annual leader growth for mountain big sagebrush averaged less than 2 inches in 2001, while bitterbrush and serviceberry averaged 2 inches; leader growth was similar in 2006 for each species. Other browse species sampled include stickyleaf low rabbitbrush, broom snakeweed, gray horsebrush, and prickly pear cactus.

Herbaceous Understory

Grass and forb composition is diverse but includes many biennial and perennial weeds or species of poor forage value. Many also act as indicators of heavy livestock use. Thistle, aster, western yarrow, common dandelion, bulbous bluegrass, Letterman needlegrass, yellow salsify, flannel mullein, death camas, and wild onion are all examples of increaser species with heavy livestock use. Overall, the sum of nested frequency for perennial grasses has increased since 1984. Perennial forbs have decreased in sum of nested frequency each year since 1990, very slightly some years. Grasses have provided most of the herbaceous cover and nearly half of the total cover since 1996. There have been over 50 species of forbs sampled since 1984. Grass species with good forage value include bluebunch wheatgrass, crested wheatgrass, thickspike, and Sandberg bluegrass. The dominant grasses are crested wheatgrass, bulbous bluegrass, and Letterman needlegrass. Bulbous bluegrass is the most abundant and provided 6% cover in 1996, 12% in 2001, and 10% in 2006.

1990 TREND ASSESSMENT

Mountain big sagebrush density decreased between 1984 and 1990, most of which were mature plants. Currently, there are abundant seedlings and young sagebrush. The majority of the sagebrush are lightly hedged and have good vigor and fair growth. The other browse have stable or increased numbers. The only shrubs to be uniformly and heavily utilized are the large bitterbrush plants. They are browsed year-round, but still display good vigor. Low rabbitbrush increased on the density plots due to an increase in young in the population. It is the most abundant browse species. The seeded and native grasses had a high nested frequency. The nested frequency of crested wheatgrass increased significantly, while bluebunch wheatgrass decreased. Several new forbs were sampled in 1990, but the most common species remain hoary aster, thistle, and yarrow; all increasers responding to heavy grazing.

browse - down (-2) grass - up (+2) forb - up (+2)

1996 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density increased and decadence decreased, but this is likely due to the increased browse sample size taken beginning in 1996. The increased sample size provides better estimates for patchy browse distributions. The densities of other key browse species changed little. The grass trend is stable. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased slightly, but this is likely a product of different sampling areas in 1996. Bulbous bluegrass and cheatgrass were sampled for the first time in 1996. The forb trend is slightly down. The nested frequency of perennial forbs decreased 27%, but some of this decrease is likely caused by the change in sample locations in 1996. The forb composition continues to be poor. The Desirable Components Index score is good due to moderate browse cover, low browse decadence, excellent perennial grass cover, low annual grass cover, and excellent perennial forb cover.

winter range condition (DC Index) - good (76) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2001 TREND ASSESSMENT

Trend for browse is slightly down. Sagebrush density decreased 27%, but sagebrush cover increased slightly and the height and crown measurements increased. Although the density has decreased substantially, the plants are bigger on average. The population of sagebrush also increased in plants classified with poor vigor and decadence. Utilization on sagebrush remained moderate to heavy. Snowberry, which was moderately to heavy utilized in past years, decreased to nearly half of the 1996 density; most of the density losses were in the mature age class. Serviceberry and bitterbrush densities remained stable, vigor remained normal, and decadence remained low. The grass trend is stable. The nested frequency of perennial grasses, excluding bulbous bluegrass, reamained stable. The nested frequencies of thickspike wheatgrass, Sandberg bluegrass, and Letterman needlegrass increased significantly and bluebunch wheatgrass decreased significantly. The nested frequency of bulbous bluegrass increased significantly, and that of cheatgrass did not change. The forb trend is stable. The nested frequency of perennial forbs remained unchanged and forb composition remained poor.

The DCI score improved to excellent due to an increase in browse cover.

winter range condition (DC Index) - excellent (81) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is down. Sagebrush, the key browse species, density decreased 26%, decadence increased to 47%, and plants with poor vigor increased to 63% of the population. As well, plants classified as dying increased to 27% of the population. This increase in poor vigor is likely caused by the sagebrush defoliator moth infestation. The densities of the other key browse species snowberry, serviceberry, and bitterbrush either remained unchanged or increased. The grass trend is slightly down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 10%. The nested frequency of Sandberg bluegrass decreased significantly. The forb trend is slightly down. The nested frequency of perennial forbs did not change substantially from 2001 to 2006, but has decreased slightly since 1996. The forb composition continues to be poor. The DCI score decreased to good due to a decrease in browse cover and increase in browse decadence.

winter range condition (DC Index) - good (75) Mid-level potential scale
browse - down (-2) grass - slightly down (-1) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 9

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	$_{b}$132	$_{c}$216	$_{a}$71	$_{a}$82	$_{a}$92	2.39	4.20	4.93
G	Agropyron dasystachyum	$_{b}$80	$_{a}$17	$_{b}$72	$_{c}$124	$_{bc}$94	.74	2.00	1.24
G	Agropyron intermedium	-	-	2	-	-	.15	-	-
G	Agropyron spicatum	$_{b}$47	$_{a}$14	$_{b}$68	$_{a}$15	$_{a}$14	1.48	.60	.29
G	Bromus brizaeformis (a)	-	-	-	3	-	-	.03	-
G	Bromus inermis	-	13	7	6	6	.18	.18	.06
G	Bromus tectorum (a)	-	-	18	18	8	.22	.06	.04
G	Koeleria cristata	$_{a}$-	$_{a}$-	$_{a}$4	$_{ab}$16	$_{b}$21	.03	.39	.19
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$135	$_{c}$230	$_{c}$233	6.46	11.66	9.93
G	Poa fendleriana	$_{a}$-	$_{ab}$4	$_{ab}$8	$_{b}$10	$_{ab}$9	.21	.18	.09
G	Poa pratensis	$_{b}$116	$_{c}$182	$_{c}$182	$_{ab}$81	$_{a}$59	4.97	2.01	1.74
G	Poa secunda	$_{a}$10	$_{a}$25	$_{a}$17	$_{b}$58	$_{a}$36	.42	.89	1.54
G	Sitanion hystrix	-	-	-	5	6	-	.18	.07
G	Stipa columbiana	$_{b}$133	$_{c}$221	$_{a}$18	$_{a}$6	$_{a}$3	.27	.06	.15
G	Stipa comata	-	-	-	6	-	-	.06	-
G	Stipa lettermani	$_{a}$-	$_{a}$-	$_{b}$165	$_{b}$176	$_{b}$184	5.61	3.22	6.03
Total for Annual Grasses		0	0	18	21	8	0.22	0.09	0.03
Total for Perennial Grasses		518	692	749	815	757	22.95	25.68	26.29
Total for Grasses		518	692	767	836	765	23.18	25.77	26.33

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Achillea millefolium	52	46	30	30	47	.29	.46	1.02
F	Agoseris glauca	-	-	7	-	2	.01	-	.00
F	Allium acuminatum	a29	a6	a14	b42	b55	.08	.13	.15
F	Alyssum alyssoides (a)	-	-	a6	b29	c62	.01	.14	.32
F	Arabis sp.	a-	b13	ab7	a-	ab5	.01	-	.04
F	Astragalus beckwithii	-	-	2	1	-	.03	.00	-
F	Aster chilensis	a9	b34	a9	a13	a6	.18	.42	.04
F	Astragalus convallarius	ab13	ab12	a5	b34	c59	.04	.60	.83
F	Balsamorhiza sagittata	-	-	-	-	-	-	.00	-
F	Camelina microcarpa (a)	-	-	-	-	2	-	-	.03
F	Calochortus nuttallii	3	11	13	17	9	.04	.20	.02
F	Chenopodium fremontii (a)	-	-	-	3	-	-	.00	-
F	Cirsium undulatum	c137	b73	a38	a24	a17	.61	.55	.10
F	Collomia linearis (a)	-	-	a-	b26	a-	-	.06	-
F	Comandra pallida	a15	a22	b50	ab30	ab28	.38	.15	.61
F	Collinsia parviflora (a)	-	-	a-	b35	b52	-	.06	.10
F	Cordylanthus ramosus (a)	-	-	a5	b30	b29	.06	.35	.32
F	Crepis acuminata	6	-	-	-	5	-	-	.04
F	Cruciferae	-	2	-	-	-	-	-	-
F	Cryptantha sp.	4	-	-	-	-	-	-	-
F	Cynoglossum officinale	-	2	2	-	-	.03	-	-
F	Delphinium nuttallianum	-	-	3	-	-	.00	-	-
F	Descurainia pinnata (a)	-	-	-	-	2	-	-	.00
F	Epilobium brachycarpum (a)	-	-	a-	b12	c36	-	.05	.37
F	Erigeron pumilus	a2	c34	c41	bc29	ab10	.30	.09	.07
F	Eriogonum racemosum	4	15	5	3	5	.01	.01	.01
F	Eriogonum umbellatum	-	-	3	-	-	.01	-	-
F	Gayophytum ramosissimum(a)	-	-	b15	a-	b18	.05	-	.05
F	Hackelia patens	-	-	6	1	-	.30	.00	-
F	Holosteum umbellatum (a)	-	-	a6	b40	a3	.01	.21	.00
F	Ipomopsis aggregata	-	2	1	-	-	.03	-	-
F	Lactuca serriola	-	3	-	-	-	-	-	-
F	Lithospermum ruderale	-	2	4	3	2	.03	.03	.69
F	Lupinus argenteus	a2	a4	ab22	bc40	c37	.74	1.28	1.71
F	Machaeranthera canescens	bc70	d128	c74	ab19	a14	.51	.12	.09
F	Machaeranthera grindelioides	-	-	-	1	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$68	$_{b}$17	-	.28	.04
F	Navarretia intertexta (a)	-	-	-	3	-	-	.00	-
F	Penstemon sp.	-	2	-	-	1	-	-	.00
F	Phlox longifolia	$_{a}$-	$_{b}$22	$_{b}$10	$_{b}$15	$_{b}$30	.05	.04	.16
F	Polygonum douglasii (a)	-	-	$_{b}$81	$_{a}$28	$_{b}$80	.22	.08	.43
F	Ranunculus testiculatus (a)	-	-	$_{a}$3	$_{b}$22	$_{a}$-	.00	.09	-
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$16	$_{ab}$9	-	.15	.06
F	Senecio multilobatus	3	-	-	4	7	-	.01	.02
F	Sphaeralcea coccinea	4	18	14	8	4	.31	.06	.18
F	Taraxacum officinale	$_{ab}$6	$_{c}$34	$_{bc}$26	$_{c}$32	$_{a}$2	.21	.26	.01
F	Tragopogon dubius	$_{a}$7	$_{b}$56	$_{a}$25	$_{a}$19	$_{a}$4	.27	.24	.06
F	Unknown forb-annual (a)	-	-	$_{b}$12	$_{a}$-	$_{a}$-	.07	-	-
F	Verbascum thapsus	11	9	2	-	-	.03	-	-
F	Vicia americana	$_{a}$-	$_{b}$15	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Viguiera multiflora	1	-	-	-	-	-	-	-
F	Zigadenus paniculatus	$_{a}$-	$_{ab}$3	$_{ab}$1	$_{ab}$8	$_{b}$12	.03	.15	.18
Total for Annual Forbs		0	0	128	296	301	0.43	1.37	1.69
Total for Perennial Forbs		378	568	414	389	370	4.59	5.02	6.15
Total for Forbs		378	568	542	685	671	5.02	6.40	7.85

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

BROWSE TRENDS --
Management unit 06 , Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	13	13	11	.97	1.42	1.47
B	Artemisia tridentata vaseyana	55	43	45	5.86	9.43	5.65
B	Chrysothamnus viscidiflorus viscidiflorus	85	86	94	3.79	6.31	8.35
B	Mahonia repens	21	17	15	.93	.22	.32
B	Opuntia sp.	4	4	5	.91	.91	.60
B	Purshia tridentata	11	16	11	.30	.89	1.59
B	Symphoricarpos oreophilus	28	25	24	3.65	5.55	4.56
B	Tetradymia canescens	3	2	5	-	.38	.15
Total for Browse		220	206	210	16.44	25.13	22.69

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 9

Species	Percent Cover '06
Amelanchier alnifolia	1.28
Artemisia tridentata vaseyana	6.43
Chrysothamnus viscidiflorus viscidiflorus	12.25
Mahonia repens	.48
Opuntia sp.	.41
Purshia tridentata	2.21
Symphoricarpos oreophilus	7.53

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 9

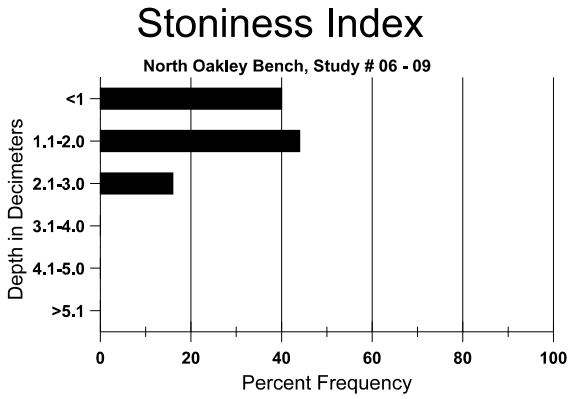
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.0	2.0
Artemisia tridentata vaseyana	1.6	2.1
Purshia tridentata	2.0	1.6

BASIC COVER --
Management unit 06 , Study no: 9

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	7.75	12.00	46.85	55.62	55.27
Rock	2.00	1.50	1.37	1.79	2.08
Pavement	.25	1.50	.91	.32	1.07
Litter	60.50	47.00	39.72	38.70	35.50
Cryptogams	1.25	4.25	.97	2.75	.20
Bare Ground	28.25	33.75	21.67	21.97	21.64

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 09, North Oakley Bench

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.6	64.4 (19.7)	7.0	38.9	33.1	28.0	4.2	43.8	217.6	0.7



PELLET GROUP DATA --
Management unit 06 , Study no: 9

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'01	'06	'01	'06
Sheep	1	-	-	-	-
Rabbit	3	3	10	-	-
Horse	-	3	2	-	3 (7)
Elk	5	21	43	30 (73)	59 (146)
Deer	15	11	15	19 (48)	46 (112)
Cattle	6	12	2	22 (54)	13 (32)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**66**	-	-	-	66	-	100	0	100	-	0	-/-
90	**199**	66	133	66	-	-	67	33	0	-	33	25/31
96	**280**	20	20	260	-	-	29	50	0	-	0	25/30
01	**260**	-	-	220	40	-	23	77	15	-	0	28/34
06	**220**	-	60	160	-	-	18	64	0	-	0	29/29
Artemisia tridentata vaseyana												
84	**3666**	66	1000	1400	1266	-	56	18	35	-	5	13/7
90	**1533**	2466	533	800	200	-	30	4	13	-	4	14/17
96	**2180**	140	380	1600	200	880	46	21	9	-	9	20/28
01	**1600**	40	180	1220	200	240	46	23	13	8	15	22/35
06	**1180**	40	200	420	560	360	27	12	47	27	63	22/34

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
84	**6933**	-	-	5133	1800	-	0	0	26	-	0	16/15
90	**9932**	1133	1733	6533	1666	-	27	5	17	.60	21	9/10
96	**6660**	100	760	5800	100	40	.30	0	2	-	0	11/16
01	**7500**	-	640	6780	80	20	2	0	1	.26	.26	9/16
06	**8640**	-	940	7520	180	20	7	0	2	.92	.92	10/21
Mahonia repens												
84	**66**	-	66	-	-	-	0	0	-	-	0	-/-
90	**1933**	-	1333	600	-	-	14	0	-	-	0	3/4
96	**6340**	320	5040	1300	-	-	0	0	-	-	0	3/5
01	**3960**	-	440	3520	-	-	0	0	-	-	0	2/3
06	**5120**	20	660	4460	-	-	0	0	-	-	0	2/3
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	66	-	-	-	-	0	0	0	-	0	-/-
96	**80**	-	-	80	-	-	0	0	0	-	0	7/20
01	**80**	-	-	60	20	-	0	0	25	-	0	4/19
06	**180**	-	-	180	-	-	0	0	0	-	0	5/15
Purshia tridentata												
84	**266**	-	66	200	-	-	50	25	0	-	0	30/34
90	**266**	-	66	200	-	-	0	100	0	-	0	22/41
96	**260**	-	-	260	-	-	38	62	0	-	0	14/40
01	**320**	-	40	260	20	-	31	56	6	-	0	11/36
06	**240**	-	-	240	-	-	0	100	0	-	0	21/51
Symphoricarpos oreophilus												
84	**266**	-	-	200	66	-	75	0	25	-	0	11/15
90	**465**	-	133	266	66	-	57	14	14	4	14	12/14
96	**1000**	80	140	860	-	80	38	26	0	-	0	24/42
01	**560**	-	60	480	20	-	7	4	4	-	0	29/49
06	**840**	-	80	700	60	-	2	0	7	5	17	27/39
Tetradymia canescens												
84	**66**	-	66	-	-	-	0	0	0	-	0	-/-
90	**66**	-	-	66	-	-	100	0	0	-	0	13/14
96	**60**	40	20	40	-	-	100	0	0	-	0	11/19
01	**60**	20	40	20	-	-	0	0	0	-	0	9/17
06	**240**	-	60	160	20	-	0	0	8	-	0	9/16

Trend Study 6-10-06

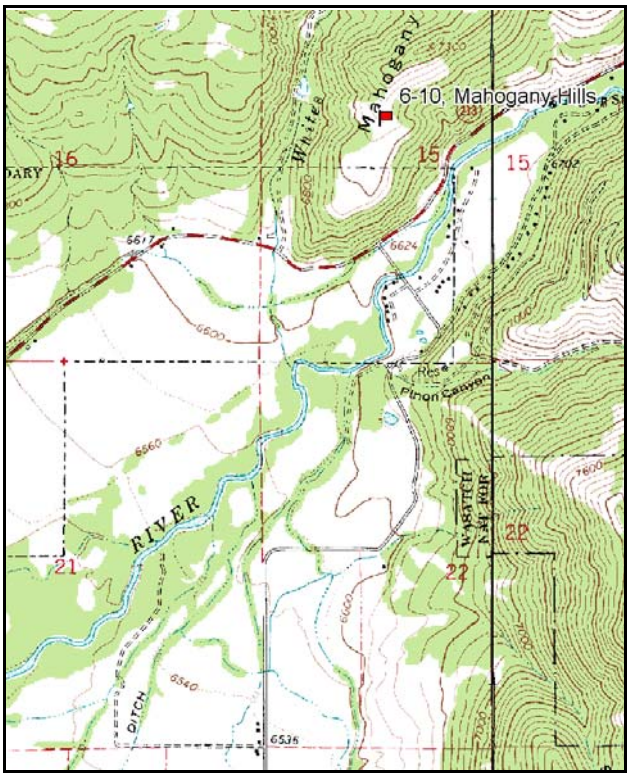
Study site name: Mahogany Hills . Vegetation type: Mountain brush .

Compass bearing: frequency baseline 162 degrees magnetic.

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

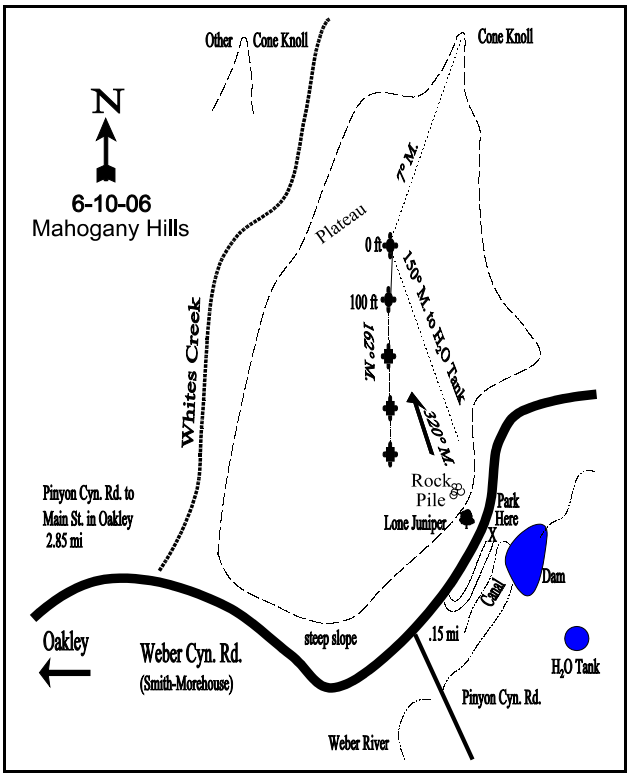
LOCATION DESCRIPTION

From Oakley, proceed up Weber Canyon watching for Pinyon Canyon Lane which is a right turn. From this road proceed 0.15 miles farther up Weber Canyon and park opposite a small irrigation canal dam. The main river dam to supply the canal is 100 yards upstream. From the river diversion walk up the steep slope at 273 degrees magnetic to a large lone juniper and mahogany. From the lone juniper and mahogany, a rock pile can be found 55 paces at 320 degrees magnetic. From the rock pile, the 0-foot baseline stake is approximately 80 paces at a bearing of 320 degrees magnetic. The 0-foot stake of the is marked by with browse tag #7952. To triangulate on the 0-foot stake when in the middle of plateau: from the stake to a cone-knoll to the north is 7 degree magnetic, from the stake to a water tank on the right at the mouth of Pinyon Canyon is 150 degrees magnetic.



Map Name: Kamas

Township 1S , Range 6E , Section 15



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4509302 N 478425 E

DISCUSSION

Mahogany Hills - Trend Study No. 6-10

Study Information

This study was established in 1984 to sample critical big game winter range at the mouth of the Upper Weber River Canyon (elevation: 7,100 feet, slope: 12%, aspect: southeast). The vegetation type is best categorized as mountain big sagebrush-grass with many mountain brush species. Elk use has been moderate, while deer use has been light. There has been no evidence of livestock use. The pellet group transect data estimates in 2001 were 41 elk days use/acre (101 edu/ha) and 11 deer days use/acre (26 ddu/ha). The 2006 pellet group data estimates were 59 elk and 48 deer days use/acre (146 edu/ha and 119 ddu/ha). Both deer and elk pellet appeared to be from fall, winter, and spring.

Soil

The soil is in the Agassiz series which consists of very shallow and shallow, somewhat excessively drained, moderate or moderately rapidly permeable soils on mountainsides (USDA-NRCS 2006). The effective rooting depth was estimated at almost 13 inches. The soil texture is a loam with a neutral soil reaction (6.7 pH). This area has a diverse plant composition, especially among grasses. Vegetation and litter cover are excellent. No significant erosion has been noted. The erosion soil condition class assessments completed in 2001 and 2006 were stable.

Browse

Mountain big sagebrush dominates the browse component. It provided 16% cover in 1996 and 11% in 2001 and 2006. Decadence has been high for this species since 1984 (between 40-82% decadence). Sagebrush density was estimated at 4,133 plants/acre in 1984, but has steadily declined to slightly more than 1,900 plants/acre in 2001 and 2006. Lower density numbers may be due to the greatly increased sample size used starting in 1996, which better estimates browse populations. Recruitment from young plants has also been low at less then 5% in all readings, due to the high competition with smooth brome for seedling establishment. Plants classified as dying increased from 4% of the population in 1996 to 8% in 2001, to 21% in 2006. Density may continue to decline in the future with only half of the population classified as mature in 2001 and 2006, the low recruitment, and increasing numbers of dying individuals. Utilization on mountain big sagebrush has been moderate to heavy for almost all readings, and plants classified with poor vigor have averaged around 17%. Average leader growth on mountain big sagebrush was less than 2 inches in 2001 and 2006.

Other valuable browse species that contribute to the community include mountain snowberry, serviceberry, true mountain mahogany, and antelope bitterbrush. These species display moderate to heavy use, but low percent decadence and normal vigor. Annual leader growth averaged about 2.5 inches for serviceberry and mountain mahogany in 2001. In 2006, serviceberry leader growth was about 4 inches, but only 2.5 inches for mahogany. Also present are some less desirable shrubs such as stickyleaf low rabbitbrush and gray horsebrush. Stickyleaf low rabbitbrush has shown some dynamic changes in its density, but with very few young in the population, these increases are due mostly to the much larger sample size utilized in 1996, not an actual increase in the population. Gambel oak density was estimated at 460 stems/acre in 1996, 1,120 stems/acre in 2001, and 1,180 stems/acre in 2006. Since 1996, oak has been light to moderately used. A late snow storm and cold temperatures in June 2001 killed a lot of the leaf and meristematic biomass of the oak in the 2001 sampling.

Herbaceous Understory

Perennial grasses are an important component and have provided 33-36% cover since 1996, which is the majority of the herbaceous cover. Of the 15 species of grasses identified, three are seeded species that are more commonly found in meadows and pastures. Smooth brome is the most abundant grass and has increased in abundance since 1984. It provided 20% cover in 1996, 25% cover in 2001, and 24% cover in 2006. It is a shade tolerant, sod-forming species which can, in mountain brush communities, dominate and outcompete many herbaceous understory species and browse seedlings, especially sagebrush. Sandberg, Kentucky, and

mutton bluegrasses are also fairly abundant. Forbs also have a diverse composition and include several palatable and valuable species. Arrowleaf balsamroot, one-flowered helianthella, low penstemon, and redroot eriogonum are preferred forbs. Forb cover was about 6% in 1996 and 2001 and increased to 9% in 2006.

1990 TREND ASSESSMENT

The data shows the effects of drought on the mountain big sagebrush community. Compared to the wet years, when this trend study was established in 1984, there is obviously less production for sagebrush and grass in 1990. The density of sagebrush has decreased, with the density of mature sagebrush increasing due to a decline in percent decadence. The majority of the population is moderately hedged, compared to 61% that were heavily browsed in 1984. Populations of the other palatable, but less common browse were unchanged. Most are now moderately hedged. Smooth brome is thick in the understory. There is a large diversity of forbs that provide significant forage. There are also several palatable species for deer that inhabit the area year-round. Elk use appears to be moderate in the winter.

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

1996 TREND ASSESSMENT

The browse trend is stable. Sagebrush densities have decreased slightly, but this is likely due in part to the increased sample size in 1996, which better estimates patchy communities. Part of the decline could be due to the very competitive and extremely abundant smooth brome, which is a sod-forming shade-tolerant grass. Few seedlings were encountered on all readings and there are few places for sagebrush seedlings to establish. The population is becoming more decadent and dying. The other browse species are doing much better. The grass trend is stable. The nested frequency of perennial grasses increased slightly, but this is likely due to the change in the locations of sampling belts. The forb trend is stable. The nested frequency of perennial forbs is unchanged. The Desirable Components Index score is good due to excellent browse, perennial grass, and perennial forb cover.

winter range condition (DC Index) - good (76) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

Sagebrush density continues to decline, and decadence is moderately high at 48%. The density of young recruited into the population is low at only 20 plant/acre. This species may continue to decline in the future without an increase in reproductive success, which is unlikely due to the high ground cover of smooth brome. The other palatable preferred browse are stable. Serviceberry, true mountain mahogany, and bitterbrush show stable densities, low decadence, and normal vigor. They also have much more extensive root structures which are more competitive in drought conditions. Trend for browse is down overall because mountain big sagebrush is the dominant browse species. The grass trend is slightly down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 12% due in part to a significantly decrease in the nested frequency of bluebunch wheatgrass. Cheatgrass was sampled for the first time at this location, but only in one quadrat. The forb trend is down. The nested frequency of perennial forbs decreased 21%. The DCI score remained good, although the browse cover value decreased.

winter range condition (DC Index) - good (68) Mid-level potential scale
browse - down (-2) grass - slightly down (-1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. Mountain big sagebrush density remained unchanged. Decadence did not change and plants with poor vigor changed little. Plants classified as dying increased to 21% of the population. The densities of other preferred browse species fluctuated some, but were stable overall. The grass trend is slightly down. The nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 16%. Some of this

decline is due to significant decreases in the nested frequencies of thickspike wheatgrass and Kentucky bluegrass. The forb trend is up. The nested frequency of perennial forbs increased 49%. The DCI score remained good.

winter range condition (DC Index) - good (67) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 10

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	11	7	8	5	4	.27	.03	.00
G	Agropyron dasystachyum	$_{b}$13	$_{ab}$8	$_{ab}$2	$_{b}$17	$_{a}$-	.00	.52	-
G	Agropyron spicatum	$_{b}$97	$_{b}$120	$_{b}$85	$_{a}$37	$_{a}$23	2.52	.98	.43
G	Bromus inermis	$_{a}$159	$_{b}$217	$_{c}$278	$_{c}$293	$_{c}$295	19.99	25.12	24.01
G	Bromus tectorum (a)	-	-	-	2	-	-	.00	-
G	Carex sp.	-	-	-	-	2	-	-	.15
G	Dactylis glomerata	1	-	5	1	-	.15	.00	-
G	Koeleria cristata	$_{a}$-	$_{a}$-	$_{b}$33	$_{b}$19	$_{c}$76	.82	.83	6.19
G	Melica bulbosa	-	-	7	-	1	.01	-	.00
G	Phleum pratense	2	-	-	-	-	-	-	-
G	Poa bulbosa	$_{a}$-	$_{a}$8	$_{a}$9	$_{a}$3	$_{b}$31	.33	.06	1.14
G	Poa fendleriana	55	35	65	76	33	2.61	2.40	1.07
G	Poa pratensis	$_{b}$80	$_{b}$76	$_{b}$115	$_{b}$70	$_{a}$34	3.40	1.42	.34
G	Poa secunda	$_{ab}$129	$_{b}$133	$_{ab}$117	$_{a}$129	$_{a}$79	2.68	3.29	2.91
G	Stipa columbiana	$_{b}$40	$_{b}$25	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
G	Stipa comata	$_{ab}$8	$_{b}$12	$_{ab}$22	$_{a}$1	$_{a}$-	.58	.03	-
Total for Annual Grasses		0	0	0	2	0	0	0.00	0
Total for Perennial Grasses		595	641	746	651	578	33.41	34.70	36.30
Total for Grasses		595	641	746	653	578	33.41	34.71	36.30
F	Achillea millefolium	7	2	1	-	3	.00	-	.15
F	Agoseris glauca	-	-	-	6	5	-	.01	.01
F	Alyssum alyssoides (a)	-	-	$_{a}$14	$_{ab}$23	$_{b}$32	.05	.27	.09
F	Allium sp.	$_{a}$-	$_{b}$28	$_{a}$3	$_{a}$4	$_{c}$65	.01	.01	.33
F	Antennaria rosea	1	-	1	-	-	.03	-	-
F	Arabis sp.	$_{ab}$8	$_{a}$1	$_{b}$17	$_{a}$-	$_{ab}$9	.04	-	.05
F	Arenaria sp.	-	4	-	-	-	-	-	-
F	Artemisia ludoviciana	-	-	3	3	3	.38	.15	.38
F	Astragalus convallarius	$_{a}$4	$_{b}$32	$_{c}$61	$_{bc}$53	$_{bc}$34	1.10	.84	.61
F	Balsamorhiza sagittata	10	4	5	9	13	.57	.92	2.14

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Castilleja linariaefolia	6	3	11	2	10	.52	.12	.27
F	Calochortus nuttallii	$_{a}$-	$_{a}$5	$_{a}$-	$_{a}$-	$_{b}$27	-	-	.09
F	Cirsium undulatum	3	4	6	5	-	.07	.15	-
F	Comandra pallida	$_{a}$-	$_{ab}$2	$_{b}$10	$_{ab}$2	$_{ab}$5	.08	.16	.56
F	Collinsia parviflora (a)	-	-	24	17	15	.12	.06	.06
F	Cordylanthus ramosus (a)	-	-	$_{a}$1	$_{ab}$7	$_{b}$16	.00	.04	.34
F	Crepis acuminata	$_{a}$-	$_{c}$97	$_{b}$59	$_{b}$56	$_{b}$68	.56	.60	1.47
F	Draba sp. (a)	-	-	-	-	4	-	-	.01
F	Erigeron pumilus	3	4	5	5	4	.04	.01	.06
F	Eriogonum racemosum	7	11	10	9	2	.24	.13	.01
F	Eriogonum umbellatum	-	-	6	5	8	.12	.06	.33
F	Hackelia patens	$_{d}$88	$_{c}$38	$_{bc}$22	$_{ab}$4	$_{a}$-	.24	.03	.00
F	Helianthella uniflora	$_{a}$-	$_{a}$-	$_{b}$29	$_{b}$18	$_{b}$26	1.39	1.51	1.60
F	Holosteum umbellatum (a)	-	-	$_{b}$11	$_{a}$3	$_{a}$-	.05	.00	-
F	Lappula occidentalis (a)	-	-	-	-	6	-	-	.01
F	Lithospermum ruderale	3	-	7	6	3	.21	.12	.21
F	Lomatium sp.	-	-	-	-	11	-	-	.07
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$15	$_{b}$12	-	.13	.03
F	Penstemon humilis	$_{b}$11	$_{b}$13	$_{ab}$5	$_{a}$-	$_{a}$-	.06	-	-
F	Phlox longifolia	-	3	-	3	-	-	.00	-
F	Polygonum douglasii (a)	-	-	$_{b}$15	$_{a}$-	$_{b}$13	.04	-	.04
F	Ranunculus testiculatus (a)	-	-	-	-	1	-	-	.00
F	Schoencrambe linifolia	-	-	2	1	-	.00	.03	-
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	$_{b}$14	-	.10	.15
F	Zigadenus paniculatus	-	-	3	3	2	.01	.03	.00
Total for Annual Forbs		0	0	65	65	99	0.28	0.51	0.59
Total for Perennial Forbs		151	251	266	209	312	5.73	5.02	8.51
Total for Forbs		151	251	331	274	411	6.01	5.53	9.10

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

BROWSE TRENDS --
Management unit 06 , Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	24	31	24	3.34	2.84	1.99
B	Artemisia tridentata vaseyana	80	69	68	16.30	11.05	11.46
B	Cercocarpus montanus	1	3	1	1.31	.18	.15
B	Chrysothamnus depressus	4	6	7	.30	.27	.71
B	Chrysothamnus viscidiflorus viscidiflorus	39	50	41	2.55	1.41	2.56
B	Gutierrezia sarothrae	0	0	1	-	-	-
B	Purshia tridentata	9	10	11	1.49	1.10	.60
B	Quercus gambelii	7	7	6	.91	1.08	.91
B	Symphoricarpos oreophilus	54	46	51	10.48	6.54	7.14
B	Tetradymia canescens	4	5	5	.18	.18	.15
Total for Browse		222	227	215	36.89	24.68	25.70

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 10

Species	Percent Cover '06
Amelanchier alnifolia	3.96
Artemisia tridentata vaseyana	9.46
Chrysothamnus depressus	.10
Chrysothamnus viscidiflorus viscidiflorus	2.88
Purshia tridentata	2.00
Quercus gambelii	1.03
Symphoricarpos oreophilus	9.10
Tetradymia canescens	.30

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 10

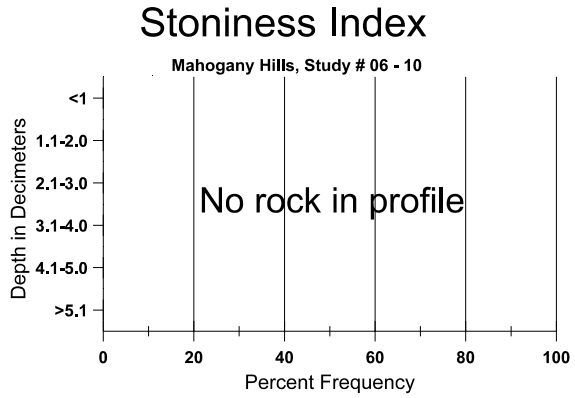
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.6	4.1
Artemisia tridentata vaseyana	1.8	1.7
Cercocarpus montanus	2.4	2.7
Purshia tridentata	-	3.3

BASIC COVER --
Management unit 06 , Study no: 10

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	5.00	16.50	61.87	61.94	66.13
Rock	.50	0	.05	.03	.01
Pavement	.50	0	.09	.14	.07
Litter	80.50	76.00	75.13	70.69	58.55
Cryptogams	.50	.75	.74	.19	.06
Bare Ground	13.00	6.75	5.88	3.95	5.35

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 10, Mahogany Hills

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.7	58.4 (14.5)	6.7	38.9	35.1	26.0	3.7	32.5	195.2	0.6



PELLET GROUP DATA --
Management unit 06 , Study no: 10

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	1
Elk	22	17	14
Deer	12	3	11

Days use per acre (ha)	
'01	'06
-	-
41 (101)	59 (146)
11 (26)	48 (119)

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**399**	-	66	-	333	-	0	100	83	-	67	-/-
90	**266**	-	66	-	200	-	75	25	75	-	25	-/-
96	**560**	-	-	380	180	-	64	25	32	-	4	33/39
01	**880**	-	40	700	140	-	23	34	16	-	0	33/36
06	**620**	-	80	500	40	20	48	35	6	-	3	36/32
Artemisia tridentata vaseyana												
84	**4133**	-	-	733	3400	-	34	61	82	1	27	32/41
90	**3265**	-	66	1733	1466	-	76	4	45	4	16	27/30
96	**2780**	-	100	1560	1120	720	60	32	40	4	17	28/39
01	**1920**	-	20	980	920	700	56	21	48	8	18	26/34
06	**1960**	-	80	940	940	680	43	27	48	21	21	26/33
Cercocarpus montanus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**132**	-	66	-	66	-	0	50	50	15	50	-/-
96	**20**	-	-	20	-	-	0	0	0	-	0	54/63
01	**60**	-	20	40	-	-	0	67	0	-	0	40/37
06	**40**	-	-	40	-	-	0	100	0	-	0	46/59
Chrysothamnus depressus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**220**	-	-	220	-	-	0	0	-	-	0	7/10
01	**200**	-	-	200	-	-	0	0	-	-	0	8/9
06	**340**	-	120	220	-	-	53	0	-	-	0	8/13
Chrysothamnus viscidiflorus viscidiflorus												
84	**398**	-	66	66	266	-	0	0	67	-	0	10/13
90	**66**	-	-	66	-	-	0	0	0	-	0	13/3
96	**1740**	-	20	1720	-	-	0	0	0	-	1	14/16
01	**1680**	40	20	1660	-	-	0	0	0	-	0	12/15
06	**1500**	-	60	1440	-	-	4	0	0	-	0	14/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	8/8
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	6/9
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
84	**466**	-	-	466	-	-	0	100	-	-	43	23/39
90	**266**	-	-	266	-	-	75	0	-	-	0	25/40
96	**240**	-	-	240	-	-	42	42	-	-	0	16/36
01	**280**	-	20	260	-	-	7	64	-	-	0	14/34
06	**360**	-	40	320	-	-	28	28	-	-	0	18/34
Quercus gambelii												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**460**	-	-	460	-	80	83	4	0	-	0	32/22
01	**1120**	-	100	880	140	240	68	4	13	13	70	22/18
06	**1180**	-	260	800	120	160	34	0	10	10	10	23/11
Symphoricarpos oreophilus												
84	**1265**	-	66	1133	66	-	5	0	5	-	0	20/30
90	**1266**	-	333	400	533	-	26	5	42	5	26	22/37
96	**3380**	100	520	2840	20	-	18	0	1	-	0	19/32
01	**1860**	-	60	1720	80	-	4	0	4	-	0	18/36
06	**3720**	60	240	3480	-	-	0	0	0	-	0	18/27
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	-	80	-	-	25	0	-	-	0	17/18
01	**100**	-	-	100	-	-	0	0	-	-	0	15/22
06	**100**	-	-	100	-	-	40	0	-	-	0	14/18

Trend Study 6-12-06

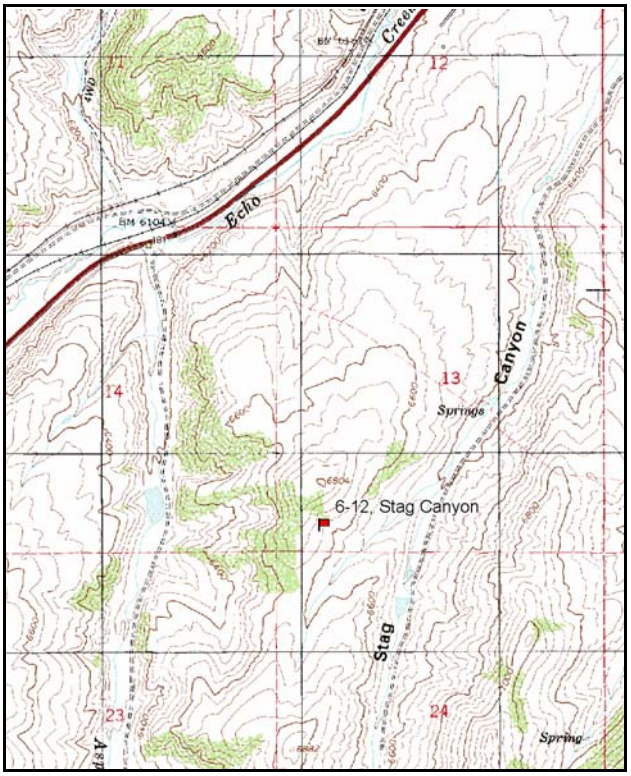
Study site name: Stag Canyon . Vegetation type: Big sagebrush .

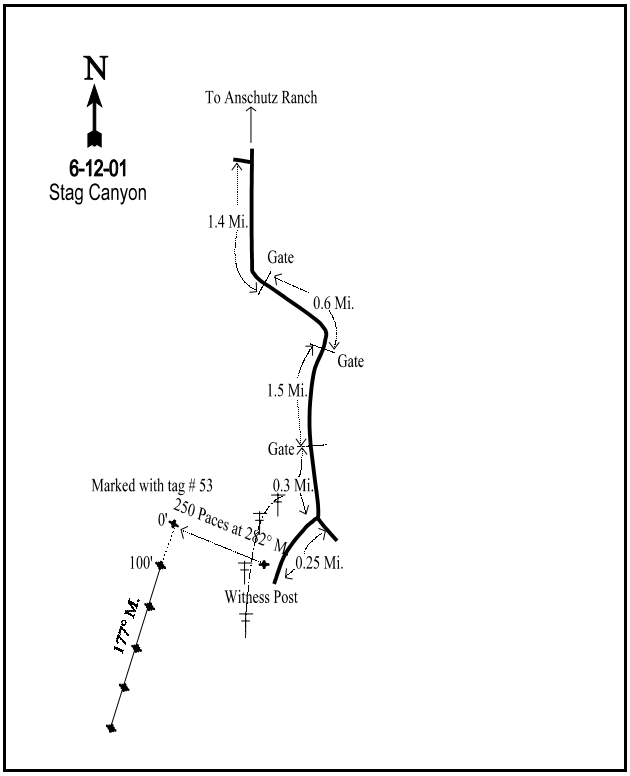
Compass bearing: frequency baseline 177 degrees magnetic.

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

LOCATION DESCRIPTION

Take exit # 185 on I-80, up Echo Canyon and turn right on the frontage road (west). Drive 1.4 miles, turn left, and go through the locked Aspen Meadows Ranch gate. Go 0.6 miles and turn off to the right through the gate next to the corral. Go 1.5 miles to a gate and proceed 0.3 miles from the gate to a fork. Turn right and drive 0.25 miles to a witness post on the right hand (west) side of the road. From the witness post walk 90 paces at 282 degrees magnetic to the 0-foot baseline stake, marked by browse tag #53. The baseline runs 177 degrees magnetic.





Map Name: Castle Rock

Diagrammatic Sketch

Township 4N , Range 6E , Section 13

UTM NAD 27, UTM 12T 4546607 N 481092 E

DISCUSSION

Stag Canyon - Trend Study No. 6-12

Study Information

This study was established in 1996 over concerns of elk use on an old burn (elevation: 6,700 feet, slope: 10-15%, aspect: east). The area is dominated by mountain big sagebrush and adequate juniper thermal cover is located a short distance up the ridge. The study location was determined by the abundant elk pellet groups. In 1996, the pellet group quadrat frequency was 47% for elk, 10% for deer, and 6% for cattle. The pellet group quadrat frequency in 2001 was only 9% for elk, 13% for deer, and 4% for cattle. The pellet group transect estimates in 2001 were 60 elk days use/acre (149 edu/ha), 15 deer days use/acre (36 ddu/ha), and 11 cow days use/acre (27 cdu/ha). Most of the elk pellet groups were from late winter and deer pellets were from spring and early summer. In 2006, the pellet group quadrat frequency remained low. The pellet group transect estimates in 2006 were 35 elk, 21 deer, and 1 horse days use/acre (86 edu/ha, 51 ddu/ha, and 3 hdu/ha). Most pellet groups were from winter.

Soil

The soil is in the Richsum-Heiners series complex, which are shallow to very deep, well drained, moderatedly permeable soils on high tablelands, low mountains, and valley sides. They formed in residuum, slope alluvium, and valley side alluvium derived from shale, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is sandy clay loam with a slightly alkaline soil reaction (7.4 pH). There is little surface rock, but there is considerable rock throughout the profile. Relative bare ground cover has been high at 31% in 1996, 37% in 2001, and 40% in 2006. There are some signs of minor sheet erosion, but it is limited by the moderately gentle slopes. The soil erosion condition class measurement was stable in 2001 and slight in 2006.

Browse

The browse composition consists primarily of mountain big sagebrush and stickyleaf low rabbitbrush. Mountain big sagebrush provided 10% cover in 1996, 12% in 2001, and 17% in 2006. The sagebrush population appeared to be expanding in 1996 with a high abundance of seedlings (1,960 plants/acre) and young (3,640 plants/acre). Young plants made up 71% of the population. This caused the density to increase from 5,120 plants/acre in 1996 to 5,720 plants/acre in 2001. Young plants continued to be abundant in 2001, making up 29% of the population, but seedlings were scarce. The population then dropped to 3,880 plants/acre in 2006, with few seedlings and 820 young plants/acre (21% of the population). It is likely that a few dry years between 2001 and 2006, especially 2002 (Utah Climate Summaries 2006), were the cause of some die off in the young and less-established mature age classes. Sagebrush has exhibited very low percent decadence, light use, and normal vigor. The sagebrush defoliator moth (*Aroga websterii*) was also identified on 600 plants/acre in 2006, but did not appear to have affected the vigor of the plants (which could have been because the effects of the moth were not yet apparent by the end of June when the study was sampled). Average leader growth on big sagebrush was less than 2 inches in 2001 and 2006. Increaser species make up the remainder of the browse; these species include stickyleaf low rabbitbrush, broom snakeweed, and prickly pear.

Herbaceous Understory

The herbaceous understory is marginal and weedy. The major problem in 1996 was that three species (cheatgrass, wavyleaf thistle, and flannel mullein) contributed most of the herbaceous cover. Elk tend to congregate on areas with these forbs and select them in the spring. In 2001, all three of these species significantly decreased in nested frequency. In 2006, cheatgrass increased significantly, but the other two species decreased significantly again. In 2001, the nested frequency for perennial grasses increased, while that of perennial forbs drastically decreased. In 2006, the nested frequency of perennial grasses decreased slightly and perennial forbs increased slightly. Musk thistle was very thick on the road and surrounding meadows in 2001 and 2006.

2001 TREND ASSESSMENT

The trend for browse is slightly up. Mountain big sagebrush density increased, has low decadence, light use, and normal vigor. Young plants remained abundant in the population. The grass trend is up. The nested frequency of perennial grasses increased 21% and cheatgrass nested frequency decreased significantly. The forb trend is down. The nested frequency of perennial forbs decreased 68%, most of which was due to significant decreases in the nested frequencies of wavyleaf thistle, flannel mullein, scarlet globemallow, and longleaf phlox. The 1996 Desirable Components Index score was fair due to moderate browse cover, low browse decadence, high recuitment, moderate perennial grass cover, and excellent perennial forb cover. The 2001 DCI remained fair.

1996 winter range condition (DC Index) - fair (63) Mid-level potential scale
2001 winter range condition (DC Index) - fair (60) Mid-level potential scale
browse - slightly up (+1) grass - up (+2) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is slightly down. The density of sagebrush decreased 32%. This decrease occurred in both the young and mature age classes. However, the sagebrush cover increased from 12% to 17% and average height/crown measurements also increased, which indicate possible self-thinning and stabilization of the population. The grass trend is slightly down. The nested frequency of perennial grasses decreased 13% and cheatgrass nested frequency increased significantly. The forb trend is slightly up. The nested frequency of perennial forbs increased, but this was due mainly to significant increases in low growing forbs. The nested frequency of annual forbs increased more than two-fold and the nested frequency of the weedy annual forb, bur buttercup, increased significantly. The DCI score remained fair.

winter range condition (DC Index) - fair (63) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 12

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	78	91	57	2.58	2.12	1.14
G	Agropyron spicatum	11	11	11	.18	.19	.52
G	Bromus tectorum (a)	$_{b}$272	$_{a}$154	$_{b}$273	4.43	1.85	3.98
G	Elymus cinereus	5	5	5	.03	.41	.15
G	Oryzopsis hymenoides	57	64	66	2.05	1.42	3.57
G	Poa fendleriana	-	2	3	-	.00	.03
G	Poa pratensis	14	34	23	.45	1.35	.08
G	Poa secunda	10	8	17	.12	.05	.42
G	Stipa comata	$_{b}$15	$_{a}$14	$_{b}$18	.34	.42	.34
Total for Annual Grasses		272	154	273	4.43	1.85	3.98
Total for Perennial Grasses		190	229	200	5.77	5.99	6.27
Total for Grasses		462	383	473	10.21	7.84	10.26

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Alyssum alyssoides (a)	$_{a}$103	$_{b}$342	$_{b}$355	.27	3.48	1.23
F	Allium sp.	$_{a}$-	$_{a}$2	$_{b}$13	-	.00	.10
F	Arabis sp.	2	-	-	.00	-	-
F	Astragalus beckwithii	$_{a}$-	$_{a}$1	$_{b}$28	-	.15	.61
F	Astragalus convallarius	$_{a}$3	$_{ab}$9	$_{b}$16	.00	.07	.28
F	Astragalus sp.	-	-	-	-	-	.00
F	Astragalus utahensis	2	-	2	.03	-	.03
F	Calochortus nuttallii	-	-	9	-	-	.03
F	Cirsium undulatum	$_{b}$144	$_{a}$32	$_{a}$8	4.98	.51	.07
F	Collomia linearis (a)	-	4	-	-	.00	-
F	Collinsia parviflora (a)	$_{a}$18	$_{a}$6	$_{b}$167	.07	.01	.53
F	Cordylanthus ramosus (a)	$_{a}$1	$_{a}$19	$_{b}$51	.03	.58	1.51
F	Crepis acuminata	-	-	1	-	-	.00
F	Draba sp. (a)	-	-	10	-	-	.02
F	Epilobium brachycarpum (a)	1	-	9	.00	-	.04
F	Erigeron pumilus	3	2	-	.00	.00	-
F	Gayophytum ramosissimum(a)	-	2	3	-	.01	.00
F	Gilia sp. (a)	-	4	-	-	.00	-
F	Holosteum umbellatum (a)	5	-	7	.01	-	.01
F	Lithospermum ruderale	-	-	4	-	.00	.07
F	Machaeranthera spp	-	1	-	-	.15	-
F	Microsteris gracilis (a)	$_{a}$-	$_{a}$4	$_{b}$91	-	.00	.24
F	Phlox longifolia	$_{b}$42	$_{a}$19	$_{b}$49	.19	.09	.62
F	Polygonum douglasii (a)	$_{b}$26	$_{a}$-	$_{a}$-	.05	-	-
F	Ranunculus testiculatus (a)	$_{a}$5	$_{a}$3	$_{b}$178	.01	.00	1.08
F	Sisymbrium altissimum (a)	1	-	-	.00	-	-
F	Sphaeralcea coccinea	$_{b}$26	$_{a}$9	$_{a}$7	.28	.05	.39
F	Tragopogon dubius	6	-	-	.01	.00	.00
F	Unknown forb-perennial	2	-	-	.03	-	-
F	Verbascum thapsus	$_{c}$59	$_{b}$17	$_{a}$-	2.33	.32	-
Total for Annual Forbs		160	384	871	0.46	4.10	4.69
Total for Perennial Forbs		289	92	137	7.88	1.37	2.23
Total for Forbs		449	476	1008	8.34	5.48	6.93

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

BROWSE TRENDS --
Management unit 06 , Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Artemisia tridentata vaseyana	66	74	77	9.56	11.69	16.64
B	Chrysothamnus viscidiflorus viscidiflorus	59	61	48	5.48	5.69	5.32
B	Gutierrezia sarothrae	35	27	9	1.61	.86	.09
B	Opuntia sp.	3	3	4	.15	.03	.03
Total for Browse		163	165	138	16.80	18.27	22.09

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 12

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	25.86
Chrysothamnus viscidiflorus viscidiflorus	6.66

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 12

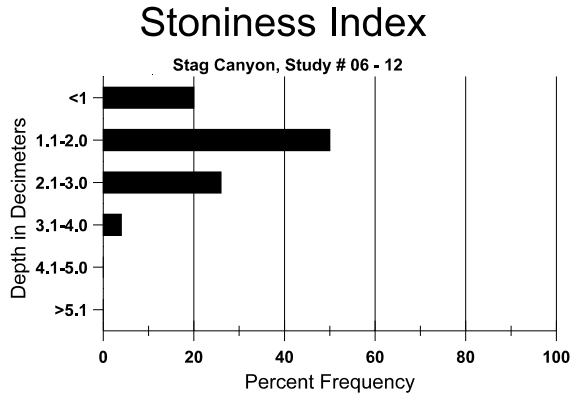
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.9	1.6

BASIC COVER --
Management unit 06 , Study no: 12

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	33.05	32.68	34.59
Rock	1.72	1.37	1.80
Pavement	2.63	5.55	5.02
Litter	40.31	36.14	26.92
Cryptogams	.04	.24	.57
Bare Ground	34.56	45.35	45.02

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 12, Stag Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.8	70.8 (9.7)	7.4	47.3	26.7	26.0	2.9	11.9	169.6	0.7



PELLET GROUP DATA --
Management unit 06 , Study no: 12

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	3	5	22
Horse	-	-	2
Elk	47	9	6
Deer	10	13	10
Cattle	6	4	1

Days use per acre (ha)	
'01	'06
-	-
-	1 (3)
60 (149)	35 (86)
15 (36)	21 (51)
11 (27)	-

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
96	**5120**	1960	3640	1460	20	660	2	.78	0	-	.39	33/40
01	**5720**	20	1680	3900	140	60	2	0	2	.34	.34	30/35
06	**3880**	400	820	2820	240	80	13	0	6	5	6	33/41
Chrysothamnus viscidiflorus viscidiflorus												
96	**2660**	40	80	2460	120	-	5	.75	5	-	0	11/23
01	**3480**	40	20	3040	420	-	0	0	12	4	4	9/21
06	**3040**	-	540	1960	540	-	4	0	18	3	6	10/22
Gutierrezia sarothrae												
96	**3120**	-	560	2520	40	-	0	0	1	-	0	7/10
01	**1840**	-	-	1780	60	-	0	0	3	3	3	7/11
06	**240**	-	20	200	20	20	0	0	8	8	8	5/6
Juniperus osteosperma												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	20	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
96	**100**	-	-	100	-	-	0	0	-	-	0	5/8
01	**140**	-	-	140	-	-	0	0	-	-	0	4/10
06	**100**	-	-	100	-	-	0	0	-	-	0	5/7
Purshia tridentata												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	10/63
06	**0**	-	-	-	-	-	0	0	-	-	0	10/78
Tetradymia canescens												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	6/26

SUMMARY

MANAGEMENT UNIT 6 - CHALK CREEK

Of the 11 trend studies in this management unit, ten studies were reread in 2006, and one study, South Fork Chalk Creek (6-8), was not read because of a problem accessing the private land.

Vegetation trends are dependent upon annual and spring precipitation patterns. Precipitation data from this herd unit was compiled from the Echo Dam, Wanship Dam, and Coalville weather stations (Figures 1 and 2). In 2001 and 2002, the average precipitation values at the 3 weather stations were well below normal and below drought level in 2002 (75% of normal; Figure 1). Spring precipitation for the unit was below normal in 2005 and below 75% of normal from 2000 to 2002 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. It is likely that declining browse trends are a product of the period of drought in 2001 and 2002 (Figure 3).

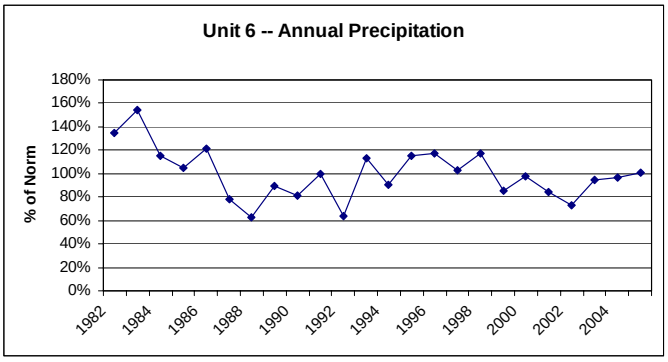


Figure 1. Annual precipitation for unit 6. Precipitation data was collected at Echo Dam, Wanship Dam, and in Coalville (Utah climate summaries 2006).

The average browse trend for the unit has steadily decreased since 1984 (Figure 3). Since 2001, mountain big sagebrush, basin big sagebrush, and low sagebrush populations have deceased in density (Figure 4). Mountain big sagebrush densities have decreased 356 plants/acre on average, while basin decreased 920 plants/acre, and low decreased 1,300 plants/acre. It must be noted that basin and low sagebrush were only sampled on one study (Anshutz Ranch), but mountain big sagebrush was sampled on the other 9 studies. Both basin big sagebrush and low sagebrush densities increased from 1996 to 2001, but returned to 1996 densities in 2006 (Figure 4). Mountain big sagebrush, on the other hand, has continually decreased for a net density decrease of 687 plants/acre since 1996 (a net loss of 45%). Part of the decrease in the average mountain big sagebrush density for the unit was a burn which nearly completely removed the sagebrush from the Echo Canyon Rest Area study (6-2) in 1999. The average sagebrush cover for the three species of sagebrush have not changed substantially since 2001 (Figure 5). The percentage of plants classified as decadent of low and basin big sagebrush decreased from 2001, but increased substantially for mountain big sagebrush (Figure 6). This increase in mountain big sagebrush decadence is likely tied to the decrease in density. It is interesting that, despite the decreases in the average mountain big sagebrush density across the unit, cover has not changed, which implies that sagebrush individuals are getting bigger (Figures 4 and 5).

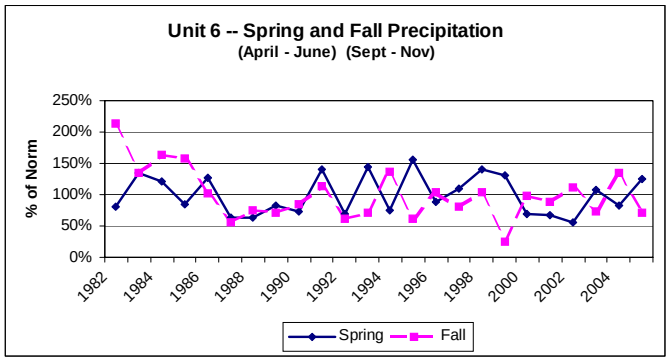


Figure 2. Spring and fall precipitation for unit 6. Precipitation data was collected at Echo Dam, Wanship Dam, and in Coalville (Utah climate summaries 2006).

No individual browse trends for the unit improved in

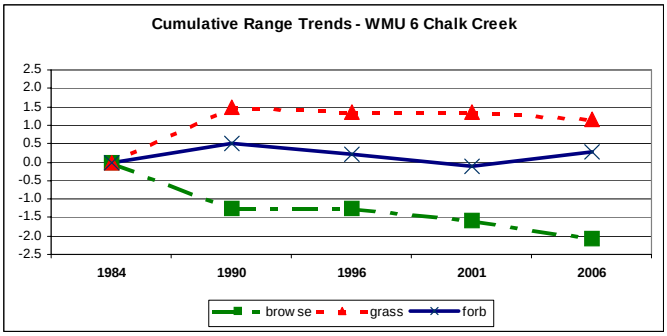


Figure 3. Cumulative range trends for unit 6, Chalk Creek.

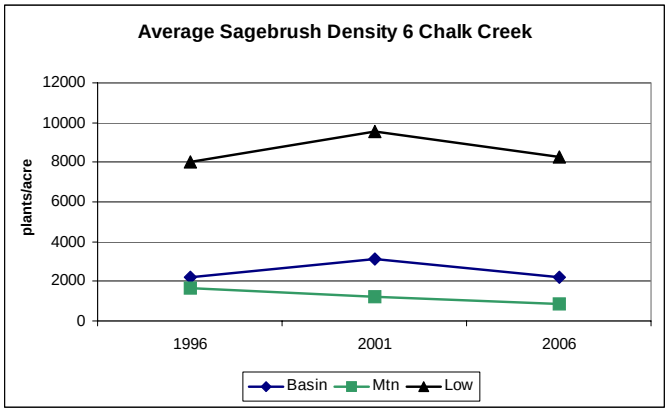


Figure 4. Average basin big sagebrush, mountain big sagebrush, and low sagebrush densities since 1996.

2006. The trends for Anshutz Ranch (6-1), Crandall Canyon (6-7), and Stag Canyon (6-12) were slightly down and the trend was down for North Oakley Bench (6-9); the trends for the other 7 studies were stable.

The low precipitation years mentioned above definitely played a role in the decreasing browse trends, but infestations of the sagebrush defoliator moth (*Aroga websterii*) are likely a cause of the decreasing browse trends, or at least the appearance of dying plants. At the Anshutz Ranch study (6-1), approximately 360 plants/acre of low sagebrush and 140 plants/acre of basin big sagebrush were infested or showed poor vigor that resembled the infestation. Approximately 540 plants/acre (46% of the population) were classified as being infested with the moth or of poor vigor at the North Oakley Bench study (6-9). The moth and spittle bug infested 600 plants/acre (15% of the population) at the Stag Canyon study (6-12). The moth was identified on the Spring Hollow Burn (6-3) study, but not sampled in the density measurements.

The herbaceous understory trends decreased on average across the unit from 2001 to 2006 and have steadily decreased since 1996. The average forb trends in 2006 increased slightly, but the grass trends decreased (Figure 2). The unit average perennial grass cover increased from 13% in 1996 to 16% in 2001 and 2006, but the perennial grass nested frequency unit average decreased from 2001 to 2006 (Figures 7 and 8). The perennial forb cover and nested frequencies unit averages have not changed since 1996 (Figures 7 and 8). The unit averages of cheatgrass cover and nested frequency decreased from 1996 to 2001 and have stayed at 2001 values (Figures 7 and 8). With the exception of the Echo Canyon Rest Area (6-2) and Stag Canyon (6-12) studies, cheatgrass cover and nested frequency remained low from 2001 to 2006. Bulbous bluegrass has been sampled on 6 studies since 1996. It has not changed much in cover nor nested frequency across the unit since 1996 and provides little cover on most studies (Figures 7 and 8). On 2 studies (North Oakley Bench and Mahogany Hills), it has increased in nested frequency and cover since 1996, and dominates at North Oakley Bench. Studies with increasing bulbous bluegrass cover and nested frequencies appear to have hindered cheatgrass growth. Stewart and Hull (1949) reported that bulbous bluegrass seed and bulbils distributed in established cheatgrass stands could reduce the cheatgrass densities.

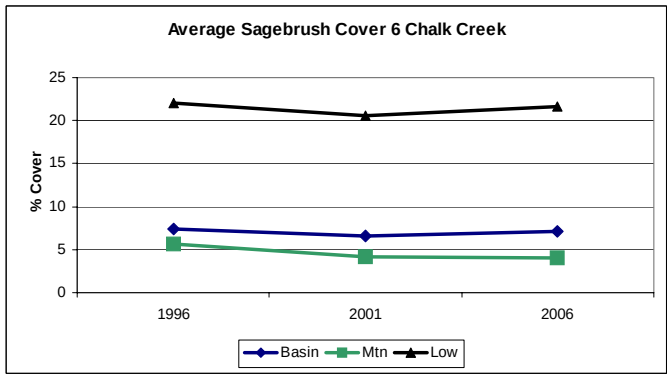


Figure 5. Average low sagebrush, basin big sagebrush, and mountain big sagebrush cover for unit 6.

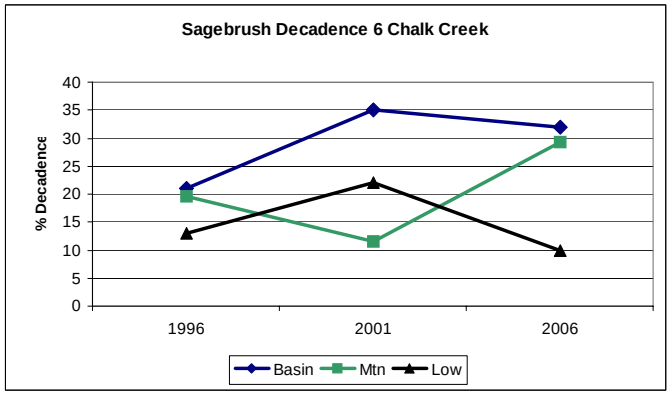


Figure 6. Average percent decadence for low sagebrush, mountain big sagebrush, and basin big sagebrush in unit 6.

The unit-wide Desirable Components Index (DCI) scores have remained fair for the High potential studies and have fluctuated between poor and fair in the Mid-level potential studies (Figure 9). The DCI scores of the Mid-level potential studies are poor because 5 of the 10 studies in the unit have very low

sagebrush cover (less than 1%) and one study has less than 2% cover. The good perennial grass cover across the unit prevents the DCI scores at these studies from being very poor.

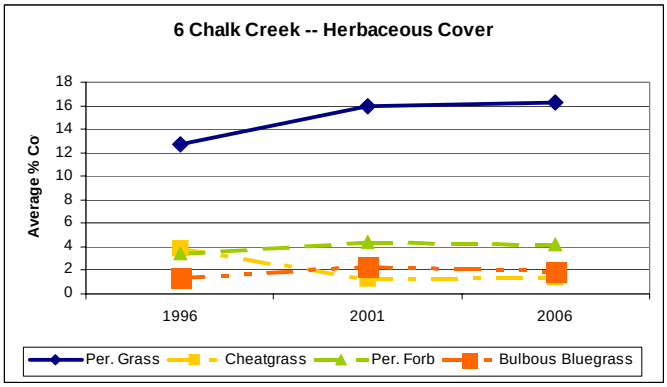


Figure 7. Unit 6 herbaceous understory cover averages.

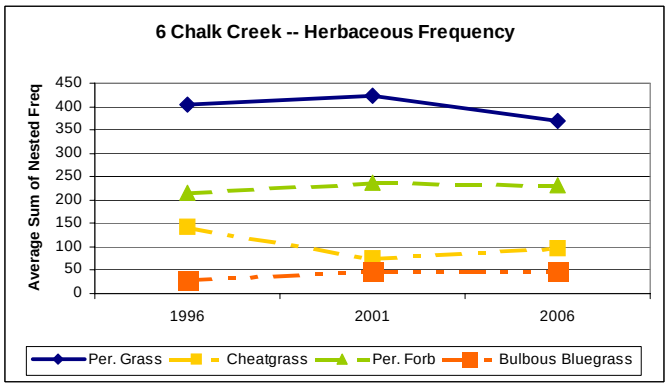


Figure 8. Unit 6 herbaceous understory nested frequency averages.

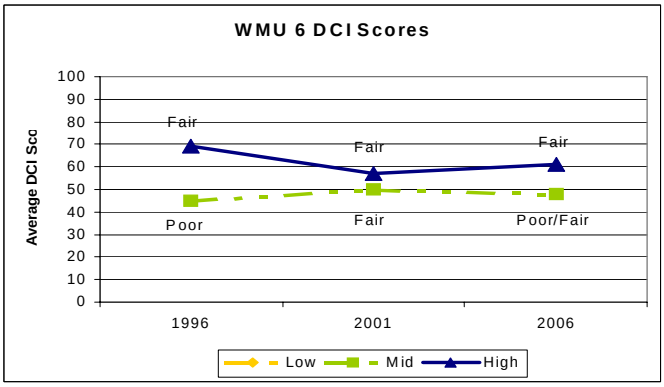
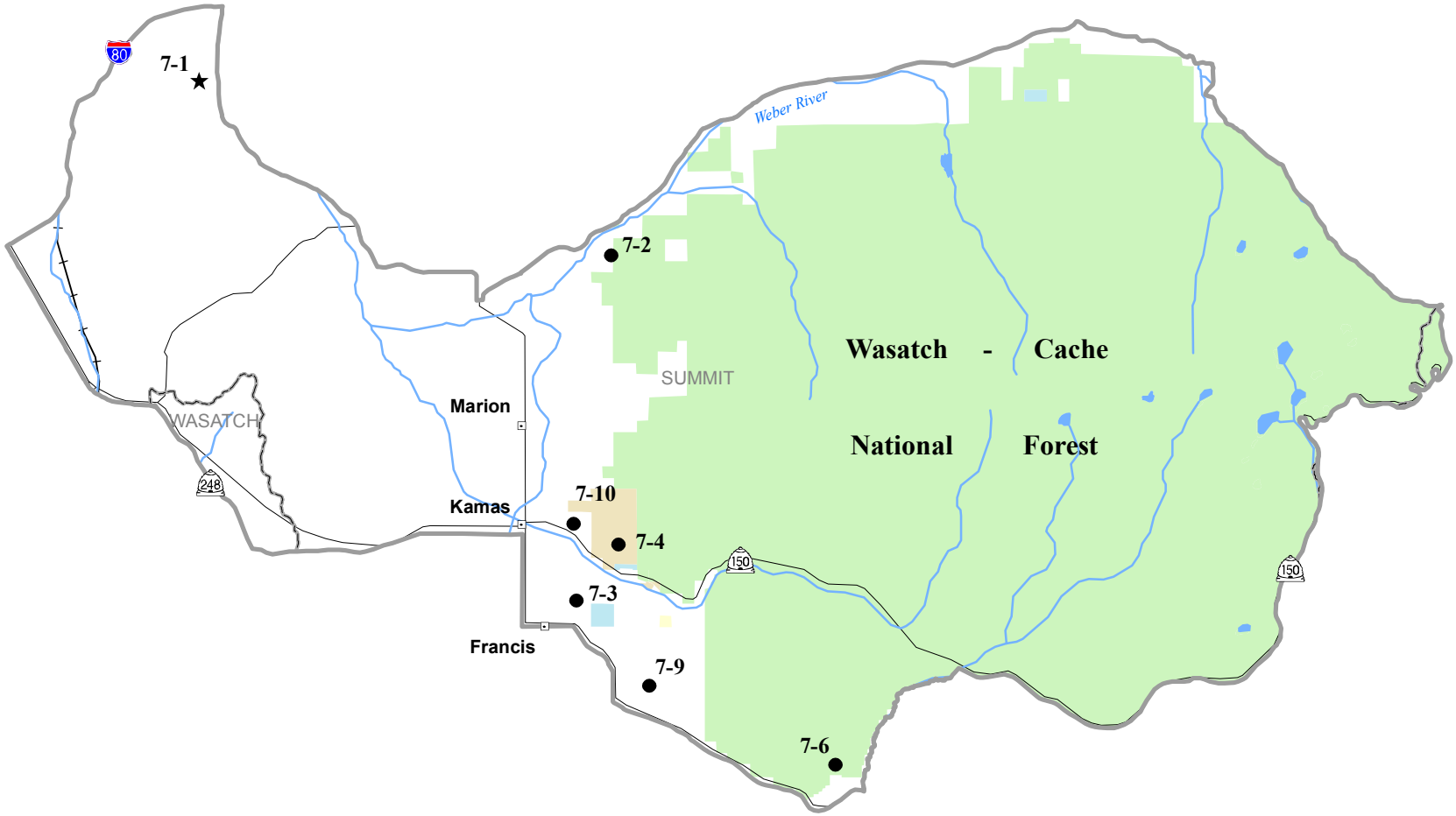


Figure 9. Unit 6 average Desirable Components Index (DCI) scores by year. The DCI ratings are divided into 3 categories based on different ecological potentials. These are: Low, Mid-level, and High.

Management Unit 7

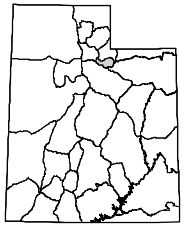


- Transect location
- Suspended site
- Forest Service
- BLM
- State of Utah
- Private
- Utah DWR
- Water body
- Perennial stream
- Intermittent stream
- Road
- County boundary
- Railroad

N

Map Scale 1:235,000
(1 inch = 3.7 miles)

Unit Location



WILDLIFE MANAGEMENT UNIT 7 - KAMAS

Boundary Description

Summit and Wasatch Counties - Boundary begins at the junction of I-80 and SR-32 (Wanship); south on SR-32 to the Weber Canyon Road at Oakley; east on this road to Holiday Park and the Weber River Trail; east on the Weber River Trail to SR-150 near Pass Lake; south on SR-150 to the Soapstone Basin road (USFS 037); south on this road to SR-35; west on SR-35 to Francis and SR-32; west on SR-32 to US-40 near Jordanelle; north on US-40 to I-80; north on I-80 to SR-32 and Wanship.

Management Unit Description

The Kamas herd unit is located between the Uinta and Wasatch Mountains in the north-central part of the state. The 1977 inventory of the Kamas unit, then known as Herd Unit 20, classified 10% of the unit as winter range (Giunta 1979). Boundary changes in 1985 reduced the total acreage and shifted a portion of the winter range north of the Weber River into the Chalk Creek management unit. There was another realignment of the herd unit boundaries again in 1996 and in 2004. Even with these changes, the ratio of winter to summer range has stayed basically the same, with about 10% of the area being classified as winter range. The obvious limiting factor for big game in this management unit is the lack of adequate amounts of good quality winter range. With severe winters, the available range is reduced even further. An example of this problem can be illustrated by the large winter deer losses which occurred during the winter of 1992-93.

The western portion of the unit is primarily privately-owned land. The mountainous portion of the unit is managed by the U.S. Forest Service. The Kamas Wildlife Management Area is administered by the DWR. For deer, over 67% of the winter range is under private ownership. The Forest Service manages another 28% of the normal winter range. There is abundant summer range in the Uinta Mountains to the east. These mountains contain the headwaters of the Weber and Provo Rivers, which flow west through the Rhodes and Heber Valleys. The south and west exposures along these rivers, in addition to land along Beaver Creek and the mountain face east and north of Kamas, provide the major deer wintering areas.

Because of the varying topography, the deer winter range is separated into several distinct areas. The upper limits vary considerably, but lower limits generally follow the canyon bottoms, roads, and the upper limits of cultivated land. Wintering areas north of the Weber River, on the Kamas face, Beaver Creek, and the Provo River, have long been recognized as critical to the deer herd on the western edge of the Uinta Mountains. However, there has been a controversy regarding which deer use the Weber River winter range. Data on migration patterns led to the boundary change which shifted this important winter range into the Chalk Creek unit. An area south of Wanship that was surveyed as winter range in 1977 was not considered winter range on the 1984 herd unit map, but the area was sampled with study 7-1 in the past. For a complete and detailed description of all the winter range areas and vegetation types sampled, consult the 1977 Range Inventory (Giunta 1979). The report includes an acreage breakdown by vegetation type and geographic area.

Fourteen different vegetation types were classified, but only nine of the more important types were sampled in the 1977 inventory. Of those, two emerge as the dominant and most valuable types. Together, the oakbrush and sagebrush-grass types occupied more than 70% of the normal winter range. The oakbrush type, dominated by Gambel oak with big sagebrush, serviceberry, and snowberry as the subdominant associates, is often found at the more mesic, higher elevations. The oakbrush range condition, in 1977, was considered generally satisfactory and exhibited light to moderate deer use. Sagebrush-grass, the second most abundant type, often occurs interspersed with the oak type. It normally occupies the lower, especially critical portions of the winter range. Much of the lower areas have been converted to cropland or are heavily grazed by livestock. Other important types include the rather depleted sagebrush type and a significant mountain brush stand on the south-facing slope of Pinyon Canyon.

Big Game Management Objectives

Management objectives for deer are to keep the herd in balance with the available range, which includes a yearly harvest of 1,300 bucks with normal conditions. The number of antlerless deer permits would depend on targeted population goals (9,000 wintering deer, modeled number) and condition and trend of the winter range. Management objectives for elk are to achieve a target population size of 650 wintering elk under normal conditions (modeled number), with a bull to cow ratio of 8:100, and with at least 4 of these bulls 2½ years of age or older. To maintain these target populations, antlerless and either sex permits and a variety of harvest methods and seasons will be used (1998 Utah Big Game Management Plan).

The lack of winter range is the major limiting factor for the deer herd in this unit. A major concern is the continuing loss of habitat to housing and agriculture centered on private lands. Other management concerns for both deer and elk include increases in road building and the resultant highway mortality, minimizing crop depredation by wildlife on private lands, and predation. Overuse by both livestock and big game has led to a deteriorating range condition in many critical locations.

The key solution to the deer problems on the herd unit is the protection of the remaining critical winter range. Land purchase in this unit is a high priority of the Division's land acquisition program. The Division has made purchases of critical land east of Kamas in which improvements should be made to enhance the quality of the range. It will be necessary to work with private landowners to discourage overgrazing, and insure hunter access and adequate depredation protection.

Range Trend Studies

There are seven trend studies in management unit 7. Five of these were established in 1984. Two trend studies near Jordanelle Reservoir were in unit 7, but boundary changes have moved them to unit 17 and will be monitored with the Central Region. Trend studies in this management unit were reread in 1990, 1996, 2001, and 2006. One study, Stevens Hollow (7-1), was discontinued in 2001 by request of the Division biologist who manages the unit. The area surrounding the Stevens Hollow study is undergoing extensive development.

Trend Study 7-2-06

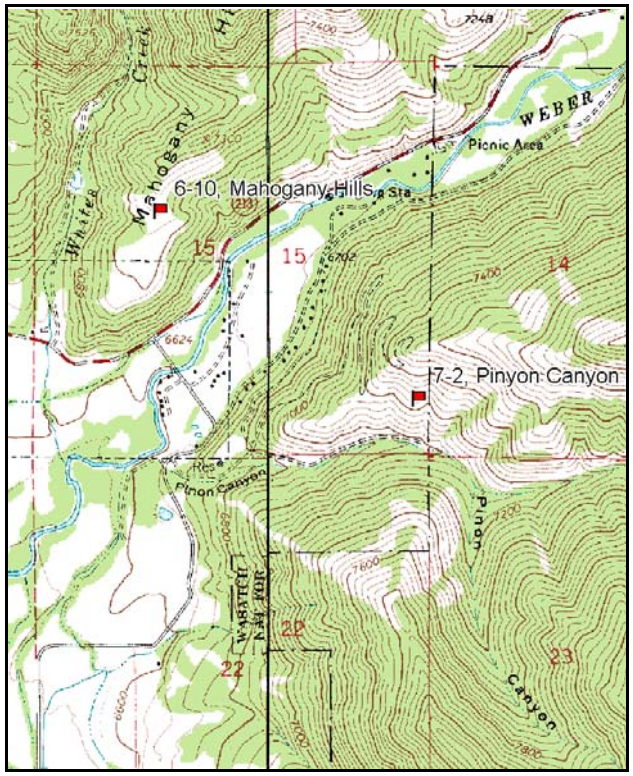
Study site name: Pinyon Canyon . Vegetation type: Mountain Brush .

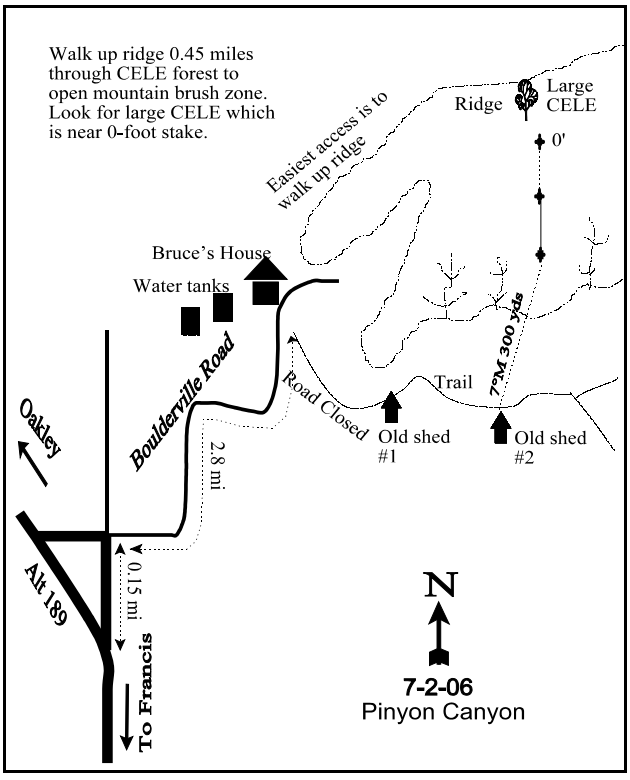
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

Where Highway 189 turns northwest between Kamas and Oakley, proceed north for 0.15 miles. At this intersection turn right (east) onto Boulderville Road and travel 2.8 miles. Turn right onto a dirt road proceeding up Pinyon Canyon to a private home, passing two water storage tanks. Contact landowner before proceeding through private land. From the land owners home, walk up the ridge through a Curlleaf mahogany and pinyon forest for about a half mile. As the forest opens up into a mountain brush vegetation type look for a lone, large Curlleaf mahogany on the southwest facing slope. The 0-foot baseline stake is just below this mahogany. The 0-foot stake is marked by browse tag #7957.





Map Name: Hoyt Peak

Diagrammatic Sketch

Township 1S , Range 6E , Section 15

UTM NAD 27, UTM 12T 4508531 N 479481 E

DISCUSSION

Pinyon Canyon - Trend Study No. 7-2

Study Information

The Pinyon Canyon study is located in a drainage containing one of the better and more important mountain brush big game wintering areas in the herd unit (elevation: 7,200 feet, slope: 35-40%, aspect: south). This site is rather high for winter range, but with the favorable aspect and slope, the area remains available to big game during all but the most severe winters. Pellet group quadrat frequencies and pellet group transect data have indicated that elk utilize the area much more than deer. Pellet group transect data collected in 2001 estimated 69 elk days use/acre (170 edu/ha) and 30 deer days use/acre (74 ddu/ha). In 2006, elk use was estimated at 100 days use/acre (248 edu/ha) and deer use was at 11 days use/acre (26 ddu/ha). Several moose pellet groups have also been observed on the site, but occurred outside the sampling area. The mountain brush community in this area exhibits considerable variation in overstory dominance. The mixture of shrubs includes varying densities of true mountain mahogany, serviceberry, mountain big sagebrush, antelope bitterbrush, Gambel oakbrush, mountain snowberry, and a few scattered curlleaf mountain mahogany.

Soil

The Agassiz soil series consists of very shallow and shallow, somewhat excessively drained, moderate or moderately rapidly permeable soils on mountainsides. They formed in shallow material over weathered limestone (USDA-NRCS 2006). Soils are moderately rocky on the surface and throughout the profile. Parent material appears to be limestone, sandstone, and shale. In places, the soil has a reddish color, indicating a high iron oxide content. Effective rooting depth was estimated at about 12 inches. This should not be a limiting factor to vegetation growth. Soil texture is classified as a loam with a slightly alkaline soil reaction (7.7 pH). Permeability would be moderately slow when combined with the steep slope and high surface rock cover. There is a moderately high potential for runoff and erosion. Vegetation and litter cover are fair. Under most conditions this will help prevent erosion from most high intensity summer rain events. A condition class assessment estimated slight soil erosion in 2001, but stable in 2006.

Browse

The browse component is composed of many species that include true mountain mahogany, mountain snowberry, mountain big sagebrush, antelope bitterbrush, Gambel oak, and Saskatoon serviceberry. The browse component provides about one-third of the total vegetation cover. The preferred species: serviceberry, mountain big sagebrush, and true mountain mahogany had on average a much lower decadence in 1996, 2001, and 2006 compared to the 1984 and 1990 readings. The level of use exhibited on these species has been moderate to heavy in most readings, with generally less use in the last readings. Utilization on mountain big sagebrush has shown the most improvement since 1984,when 100% were classified as having heavy use. Utilization of big sagebrush was classified as light to moderate for the last three readings. Recruitment from young plants has been moderate to high for serviceberry and true mountain mahogany in all samples. Sagebrush density has declined slightly at each reading, but cover has increased as plant size has increased.

Herbaceous Understory

The herbaceous composition consists of an excellent grass component, dominated primarily by bluebunch wheatgrass. Bluebunch wheatgrass contributed 65% of the grass cover in 1996 and 73% in 2006. Nested frequency significantly decreased in 2001, but remained stable in 2006. Sandberg bluegrass is the second most abundant perennial grass and has maintained a stable frequency from 1990 to 2001, but declined significantly in 2006. Cheatgrass is also moderately abundant. It was less abundant in 2001. In 2006, cheatgrass was abundant (found in 93% of quadrats), but was not as robust and cover was lower. Forbs occur only occasionally. All forbs combined have provided only about 13% of the total vegetation cover from 1996 to 2006. None of the forbs provide significant amounts of forage or ground cover except for rock goldenrod. Pale alyssum is an annual species that has increased at each of the last two readings.

1990 TREND ASSESSMENT

True mountain mahogany is heavily to severely hedged. Its density has slightly decreased since 1984. The density of young and mature plants also declined slightly, while decadent mahogany shrubs increased to 36% of the population. Contrasting data was found for the serviceberry population. These palatable shrubs are moderately to heavily hedged but have normal vigor. Density is stable to slightly increasing. Decadent plants decreased from 65% to 11% of the population. Oregon grape is still the most numerous woody species. In comparison with the 1977 line intercept transect data from the same site, mountain big sagebrush continues on the downward trend that was noted in 1984. The moderately dense grass understory of bluebunch wheatgrass and Sandberg and mutton bluegrasses is almost unchanged. Sum of nested frequency for perennial forbs increased.

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

1996 TREND ASSESSMENT

The key browse, serviceberry, mountain big sagebrush, and true mountain mahogany, provide 59% of the total browse cover. Overall, there has been a decrease in those plants classified as heavily browsed, vigor has improved, and percent decadence has decreased for all key species. Overall, the trend for browse is improving. The grass trend is slightly up as the nested frequency for bluebunch wheatgrass increased. The trend for cheatgrass should be monitored closely. Perennial forb nested frequency decreased 41%. The forb trend is down.

winter range condition (DC Index) - fair-good (69) Higher potential scale
browse - slightly up (+1) grass - slightly up (+1) forb - down (-2)

2001 TREND ASSESSMENT

Trend for browse is stable. Serviceberry, mountain big sagebrush, and true mountain mahogany have stable densities and low percent decadence. Use remains moderate to heavy on serviceberry and mountain mahogany, but mostly light on mountain big sagebrush. Trend for grasses is stable. Bluebunch wheatgrass decreased in nested frequency, but Sandberg bluegrass increased. Cheatgrass nested frequency was significantly lower, but still very abundant. The trend for forbs is up as perennial forbs increased in sum of nested frequency although they continue to be in low abundance.

winter range condition (DC Index) - fair (65) Higher potential scale
browse - stable (0) grass - stable (0) forb - up (+2)

2006 TREND ASSESSMENT

The browse trend is stable. Serviceberry density decreased, while bitterbrush density increased. True mountain mahogany density has remained stable and recruitment has been very good. A greater amount of preferred browse cover would be desired. The grass trend is slightly down. Sandberg bluegrass nested frequency declined significantly. Total perennial grass nested frequency declined about 14%. Cheatgrass increased significantly to the same level as the 1996 reading. The forb trend is slightly down. Perennial forb nested frequency decreased about 10%. The annual pale alyssum also increased significantly in 2006.

winter range condition (DC Index) - fair (65) Higher potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	5	-	-	-	-	-	-	-
G	Agropyron spicatum	ab275	a266	c322	ab286	b288	19.45	11.37	17.66
G	Bromus japonicus (a)	-	-	-	-	4	-	-	.01
G	Bromus tectorum (a)	-	-	b274	a215	b272	6.51	5.66	3.95
G	Poa fendleriana	c107	bc65	ab50	a28	a23	.67	.60	.53
G	Poa secunda	a93	b172	b175	b196	a127	3.40	4.27	1.92
Total for Annual Grasses		0	0	274	215	276	6.51	5.66	3.96
Total for Perennial Grasses		480	503	547	510	438	23.54	16.25	20.12
Total for Grasses		480	503	821	725	714	30.05	21.92	24.08
F	Agoseris glauca	a-	a-	a-	b10	b11	-	.05	.07
F	Allium acuminatum	b34	bc37	a5	bc50	c64	.01	.25	.33
F	Alyssum alyssoides (a)	-	-	a28	b64	c281	.16	.61	2.60
F	Astragalus sp.	-	1	-	2	2	-	.01	.15
F	Balsamorhiza sagittata	3	-	-	-	1	-	-	.15
F	Camelina microcarpa (a)	-	-	c117	b51	a3	.61	.23	.03
F	Calochortus nuttallii	6	3	-	4	6	-	.01	.02
F	Chaenactis douglasii	ab6	c28	b13	a-	a-	.05	-	-
F	Chenopodium fremontii (a)	-	-	-	1	-	-	.00	-
F	Cirsium undulatum	b41	b40	a9	a12	a6	.10	.54	.59
F	Comandra pallida	24	21	26	21	18	.23	.31	.53
F	Collinsia parviflora (a)	-	-	-	2	-	-	.00	-
F	Crepis acuminata	-	3	1	2	7	.03	.03	.12
F	Cymopterus sp.	-	-	2	5	1	.03	.36	.00
F	Descurainia pinnata (a)	-	-	-	7	5	-	.07	.01
F	Draba sp. (a)	-	-	-	-	6	-	-	.01
F	Epilobium brachycarpum (a)	-	-	-	9	8	-	.02	.04
F	Erigeron pumilus	-	-	2	2	1	.15	.03	.03
F	Erigeron strigosis	-	-	2	-	-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	6	-	1	.01	-	.00
F	Gilia sp. (a)	-	-	-	4	-	-	.00	-
F	Helianthus sp.	-	-	7	-	-	.06	-	-
F	Holosteum umbellatum (a)	-	-	8	8	-	.09	.01	-
F	Ipomopsis aggregata	-	-	-	2	-	-	.00	-
F	Lappula occidentalis (a)	-	-	-	-	1	-	-	.00
F	Lomatium sp.	-	-	1	-	5	.01	-	.18

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$68	$_{a}$7	-	.24	.01
F	Penstemon humilis	14	22	19	11	11	.43	.27	.45
F	Petradoria pumila	$_{ab}$41	$_{b}$61	$_{ab}$38	$_{a}$34	$_{a}$24	1.62	1.86	1.11
F	Phlox longifolia	-	-	1	-	-	.00	-	-
F	Polygonum douglasii (a)	-	-	3	-	-	.00	-	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$8	$_{b}$47	$_{b}$54	.02	.41	.62
F	Streptanthus cordatus	-	3	-	-	-	-	-	-
F	Tragopogon dubius	$_{a}$4	$_{a}$-	$_{a}$7	$_{b}$21	$_{a}$5	.09	.38	.07
F	Unknown forb-perennial	-	2	-	-	-	-	-	-
F	Viguiera multiflora	2	3	-	5	1	-	.03	.00
F	Zigadenus paniculatus	-	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	170	261	366	0.91	1.63	3.36
Total for Perennial Forbs		175	225	133	181	163	2.84	4.18	3.83
Total for Forbs		175	225	303	442	529	3.75	5.82	7.20

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

BROWSE TRENDS --
Management unit 07 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	27	25	19	1.41	.66	.93
B	Artemisia tridentata vaseyana	17	13	12	.68	1.86	2.51
B	Cercocarpus montanus	35	32	33	3.99	4.24	3.01
B	Gutierrezia sarothrae	3	0	1	.18	-	-
B	Mahonia repens	3	4	5	.15	.24	.09
B	Purshia tridentata	4	3	4	1.14	1.66	1.76
B	Quercus gambelii	1	3	1	.33	.93	1.17
B	Symphoricarpos oreophilus	19	19	22	2.37	3.75	3.40
Total for Browse		109	99	97	10.26	13.35	12.91

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 2

Species	Percent Cover '06
Amelanchier alnifolia	3.08
Artemisia tridentata vaseyana	3.63
Cercocarpus montanus	3.84
Mahonia repens	.08
Purshia tridentata	2.90
Quercus gambelii	1.08
Symphoricarpos oreophilus	1.54

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 2

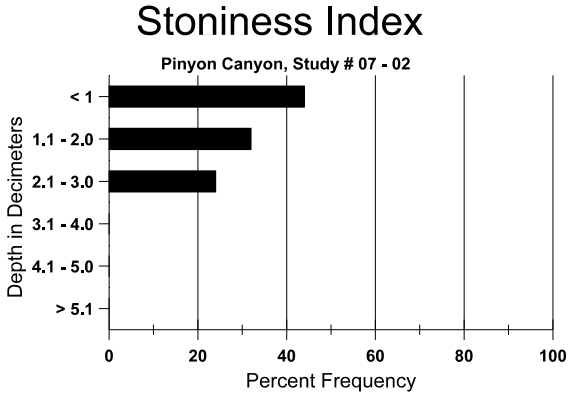
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	3.8	4.6
Artemisia tridentata vaseyana	-	1.3
Cercocarpus montanus	2.1	4.0
Purshia tridentata	-	3.7

BASIC COVER --
Management unit 07 , Study no: 2

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.50	9.50	43.43	39.25	39.79
Rock	23.00	25.25	17.19	15.94	18.73
Pavement	8.25	4.00	6.61	5.94	7.36
Litter	45.75	40.00	41.18	30.26	25.50
Cryptogams	1.75	0	.39	.15	.01
Bare Ground	17.75	21.25	14.82	33.31	22.39

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 02, Pinyon Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.9	60.3 (11.0)	7.7	40.6	32.4	27.0	3.8	8.4	89.6	0.8



PELLET GROUP DATA --
Management unit 07 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Elk	32	43	49
Deer	11	14	3

Days use per acre (ha)	
'01	'06
69 (170)	100 (248)
30 (74)	11 (26)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**1133**	66	200	200	733	-	6	88	65	4	65	27/21
90	**1266**	-	533	600	133	-	21	26	11	-	0	22/22
96	**940**	80	420	500	20	-	53	13	2	2	2	29/37
01	**1260**	-	640	460	160	20	19	22	13	11	14	30/39
06	**560**	20	200	320	40	20	0	50	7	4	4	31/35
Artemisia tridentata vaseyana												
84	**132**	-	-	66	66	-	0	100	50	-	0	24/20
90	**66**	-	-	-	66	-	100	0	100	-	0	-/-
96	**380**	-	140	160	80	160	47	0	21	11	11	21/31
01	**280**	-	20	220	40	120	14	0	14	-	7	22/34
06	**240**	-	20	200	20	60	33	17	8	8	17	31/43

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus montanus												
84	**1066**	-	466	400	200	-	0	56	19	-	0	46/28
90	**932**	-	333	266	333	-	14	64	36	-	0	42/27
96	**780**	-	200	560	20	20	44	41	3	-	0	34/40
01	**760**	20	120	540	100	40	34	50	13	-	0	34/37
06	**740**	40	120	480	140	20	19	70	19	5	8	32/36
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	14/21
01	**0**	-	-	-	-	-	0	0	-	-	0	19/27
06	**0**	-	-	-	-	-	0	0	-	-	0	12/24
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**140**	-	-	140	-	-	0	0	-	-	0	7/10
01	**0**	-	-	-	-	-	0	0	-	-	0	9/32
06	**20**	-	-	20	-	-	0	0	-	-	0	8/9
Mahonia repens												
84	**8600**	-	8600	-	-	-	0	0	-	-	0	-/-
90	**10466**	-	4800	5666	-	-	0	0	-	-	0	4/4
96	**380**	20	80	300	-	-	0	0	-	-	0	4/5
01	**680**	-	-	680	-	-	0	0	-	-	0	4/6
06	**840**	-	60	780	-	-	0	0	-	-	0	4/4
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**240**	-	-	240	-	-	75	25	0	-	0	19/47
01	**60**	-	-	60	-	-	100	0	0	-	0	22/84
06	**420**	-	-	400	20	-	29	5	5	-	0	24/55
Quercus gambelii												
84	**2200**	-	400	1400	400	-	15	61	18	-	0	47/19
90	**1933**	-	1200	733	-	-	66	0	0	-	0	43/29
96	**20**	-	20	-	-	-	0	0	0	-	0	64/65
01	**120**	-	-	120	-	-	0	0	0	-	0	58/34
06	**40**	80	-	20	20	-	0	0	50	50	50	58/39

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sambucus cerulea												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	28/66
06	**0**	-	-	-	-	-	0	0	-	-	0	37/72
Symphoricarpos oreophilus												
84	**1533**	-	200	1000	333	-	65	13	22	-	0	22/23
90	**2199**	-	400	1133	666	-	42	0	30	.90	3	21/26
96	**600**	40	160	440	-	-	27	0	0	-	0	18/33
01	**420**	-	-	420	-	-	14	0	0	-	0	20/43
06	**700**	40	80	580	40	20	0	3	6	3	3	20/25

Trend Study 7-3-06

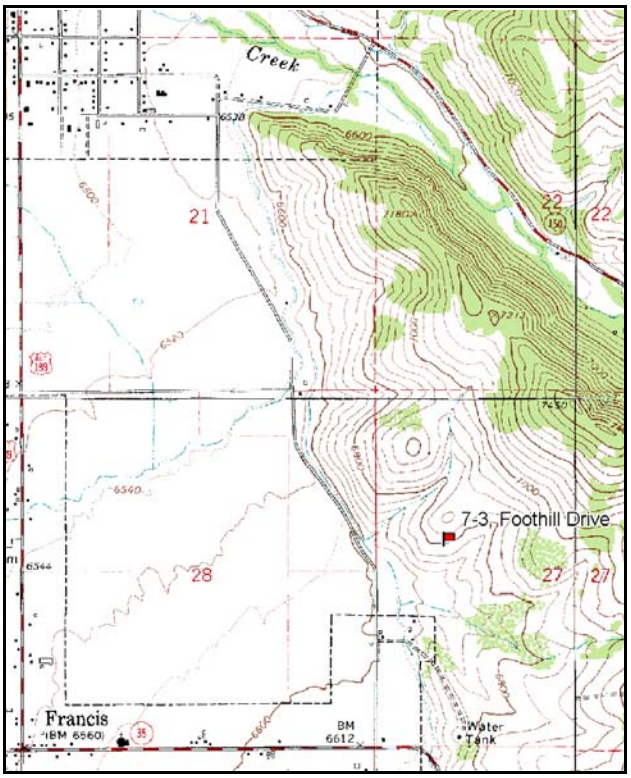
Study site name: Foothill Drive . Vegetation type: Big Sagebrush-Grass .

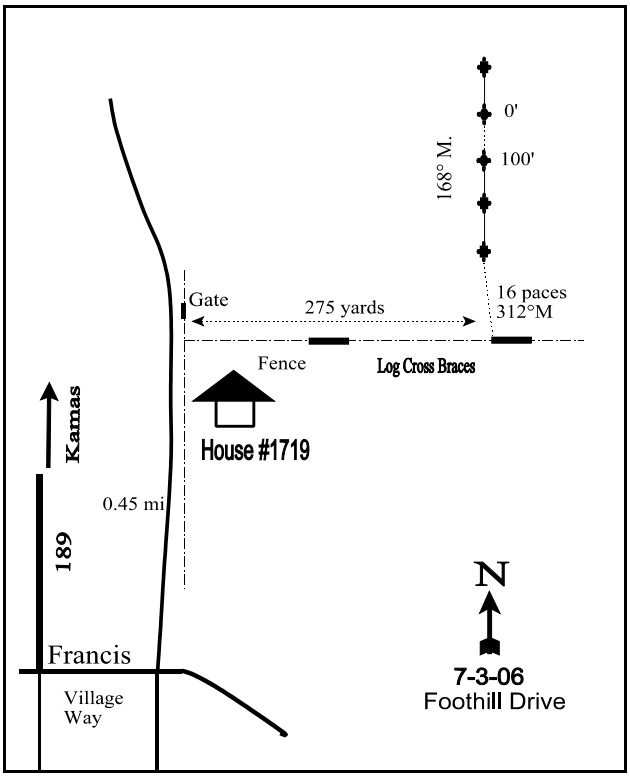
Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

At the junction of 189 and Village Way in Francis, proceed east for 1.0 mile. Turn left (north) onto Foothill Drive, and proceed 0.45 miles to house #1719 on the right. Park here and walk east along the east-west running fence, just north of the house, for approximately 275 yards to the second large log cross-brace on the fence. Walk 16 paces at 312 degrees magnetic to the 300-foot baseline stake. Three hundred feet to the north at a bearing of 348 degrees magnetic is the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7958. The first 300 feet of the baseline runs 168 degrees magnetic. Line 4 runs off the 0-foot baseline stake at a bearing of 348 degrees magnetic.





Map Name: Francis Diagrammatic Sketch

Township 2S , Range 6E , Section 27 UTM NAD 27, UTM 12T 4496275 N 478254 E

DISCUSSION

Foothill Drive - Trend Study No. 7-3

Study Information

The Foothill Drive study is located east of Francis and north of the Provo River on privately owned critical deer winter range (elevation: 6,800 feet, slope: 30%, aspect: southeast). This study samples an open mountain big sagebrush-grass hill that is surrounded by adjacent ridges dominated by Gambel oakbrush. Animal use during winter comes from deer and elk. Domestic cattle and horses also use the area. The overall intensity of use has been heavy in the past and the impact of grazing and browsing animals is evident. The field crew observed the remains of seven winter-killed deer in 1984 and one in 2006. Estimates from pellet group data in 2001 showed 56 deer days use/acre (139 ddu/ha). Use by elk and cattle was low in 2001 at an estimated 2 elk days use/acre (5 edu/ha) and 7 cow days use/acre (16 cdu/ha). In 2006, deer use was 68 days use/acre (169 ddu/ha). Cattle use was 9 days use/acre (22 cdu/ha) and horse use was 7 days use/acre (17 hdu/ha).

Soil

The Horrocks soil series consists of deep, well drained, moderately slowly permeable soils that formed in glacial deposits, alluvium, colluvium and residuum from andesite, sandstone and quartzite. These soils are on mountain slopes and terminal moraines (USDA-NRCS 2006). Soils are clay loam in texture with a slightly acidic soil reaction (6.4 pH). Soil depth is quite shallow due to the abundance of rock on the soil surface and in the profile. Effective rooting depth was estimated at only 9 inches. Vegetation and litter cover are good and coupled with the high amount of surface rock cover, erosion is mostly minimal. Protective cover at the bottom of the slope was poor where there was noticeable trampling damage from cattle, but had recovered by 2006. An erosion condition class assessment showed stable soils in 2001 and 2006. Bare ground has been very low at less than 7% cover from 1996 to 2006.

Browse

After the heavy winters of 1983-1984, approximately 84% of the mountain big sagebrush population was classified as heavily browsed. The level of use has steadily declined with each reading to only light use until 2006 when some moderate to heavy use was noted. Sagebrush vigor has been generally good, except in 1984, when 33% of the population showed poor vigor. Decadence in the sagebrush population has drastically improved since 1984. Decadence was estimated at 90% in 1984 and decreased to 10% in 2006. The population appears to have undergone a period of thinning since the 1980's. Plant size has increased with each reading. Cover increased from 6% in 1996 to 9% in 2006. Sagebrush density decreased from 1,180 plants/acre in 1996 and 2001 to 980 plants/acre in 2006. Annual leader growth on sagebrush averaged 2.2 inches in 2001 and 1.7 inches in 2006.

Most of the other browse consists of low value increasers including broom snakeweed, Oregon grape, Woods rose, prickly pear, and dwarf rabbitbrush. A few isolated, heavily browsed serviceberry plants are also found on the site.

Herbaceous Understory

The herbaceous understory provides three-fourths of the total vegetation cover, although composition is dominated by annuals and weeds. Cheatgrass is especially abundant and contributes most of the grass cover. Cheatgrass is spread uniformly over the site and thus poses a fire hazard, especially for the key browse mountain big sagebrush. Kentucky bluegrass is the most abundant perennial grass. It had its greatest abundance in 2001, but decreased to its all-time low in 2006. Showy goldeneye was the most abundant perennial forb in 1996, but this species significantly decreased in 2001. Cudweed sagewort, hairy goldaster, and showy goldeneye have been the most abundant perennial forbs. Abundant annual forbs include storksbill and willowweed.

1990 TREND ASSESSMENT

Mountain big sagebrush is the key species for deer on this critical winter range. The 1984 reading found a highly decadent (90%) and apparently declining population. In 1990, although there are still dying shrubs, it appears that the sagebrush population is improving and stabilizing. There is an abundance of sagebrush seedlings, and percent decadence decreased to 45%. Use also declined to a more moderate level with improved vigor. Sagebrush cover is variable, but averages 6% across the site. One negative change since 1984 is the great increase in the density of broom snakeweed. Nested frequency of Kentucky bluegrass declined significantly. No other perennials were abundant. There was an increase in nested frequency for thistle, low fleabane, cudweed sagewort, and showy goldeneye.

browse - up (+2) grass - down (-2) forb - up (+2)

1996 TREND ASSESSMENT

The browse trend is limited to only one species, mountain big sagebrush. Density decreased, but these changes in density for this shrub are likely due to the larger sample size used beginning in 1992 which better estimates shrub populations with clumped and/or discontinuous distributions. Sagebrush appears to have stabilized with improved vigor and decreased decadence. All these parameters indicate a stable population. The herbaceous understory is made up of weedy increasers. Annuals and biennials dominate this site. Trend for perennial grasses is slightly down. These species provide high amounts of fine fuel that could provide fuel for a destructive wildfire, which would destroy sagebrush. The forb trend is stable with sum of nested frequency for perennial species changing very little. The Desirable Components Index (see methods) rated this site as very poor due to the poor understory with abundant weeds.

winter range condition (DC Index) - very poor (32) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2001 TREND ASSESSMENT

Trend for browse is stable. Mountain big sagebrush has a stable density, percent decadence slightly decreased, and use is mostly light. The number of young sagebrush remains stable at 10% of the population. The trend for grasses is slightly up. Nested frequency of Kentucky bluegrass significantly increased. The trend for forbs is down as perennials decreased and annuals increased. The Desirable Components Index (see methods) rated this site as poor due to the abundance of annuals in the understory.

winter range condition (DC Index) - very poor-poor (35) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. Sagebrush density did decrease slightly, but percent decadence also decreased. Young plants were less abundant, but seedlings were numerous. This population has self thinned itself and matured as average height and crown increased by about five inches since 2001. Sagebrush cover increased from 7% to 9% in 2006. The grass trend is down. Kentucky bluegrass and Sandberg bluegrass each decreased significantly, while cheatgrass significantly increased. Cheatgrass was sampled in 100% of the quadrats and at 16% cover is a fire hazard. The forb trend is also down as perennials have decreased again and annuals are even more abundant. A noxious weed (musk thistle) was also sampled for the first time in 2006. Storksbill and willowweed were the most abundant forbs.

winter range condition (DC Index) - very poor (24) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	14	17	19	15	9	.30	.41	.04
G	Bromus japonicus (a)	-	-	$_{b}$150	$_{b}$123	$_{a}$52	2.35	1.10	.24
G	Bromus tectorum (a)	-	-	$_{ab}$298	$_{a}$292	$_{b}$337	10.20	10.08	16.37
G	Poa bulbosa	-	-	-	-	1	-	-	.00
G	Poa fendleriana	-	-	-	-	1	-	-	.03
G	Poa pratensis	$_{d}$138	$_{bc}$91	$_{ab}$54	$_{c}$100	$_{a}$32	1.06	2.16	.40
G	Poa secunda	$_{b}$48	$_{ab}$41	$_{b}$59	$_{b}$42	$_{a}$13	1.25	.43	.25
G	Sitanion hystrix	-	-	-	-	-	-	-	.00
Total for Annual Grasses		0	0	448	415	389	12.55	11.19	16.61
Total for Perennial Grasses		200	149	132	157	56	2.61	3.00	0.73
Total for Grasses		200	149	580	572	445	15.17	14.20	17.34
F	Agoseris glauca	-	-	-	-	2	-	-	.00
F	Alyssum alyssoides (a)	-	-	$_{b}$38	$_{a}$8	$_{b}$58	.16	.07	.32
F	Allium sp.	-	-	-	2	5	-	.00	.01
F	Antennaria rosea	-	3	-	-	-	-	-	-
F	Arabis sp.	-	-	-	5	4	-	.01	.01
F	Artemisia ludoviciana	$_{a}$10	$_{a}$28	$_{a}$36	$_{b}$67	$_{a}$32	2.03	3.72	.33
F	Aster sp.	5	-	3	-	10	.03	-	.21
F	Astragalus sp.	9	-	-	2	3	-	.00	.00
F	Camelina microcarpa (a)	-	-	-	-	1	-	-	.00
F	Carduus nutans (a)	-	-	-	-	5	-	-	.12
F	Cirsium undulatum	$_{c}$51	$_{d}$94	$_{bc}$47	$_{ab}$16	$_{a}$5	1.09	1.32	.04
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Comandra pallida	3	-	-	-	3	-	-	.03
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$7	$_{b}$13	-	.02	.07
F	Crepis acuminata	1	-	-	-	-	-	-	-
F	Cryptantha sp.	$_{b}$10	$_{ab}$3	$_{ab}$1	$_{ab}$2	$_{a}$-	.00	.00	-
F	Descurainia pinnata (a)	-	-	-	2	1	-	.00	.00
F	Draba sp. (a)	-	-	2	-	8	.00	-	.01
F	Epilobium brachycarpum (a)	-	-	$_{b}$164	$_{a}$81	$_{b}$169	2.44	.41	1.31
F	Erodium cicutarium (a)	$_{b}$18	$_{a}$-	$_{b}$20	$_{c}$220	$_{c}$225	.27	7.85	4.25
F	Erigeron pumilus	$_{a}$-	$_{c}$37	$_{b}$11	$_{a}$-	$_{a}$-	.40	-	-
F	Eriogonum racemosum	$_{ab}$9	$_{a}$6	$_{ab}$9	$_{ab}$16	$_{b}$13	.13	.60	.15
F	Eriogonum umbellatum	-	-	-	-	3	-	-	.03
F	Grindelia squarrosa	-	-	-	3	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Heterotheca villosa	$_{a}$-	$_{b}$15	$_{b}$31	$_{c}$55	$_{b}$28	1.60	4.15	.95
F	Holosteum umbellatum (a)	-	-	$_{a}$59	$_{a}$41	$_{b}$146	.44	.11	.59
F	Lactuca serriola	$_{a}$-	$_{ab}$7	$_{b}$22	$_{a}$1	$_{ab}$7	.07	.00	.01
F	Lupinus argenteus	$_{b}$15	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	.00	-	-
F	Machaeranthera canescens	2	-	-	-	-	-	-	-
F	Marrubium vulgare	-	-	-	-	-	-	.03	-
F	Microsteris gracilis (a)	-	-	-	-	3	-	-	.00
F	Phlox longifolia	-	-	-	1	1	-	.00	.00
F	Polygonum douglasii (a)	-	-	$_{b}$17	$_{ab}$8	$_{a}$2	.04	.07	.00
F	Potentilla gracilis	-	-	2	2	1	.00	.00	.03
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{a}$3	$_{b}$12	-	.00	.08
F	Sphaeralcea grossulariifolia	-	-	1	-	-	.00	-	-
F	Tragopogon dubius	3	2	11	9	2	.05	.04	.00
F	Verbascum thapsus	-	-	5	-	1	.33	-	.03
F	Viguiera multiflora	$_{a}$3	$_{b}$63	$_{c}$115	$_{a}$21	$_{b}$59	3.50	.73	1.36
Total for Annual Forbs		18	0	300	373	643	3.37	8.56	6.78
Total for Perennial Forbs		121	270	294	202	179	9.27	10.66	3.24
Total for Forbs		139	270	594	575	822	12.64	19.23	10.03

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

BROWSE TRENDS --
Management unit 07 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	1	2	1	.15	.06	.15
B	Artemisia tridentata vaseyana	42	39	37	5.77	7.40	8.64
B	Cercocarpus montanus	0	0	1	-	-	-
B	Chrysothamnus depressus	3	2	1	.03	-	-
B	Gutierrezia sarothrae	52	55	3	2.41	1.66	-
B	Mahonia repens	28	29	32	.42	1.12	1.07
B	Opuntia sp.	13	17	14	.21	.45	.21
B	Rosa woodsii	6	7	7	.59	.81	.93
Total for Browse		145	151	96	9.60	11.51	11.00

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 3

Species	Percent Cover '06
Artemisia tridentata vaseyana	10.13
Mahonia repens	.96
Opuntia sp.	.25
Rosa woodsii	1.00

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 3

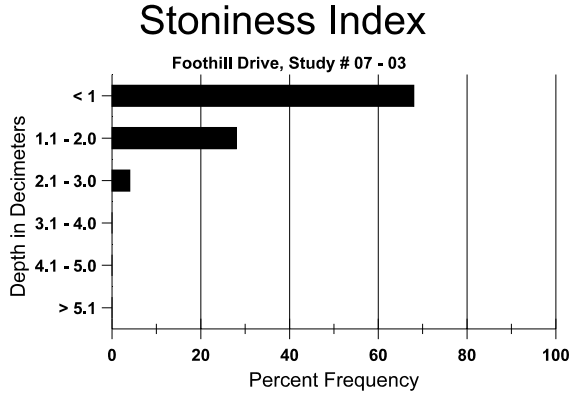
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	3.5
Artemisia tridentata vaseyana	2.3	1.7

BASIC COVER --
Management unit 07 , Study no: 3

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	5.50	40.96	47.83	34.70
Rock	29.00	34.25	32.87	37.01	44.18
Pavement	1.00	2.50	1.21	3.64	4.41
Litter	52.50	50.50	41.41	30.40	22.21
Cryptogams	.75	.75	.31	0	.01
Bare Ground	13.75	6.50	1.34	4.97	6.54

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 03, Foothill Drive

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.0	57.4 (9.8)	6.4	42.2	29.1	28.7	5.0	27.4	243.2	0.6



PELLET GROUP DATA --
Management unit 07 , Study no: 3

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	7	1
Horse	-	-	2
Elk	-	-	1
Deer	23	11	22
Cattle	7	-	6

Days use per acre (ha)	
'01	'06
-	-
1 (1)	7 (17)
2 (5)	-
56 (139)	68 (169)
7 (16)	9 (23)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**33**	-	-	-	33	-	0	100	100	-	0	-/-
90	**33**	-	33	-	-	-	100	0	0	-	0	-/-
96	**20**	-	-	20	-	-	100	0	0	-	0	19/29
01	**40**	-	-	40	-	-	50	50	0	-	0	30/37
06	**20**	-	-	20	-	-	100	0	0	-	0	22/31
Artemisia tridentata vaseyana												
84	**1632**	100	-	166	1466	-	16	84	90	10	33	15/13
90	**1932**	833	200	866	866	-	50	7	45	4	7	27/28
96	**1180**	-	120	820	240	660	32	2	20	-	0	18/34
01	**1180**	-	120	860	200	200	5	2	17	8	8	21/38
06	**980**	180	60	820	100	40	35	29	10	6	6	25/43
Cercocarpus montanus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	100	0	-	-	0	-/-
Chrysothamnus depressus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	-	80	-	-	25	0	-	-	0	9/18
01	**40**	-	-	40	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	100	-	-	0	6/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
84	**1100**	-	-	1100	-	-	0	0	0	-	0	9/12
90	**10599**	-	3666	6933	-	-	0	0	0	-	0	9/13
96	**4360**	-	180	4180	-	20	0	0	0	-	0	9/12
01	**2680**	-	-	2600	80	40	0	0	3	.74	.74	9/12
06	**60**	-	20	40	-	-	67	0	0	-	0	6/6
Mahonia repens												
84	**933**	-	933	-	-	-	0	0	-	-	0	-/-
90	**1266**	33	1133	133	-	-	0	0	-	-	0	4/3
96	**3260**	-	360	2900	-	-	0	0	-	-	0	5/8
01	**7000**	-	-	7000	-	-	0	0	-	-	0	3/4
06	**6740**	-	340	6400	-	-	0	0	-	-	0	3/4
Opuntia sp.												
84	**366**	-	100	266	-	-	0	0	0	-	0	4/6
90	**166**	66	-	133	33	-	0	0	20	-	20	4/9
96	**400**	-	40	340	20	-	0	0	5	-	0	5/11
01	**620**	-	40	560	20	-	0	0	3	-	0	5/12
06	**1140**	20	340	420	380	-	0	0	33	-	5	5/18
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**1060**	-	500	560	-	-	0	0	0	-	0	16/18
01	**1400**	-	-	1380	20	20	69	26	1	1	1	8/7
06	**1960**	-	460	1500	-	20	0	0	0	-	0	7/8
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	15/29

Trend Study 7-4-06

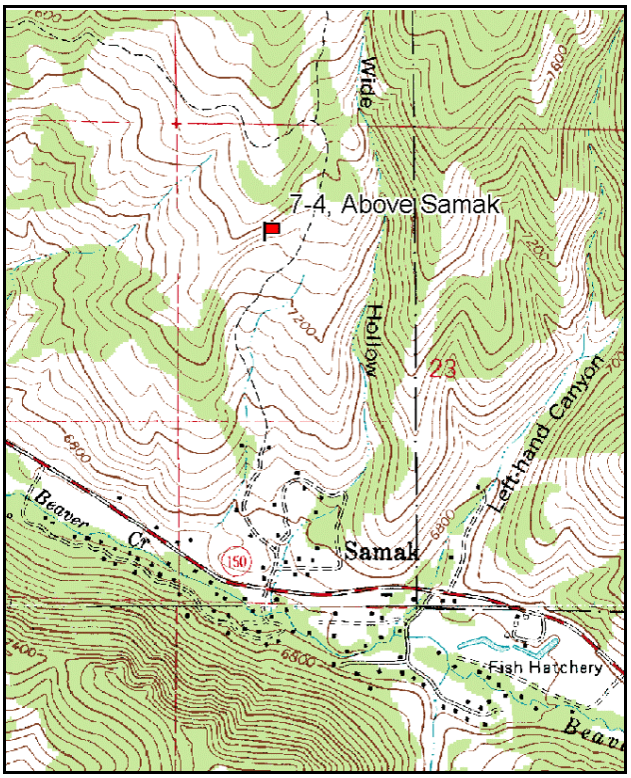
Study site name: Above Samak . Vegetation type: Mountain Brush .

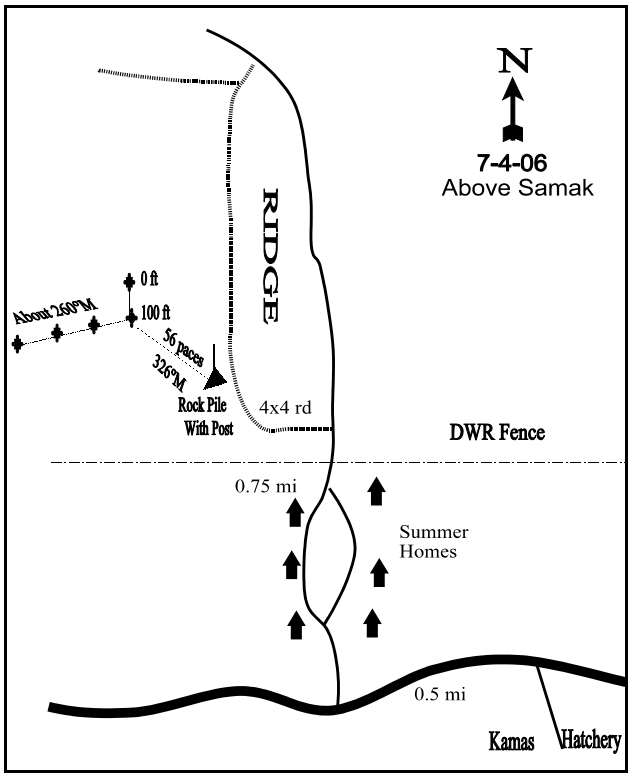
Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the Kamas fish hatchery proceed west 0.5 miles. Turn right onto a dirt road and proceed north. The road will split (go left) around the summer houses and reunite in 0.2 miles. After passing the homes, you will come to a DWR fence and gate. Proceed 0.1 miles past the gate and turn left, proceeding up a very steep hill (4X4 recommended). Drive north to a half high witness post in the middle of a rock pile on th left side of the road. The rockpile is 0.50 miles from the highway. From the rockpile, walk 56 paces at 326 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7959. The rest of the baseline doglegs at the 100-foot baseline stake and runs 260 degrees magnetic.





Map Name: Hoyt Peak

Diagrammatic Sketch

Township 2S , Range 6E , Section 22

UTM NAD 27, UTM 12T 4498170 N 479900 E

DISCUSSION

Above Samak - Trend Study No. 7-4

Study Information

The Above Samak study is located on the Kamas Wildlife Management Area in Beaver Creek Canyon (elevation: 7,300 feet, slope: 20-25%, aspect: southwest). This area can be classified as deer and elk winter range during more mild winters or transitional spring-fall range during the more harsh winters. The site and surrounding area was burned and seeded in the early-1960's. Domestic livestock also graze the area during the summer. The community was originally dominated by Gambel oak with some mountain brush species and little herbaceous cover. The site is now made up of scattered openings of mountain brush and seeded grasses interspersed with Gambel oak clones. Animal use is quite variable, depending on wintering conditions. There was moderate to heavy use on all browse species during the harsh winter of 1983-84. In 2001, pellet group transect data collected along the study baseline estimated 23 elk days use/acre (56 edu/ha), 31 deer days use/acre (76 ddu/ha), and 9 cow days use/acre (23 cdu/ha). In 2006, animal use was estimated at 11 elk days use/acre (26 edu/ha), 21 deer days use/acre (51 ddu/ha), and 22 cow days use/acre (54 cdu/ha). Cattle had grazed the area during June of 2006.

Soil

The Yeates Hollow series consists of deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium and residuum from conglomerate, sandstone and quartzite. These soils are on fan remnants, hills, and mountain slopes (USDA-NRCS 2006). Soils are very rocky. Cover from surface rock and pavement is moderately high at around 21%. Relative percent bare ground was estimated at about 18% in 2001 and 14% in 2006. The ratio of bare ground to protective ground cover (vegetation, litter, and cryptogams) decreased from 1:3.6 in 1996 and 2001 to 1:2.8. Effective rooting depth was estimated at nearly 16 inches. Soil texture was classified as a clay loam with a neutral soil reaction (6.8 pH). With the high amount of rock in the upper soil profile, the moderately steep slope, and the southwest aspect, this site can be rather dry during the summer. Litter and vegetation cover appear adequate to prevent serious erosion. Some "trailing" and trampling damage associated with livestock use is apparent but not extreme. An erosion condition class assessment determined soils to be stable in 2001 and 2006.

Browse

Browse composition consists of a mix of Gambel oak, mountain snowberry, mountain big sagebrush, Saskatoon serviceberry, and several less numerous shrubs. Gambel oak has provided about 3% cover since 1996. The oak population has consisted of a preponderance of young plants in the past. Oak clones vary in height throughout the site, with the larger ones being estimated at 12-15 feet. Due to a late frost in this area in June of 2001, many of the oak showed leaf damage and death when the site was sampled in July of 2001. As a result, 18% of the plants sampled were classified with poor vigor. Poor vigor was only 9% in 2006.

Browse utilization has been heaviest on serviceberry and bitterbrush. Serviceberry density was estimated at just under 300 plants/acre in 1996 and 2001 and was down to 180 plants/acre in 2006. Decadence was steady at around 20% until 2006 with an increase to 56%. Mountain big sagebrush has provided about 6-8% cover. Density of mountain big sagebrush has declined at every reading and was estimated at 900 plants/acre in 2006. Use on sagebrush was moderate to heavy in 1984, but has been more moderate to light since. Decadence increased from 6% to 17% to 24% in 2006. Recruitment from young plants was fairly low, but was better in 2006 at 11% of the population. Mountain snowberry density increased in 2001 and again in 2006. Density was 1,200 plants/acre in 1996 and increased to 2,240 plants/acre in 2006. Young plants were very numerous in 2006 at 29% of the population. Annual leader growth for mountain big sagebrush averaged 1.3 inches in 2001 and 2.0 inches in 2006. Serviceberry annual growth averaged 2.3 inches in 2001 and 2.4 inches in 2006.

Herbaceous Understory

The composition of the herbaceous understory is dominated by seeded species, primarily grasses. Smooth

brome, crested wheatgrass, and intermediate wheatgrass are all very common. These three species dominate the site. Grasses showed evidence of heavy grazing in the past and were grazed to about three inches in stubble height in 2006. Alfalfa, also a seeded species, is the most abundant forb in terms of cover. At this higher elevation, alfalfa has shown no sign of decline like it does on many other lower elevation range seedings. Alfalfa showed heavy grazing in 2006 and has a sprawling growth form.

1990 TREND ASSESSMENT

The data indicates several changes in the mountain big sagebrush population. There has been a significant decline in sagebrush density (from 2,399 plants/acre to 1,665 plants/acre), there are few seedlings and young, and the amount of hedging is somewhat lighter than 1984 levels. The reduced vigor and increased percent decadence is most likely related to moisture stress (drought) and competition. Sagebrush cover averages about 9%. Oakbrush has not expanded, although there are a large number of young sprouts within the clones. Grass abundance is high due to the presence of seeded grasses. Grass species identification was difficult due to heavy utilization before the study was sampled in mid-September. Total sum of nested frequency for grasses was only slightly higher. Frequency and density of alfalfa is unchanged, but other perennial forbs did decline somewhat.

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

1996 TREND ASSESSMENT

The key browse species (mountain big sagebrush) is now stable at a lower density. These changes in density for this shrub are likely due to the larger sample size used beginning in 1992 which better estimates shrub populations with clumped and/or discontinuous distributions. Vigor has improved and decadence is only 6%. Browse trend is stable. Both grass and forb trends are improved slightly with increased sum of nested frequency values. The Desirable Components Index (see methods) rated this site as fair. A greater amount of cover from preferred browse species would be desired.

winter range condition (DC Index) - fair (66) Higher potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

2001 TREND ASSESSMENT

Trend for browse is slightly down. Mountain big sagebrush slightly decreased in density and level of use, while percent decadence increased. The grass trend is stable with very little change in nested frequency. Seeded species dominate on the site, especially smooth brome. Forbs are up as perennial forbs have increased in sum of nested frequency in 2001.

winter range condition (DC Index) - fair (66) Higher potential scale
browse - slightly down (-1) grass - stable (0) forb - up (+2)

2006 TREND ASSESSMENT

The browse trend continues to decline. Mountain big sagebrush density declined 24% and decadence increased to 24%. Cover declined from 8% to 6%. Saskatoon serviceberry also declined. Density is lower and decadence increased to 56%. Utilization has also been very heavy. The grass trend remains stable. Smooth brome dominates the site along with other exotic seeded species that provide abundant forage. Annuals are not a problem. The forb trend is down. Sum of nested frequency of perennial forbs declined 41% to levels similar to 1990 and 1996. However, alfalfa has remained unchanged. Aggressive exotic species such as smooth brome may be out competing other herbaceous species.

winter range condition (DC Index) - fair (62) Higher potential scale
browse - down (-2) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	ab117	a100	ab145	ab124	b149	5.53	2.86	4.31
G	Agropyron dasystachyum	a-	a-	a-	b11	a-	-	.27	-
G	Agropyron intermedium	a55	a47	b103	ab77	ab78	4.07	1.88	1.88
G	Agropyron spicatum	b26	b20	b16	ab5	a-	.46	.04	-
G	Bromus inermis	243	267	249	266	260	12.64	10.56	9.60
G	Bromus japonicus (a)	-	-	-	3	-	-	.03	-
G	Poa bulbosa	a-	a-	ab3	b9	b10	.00	.16	.13
G	Poa fendleriana	a-	b20	a1	a5	a3	.00	.18	.18
G	Poa pratensis	-	4	-	-	-	-	-	-
G	Poa secunda	3	8	7	14	17	.10	.25	.57
G	Stipa lettermani	-	7	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	3	0	0	0.03	0
Total for Perennial Grasses		444	473	524	511	517	22.83	16.22	16.69
Total for Grasses		444	473	524	514	517	22.83	16.25	16.69
F	Achillea millefolium	5	4	1	2	5	.06	.03	.03
F	Agoseris glauca	-	-	-	3	-	-	.00	-
F	Allium acuminatum	10	18	6	27	19	.04	.07	.06
F	Alyssum alyssoides (a)	-	-	-	2	-	-	.00	-
F	Arabis sp.	-	4	4	9	1	.04	.07	.03
F	Astragalus convallarius	3	2	6	-	7	.06	-	.33
F	Aster sp.	-	-	-	-	3	-	-	.03
F	Astragalus sp.	a-	a-	a-	b15	b11	-	.34	.13
F	Castilleja chromosa	-	-	-	-	3	-	-	.00
F	Calochortus nuttallii	-	-	-	4	-	-	.01	-
F	Chaenactis douglasii	-	-	1	-	-	.00	-	-
F	Cirsium sp.	1	6	-	-	-	-	-	-
F	Comandra pallida	-	-	-	5	4	-	.07	.04
F	Collinsia parviflora (a)	-	-	a31	b86	b53	.14	.33	.14
F	Crepis acuminata	-	-	-	-	-	-	-	.00
F	Cryptantha sp.	b20	a-	a-	a-	a-	-	-	-
F	Epilobium brachycarpum (a)	-	-	a-	a2	b15	-	.00	.11
F	Erigeron pumilus	b15	b10	b15	a-	a-	.13	-	-
F	Eriogonum racemosum	-	-	-	7	1	-	.09	.03
F	Holosteum umbellatum (a)	-	-	-	-	7	-	-	.02
F	Machaeranthera canescens	b35	a6	a4	a-	a-	.04	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Medicago sativa	42	40	55	59	44	2.96	4.21	2.58
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$51	$_{b}$11	-	.22	.02
F	Penstemon humilis	$_{b}$55	$_{b}$55	$_{b}$55	$_{ab}$29	$_{a}$8	1.02	.32	.10
F	Petradoria pumila	$_{a}$-	$_{a}$-	$_{b}$25	$_{b}$38	$_{b}$29	1.08	2.44	2.45
F	Phlox longifolia	$_{a}$-	$_{ab}$8	$_{ab}$2	$_{b}$9	$_{ab}$11	.00	.05	.07
F	Polygonum douglasii (a)	$_{ab}$-	$_{a}$-	$_{b}$21	3	23	.04	.00	.05
F	Ranunculus testiculatus (a)	-	-	$_{a}$21	$_{b}$94	$_{b}$98	.07	1.78	.93
F	Senecio integerrimus	$_{a}$-	$_{a}$2	$_{a}$-	$_{b}$12	$_{a}$2	-	.08	.00
F	Veronica biloba (a)	-	-	$_{b}$117	$_{b}$116	$_{a}$57	.46	.50	.30
F	Verbascum thapsus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$28	$_{a}$-	-	.48	-
F	Zigadenus paniculatus	-	2	4	4	-	.09	.06	-
Total for Annual Forbs		0	0	190	354	264	0.72	2.84	1.58
Total for Perennial Forbs		186	157	178	251	148	5.55	8.38	5.91
Total for Forbs		186	157	368	605	412	6.27	11.23	7.50

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

BROWSE TRENDS --
Management unit 07 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	13	12	8	1.27	1.42	1.06
B	Artemisia tridentata vaseyana	39	38	35	6.27	8.01	5.76
B	Cercocarpus depressus	0	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	3	7	8	.12	.06	.24
B	Mahonia repens	34	35	35	.90	.21	.70
B	Purshia tridentata	1	2	2	.03	.48	.56
B	Quercus gambelii	19	21	16	3.82	2.72	3.00
B	Symphoricarpos oreophilus	29	36	41	3.82	5.22	4.74
Total for Browse		138	152	146	16.25	18.13	16.08

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 4

Species	Percent Cover '06
Amelanchier alnifolia	.70
Artemisia tridentata vaseyana	6.73
Chrysothamnus viscidiflorus viscidiflorus	.33
Mahonia repens	.40
Purshia tridentata	1.18
Quercus gambelii	6.91
Symphoricarpos oreophilus	6.19

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 4

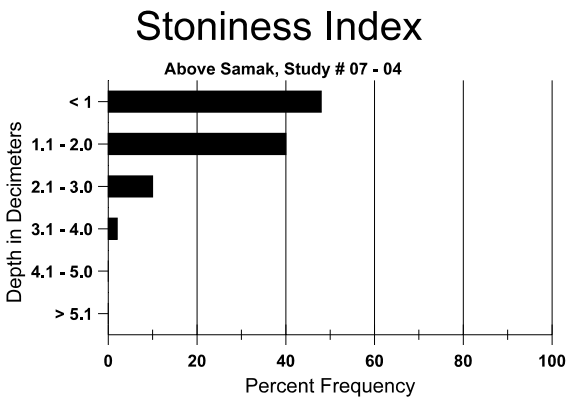
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.3	2.4
Artemisia tridentata vaseyana	1.3	2.0

BASIC COVER --
Management unit 07 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	5.00	11.00	44.96	44.24	35.26
Rock	12.50	13.25	16.81	15.30	16.32
Pavement	9.25	15.00	3.97	5.63	6.30
Litter	54.75	40.50	45.09	35.33	39.91
Cryptogams	0	.75	.66	.33	.06
Bare Ground	18.50	19.50	9.90	21.62	15.23

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 04, Above Samak

Effective rooting depth (in)	Temp °F (depth)	PH				%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



PELLET GROUP DATA --
Management unit 07 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	1	5
Elk	8	17	11
Deer	12	8	13
Cattle	3	4	6

Days use per acre (ha)	
'01	'06
-	-
23 (56)	11 (26)
31 (76)	21 (51)
9 (23)	22 (54)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**466**	-	66	400	-	-	29	71	0	-	0	40/37
90	**332**	133	133	133	66	-	20	60	20	-	0	34/30
96	**280**	20	-	220	60	20	14	71	21	7	7	31/43
01	**260**	-	-	200	60	40	46	46	23	8	8	29/33
06	**180**	-	-	80	100	20	22	78	56	22	22	37/41
Artemisia tridentata vaseyana												
84	**2399**	200	666	1400	333	-	61	39	14	-	0	20/29
90	**1665**	-	133	1066	466	-	52	8	28	1	12	19/23
96	**1320**	20	60	1180	80	280	61	6	6	-	0	21/35
01	**1180**	40	20	960	200	200	41	14	17	3	7	25/34
06	**900**	100	100	580	220	280	20	9	24	9	9	27/42

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus depressus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**20**	-	-	-	20	-	100	0	100	-	0	-/-
06	**20**	-	-	-	20	-	0	0	100	-	0	2/2
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**60**	-	-	60	-	-	0	0	0	-	0	12/17
01	**180**	-	-	180	-	-	0	0	0	-	0	10/12
06	**280**	-	-	260	20	-	0	0	7	7	7	12/20
Mahonia repens												
84	**15800**	-	-	15800	-	-	0	0	0	-	0	4/6
90	**5000**	-	4200	800	-	-	0	0	0	-	0	4/5
96	**2880**	-	100	2780	-	-	0	0	0	-	0	3/5
01	**4880**	20	320	4560	-	-	0	0	0	-	0	3/3
06	**4940**	-	100	4800	40	20	0	0	1	-	0	3/4
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	4/8
06	**0**	-	-	-	-	-	0	0	-	-	0	6/13
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	100	-	-	0	11/41
01	**40**	-	-	40	-	-	50	0	-	-	0	19/68
06	**40**	-	-	40	-	-	50	50	-	-	0	13/48
Quercus gambelii												
84	**12600**	3066	10000	2600	-	-	75	8	0	-	0	47/37
90	**10799**	4200	8400	866	1533	-	15	0	14	.37	3	58/29
96	**1360**	220	700	620	40	200	24	0	3	-	0	31/25
01	**3340**	-	1280	1620	440	420	0	0	13	2	18	51/20
06	**1500**	820	420	880	200	400	1	0	13	9	9	35/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus												
84	**1066**	-	133	933	-	-	100	0	0	-	0	18/29
90	**1999**	66	133	1333	533	-	20	7	27	4	33	14/15
96	**1200**	-	120	920	160	60	38	12	13	7	7	16/31
01	**1500**	-	140	1320	40	-	0	0	3	-	0	15/28
06	**2240**	180	640	1560	40	-	2	.89	2	.89	.89	16/29
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	8/20
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 7-6-06

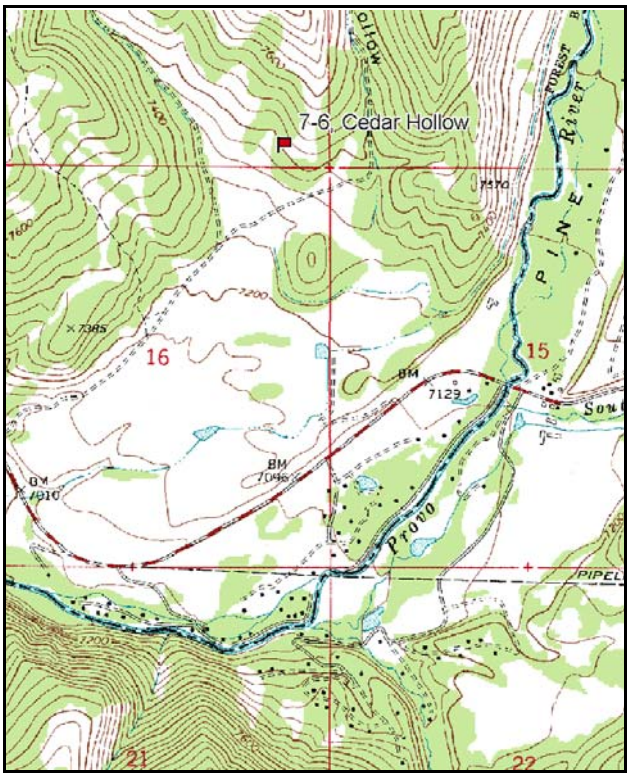
Study site name: Cedar Hollow . Vegetation type: Mountain Brush .

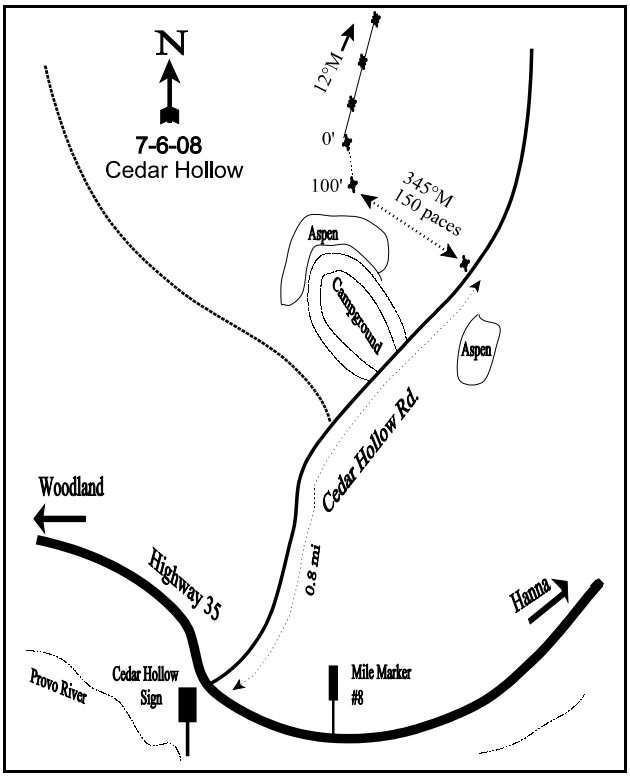
Compass bearing: frequency baseline 166 degrees magnetic.

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

LOCATION DESCRIPTION

Eastbound on Highway 35 from Woodland, turn left (north) at the Cedar Hollow sign. If you pass mile-marker 8 you have gone too far. Travel 0.8 miles on the main dirt road passing two left turns, and stop next to a small witness post on the left side of the road. There is a small stand of aspen on the right. From the witness post walk at a bearing of 345 degrees magnetic for 150 paces to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #416.





Map Name: Woodland

Diagrammatic Sketch

Township 3S , Range 7E , Section 16

UTM NAD 27, UTM 12T 4490451 N 487453 E

DISCUSSION

Cedar Hollow - Trend Study No. 7-6

Study Information

The Cedar Hollow study is located at the upper limits of normal winter range (elevation: 7,400 feet, slope: 15%, aspect: south). Because of the moderately high elevation, this area probably does not constitute critical range, but more likely it is transitional spring-fall range for big game. There are generally few signs of heavy or excessive big game use on browse, except for bitterbrush and serviceberry, because of their relatively low populations. The vegetation composition of the area consists of serviceberry, moderately tall Gambel oakbrush clones, and quaking aspen intermixed with more open areas dominated by mountain big sagebrush and mountain snowberry. Pellet groups of deer, elk, and moose are present, yet none are very abundant. Cattle also graze the area. A pellet group transect read along the vegetation baseline in 2001 estimated 5 elk days use/acre (12 edu/ha), 20 deer days use/acre (50 ddu/ha), and 1 moose day use/acre (2 mdu/ha). In 2006, animal use was estimated at 2 elk days use/acre (5 edu/ha), 12 deer days use/acre (30 ddu/ha), and 4 cow days use/acre (9 cdu/ha).

Soil

The soil series is part of the Yeates Hollow-Henefer complex. The Yeates Hollow series consists of deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium and residuum from conglomerate, sandstone and quartzite. The Henefer series consists of very deep, well drained, slowly permeable soils. These soils formed in alluvium and colluvium from quartzite and sandstone on fan remnants, mountain toe slopes and mountain slopes (USDA-NRCS 2006). Soils appear to be moderately deep and well-drained. Effective rooting depth was estimated at 11 inches. Soil texture is classified as a clay loam with a neutral soil reaction (7.0 pH). Surface rock is of varying size and covers an estimated 21% of the soil surface (pavement included). Parent material is sandstone and limestone. This area is within the 24-28 inch precipitation zone (USDA et al. 1999) and thus has a fairly extensive vegetation cover. Overall soil condition is fair to good. An erosion condition class assessment determined stable soils in 2001 and 2006.

Browse

Gambel oak occurs frequently in the study area, but consists of clumps of mature plants that are partially unavailable because of their height. The most important species based on abundance, cover, and relative palatability is mountain big sagebrush. Mountain big sagebrush density was estimated at about 1,800 plants/acre in 1996 and 2001, but declined by nearly half in 2006 to 940 plants/acre. The sagebrush population had a very high incidence of decadent plants in 1984 at 75%. Percent decadence has been much lower since 1984, but was moderately high in 2006 at 43%. Use was moderate to heavy on sagebrush in 1984, but has since declined to light to moderate. Drought conditions (below 75% of normal precipitation) in 2001 and 2002 may have increased decadence in the 2006 reading. Winter injury is another possibility. Winter injury occurs when water in the cell freezes and ruptures the cell membrane during a cold spell in early fall or spring (Walser et al. 1990). Another injury classified as winter injury is when there is no moisture available to the plant (drought or frozen ground) and with warm weather in February and March, breaks dormancy causing the death of the sagebrush crown (Nelson and Tiernan 1983). Annual leader growth on sagebrush averaged just under 2 inches in 2001 and in 2006.

Serviceberry and bitterbrush provide additional preferred forage, but they occur in low densities. Both species show moderate to heavy use. Serviceberry density declined in 2006, while bitterbrush density increased. Gambel oak occurs in scattered clones throughout the area, but this species is not extensively sampled by this particular study. Oak density was estimated at 900 stems/acre in 2001, and the entire population was classified as having poor vigor. Reduced vigor in the population of Gambel oak occurred because of a late snow storm and cold temperatures in June 2001. The resultant cold temperatures caused widespread meristematic and leaf death on oak, including this particular study. Oak density was only 340 stems/acre in 2006.

Herbaceous Understory
This site has a fair herbaceous understory component. Grass composition is diverse, including several aggressive increasers which provide an effective ground cover and an important source of livestock forage. A sedge, bulbous bluegrass, mutton bluegrass, and bluebunch wheatgrass are the most abundant grasses. Utilization on grasses was light to moderate in 1996, with no utilization apparent in 2001. In 2006, the sedge and mountain brome had been heavily grazed. Forbs are primarily composed of perennials and are diverse with 21 perennial species sampled in 2006.

1990 TREND ASSESSMENT
Browse composition is basically unchanged. Mountain big sagebrush shows a slightly lower density, which is not surprising based on the highly decadent population (75%) encountered during the initial sampling. Young shrubs have replaced some of the decadent plants, but overall density is down. Vigor is less than optimum on half of the sagebrush even though there has been only light to moderate utilization the last several years. Sagebrush cover averages about 10%. Serviceberry has increased in density. The 1990 data shows an increase in grass frequency and number of species encountered. A larger number of forb species were identified, surprising for late in a dry year.

browse - stable (0) grass - up (+2) forb - slightly up (+1)

1996 TREND ASSESSMENT
The browse trend is still stable. The increased density of mountain big sagebrush is likely a function of the larger sampling design that picked up more plants. Mountain big sagebrush currently makes up 40% of the browse cover, has improved vigor, and a substantially lower percent decadence in the population. Bitterbrush and mountain snowberry are also in good health. The grass trend is stable. Nine perennial species were sampled. Bulbous bluegrass and Kentucky bluegrass are increasers with grazing and should be monitored closely. The decline in forb frequency is attributed to the increased sample size. The trend is stable. The Desirable Components Index (see methods) rated this site as poor-fair. Preferred browse (serviceberry, mountain big sagebrush, and bitterbrush) cover could be higher and the presence of bulbous bluegrass does not add to the understory.

winter range condition (DC Index) - poor-fair (57) Higher potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT
Trend for browse is slightly up. Mountain big sagebrush shows a stable density with use remaining light to moderate. Decadence is moderate at 29%, but much lower than that reported in 1984 and 1990. Serviceberry and bitterbrush densities were higher than in 1996 and these two species see the highest amount of use. The trend for grasses is slightly down. Although the overall sum of nested frequency of perennials increased slightly, this comes from a major increase in bulbous bluegrass, which is a weedy exotic species. It only provides fair forage and can out compete other desirable species. The desirable native, bluebunch wheatgrass, declined in abundance. The forb trend is up. Milkvetch increased significantly in frequency. The Desirable Components Index (see methods) rated this site as fair. Preferred browse cover increased from 1996.

winter range condition (DC Index) - fair (61) Higher potential scale
browse - slightly up.(+1) grass - slightly down (-1) forb - up (+2)

2006 TREND ASSESSMENT
The browse trend is down. Density for both mountain big sagebrush and Saskatoon serviceberry declined by about half. Mountain big sagebrush decadence was up to 43%. Sagebrush cover declined from 8 % to 6%. Winter injury could be the possible explanation for this decline, during the dry winter of 2002-2003. Bitterbrush did increase in density and was up to 20% of the total browse cover at 5% cover. Snowberry

density increased greatly, but unfortunately is not a preferred species. The grass trend is slightly up. Bulbous bluegrass decreased significantly in abundance, although cover was higher. Bluebunch wheatgrass increased significantly in sum of nested frequency. The forb trend is slightly up with a 13% increase of sum of nested frequency of perennial forbs. The DCI score improved slightly as perennial grass cover increased.

winter range condition (DC Index) - fair (65) Higher potential scale
browse - down (-2) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	-	-	-	2	-	-	.00	-
G	Agropyron spicatum	$_{b}$152	$_{b}$151	$_{ab}$145	$_{a}$107	$_{b}$163	2.03	2.06	5.82
G	Bromus carinatus	$_{a}$-	$_{a}$6	$_{a}$-	$_{b}$23	$_{ab}$6	-	.20	.09
G	Bromus inermis	-	12	-	-	4	-	-	.06
G	Bromus tectorum (a)	-	-	1	-	4	.00	-	.00
G	Carex sp.	73	92	68	78	47	4.08	4.29	2.37
G	Festuca sp.	-	-	3	-	-	.00	-	-
G	Koeleria cristata	-	-	-	2	4	-	.03	.06
G	Melica bulbosa	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$1	$_{b}$18	.00	.03	.33
G	Poa bulbosa	$_{a}$-	$_{b}$79	$_{b}$107	$_{d}$199	$_{c}$161	3.57	4.99	6.28
G	Poa fendleriana	$_{a}$97	$_{ab}$130	$_{ab}$105	$_{b}$140	$_{ab}$126	1.47	2.79	2.07
G	Poa pratensis	$_{a}$46	$_{ab}$83	$_{b}$107	$_{a}$48	$_{a}$63	2.80	.81	1.31
G	Poa secunda	$_{ab}$31	$_{a}$19	$_{a}$56	$_{a}$23	$_{a}$49	.71	.33	1.54
G	Stipa lettermani	$_{ab}$9	$_{b}$28	$_{a}$9	$_{a}$7	$_{a}$9	.09	.21	.21
Total for Annual Grasses		0	0	1	0	4	0.00	0	0.00
Total for Perennial Grasses		408	600	603	630	650	14.79	15.77	20.16
Total for Grasses		408	600	604	630	654	14.80	15.77	20.17
F	Agoseris glauca	$_{a}$-	$_{ab}$4	$_{a}$-	$_{ab}$4	$_{b}$12	-	.01	.07
F	Allium sp.	$_{a}$-	$_{a}$-	$_{ab}$5	$_{b}$24	$_{c}$59	.01	.10	.20
F	Antennaria rosea	-	-	-	-	1	-	-	.03
F	Arabis sp.	-	-	-	-	3	-	-	.00
F	Astragalus beckwithii	-	-	-	-	12	-	-	.30
F	Aster chilensis	$_{b}$105	$_{b}$121	$_{a}$48	$_{a}$35	$_{a}$45	.47	.44	1.04
F	Astragalus sp.	$_{a}$-	$_{a}$-	$_{a}$2	$_{b}$65	$_{b}$54	.01	.84	.95
F	Balsamorhiza sagittata	7	16	11	14	24	.54	1.64	2.16
F	Castilleja linariaefolia	3	1	6	6	12	.04	.21	.22
F	Calochortus nuttallii	-	2	3	4	5	.00	.01	.01
F	Cirsium undulatum	14	17	8	8	5	.07	.09	.33

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Collomia linearis (a)	-	-	$_{a}$12	$_{b}$39	$_{a}$19	.02	.16	.05
F	Comandra pallida	$_{b}$80	$_{b}$83	$_{ab}$58	$_{b}$69	$_{a}$36	.29	.78	.43
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{ab}$8	$_{b}$12	-	.02	.05
F	Crepis acuminata	-	1	3	-	1	.00	-	.03
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{b}$26	$_{a}$1	-	.05	.00
F	Erythronium grandiflorum	-	-	-	-	9	-	-	.04
F	Eriogonum racemosum	$_{a}$1	$_{ab}$8	$_{b}$12	$_{ab}$7	$_{ab}$9	.16	.04	.21
F	Eriogonum umbellatum	-	4	-	6	3	-	.21	.15
F	Gayophytum ramosissimum(a)	-	-	-	-	7	-	-	.03
F	Hackelia patens	$_{b}$10	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$5	-	-	.06
F	Holosteum umbellatum (a)	-	-	2	2	-	.00	.00	-
F	Ligusticum sp.	-	5	-	-	-	-	-	-
F	Lupinus argenteus	$_{a}$-	$_{ab}$8	$_{a}$-	$_{b}$7	$_{ab}$1	.03	.21	.03
F	Machaeranthera canescens	$_{ab}$30	$_{a}$6	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$7	$_{ab}$5	.00	.02	.01
F	Penstemon leonardi	$_{a}$-	$_{b}$17	$_{b}$26	$_{b}$18	$_{b}$11	.65	.34	.10
F	Phlox longifolia	$_{a}$-	$_{c}$32	$_{bc}$15	$_{ab}$10	$_{bc}$25	.04	.05	.10
F	Polygonum douglasii (a)	-	-	$_{ab}$8	$_{a}$-	$_{b}$15	.01	-	.03
F	Senecio integerrimus	$_{a}$-	$_{a}$1	$_{a}$7	$_{c}$21	$_{bc}$13	.07	.18	.13
F	Solidago sp.	$_{b}$41	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Streptanthus cordatus	1	2	-	3	-	-	.00	-
F	Tragopogon dubius	$_{a}$-	$_{a}$-	$_{a}$1	$_{b}$7	$_{a}$-	.00	.01	-
F	Zigadenus paniculatus	-	3	-	3	5	-	.00	.09
Total for Annual Forbs		0	0	22	82	59	0.04	0.27	0.19
Total for Perennial Forbs		292	331	205	311	350	2.42	5.23	6.76
Total for Forbs		292	331	227	393	409	2.47	5.50	6.95

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

BROWSE TRENDS --
Management unit 07 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	19	20	13	.22	.87	.56
B	Artemisia tridentata vaseyana	59	58	39	8.10	8.01	6.19
B	Ceanothus velutinus	2	2	2	-	.15	.03
B	Chrysothamnus depressus	0	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	51	53	52	1.85	1.98	2.29
B	Eriogonum heracleoides	0	4	6	-	.06	.23
B	Eriogonum microthecum	17	0	0	.22	-	-
B	Juniperus scopulorum	0	0	0	-	-	.03
B	Mahonia repens	65	60	69	1.16	2.63	1.69
B	Opuntia sp.	3	3	2	.03	-	.15
B	Pachistima myrsinites	4	0	3	.03	-	-
B	Purshia tridentata	15	16	17	2.93	3.94	5.09
B	Quercus gambelii	3	5	4	1.25	1.63	1.16
B	Symphoricarpos oreophilus	67	65	68	4.55	7.30	7.58
Total for Browse		305	287	276	20.35	26.61	25.04

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 6

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	.61
Artemisia tridentata vaseyana	-	6.30
Ceanothus velutinus	-	.41
Chrysothamnus viscidiflorus viscidiflorus	-	3.59
Eriogonum heracleoides	-	.48
Mahonia repens	-	1.89
Opuntia sp.	-	.08
Purshia tridentata	-	4.75
Quercus gambelii	3.40	2.33
Symphoricarpos oreophilus	-	10.25

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 6

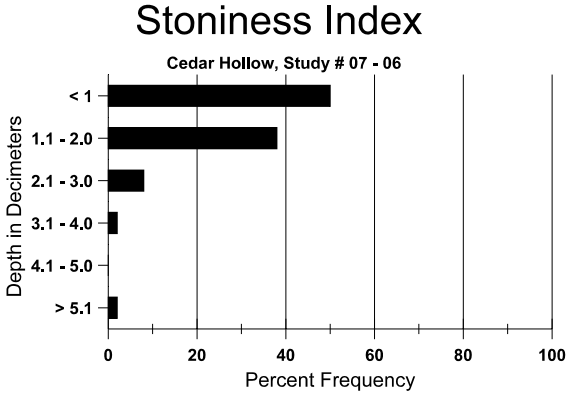
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	1.8	3.0
Artemisia tridentata vaseyana	1.8	1.8
Purshia tridentata	2.0	2.8

BASIC COVER --
Management unit 07 , Study no: 6

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.75	16.50	39.31	51.52	44.29
Rock	12.00	12.25	15.11	14.48	14.86
Pavement	7.00	11.75	4.56	7.09	7.96
Litter	60.00	46.75	42.47	35.27	25.93
Cryptogams	.25	0	.53	.21	.55
Bare Ground	17.00	12.75	11.13	17.47	21.65

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 06, Cedar Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.6	53.8 (14.5)	7.0	40.2	30.4	29.4	4.9	11.5	166.4	0.6



PELLET GROUP DATA --
Management unit 07 , Study no: 6

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	-	9
Moose	-	2	1
Elk	5	-	1
Deer	7	11	22
Cattle	1	2	1

Days use per acre (ha)	
'01	'06
-	-
1 (2)	-
5 (12)	2 (5)
20 (50)	12 (30)
-	4 (9)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
84	**66**	-	-	-	66	-	0	100	100	-	0	-/-
90	**732**	333	600	66	66	-	9	18	9	-	18	89/71
96	**380**	-	100	240	40	-	63	5	11	-	11	30/32
01	**600**	-	240	140	220	-	17	27	37	3	13	43/31
06	**280**	-	80	120	80	40	14	43	29	14	14	29/33
Artemisia tridentata vaseyana												
84	**1333**	66	-	333	1000	-	45	55	75	2	15	23/35
90	**1132**	-	133	533	466	-	29	0	41	4	18	26/28
96	**1820**	-	60	1400	360	700	33	1	20	4	5	21/33
01	**1800**	-	-	1280	520	320	20	10	29	4	17	25/37
06	**940**	80	20	520	400	440	13	0	43	15	15	22/36
Ceanothus velutinus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	-	40	-	-	0	0	-	-	0	24/90
01	**80**	-	-	80	-	-	0	0	-	-	0	19/50
06	**40**	-	-	40	-	-	100	0	-	-	0	23/78
Chrysothamnus depressus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	6/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
84	**200**	-	-	-	200	-	67	0	100	-	0	-/-
90	**799**	-	66	400	333	-	8	0	42	8	33	12/9
96	**2120**	-	140	1980	-	-	.94	0	0	-	0	12/16
01	**1980**	-	40	1740	200	-	3	0	10	-	0	10/16
06	**1860**	-	120	1620	120	-	2	0	6	1	1	11/18
Eriogonum heracleoides												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**80**	-	-	80	-	-	0	0	0	-	0	10/10
06	**140**	-	20	100	20	-	0	0	14	-	0	5/10
Eriogonum microthecum												
84	**666**	-	200	466	-	-	10	0	-	-	0	5/6
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**360**	-	20	340	-	-	0	0	-	-	0	7/12
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
84	**20599**	-	19733	866	-	-	0	0	0	-	0	6/4
90	**61799**	3533	33533	28266	-	-	.10	0	0	-	0	6/4
96	**9660**	-	2520	7140	-	80	0	0	0	-	0	4/6
01	**14260**	-	20	14220	20	-	0	0	0	.14	.14	4/5
06	**14500**	240	1020	13380	100	-	0	0	1	.27	.27	3/5
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**60**	-	-	60	-	-	0	0	-	-	0	4/11
01	**180**	-	20	160	-	-	0	0	-	-	0	4/10
06	**40**	-	-	40	-	-	0	0	-	-	0	6/13
Pachistima myrsinites												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**200**	-	80	120	-	-	0	0	-	-	0	12/36
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**180**	-	-	180	-	-	0	0	-	-	0	5/6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**320**	-	20	300	-	-	56	13	0	-	0	15/60
01	**380**	-	-	360	20	-	11	32	5	-	0	16/70
06	**420**	40	-	420	-	-	10	90	0	-	0	18/54
Quercus gambelii												
84	**466**	-	333	133	-	-	0	14	0	-	0	67/57
90	**2465**	333	1066	1266	133	-	3	0	5	-	0	72/23
96	**60**	20	-	60	-	-	0	0	0	-	0	77/98
01	**900**	-	-	900	-	40	0	9	0	-	100	-/-
06	**340**	260	60	240	40	60	0	0	12	6	6	49/23
Rosa woodsii												
84	**333**	-	200	133	-	-	0	40	-	-	20	25/5
90	**266**	-	133	133	-	-	0	0	-	-	0	18/7
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**2933**	-	1400	1200	333	-	39	5	11	-	5	23/36
90	**7133**	533	2200	4533	400	-	31	.93	6	.56	18	18/24
96	**2640**	80	360	2220	60	20	2	0	2	.75	5	17/28
01	**2100**	-	-	2040	60	-	5	0	3	-	0	16/28
06	**3740**	20	600	3120	20	-	0	0	1	-	0	16/27

Trend Study 7-9-01

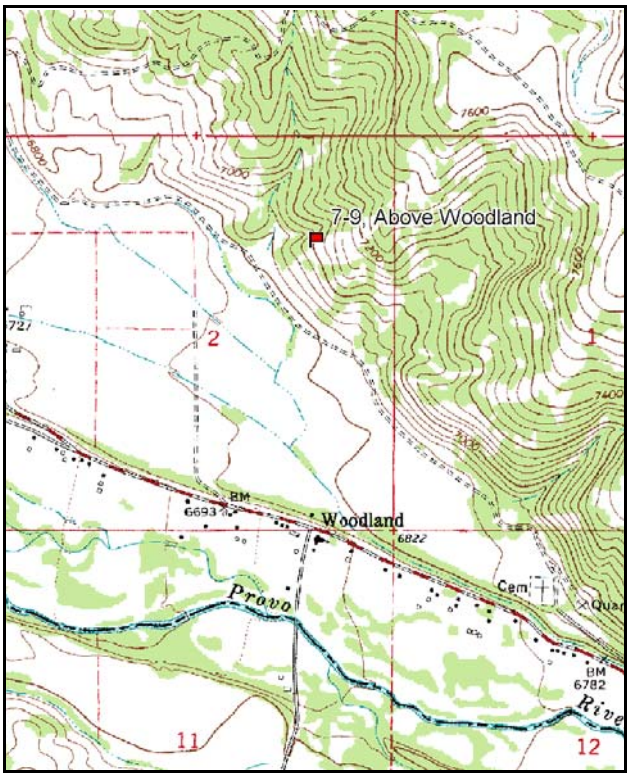
Study site name: Above Woodland . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 76 degrees magnetic.

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

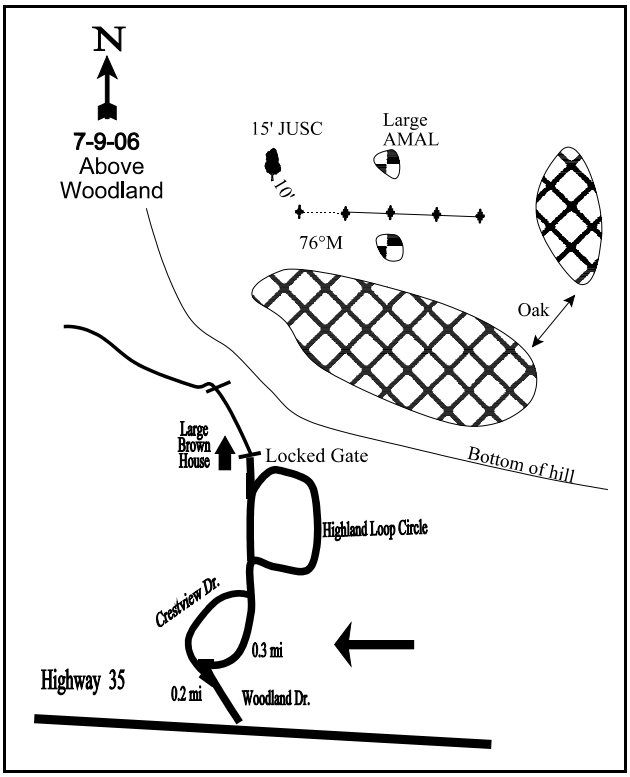
LOCATION DESCRIPTION

From the intersection of Highway 35 and Woodland Drive, west of Woodland, turn onto Woodland Drive and proceed 0.2 miles. Turn onto Crestview Drive and proceed 0.3 miles to Highland Loop Circle. Turn left and follow the circle 0.1 miles to a dirt road. Travel along the road past a large brown house to a fork after 0.15 miles to a gate. From here cross the fence and walk up the slope. Walk around the west end of a large oak clone and continue up the slope. Look for a large, lone high lined Rocky Mountain Juniper. The 0-foot baseline is ten feet from this tree. The baseline runs between a couple of large serviceberry.



Map Name: Woodland

Township 3S , Range 6E , Section 2



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4493241 N 480844 E

DISCUSSION

Above Woodland - Trend Study No. 7-9

Study Information

The Above Woodland trend study is located on private land (elevation: 7,000 feet, slope: 25-30%, aspect: southwest). It was originally established in 1984 and samples a closely intermixed mountain big sagebrush/grass and Gambel oakbrush winter range located north of Woodland. Due to low big game use and low numbers of mountain big sagebrush sampled, the site was moved about a quarter of a mile to the south. The new area supports a more dense stand of sagebrush in association with other preferred browse species including serviceberry and bitterbrush. The Provo River winter range in the Woodland area appears to be principally a "normal" winter range. Deer, elk, and moose use the area. This area is at a high enough elevation that deep snow may preclude use during severe winters. A pellet group transect read in 2001 estimated 16 deer and 31 elk days use/acre (40 ddu/ha and 78 edu/ha). In 2006, animal use was estimated at 16 deer and 64 elk days use/acre (28 ddu/ha and 157 edu/ha).

Soil

The soil is part of the Horrocks-Agassiz complex of very cobbly loams. The Horrocks soil series consists of deep, well drained, moderately slowly permeable soils that formed in glacial deposits, alluvium, colluvium and residuum from andesite, sandstone and quartzite. These soils are on mountain slopes and terminal moraines. The Agassiz soil series consists of very shallow and shallow, somewhat excessively drained, moderate or moderately rapidly permeable soils on mountainsides. They formed in shallow material over weathered limestone (USDA-NRCS 2006). Soil is moderately deep, but very stony. Surface rocks vary in size from pavement to large rock. Percent surface rock and pavement cover is high. Soil parent material appears to be sandstone and shale which gives the soil a reddish color. Due to the high rock content of the soil profile, effective rooting depth was estimated at only about 7 inches. The soil is obviously deeper considering the presence of deep rooted shrubs. Soil texture is a clay loam with a slightly acid soil reaction (6.2 pH). There is abundant protective ground cover which leaves little exposed bare ground. There is little soil movement occurring and the soil erosion condition class was determined as stable in 2001 and 2006.

Browse

The browse composition consists primarily of mountain big sagebrush with lesser amounts of serviceberry and antelope bitterbrush. Mountain big sagebrush provides over half of the total browse cover. Sagebrush density was 2,260 plants/acre in 2001, but dropped to 1,260 plants/acre in 2006. Decadence increased from 21% in 2001 to 38% in 2006. Plants classified as dying increased from 8% to 29%. Drought conditions may have contributed to this decline. Annual precipitation was only 69% of normal in 2002 at Kamas (Utah Climate Summaries 2006). Serviceberry numbered 840 plants/acre in 2001 and increased to 940 plants/acre in 2006. Utilization is moderate to heavy, vigor is good, and percent decadence is low at 10%. Only a few bitterbrush plants occur on the site. They showed moderate use in 2001 and heavy use in 2006, vigor was good. Other browse sampled include low numbers of dwarf and stickyleaf low rabbitbrush, broom snakeweed, snowberry, gray horsebrush, and high numbers of Oregon grape.

Herbaceous Understory

The herbaceous understory is moderately abundant but limited somewhat by competition with shrubs and poor site potential caused by the high rock content of the soil. Perennial grasses are diverse but only three species, bluebunch wheatgrass, Kentucky bluegrass, and Sandberg bluegrass are abundant. Annual grasses, Japanese brome and cheatgrass, also occur and were more abundant in 2006 than they were in 2001. Forbs are also diverse with 28 species identified. The only moderately abundant perennial forbs consist of Louisiana sage and silvery lupine which had the highest cover of all forb species. Most other forbs occur infrequently. Little use was found on grasses or forbs.

2006 TREND ASSESSMENT

The browse trend is down. Mountain big sagebrush is the most abundant preferred browse species even though sagebrush density declined 44% in 2006 and decadence increased to 38% of the population. No young plants were sampled either. Winter injury is the likely cause for the decline of sagebrush. Serviceberry is less abundant than sagebrush and more preferred, but increased by 11% in density since 2001. Vigor is also good. Bitterbrush density was also higher in 2006, despite heavy use. The grass trend is slightly down. Perennials species abundance changed very little, but annuals increased by more than two-fold. Japanese brome and cheatgrass each significantly increased in nested frequency. The trend for forbs is similar to grasses as annual forb nested frequency more than doubled. Perennial forb nested frequency decreased by 20%. The forb trend is down. The DCI score declined from good-excellent to fair-good in 2006. Preferred browse cover decreased, percent decadence increased, perennial grass cover was lower, and annual grass cover was higher.

2001 winter range condition (DC Index) - good-excellent (79) Mid-level potential scale
2006 winter range condition (DC Index) - fair-good (67) Mid-level potential scale
browse - down (-2) grass - slightly down (-1) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 9

Type	Species	Nested Frequency		Average Cover %	
		'01	'06	'01	'06
G	Agropyron spicatum	198	205	9.50	8.21
G	Agropyron trachycaulum	17	4	.54	.03
G	Bromus carinatus	$_{a}$1	$_{b}$29	.03	.83
G	Bromus japonicus (a)	$_{a}$135	$_{b}$179	1.26	1.75
G	Bromus tectorum (a)	$_{a}$48	$_{b}$233	.39	3.94
G	Koeleria cristata	8	6	.56	.36
G	Melica bulbosa	-	3	-	.00
G	Oryzopsis hymenoides	-	3	-	.03
G	Poa bulbosa	-	5	-	.06
G	Poa fendleriana	28	23	.23	.48
G	Poa pratensis	$_{b}$87	$_{a}$47	1.56	.68
G	Poa secunda	135	159	1.94	1.86
G	Sitanion hystrix	$_{b}$23	$_{a}$1	.43	.03
Total for Annual Grasses		183	412	1.65	5.69
Total for Perennial Grasses		497	485	14.80	12.61
Total for Grasses		680	897	16.46	18.30
F	Agoseris glauca	$_{b}$7	$_{a}$1	.01	.00
F	Alyssum alyssoides (a)	$_{a}$55	$_{b}$132	.19	.36
F	Allium sp.	36	20	.11	.11
F	Arabis sp.	4	3	.06	.00
F	Artemisia ludoviciana	40	33	1.64	.80
F	Calochortus nuttallii	6	3	.01	.00

Type	Species	Nested Frequency '01	Nested Frequency '06	Average Cover % '01	Average Cover % '06
F	Cirsium undulatum	8	11	.10	.18
F	Collomia linearis (a)	44	29	.12	.27
F	Collinsia parviflora (a)	$_{a}$24	$_{b}$46	.04	.13
F	Cymopterus sp.	$_{a}$3	$_{b}$17	.00	.14
F	Descurainia pinnata (a)	8	2	.01	.01
F	Draba sp. (a)	$_{a}$-	$_{b}$49	-	.44
F	Epilobium brachycarpum (a)	$_{a}$3	$_{b}$72	.01	.27
F	Erodium cicutarium (a)	$_{a}$-	$_{b}$12	-	.03
F	Eriogonum racemosum	$_{a}$4	$_{b}$15	.06	.48
F	Eriogonum umbellatum	4	2	.01	.15
F	Galium aparine (a)	3	2	.03	.00
F	Holosteum umbellatum (a)	7	5	.01	.01
F	Lupinus argenteus	$_{a}$10	$_{b}$16	.97	1.30
F	Microsteris gracilis (a)	$_{a}$2	$_{b}$50	.00	.19
F	Phlox longifolia	14	9	.03	.07
F	Polygonum douglasii (a)	$_{b}$50	$_{a}$14	.18	.05
F	Ranunculus testiculatus (a)	-	4	-	.01
F	Senecio integerrimus	2	1	.03	.03
F	Senecio multilobatus	1	-	.03	-
F	Tragopogon dubius	$_{b}$25	$_{a}$2	.23	.03
F	Viguiera multiflora	3	1	.09	.03
F	Zigadenus paniculatus	-	-	-	.03
Total for Annual Forbs		196	417	0.61	1.80
Total for Perennial Forbs		167	134	3.42	3.39
Total for Forbs		363	551	4.04	5.19

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

BROWSE TRENDS --
Management unit 07 , Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'01	'06	'01	'06
B	Amelanchier alnifolia	34	38	6.10	6.43
B	Artemisia tridentata vaseyana	62	44	15.92	12.15
B	Chrysothamnus depressus	10	11	.45	.45
B	Chrysothamnus viscidiflorus viscidiflorus	5	1	.15	.00
B	Gutierrezia sarothrae	20	14	.98	.48
B	Mahonia repens	37	39	1.29	1.16
B	Opuntia sp.	9	6	.03	.00
B	Purshia tridentata	1	3	1.78	.71
B	Symphoricarpos oreophilus	24	24	1.37	2.37
B	Tetradymia canescens	1	0	-	-
Total for Browse		203	180	28.10	23.79

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 9

Species	Percent Cover
	'06
Amelanchier alnifolia	7.96
Artemisia tridentata vaseyana	9.21
Chrysothamnus depressus	.85
Chrysothamnus viscidiflorus viscidiflorus	.20
Gutierrezia sarothrae	.46
Mahonia repens	.80
Purshia tridentata	1.89
Symphoricarpos oreophilus	3.86

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 9

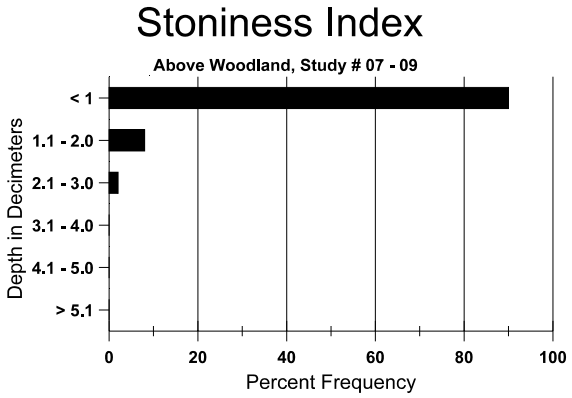
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.6	4.4
Artemisia tridentata vaseyana	1.5	2.2
Purshia tridentata	3.4	4.1

BASIC COVER --
Management unit 07 , Study no: 9

Cover Type	Average Cover %	
	'01	'06
Vegetation	48.56	41.57
Rock	23.71	22.26
Pavement	15.28	7.81
Litter	36.37	32.12
Cryptogams	.39	.57
Bare Ground	5.36	13.60

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 09, Above Woodland

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
6.6	53.0 (6.4)	6.2	36.2	35.4	28.4	3.8	27.6	214.4	0.5



PELLET GROUP DATA --
Management unit 07 , Study no: 9

Type	Quadrat Frequency	
	'01	'06
Rabbit	12	2
Moose	-	3
Elk	15	31
Deer	7	6

Days use per acre (ha)	
'01	'06
-	-
-	-
31 (78)	64 (157)
16 (40)	11 (28)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
01	**840**	20	140	620	80	-	48	26	10	2	7	30/38
06	**940**	20	180	680	80	-	6	72	9	-	2	33/42
Artemisia tridentata vaseyana												
01	**2260**	-	80	1700	480	680	6	0	21	8	8	22/34
06	**1260**	20	-	780	480	640	21	3	38	29	29	22/37
Chrysothamnus depressus												
01	**260**	-	-	260	-	-	0	0	-	-	0	7/14
06	**300**	20	-	300	-	-	0	7	-	-	0	7/14
Chrysothamnus viscidiflorus viscidiflorus												
01	**140**	-	-	140	-	-	0	0	-	-	0	13/15
06	**20**	-	-	20	-	-	0	0	-	-	0	16/21
Gutierrezia sarothrae												
01	**700**	-	60	620	20	-	0	0	3	3	3	8/14
06	**520**	-	20	500	-	-	0	0	0	-	0	7/11
Mahonia repens												
01	**10760**	-	140	10620	-	-	0	0	0	-	0	4/5
06	**8420**	-	180	8220	20	-	0	0	0	-	0	3/4
Opuntia sp.												
01	**340**	-	20	320	-	-	0	0	-	-	0	3/8
06	**120**	-	20	100	-	-	0	0	-	-	0	3/8
Purshia tridentata												
01	**20**	-	-	20	-	-	100	0	-	-	0	26/122
06	**80**	-	-	80	-	-	0	100	-	-	0	21/68
Symphoricarpos oreophilus												
01	**500**	-	20	400	80	-	0	0	16	4	4	18/29
06	**700**	-	40	620	40	-	6	3	6	6	6	16/23
Tetradymia canescens												
01	**20**	-	-	20	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 7-10-06

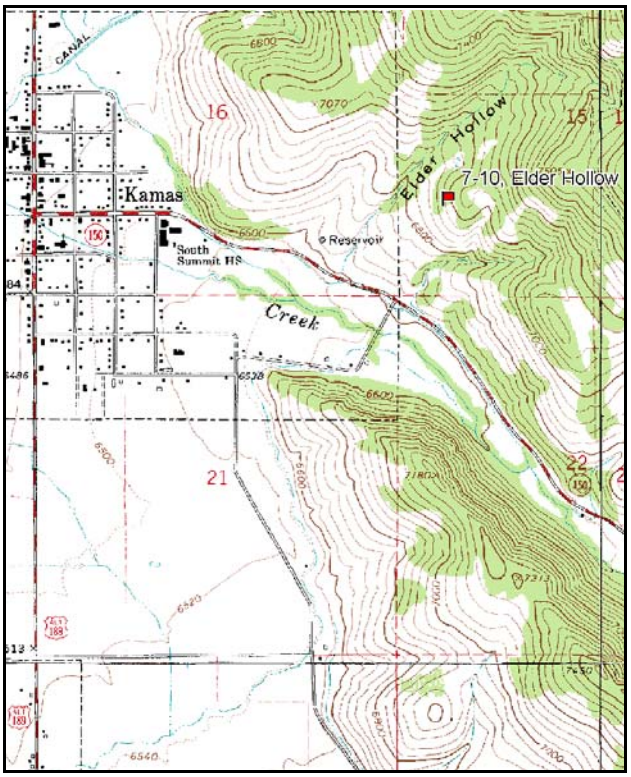
Study site name: Elder Hollow . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 169 degrees magnetic.

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

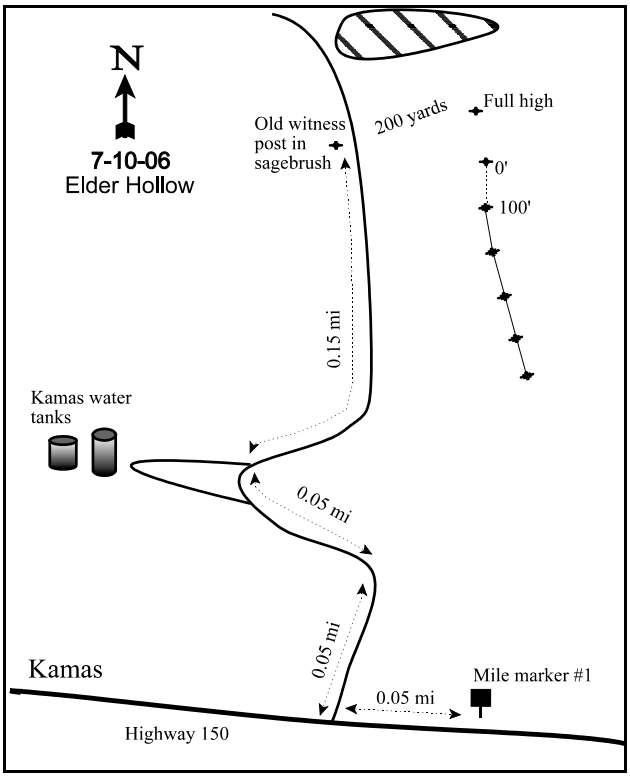
LOCATION DESCRIPTION

Westbound on Highway 150 (Mirror Lake Highway) from mile marker 1, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key. The site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left. The post is in dense sagebrush 3 feet form road. From the post, walk 200 yards at 66 degrees magnetic to a witness post. The 0-foot stake is just a couple of paces south of the witness post. The baseline doglegs down through the same vegetation type. Line 1 runs 169 degrees magnetic. Line 2 runs 151 degrees magnetic. Line 3 runs 149 degrees magnetic. Lines 4 and 5 run 146 degrees magnetic.



Map Name: Kamas

Township 2S , Range 6E , Section 15



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4499007 N 478156 E

DISCUSSION

Elder Hollow - Trend Study No. 7-10

Study Information

The Elder Hollow trend study (elevation: 7,000 feet, slope: 35-40%, aspect: southwest) replaces the Kamas Water Tank trend study established in 1984, which sampled critical deer winter range located immediately east of Kamas. This privately owned site has been intensively grazed by sheep, cattle, and horses for many years. When it was revisited in 1996, the land was for sale, so the study site was moved up the ridge about 200 yards so it could be accessible in the future. There was little sign that the old site was used by wildlife, but the new location has abundant indications of use and is critical winter range. The vegetation type is mountain big sagebrush/grass that also contains a diverse mix of other shrub species. Pellet group quadrat frequency was 45% for deer and 27% for elk in 1996. During the 2001 reading, pellet group quadrat frequency was 39% for deer and only 3% for elk. A pellet group transect read on the site in 2001 estimated 103 deer, 8 elk, and 6 cow days use/acre (253 ddu/ha, 20 edu/ha, and 14 cdu/ha). Animal use in 2006 was estimated at 133 deer, 9 elk, and 3 cow days use/acre (327 ddu/ha, 22 edu/ha, and 7 cdu/ha).

Soil

The Yeates Hollow series consists of deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium and residuum from conglomerate, sandstone and quartzite. These soils are on fan remnants, hills, and mountain slopes (USDA-NRCS 2006). Soil is moderately deep with an effective rooting depth of 14 inches. Texture is a sandy clay loam\loam with a neutral soil reaction (7.0 pH). Rock is common on the surface and throughout the soil profile. Protective ground cover of vegetation and litter is abundant but interspaces between shrubs show signs of localized erosion. Terracing along the slope and soil pedestalling on the uphill side of shrubs is common. The erosion condition class was determined as slight in 2001. Conditions were improved in 2006 and erosion was rated as stable.

Browse

The site supports several preferred browse species. These include mountain big sagebrush, serviceberry, bitterbrush, and snowberry. The key species is mountain big sagebrush which makes up the majority of the browse cover. Sagebrush cover was 22% in 1996, declined to 19% in 2001, and declined further to only 11% in 2006. Density of sagebrush was estimated at 2,540 plants/acre in 1996, 2,140 plants/acre in 2001, and declined to 1,520 plants/acre in 2006. Recruitment has been poor. Decadence was low in 1996 at 20%, but increased to 38% in 2001 and 37% in 2006. Poor vigor increased from only 11% in 2001 to 39% of the population in 2006. Damage from the sagebrush defoliator moth (*Aroga websteri*) was noted in 2006. The decline of this population may also be due in part to drought conditions and in 2002 and 2003 when annual precipitation was only 70% of normal and precipitation at Kamas. January and February precipitation was well below normal (Utah Climate Summaries 2006), which can cause winter injury (Nelson and Tiernan 1983). Annual leader growth was averaging only 1.4 inches in 2001 and 1.7 inches in 2006.

Serviceberry is moderately abundant. Cover was 1-2% from 1996-2006. Utilization has been moderate to heavy with good vigor. Annual leader growth of serviceberry averaged only 2.3 inches in 2001 and 2.5 inches in 2006. The few scattered bitterbrush are heavily browsed but in good vigor. Mature bitterbrush have a low-growing, spreading growth form. Bitterbrush density increased from 60 plants/acre in 2001 to 220 plants/acre in 2006. Utilization was heavy, but vigor was good. A few increaser shrubs are found on the site but most occur in limited numbers. Broom snakeweed was abundant in 1996 and 2001, but was much less abundant in 2006.

Herbaceous Understory

Understory growth is limited because of the slope and aspect, combined with competition from browse species like mountain big sagebrush. A variety of perennial grasses occur on the site but none are abundant. The only common species include Kentucky bluegrass and Sandberg bluegrass. Cheatgrass, an annual, is also

moderately abundant. It accounted for 38% of the grass cover in 1996, 51% in 2001, and 65% in 2006. Cheatgrass sum of nested frequency was significantly higher in 2006 and was sampled in 99% of the quadrats. Forbs are also diverse but most occur only rarely. Common perennials include wavyleaf thistle, redroot eriogonum, silvery lupine, and low penstemon. Annual forbs are also common and produce similar cover as perennial forbs. Annual forbs like pale alyssum, storksbill, and bur buttercup dominate bare areas in the shrub interspaces.

2001 TREND ASSESSMENT

Trend for browse is slightly down. Mountain big sagebrush density has declined slightly (16%). Utilization continues to be moderate to heavy with good vigor on all but 29% of the decadent shrubs. Recruitment is poor. Serviceberry has increased in density, displays moderate to heavy use, good vigor, with no decadent plants sampled. Trend for grasses is stable. Sum of nested frequency for perennial grasses was basically unchanged. The biggest change for perennial grasses is the significant decline in the nested frequency of Kentucky bluegrass. This is somewhat counterbalanced by a significant increase in crested wheatgrass and Sandberg bluegrass. Kentucky bluegrass is still the most abundant perennial grass. Cheatgrass, an annual, provides half of the total grass cover. The forb trend is slightly up as frequency of perennial forbs has increased slightly. Annual forbs increased substantially and currently produce as much cover as perennial forbs. The largest change came from the significant increase in bur buttercup. The Desirable Components Index (see methods) rated this site as fair in 1996 and poor-fair in 2001. The decline was due to increased decadence of sagebrush and less perennial grass cover.

1996 winter range condition (DC Index) - fair (58) Mid-level potential scale
2001 winter range condition (DC Index) - poor-fair (51) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is down. Mountain big sagebrush density declined 29%. Sagebrush cover decreased from 19% to 11%. Sagebrush vigor was poor. Sagebrush defoliator moth and very dry years in 2002 and 2003 have contributed to this decline. Serviceberry density also declined 45%. Bitterbrush density did increase, but is only a minor portion of the total browse cover. The grass trend is down. Perennial grasses were stable, but cheatgrass increased significantly in sum of nested frequency. Cheatgrass quadrat frequency increased from 84% to 99%. Cover was also up to 10%, which can be a fire hazard. The forb trend is down. Perennial forbs decreased in sum of nested frequency and a weedy species like storksbill increased significantly in nested frequency. The DCI score declined to poor. Preferred browse cover was lower and cheatgrass cover increased, which detrimentally effects the site.

winter range condition (DC Index) - poor (39) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 10

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	a16	ab25	b43	.28	.47	1.37
G	Agropyron spicatum	a6	a11	b25	.03	.13	1.07
G	Bromus carinatus	b10	ab2	a-	.08	.01	-
G	Bromus tectorum (a)	a303	a277	b388	3.80	3.95	10.46
G	Carex sp.	17	17	15	.36	.28	.25
G	Oryzopsis hymenoides	-	3	3	.00	.01	.03
G	Poa bulbosa	-	-	11	-	-	.39
G	Poa fendleriana	4	1	4	.06	.00	.18
G	Poa pratensis	c125	b65	a33	4.13	.64	.33
G	Poa secunda	50	74	69	.90	1.96	1.87
G	Sitanion hystrix	13	25	12	.25	.14	.13
G	Stipa comata	-	8	6	-	.06	.04
Total for Annual Grasses		303	277	388	3.80	3.95	10.46
Total for Perennial Grasses		241	231	221	6.12	3.72	5.70
Total for Grasses		544	508	609	9.93	7.68	16.16
F	Agoseris glauca	2	13	11	.00	.05	.08
F	Alyssum alyssoides (a)	272	316	318	1.76	2.36	3.42
F	Artemisia ludoviciana	14	26	18	.22	.58	.40
F	Arabis perennans	6	1	-	.01	.00	-
F	Astragalus convallarius	1	8	7	.00	.21	.12
F	Astragalus sp.	-	-	1	-	.00	.01
F	Astragalus utahensis	1	-	-	.00	-	-
F	Camelina microcarpa (a)	-	6	-	-	.02	-
F	Calochortus nuttallii	6	10	1	.01	.02	.00
F	Chaenactis douglasii	5	-	-	.03	-	-
F	Cirsium undulatum	b35	b32	a9	.56	.91	.69
F	Collomia linearis (a)	a-	b14	ab9	-	.05	.02
F	Comandra pallida	7	9	7	.06	.09	.06
F	Collinsia parviflora (a)	a8	b138	a14	.04	.53	.02
F	Crepis acuminata	-	-	4	-	-	.03
F	Cynoglossum officinale	-	4	-	-	.03	-
F	Draba sp. (a)	24	5	1	.03	.04	.00
F	Epilobium brachycarpum (a)	10	10	3	.02	.03	.00
F	Erodium cicutarium (a)	a1	b38	c86	.00	.89	2.17
F	Eriogonum racemosum	29	21	18	.21	.54	.46

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Eriogonum umbellatum	-	1	2	-	.03	.06
F	Gayophytum ramosissimum(a)	-	-	5	-	-	.04
F	Hackelia patens	-	-	4	-	-	.03
F	Heterotheca villosa	$_{a}$1	$_{ab}$5	$_{b}$13	.03	.40	.48
F	Holosteum umbellatum (a)	$_{a}$1	$_{b}$20	$_{ab}$8	.00	.09	.01
F	Lactuca serriola	-	1	-	-	.00	-
F	Lithospermum ruderale	$_{a}$-	$_{a}$-	$_{b}$11	.15	-	.33
F	Lomatium sp.	-	1	-	-	.00	-
F	Lupinus argenteus	$_{a}$13	$_{b}$45	$_{a}$17	.75	2.53	.60
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$29	$_{a}$6	-	.06	.02
F	Oenothera pallida	3	7	4	.00	.06	.03
F	Penstemon humilis	$_{b}$42	$_{ab}$29	$_{a}$17	.87	.48	.73
F	Penstemon sp.	2	4	2	.00	.03	.15
F	Phlox longifolia	-	3	-	-	.01	-
F	Polygonum douglasii (a)	8	-	4	.01	-	.01
F	Ranunculus testiculatus (a)	$_{a}$60	$_{b}$211	$_{b}$217	.20	2.04	1.33
F	Taraxacum officinale	$_{a}$-	$_{b}$5	$_{b}$2	-	.01	.03
F	Tragopogon dubius	$_{b}$14	$_{ab}$7	$_{a}$-	.08	.06	-
F	Viguiera multiflora	$_{b}$20	$_{a}$6	$_{a}$4	.16	.06	.18
F	Zigadenus paniculatus	3	7	2	.01	.10	.06
Total for Annual Forbs		384	787	671	2.08	6.15	7.07
Total for Perennial Forbs		204	245	154	3.21	6.26	4.57
Total for Forbs		588	1032	825	5.30	12.41	11.65

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

BROWSE TRENDS --
Management unit 07 , Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	20	31	21	1.53	1.84	1.36
B	Artemisia tridentata vaseyana	74	73	56	21.76	18.50	10.86
B	Chrysothamnus depressus	3	3	3	-	-	-
B	Chrysothamnus nauseosus albicaulis	1	2	0	-	.03	-
B	Chrysothamnus nauseosus consimilis	0	1	0	-	.03	-
B	Chrysothamnus viscidiflorus viscidiflorus	5	10	7	.53	.19	.62
B	Eriogonum heracleoides	1	1	0	-	.00	-
B	Gutierrezia sarothrae	38	42	28	1.24	1.41	.25
B	Mahonia repens	4	2	1	-	-	-
B	Opuntia sp.	17	13	16	.54	.16	.27
B	Prunus virginiana	1	0	0	-	-	-
B	Purshia tridentata	4	3	6	.56	.53	.41
B	Symphoricarpos oreophilus	38	46	48	3.80	6.99	4.78
B	Tetradymia canescens	14	14	15	.21	.46	.62
Total for Browse		220	241	201	30.20	30.17	19.19

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 10

Species	Percent Cover '06
Amelanchier alnifolia	2.61
Artemisia tridentata vaseyana	12.56
Chrysothamnus depressus	.18
Chrysothamnus nauseosus albicaulis	.35
Chrysothamnus viscidiflorus viscidiflorus	.55
Gutierrezia sarothrae	.36
Opuntia sp.	.16
Purshia tridentata	.76
Symphoricarpos oreophilus	7.81
Tetradymia canescens	.85

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 10

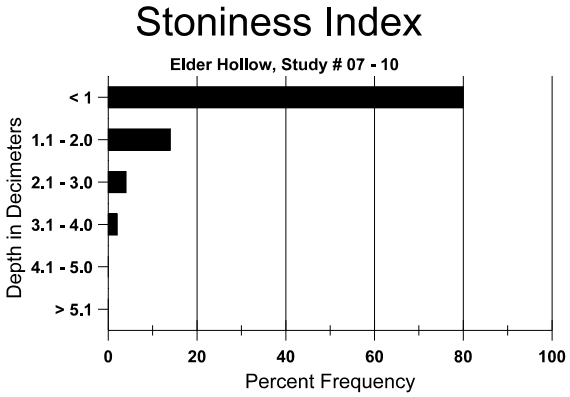
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.3	2.5
Artemisia tridentata vaseyana	1.4	1.7

BASIC COVER --
Management unit 07 , Study no: 10

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	41.93	46.54	43.02
Rock	22.34	19.41	21.83
Pavement	4.72	4.82	4.77
Litter	43.82	38.67	29.56
Cryptogams	.26	.32	.30
Bare Ground	6.30	13.25	13.17

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 10, Elder Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.1	38.4 (13.2)	7.0	48.2	27.1	24.7	3.7	16.6	198.4	0.6



PELLET GROUP DATA --
Management unit 07 , Study no: 10

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	4	10
Elk	27	3	-
Deer	45	39	56
Cattle	-	-	1

Days use per acre (ha)	
'01	'06
-	-
8 (20)	9 (22)
102 (253)	133 (327)
6 (14)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	**520**	-	40	480	-	-	35	54	-	-	0	22/29
01	**840**	-	60	780	-	-	45	33	-	-	2	23/30
06	**460**	-	40	420	-	-	9	87	-	-	0	27/31
Artemisia tridentata vaseyana												
96	**2540**	-	160	1880	500	880	50	28	20	3	3	20/44
01	**2140**	-	40	1280	820	560	50	17	38	10	11	22/39
06	**1520**	20	80	880	560	680	37	24	37	24	39	22/40
Chrysothamnus depressus												
96	**100**	-	-	100	-	-	0	0	-	-	0	7/17
01	**100**	-	-	100	-	-	40	0	-	-	0	5/16
06	**60**	-	-	60	-	-	0	0	-	-	0	7/18
Chrysothamnus nauseosus albicaulis												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	0	0	-	-	0	50/53
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus consimilis												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	20	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
96	**160**	-	40	120	-	-	0	0	0	-	0	11/19
01	**340**	-	-	340	-	-	18	18	0	-	0	8/75
06	**260**	-	-	240	20	-	31	0	8	-	0	11/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Eriogonum heracleoides												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	8/15
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
96	**4100**	40	700	3400	-	-	0	0	0	-	0	8/12
01	**3100**	-	120	2980	-	80	0	0	0	-	0	7/8
06	**1140**	40	140	980	20	-	5	0	2	2	2	7/8
Mahonia repens												
96	**100**	-	-	100	-	-	0	0	-	-	0	4/4
01	**180**	-	-	180	-	-	0	0	-	-	0	2/3
06	**40**	-	-	40	-	-	0	0	-	-	0	-/-
Opuntia sp.												
96	**560**	-	20	520	20	-	0	0	4	4	7	4/12
01	**340**	-	60	280	-	-	0	0	0	-	0	4/8
06	**400**	-	80	280	40	20	0	0	10	10	10	4/14
Prunus virginiana												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
96	**80**	-	-	80	-	-	0	100	-	-	0	10/51
01	**60**	-	-	60	-	-	33	67	-	-	0	9/50
06	**220**	-	-	220	-	-	18	73	-	-	0	9/32
Symphoricarpos oreophilus												
96	**1260**	20	220	1020	20	-	10	0	2	2	2	21/30
01	**1200**	20	140	1040	20	-	7	2	2	-	0	22/33
06	**1600**	20	140	1420	40	-	9	1	3	-	0	24/35
Tetradymia canescens												
96	**480**	-	120	320	40	-	0	0	8	4	4	8/18
01	**440**	-	20	400	20	-	14	0	5	-	0	9/14
06	**480**	-	40	380	60	-	8	0	13	4	4	11/21

SUMMARY

HERD UNIT 7 - KAMAS

Seven trend studies occur in Wildlife Management Unit 7. These studies were established in 1984 and reread in 1990, 1996, 2001, and 2006. In 1996, the Kamas Water Tanks trend study was moved and renamed Elder Hollow (7-10). In 2001, Stevens Hollow (7-1) was discontinued and the trend study, Above Woodland (7-9), was moved to a nearby more suitable location. Due to the change, the Above Woodland trend study is treated like a new site with baseline data available in 2001. All trend studies sample big game winter ranges, however five trend studies are above 7,000 feet making them available only during normal winters. Two studies formerly in unit 7 (Hailstone and Provo River Canyon) have been moved to unit 17 after boundary changes were made.

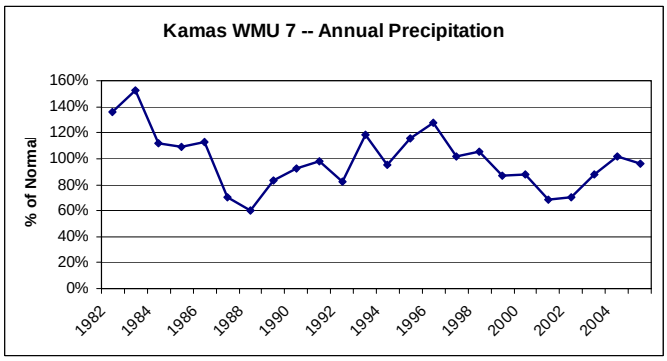


Figure 1. Percent of normal annul precipitation for Kamas, Utah from 1982 to 2006 (Utah Climate Summaries 2006).

Precipitation data at Kamas from the period of range trend sampling shows five years that would be considered drought (less than 75% of normal annual precipitation): 1987, 1988, 1992, 2001, and 2002 (Figure 1). Spring precipitation (April-June) was less than 75% normal precipitation in eight years: 1987, 1988, 1989, 1992, 1994, 2000, 2001, and 2002 (Figure 2). Spring precipitation is critical for herbaceous plants and shrub recruitment. In 2000, spring precipitation (April through June) was only 50% of normal. In 2001, spring precipitation was 72% of normal. Spring precipitation in 2002 was extremely rare at 34% of normal. Trend studies were originally established in 1984 during the middle of an extended wetter than normal period (Utah Climate Summaries 2006).

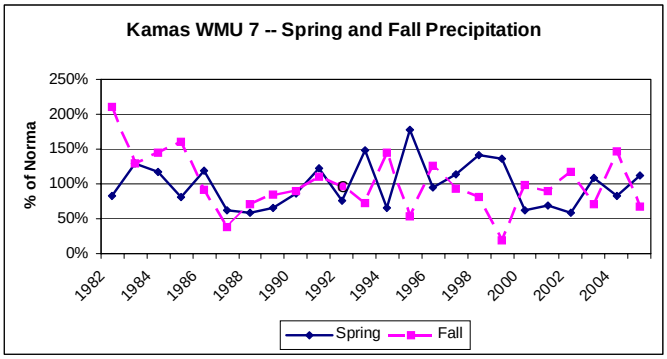


Figure 2. Percent of normal precipitation for spring and fall at Kamas, Utah from 1982 to 2006 (Utah Climate Summaries 2006).

The cumulative browse trends (Figure 3) for the entire unit showed a close to stable trend until 2001. The average browse trend for 2006 was -1.3. Two studies were stable and four were down. The downward trends in 2006 were due to declines in mountain big sagebrush populations. Average sagebrush density (Figure 4) in 1996 and 2001 was about 1,460 plants/acre and declined to 973 plants/acre in 2006. Average sagebrush decadence (Figure 5) increased from 17% in 1996 to 27% in 2001 and 2006. It appears that as percent decadence increased in 2001 many of these plants had died off by 2006. Average sagebrush cover (Figure 6) also decreased from 10% in 2001 to 8% in 2006. Drought conditions during 2001 and 2002 may have contributed to this decline. Dry conditions during winter months may have caused sagebrush winter injury (Nelson and Tiernan 1983). Evidence of the sagebrush defoliator moth was also noted in 2006 on the Elder Hollow study.

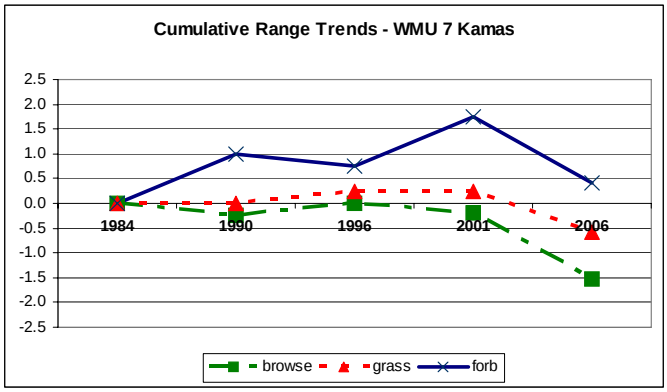


Figure 3. Cumulative range trends for WMU 7 Kamas.

Grass and forb trends have been relatively stable for this unit (Figure 3). The grass trend on average was slightly down in 2006 (-0.8), with an increase in cheatgrass frequency (figure 7). Bulbous bluegrass is only abundant on the Cedar Hollow study. Perennial grasses were only slightly less abundant in 2006. The forb trend was on average slightly down (-1.3) in 2006. Average sum of nested frequency for perennial forbs decreased 17%. Annual forbs increased on half of the trend studies in this unit.

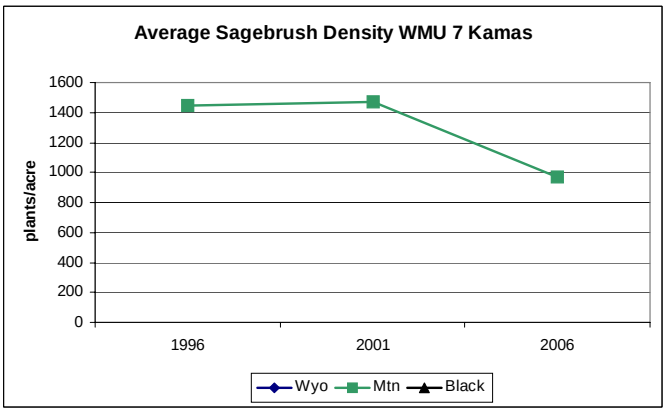


Figure 4. Average sagebrush density for unit 7 Kamas from 1996 to 2006.

The unit wide average Desirable Components Index rating (Figure 9) has remained stable with a fair rating for the three higher potential studies. Greater amounts of preferred browse cover would increase these scores. The mid-level studies ratings were poor in 1996 and 2006. High annual grass cover (Figure 8) contributed to this rating . Decreases in mountain big sagebrush cover (Figure 6) also caused the average rating to decline from fair to poor in 2006.

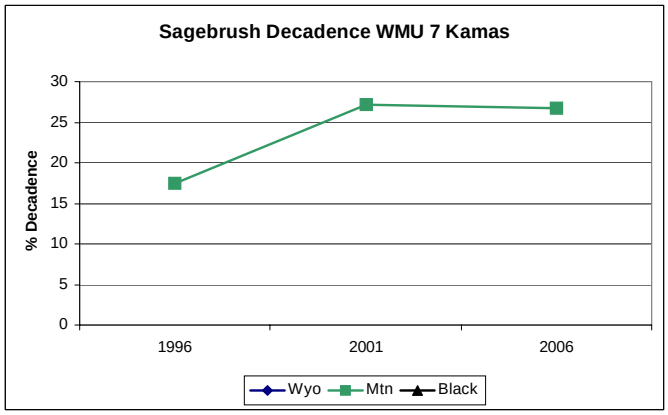


Figure 5. Average sagebrush percent decadence for unit 7 Kamas from 1996 to 2006.

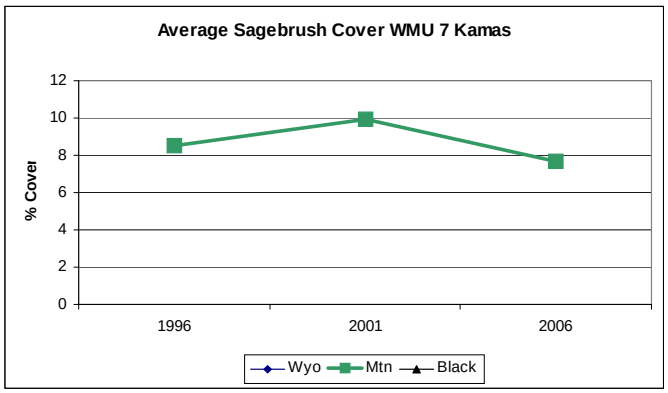


Figure 6. Average sagebrush cover for unit 7 Kamas from 1996 to 2006.

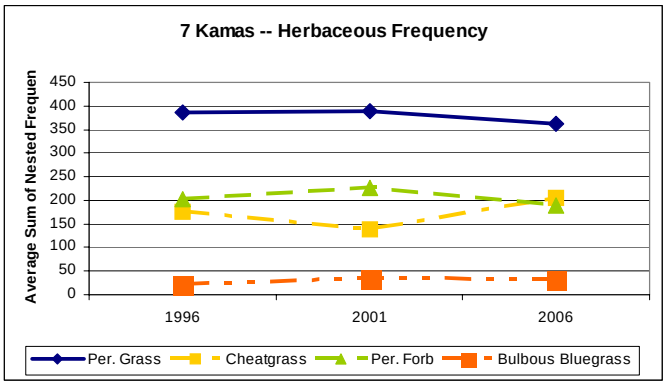


Figure 7. Average sum of nested frequency for perennial grasses, cheatgrass, perennial forbs, and bulbous bluegrass for unit 7 Kamas, from 1996 to 2006.

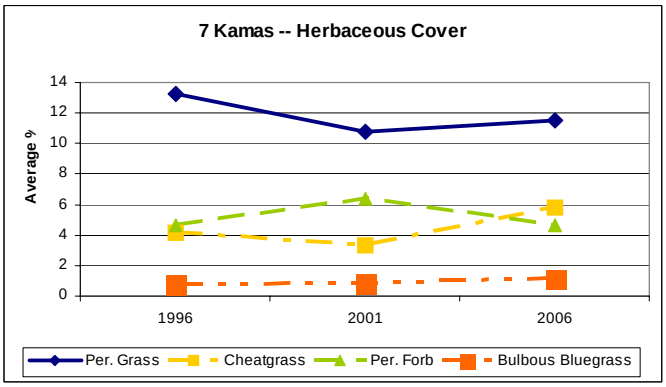


Figure 8. Average percent cover for perennial grasses, cheatgrass, perennial forbs, and bulbous bluegrass for unit 7 Kamas, from 1996 to 2006.

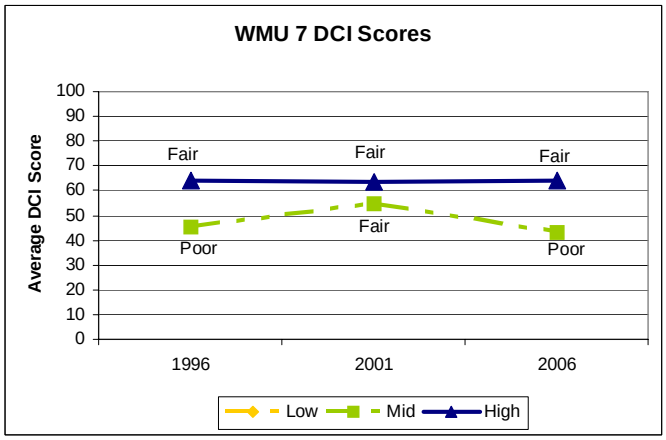


Figure 9. Average Desirable Components Index (DCI) ratings for Unit 7 Kamas, from 1996 to 2006.

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